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MASTERARBEIT / MASTER'S THESIS

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**Imagining technological futures:
Transnational feminist tech and data activism as a counter-dynamic in global processes of digitalisation**

verfasst von / submitted by

Anna Katharina Osterlow

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

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Abstract
In the literature and popular discourse, the buzzword digitalisation and the processes associated with it are often tied to ideas about technological progress and modernity, explaining it as an evolutionary, universal development, driven by dominant technology firms or at times as a self-driven transformation. This analysis sheds light on the ways in which digitalisation dynamics are negotiated, approached and shaped by transnational feminist tech and data activist networks. Therefore, diverse feminist engagements with data and technology in virtual and physical spaces are empirically mapped, by tracing the transnational encounters, flows and created sites of knowledge production between the actors in these networks. Based on their digital self-documentation and online material as historical sources, it is carved out, how the feminist actors imagine, envision and practice technological development and work with data. By outlining these engagements as part of the wider global competitions for power over shaping technological futures and claims about space connected to them, the analysis further makes a conceptual contribution to discussions on digitalisation. Contemporary feminist activism is thereby situated before the historical narratives of modernity, innovation and technology development, used by dominant actors to make claims about spaces and power. Further, the dynamic, fast-changing feminist activism is examined in the context of earlier feminist thoughts and engagements with technology and data. It is thus outlined, how technology and data are envisioned from intersectional feminist perspectives, producing counter imaginaries that compete with common ideas about technological progress, and digitalisation as a universal, linear process.

Zusammenfassung
Ausgehend von Ideen eines technologischen Fortschritts und damit einhergehenden Modernisierung werden Digitalisierung und damit assoziierte Prozesse wie die gestiegene Nutzung von Informations- und Kommunikationstechnologien überwiegend als evolutionäre, universelle Entwicklung beschrieben. In der Literatur und im öffentlichen Diskurs werden vor allem dominante Technologieunternehmen als Treiber einer solchen Entwicklung beschrieben oder als Initiatoren einer verselbstständigten Transformation. Die vorliegende Analyse beleuchtet den Daten- und Tech-Aktivismus von transnationalen feministischen Netzwerken als Gegendynamik in globalen Prozessen der Digitalisierung. Den Ansatzpunkt hierfür bieten die virtuellen sowie physischen transnationalen Begegnungen, Wissenstransfers und Verbindungen zwischen den feministischen Akteuren. Die materialreiche, von den feministischen Kollektiven erstellte Selbstdokumentation auf Internetseiten und in online Datenkollektionen dient dabei als empirische Basis, um die feministischen Imaginationen und Vorstellungen eines „technischen Globalen“ aufzuzeigen. Die somit kreierte feministische Netzwerk-Infrastruktur wird dabei als innovative Auseinandersetzung mit Technologie- und Datennarrativen sichtbar durch welche dominante Vorstellungen von technologischem Fortschritt und Digitalisierung als linearem universellem Prozess hinterfragt und verhandelt werden. Die Aneignung und Umformulierung von Visionen einer technologischen Zukunft wird dabei vor dem Kontext historischer Narrative verordnet, welche die Idee von technologischer Überlegenheit mit der Legitimierung von Raum- und Machtübernahmen verknüpften. Ebenso werden die hier betrachteten intersektionalen feministischen Aktivismen vor dem Hintergrund früherer feministischer Kämpfe um Handlungsmacht in Bezug auf Technologie und Daten betrachtet. Die feministischen Praktiken und Re-Konzeptualisierungen in Bezug auf verschiedene Digitalisierungsprozesse werden somit als Gegendynamik sichtbar, welche mit den Vorstellungen von Technologieentwicklung und Datenregimen dominanter Akteure in Verhandlung treten.

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Abbreviations

DIT	Do-it-together
DIWO	Do-it-with-others
DIY	Do-it-yourself
DOCC	Distributed Open Collaborative Courses
ETC	Eclectic tech carnival (festival)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IBM	International Business Machines Corporation
ICT	Information and Communication Technologies
ILDA	Iniciativa Latinoamericana por los Datos Abiertos
MOOC	Massive Open Online Courses
NASA	National Aeronautics and Space Administration
STEM	Science Technology Engineering and Math
TEAW	Through the Eyes of African Women
THF!	Transhackfeminist festival

1. Introduction

There are diverging visions of a "technical global" and what this constitutes. Recently, the Global Affairs President at Meta, formerly Facebook, Nick Clegg (2022) described the popularly announced "metaverse" as the next upcoming technological innovation and logical evolution of the progression of digital technologies. On the company's website, they inform the reader how this innovation is driven by "the leaders developing new technologies [at] Facebook Reality Labs, Instagram […] and WhatsApp" (Meta 2022). The future, Clegg (2022) imagines, offers a "digital transformation", with innovations in the form of new tech products for the metaverse, and side effects such as economic possibilities, job creation and positive social changes. Moreover, he states that: "like the internet, the metaverse will be an interconnected system that transcends national borders", so that "as many new platforms, technologies and companies [as possible, are] to be created – to maximize the number of Metaverse [sic] users, and the devices it reaches" (ibid.).

This euphoric description contrasts with rather concerned positions which underline the complex relationship between user agency and corporate control within the commodified and modulated environments created with technical devices (Verstraete 2014). Furthermore, critical perspectives on a proclaimed globally connected tech-world point to issues of global e-waste chains (Ntapanta 2021; Taffel 2016; Pickren 2014; Sovacool 2019), territorial fights of indigenous people in face of resource extraction by foreign companies (Bebbington and Bury 2021; Kwet 2022) and an exploitive international division of labour, which links the consumers of digital devices in countries of the Global North in new ways to workers in the Global South, who work in the production and recycling of these devices (Anwar and Graham 2021; Graham and Haarstad 2011; Radhuber 2015; Taffel 2022). Connected to these critical standpoints are arguments about the usage of digital data and an observed "datafication". In this regard, data is described as a "new asset class", with promising opportunities for capital (Aronova, Oertzen, and Sepkoski 2017, 2; World Economic Forum 2011). Further, this hype about Big Data produces new knowledge systems, which take quantitative size as a guarantor for objectivity (boyd and Crawford 2012; R. L. Hill, Kennedy, and Gerrard 2016, 333f.). As a consequence, the collection and interpretation of data influence the formation of new elites, and their growing wealth and capital, while indirect harm is produced to those suffering from abusive government surveillance and data discrimination (Aronova, Oertzen, and Sepkoski 2017, 4).

These are rather general, contrasting perspectives on a globalised technological present and future, but they reveal the underlying, diverging imaginaries that determine which roles are

assigned to technology and data. Yet, these imaginaries are rooted in historical narratives and approaches to technology and practices of data collection. Technology and data have historically provided particular thought concepts and powerful instruments for actors, to enforce their visions of social orders and spaces (Adas 1989; Appadurai 1993; Jasanoff 2015; Kerr 1995; Tatarchenko 2019; Echterhölter 2020). Thus, the different historical imaginaries impact how technology and digitalisation are thought and negotiated today and who is considered a driver of technological innovation. It is often big tech companies or start-ups in tech-concentrated sectors, that are considered innovators and providers of a technological future, like companies from Silicon Valley, new high-tech developers from Asian countries or tech-hubs in the Kenyan capital Nairobi (C. Daniels 2017, 173; Henton and Held 2013; Koepp 2002; Friederici 2018; Horowitz and Botero 2020; Qiu and Chen 2019). Workers from countries in the Global South, who train and shape digital technologies, like self-driving cars, or machine learning and recommendation systems, under precarious conditions (Anwar and Graham 2020), are seldomly recognised as drivers of innovation; neither are the users, who improve the digital applications and gadgets through their information and usage patterns (Odumosu 2017; Nafus 2014).

There is, however, a multitude of different actors that affect the way technological and data futures are imagined and the practices that emerge with these imaginaries. The various processes which are part of digitalisation dynamics are negotiated from the diverse standpoints of more and less powerful actors with different interests. This thesis thus sheds light on how innovation and development, data futures and socio-technical visions are imagined from alternative perspectives. Therefore, I examine contemporary feminist activist engagements with tech and data, situating these in the wider global dynamics that influence digitalisation outcomes.

The analysis empirically maps a network of transnational feminist actors, which are engaging in the competition for shaping technology and data concepts within larger processes of digitalisation. I thereby document a rapidly changing dynamic of feminist activism that is reported in its majority online but takes place both virtually and on the ground. The constant movement and transformation of this activism result partly from the fast nature of the internet. During the research for this thesis, a lot of the websites and other collected online contents disappeared online and are no longer accessible, as websites expired, were updated or shifted. Further, some activist groups and collaborations ceased their activities, transformed into new organisations or started with new types of activities. Moreover, new actors emerged and new connections between them. At the same time, there is not much academic literature or analytical

documentation on the transnational networks and linkages that feminist data and tech activists build. Some of the literature takes up feminist hackerspaces, as a form of feminist tech activism (Dunbar-Hester 2022; Toupin 2020; Savic and Wuschitz 2018). Hackerspaces are a sort of publicly accessible laboratories, where "anyone can access the tools to hack and make", tinker and experiment with open technology in any form (Davies 2018, 356; Dunbar-Hester 2020, 6). These studies explain the building of feminist hackerspaces as a claim of agency in the technology sector and male-dominated hacker culture. However, they are not related to the larger global dynamics in which they operate and which they aim to influence from their local perspective. Further, "hacking" is a term mainly coined from a *white,* Western lens (Dunbar-Hester 2020, 38), which, defined in narrow terms, excludes other forms of tech activism. Moreover, there is no strand in literature which investigates feminist tech and data activists as intertwined actors that engage in transregional dynamics from similar perspectives and visions.

This thesis responds to these gaps in the literature, by mapping the feminist tech and data activist initiatives, tracing the linkages between them and portraying two dynamical, related actor networks. It further offers a conceptual contribution by outlining these feminist engagements as competing visions in global negotiations on technical futures and the feminist activists as drivers of a diverging dialectic within processes of digitalisation and globalisation. From this perspective, the analysis identifies how imaginaries about technology and practices associated with digitalisation are articulated, negotiated and appropriated by the transnationally connected feminist actors. The thesis takes up primarily dominant Western perspectives on technology, centring on feminist actors that engage with these particular imaginaries. Consequently, despite the transnationality of the activist networks, the analysis focuses more on European, North and South American feminist initiatives, with some examples from Asian and African countries. This focus emerges due to the chosen analytical lens on hackerspaces and particular forms of feminist activism, which is discussed in detail in sections 3.1 and 3.5.

The lens on "imaginaries" thereby serves as an entry point to get an understanding of the competition between actors within these processes. Following Jasanoff (2015, 22), an analytical perspective on "imaginaries" is used to identify how the activists envision specific futures and translate them into social orders, technological projects and political systems. This includes the analysis of the practices through which these imaginaries are embodied and the ways different data and technical imaginaries are used to pursue particular interests. From this perspective, I examine how processes associated with digitalisation - like innovations in data and technology, the use of Big Data as a popular concept, or the development of technological artefacts - are imagined by feminist activists.

The thesis is structured into four chapters, starting with this introduction. Chapter two discusses how technology is and was used by different actors to make claims about spaces and orders on national and global levels and how dominant narratives about technology and innovation emerged from this. This provides an outline of the theoretical perspectives on globalisation and digitalisation that guide the later analysis. Further, the chapter offers a literature review and overview of the trajectories of feminist discourses on technology over time, to situate the material of the analysis within this framework of feminist activism. Chapter three maps the feminist engagements with technology and data and starts with an explanation of how the material was selected and what methodological considerations informed the analysis. The thesis ends with a discussion of the limits of the analysis and a conclusion, which highlights the transnational networks of feminist activists as relevant actors competing with dominant players over meanings and space within the larger processes of digitalisation.

2. Negotiated Imaginaries: Technology and claims of space in a global perspective

In this chapter, I explain the theoretical perspectives that inform the later analysis. Based on these perspectives, the examined feminist dealings with data and technology are outlined as strategies of engagement in the global dynamics connected to digitalisation and technological development. Therefore, dominant narratives on digitalisation and globalisation are reflected through a critical theoretical lens. Globalisation theories provide a fruitful angle to examine the buzzword "digitalisation", as both terms are often used interchangeable, thought together and related to entangled dynamics. This broader perspective is then further related to understandings of technological innovation and technology development.

A more technical definition of the term "digitalisation" in English-language dictionaries offers a description of two distinct but related processes: the action of changing an item, such as a document into a digital form, meaning into a form that is readable by a computer (something is "digitalised") and the "adoption or increased use of digital or computer technology [in all life domains]" (Cambridge Dictionary 2022; Oxford English Dictionary 2022). Digitalisation, as the process of changing the nature of an information or data object, leads back to the emergence of a conceptual distinction between analogue and digital, which arose during the 1940s (Haigh 2019, 4f.). "Digital" was then associated with "non-material", although the distinction describes more accurately the forms in which a machine presents the solution of a mathematical problem (ibid., 4). Digital, in contrast to analogue machines, present the results of mathematical problems as a series of digits (ibid.). Based on this latter distinction, "digital data" refers to the

form of binary digits (bits): the transformation of analogue signals into discrete digital signals, readable as binary values like yes/no; true/false; 0/1 (Reigeluth 2014, 244). The distinction between analogue and digital evokes the idea of digital data as immaterial or dematerialised. However, the construction of huge data centres or the interconnections between digital devices based on data challenge this assumption (ibid.).

Other terms which are used in the literature to refer to similar processes are "digitisation" and "datafication". Digitisation, equally as the dictionary proposes for digitalisation, refers to the transformation of analogue information into a digital format consisting of numerical code series, readable by a computer (Brennen and Kreiss 2016, 1). Datafication in contrast is defined as a broader endeavour, encompassing the (systematic) collection of "all aspects of life […,] turning them into data" (Cukier and Mayer-Schönberger 2014, 35). Connected to the second definition in the dictionary, Brennen and Kreiss (2016, 1) also describe digitalisation as "the way many domains of social life are restructured around digital communication and media infrastructures", hinting at socio-cultural aspects tied to the phenomenon. In this direction, the wording "digital turn or "digital transformation" is also popularly used, to describe the restructuring of academic, socio-cultural or political fields as a consequence of the increased use of digital means (Ash, Kitchin, and Leszczynski 2015; Datta 2018; Westera 2012; Pfeiffer 2021; Haigh 2019, 12).

One example of this is the popularity of the concept of Big Data, which builds the basis for a lot of contemporary digital technologies, and the algorithms embedded in their software (Bolin & Andersson Schwarz, 2015, p. 1) and which is further used in research and the development of policies and governance (Cukier and Mayer-Schönberger 2014; Goldstein and Dyson 2013). Aronova et al. (2017, 3) differentiate between Big Data as a twenty-first-century cultural phenomenon and Big Data as a specific way of doing science based on data, with more profound historic roots. The discussions on these concepts and their portrayal as "new phenomena" show how particular understandings of them are rooted in time and place and are thereby related to time-specific thought concepts. A technical understanding of Big Data characterises it as data in high-volume, high-velocity and high-variety (Chen and Yu 2018, 2) but again, the term is also related to "datafication" as a restructuring process (Cukier and Mayer-Schönberger 2014, 29). In this direction, Gieseking (2018, 151) argues that "scale is socially constructed through political and economic processes", and boyd and Crawford (2012, 663f.) propose the written capitalisation of Big Data, to define it not only as a technological but also cultural and scholarly phenomenon. Big Data is accordingly understood as a thought programme (Beer 2016), adding a sociocultural perspective to the definition.

This perspective brings up the question about the point in time when this "restructuring" and "increased use of computer technology and datafication" might have started. Often, the roots of these processes are located in the period between the 1930s and 1950s, with a geographical focus on the work in computing done in the United States (US), the growing popularity of the general-purpose digital electronic computer and the creation of the internet (Haigh 2019, 12f.). Nevertheless, it remains a point of discussion if a clear starting point can be defined at all. The analytical distinctions rely on social and cultural phenomena, which lead to multiple understandings of what constitutes digitalisation. Haigh (ibid.) therefore proposes the "early digital" not as a clear epoch in a society, but as a context-dependent change of a particular practice within a particular community.

2.1 Entangled dynamics: digitalisation from a perspective of globalisation

From a globalised perspective, the production of new technologies and infrastructures provides novel possibilities for actors to shape dynamics in global spatialisation processes (Marung and Middell 2019b, 1). Accordingly, digitalisation is a part of diverging globalisation processes (Middell 2019, 44f.). However, globalisation is sometimes framed as a driving force of digitalisation while at other times digitalisation is thought to drive globalisation. Regarded as the same process, dominant views in academic literature and popular discourse conceptualise both terms in similar ways. For example, digitalisation is described as a linear process that encompasses the increasing adoption of digital technology, diffused by Western countries (Skare and Riberio Soriano 2021; Medina, Marques, and Holmes 2014b, 2). Inherent to this idea is a narrative about the world becoming more connected or uniform, through new technologies. Especially with the outbreak of the Covid-19 pandemic and the experienced containment of physical exchanges in the local and over national borders, "digital spaces" and technological structures received attention as solutions for interactions in the future (Magis-Weinberg 2021; United Nations 2020; Gabbiadini et al. 2021; Shah et al. 2020). New communication infrastructures and habits would make the connected world become "even more connected through virtual face-to-face interaction" (Patra et al. 2020, 50).

Referring to a supposed newness and disruption, digitalisation is further designated as difficult to grasp as there is no adequate language to describe its consequences (Jaekel 2017, 8). It is portrayed as a process that happens naturally, developing (almost mystically) on its own and although it was started by humans, spreads now without human action (ibid.). This perspective further views digitalisation as a single process, which, once set into motion, now develops autonomously on its own. "Technology" as a central aspect of digitalisation is thereby

associated with actor-like characteristics, enforcing digitalisation through becoming uncontrollable, almost independent from its human creators (ibid.). The effects are moreover outlined as new, bringing about a sudden change to life structures and forms of organisation (Morley 2013, 4).

Consequently, digitalisation gets attached to a particular idea of globalisation, called by Morley (2013, 4) the "globalisation thru [sic] technology"-view. Following this view, globalisation and digitalisation both entail as key elements the transfers and diffusion of technology, dominantly from so-called developed countries to the developing regions (Herlea and Weber 2002, 25; George 2019, xxi; Morley 2013, 4f.). According to this narrative, especially big US-American technology companies summarised under the acronym "GAFAM" (Google, Apple, Facebook/Meta, Amazon and Microsoft), are considered the drivers of a global process of digitalisation, that encompasses the unilinear diffusion of technology and leads to increasing cultural uniformity in the world (Herlea and Weber 2002, 25f.; George 2019, xxi; Mavhunga 2017, 5). These narratives, as Morley (2013, 4) writes, "reduce the whole of history to one Big Story" of globalisation and digitalisation.

Conceptualising globalisation in these ways, however, overlooks the historical rootedness of these dynamics and obscures the motivations, interests and contradictions of different actors involved in them. For example, in the case of IBM's history in Chile, Medina (2008) demonstrates how the narrative of a "neutral" technology transfer overlooks the interests and strategies of the firm, of expanding its power and maintaining its market position in "foreign" countries. By adapting to changing political contexts and strategically using the mainframe computer technology in different locations, IBM also pursued its interest in building a global workforce and keeping up an international presence (ibid., 35).

Marung and Middell (2019a) exemplify in their volume "Spatial Formats under the Global Condition" how globalisation follows dialectic trends, involving various different actors, who compete over imaginations and meanings, by engaging in practices of space-making and by redefining spaces. Approaching the dynamics summarised under the term "globalisation" from an actor-centred perspective allows to examine processes of negotiation and involved power relations. It also shifts the understanding of the historically rooted processes as being one singular process or naturally unfolding (ibid., preface).

Identifying digitalisation and globalisation as entangled and part of the same dialectic dynamics, the later analysis carves out conflicting interests and ideas in the claims made about global orders and spaces through diverging understandings of technology. Locating the

engagement with technology and the diverging imaginations of digitalisation against the background of power relations brings the involved negotiation processes to the fore. Thus, taking up the conceptualisations in the volume, digitalisation is analysed as a "dialectic of flows" (Marung and Middell 2019b, 1) and a multiplicity of processes enacted by competing actors. The interactions between people (ibid., 4) and their practices and engagements with technology and tech spaces are regarded as driving these dialectics. Thereby, the circulation of ideas and cultural transfers (Middell 2019, 37) is considered a condition of digitalisation dynamics, focusing on the examination of exchanges, choices, reciprocal transfers, and knowledge mobilities (Pollock and Subramaniam 2016, 953). Changing dynamics are considered a potential for actors, which might reproduce or restructure these dynamics through new technologies (Marung and Middell 2019b, 1f.). Accordingly, new and old technologies provide instruments and influence the power of those engaging in space-making and globalisation projects (Jasanoff 2015, 23).

Technology and the spaces where it is created imagined and used, become crucial aspects in the making and claiming of spaces and spatial formats (Jasanoff and Kim 2015). The above-mentioned narratives of North American companies as drivers of globalisation through technology development are one example of how technology is seen as involved in forming a "new world order" (Marung and Middell 2019b, 1). The multiple examples of the connections between technology and the production of space in history are discussed in the next section. Furthermore, the imaginations and envisioned spaces entail visions about related concepts of technological innovation and development, which are equally discussed. Based on these perspectives, I examine how the visions of technological development are articulated, negotiated and appropriated by actors engaging with technology and digital data activism. To shed light on the complexity and dialectic of what is termed digitalisation, the later analysis carves out how these actors build networks, create alternative visions and innovate, thereby challenging the imagined formats of those who are explained as the drivers of digitalisation and globalisation.

2.2 Technology and projects of space making

Looking at examples in the history of technology makes clear how different actors linked technology to claims about society and used technology to produce and maintain envisioned spatial formats (Adas 1989; Jasanoff 2015, 22). Thereby the usage and production of technology are tied to actor-specific imaginations about global social orders and claims to power.

For example, technology played a crucial role for the Soviet state in the shaping of particular socialist versions of modernity (Tatarchenko 2019). During the Cold War period, Soviet mass production and widespread use of calculators were overlooked from a Western perspective, which focused on personal computers as embodying Western values of free information, self-determination and ideas about capitalist modernity (ibid.). Sociotechnical imaginaries are also enforced by state actors, for instance in the making of a modern Post-genocide Rwanda through large governmental spending on Information and Communication Technology (ICT) infrastructures. Another example is the creation of an Austrian technopolitical identity against the backdrop of nanotechnologies (Bowman 2015; Felt 2015). In the latter case, Ulrike Felt (2015) shows how citizens actively participate in countering or enforcing imaginaries in relation to pre-existing sociotechnical visions about Austria as a nation, and thereby shape particular versions of a national technopolitical identity that refuses nuclear energy. The example of the military intentions behind the development of the internet in the US equally demonstrates how state authorities control and influence the development and production of technology (Haigh 2019, 11). By regulating labour markets, selectively sponsoring research and structuring the use of certain digital technologies (Aspray and Loughnane 2019), states and governments engage in nation-state building connecting national and political imaginations to ideas about technology and development. The "space race" is a prominent example of how technologies and with them ideas about progress were used to make the case for particular ideological spaces and spheres of power (ibid., 173).

Looking at the spread of communication infrastructures also shows how the early expansion of sea cable telegraphs was intertwined with the capitalist expansionist endeavours of corporations. While land telegraphy was still driven by nation states in the mid-19th century, global submarine telegraphy was initially a private effort, based on the motivation to open up markets and expand on existing trade routes (Müller and Tworek 2015, 263). Here, technology development is driven by businesses and their motivations to create economic spaces that enable profit maximisation but would exclude others according to structures of race, class and gender. Later it also involved states which would use the communication infrastructure for strategic control over empires and for military purposes (ibid., 262f.). Following gendered ideas about these infrastructures, women were considered unsuitable for working ocean cables because their supposedly chatty nature was regarded as incompatible with costly telegram sending (ibid., 278).

Similarly, the interests of colonial powers directed technological choice in the colonies based on their economic and ideological motivations, which favoured their development and justified

technological intervention. In India, Britain imposed a railway system on the local context, intertwining economic interests with ideas about "civilised" or "advanced" technology in the building process (Kerr 1995). Similarly, the building of urban water infrastructure in different colonial cities like Nairobi, Kampala or Jakarta (then Batavia) was tied to self-representations of the colonial powers as "modern" and was deeply embedded in racist structures which supplied only *white* and wealthier populations with water (Nilsson 2016). Declaring Nairobi as a model city and "beacon of civilisation", the construction of water supply systems was embedded in narratives about development, modernity and race and connected to the European imperial endeavours (ibid., 491, 489).

At the same time, "sociotechnical systems" (Pfaffenberger 1992) are never simply posed upon local populations or introduced in a neutral context (Medina, Marques, and Holmes 2014b, 2; Odumosu 2017; van Laak 2020, 27). In the example of India, the workers involved in the construction of infrastructures and later, the Indian officials who took over decision-making positions, impacted the construction processes and choices made by the British, influencing how, when and where technology was constructed (Kerr 1995). For instance, the wheelbarrow introduced by the British to move ballast in railway construction was refused by the Indians. They found it did not fit their familial division of labour and contrasts their work practices (ibid., 96). In more recent history, a contextual analysis of mobile phone use patterns in Nigeria reveals how the technical infrastructure of Western companies was first crushed and then adapted to the country's specificities, as a consequence of different Nigerian calling behaviours (Odumosu 2017). The engineers establishing the phone network realised that the standard rules, used for the configuration in Western countries, did not apply in Nigeria and that the network had to be overdimensionised, to ensure its functioning (ibid., 146). This makes the complexity of the processes clear, by which dominant and not-so-dominant actors alike compete over technological systems and the meanings brought with them. Technology is thereby never just diffused or imported, but arrives in a context of existing local technological systems and is at times appropriated or bypassed (Kerr 1995, 96; Pfaffenberger 1992; Medina, Marques, and Holmes 2014b; van Laak 2020, 27, 32).

Over centuries, particular understandings of technology became linked to narratives about "modernity", "progress" and "civilisation". These narratives were used by the Western powers and colonial authorities to discursively support the space-making projects they were engaged in (Adas 1989; Jasanoff 2015). Adas (1989) traces the understanding of "machines as the measurement of men" back to accounts of the first European travellers on the African continent, to demonstrate how scholars and thinkers created a strong discourse of European material

superiority that underpinned European global hegemonic aspirations. This ranges from the first Europeans who in their accounts of encounters with local people described technology as the decisive factor that makes them superior and allows them control over the situation (ibid., 3), to later "scientific proofs of British superiority" during the industrial revolution in Europe (ibid., 160). Thereby a perception was created in academia and popular discourse that regarded European civilisation as superior and unique compared to the rest of the world (ibid., 134). European inventions were taken as the standard measure to evaluate technological progress, labelling any technology or artefact outside European traditions as "unscientific" or non-existent (Marx 2010, 576; Adas 1989; Mavhunga 2017, 3).

After European's defeats in the World Wars their conviction that "they alone were rational, in control and civilized" was shaken (Adas 1989, 413). This narrative of scientific superiority was taken over by American thinkers, promoting American technological standards and linking the development of technologies to the evolution of society (ibid., 418). In the US American context, this narrative is further rooted in the colonisation process, where technologies in the form of machines and technical objects became symbols for "the future of America". As such, they were instrumentalised, together with the concepts of civilisation and development, for the space-making missions of colonising the New World (ibid., 404). In the later American involvement overseas, reforming visions, educational programs and missionary projects were employed to "civilise" backward societies and promote American technological standards (ibid., 406).

Technology in the form of artefacts, machines, infrastructures, knowledge and practices was linked to notions of civilisation, modernity and successive steps of development and became a measurement for the evolution of society (Adas 1989; Pfaffenberger 1992; Godin 2014). These "dreamscapes of modernity" were, over time, produced by multiple actors with authority that had the power to shape public imaginations about science and technology, including state actors, policymakers, scholars, thinkers, companies involved in technology production and at times civil society (Jasanoff 2015, 25f., 27).

Today, China also plays an increasingly important role in modernisation missions on the African continent by building infrastructure and digital technologies (Xu et al. 2016; Muchie and Patra 2020). Further, market-leading, Western-based tech companies take up the narrative of modernisation and societal progress in promoting new technological inventions as future solutions (Lenz 2021; Clegg 2022). This is equally carried forward by influential positions in

popular discourse, that claim technological product inventions as the key to development (Oranye 2016; Marx 2010, 577).

These narratives disregard that a lot of the knowledge and science which builds the basis for what is deemed Western scientific thought and technological inventions is derived from the knowledge mobilities from colonised regions and the labour of enslaved people (Medina, Marques, and Holmes 2014b, 5; Harris 2011; Steele 2021, 31). Moreover, this view brings with it another understanding of technological development, tied to a newly popular idea of "innovation".

2.3 Technological innovation: Standard Views and critical approaches

Pfaffenberger (1992, 494) sketches what he calls "the Standard View of technology":

> "Necessity is the mother of invention. As Man has been faced with severe survival challenges, certain extraordinary individuals have seen, often in a brilliant flash of inspiration, how to address the challenge of Need by applying the forces, potentialities, and affordances of Nature to the fabrication of tools and material artifacts. […]".

According to Pfaffenberger, this perspective underlies most scholarly and popular thinking which addresses innovation as an invention, developed by intelligent, mainly male individuals[1], to serve society and thereby create progress. In the same direction, Adas (1989, 404) explains how in the American context of early nation-building "inventors were compared to magicians" and Haigh (2019, 10) notes the overemphasised focus of popular history on "brilliant individuals" in discussions of innovation as invention.

The focus on *white*, male "pioneers" and the idea of innovation as comprised in new inventions, however, ignores the hidden labour and innovative thinking of, for example, early female programmers or workers producing technology. The influence of female workers shaping innovation in programming and computing and the impact of the Black female mathematicians on the famous US American space race are often excluded from notions of "brilliant individuals" (Light 1999; Shetterly 2016; Kiernan 2014; Hicks 2017; Mundy 2017). In the case of computerisation, Hicks (2017, chap. 2) traces how in Britain, a "feminized machine underclass" was created shortly after the Second World War, when programming was still a realm of feminised work and not yet seen as "masculine professional endeavour" (ibid., 61). Technology thereby played a role in the hegemonic projects of states and corporations and was linked to gendered issues of labour and class. Equally, the contributions of African workers in the outsourcing sector to self-driving cars and machine-learning systems are seldomly described

[1] Here one might add the characteristics of *white* and Western.

as innovative inventions, ignoring thereby the sources of technology development within a global division of labour (Anwar and Graham 2020).

Building on the narratives of modernity, progress and newness, technological innovation is popularly conceptualised as the invention of technical artefacts, developed through applied science and planning steps in laboratories and then spread following models of diffusion (Chirikure 2017; Godin 2014). This linear or sequential model of innovation describes technological innovation as a chronological process from invention to diffusion, produced out of institutional laboratories starting with basic research, then applied research, followed by the development phase (Godin 2014, 11). Moreover, this perspective is rooted in anthropological theories about civilisation processes that assume all cultures follow the same development path. Accordingly, different cultures are assigned to varying development levels in this process (ibid., 13). In doing so, development is connected to ideas about progress and growth, and culture is interpreted as attached to steps in one single development process. Against this view, a diffusionist perspective emerged, arguing that technology is diffused and adapted, rather than invented similarly in different contexts (ibid., 16). The debates make clear, how the now popular concepts of "innovation as diffused invention" originally centre on ideas about culture borrowed from the discipline of anthropological studies.

Nevertheless, culture is often neglected in the "Standard View of technology" (Pfaffenberger 1992). Instead, there is a dominant view of technology as neutral, assigning it a certain "phantom objectivity" (Marx 2010, 576). Following this, innovation is considered a factor of economic growth, understood mainly as product invention, which, if monetisable in the market, is profitable and fosters economic development (ibid., 574, 577). For example, African mobile money payment systems and digital apps for health, entertainment or agriculture are often regarded as innovation from a Western point of view, as it fits into capitalist narratives of innovation as a marketable product (Mavhunga 2017, 173; Oranye 2016; Mworia 2016).

From a practical and more critical perspective, the movement of "appropriate technologies" in the second half of the 20th century countered the production of technology in costly high-education laboratories and argued for more contextualised creation and usage of technology (Hazeltine and Bull 2003; Dunbar-Hester 2022, 468). The idea of appropriate technology started with the creation of technological artefacts from material available in a particular context and suitable to its environment (Hazeltine and Bull 2003, 3). In this approach, technological innovation is created out of local contexts and therefore not regarded as universally applicable.

Nevertheless, it is regarded as a tool for economic development and framed as an invention out of need, thus representing largely the common understanding of technological innovation.

The popular perspectives fail to capture the innovation practices of actors "who are not deemed tech-savvy" or follow diverging principles (Gaskins 2019, 252). Contrary to the notions of technology that characterise it as objective and neutral, critical perspectives outline the linkages of technology and culture. Technologies are embedded in the socio-technical systems, cultures and imaginaries that create and reproduce them (Pfaffenberger 1992; Jasanoff and Kim 2015; van Laak 2020, 32). From a constructivist approach, technology is conceptualised as thought, idea, "package of technological and human components" (Kerr 1995, 92, 104) or "performative scripts", including networks of people, cultural meanings, knowledges, interests and visions of how life is to be lived (Jasanoff 2015, 4, 20; Wajcman 2010, 149). Technologies come along with the imagined visions, social orders and systems of different social actors, that compete and coproduce these imaginaries interdependently (Jasanoff 2015, 11). From this perspective, innovation emerges in connection to cultural practices, rituals of labour coordination and material symbols of relevance in everyday life (Pfaffenberger 1992, 505).

Thus, innovations and the production, invention and development of technologies are moreover rooted in historical processes and must be interpreted before the background of power relations, the circulation and mobilities of knowledge and ideas. Mavhunga (2017, 2) in this regard, remarks that "science, technology and innovation are […] the latest iteration of a long process of accumulative, multicultural knowledge production". Acknowledging that innovation is, and was co-produced, although in many cases through imperialistic monopolisation of knowledge (ibid.), questions the claim of a spiritual scientific heritage based on a geographical location. The assumption of a Western monopoly on technology and its development connected to the idea of innovation as a product of male genius thinking in higher-education laboratories is thereby revealed as a powerful but not unquestioned myth. In many cases, colonialism destroyed or hindered local innovations by enforcing colonial rule systems and regulating existing manufacturing or trading systems (ibid., 15). Hence, the development and innovation of technology are situated within the time contexts of historical, local and societal structures and are an outcome of the imaginations and practices of particular actors.

Further, alternative approaches to innovation entail a claim for active engagement with continuities and structures of discrimination, asking how "technoscience [might] be appropriated and reimagined for more liberatory ends" (Benjamin 2019, 4). Innovation from a technofeminist approach thus demands the deconstruction of gender and power relations

inherent in sociotechnical processes (Wajcman 2010, 149f.). This paper further considers innovation as collectively and publicly produced. Against the view that innovation happens in expert laboratories of higher science, by engineers who produce "*for*, not *with*, society" (Mavhunga 2017, 4), the later analysis concentrates on the "public as producers of technology" (Eglash 2004, vii). Thus, the focus is shifted from "the public as passive recipient of technological products" (ibid.) to acts of agency in technological innovation, which take place in various sites of knowledge production.

Accordingly, innovation is not only pursued in formalised sites of knowledge production (Mavhunga 2017, 10). Through institutionalising Western knowledge as science, Western theories and ways of knowledge production were rendered formal, designating other knowledge systems as "unscientific" (ibid., 3, 10; Daston 2017). A coherent history of *knowledge* that would go beyond unrelated detailed approaches of specific periods, declaring anything outside "modern" science as knowledge, is still lacking (Daston 2017, 150). This might be a reason why scientific modernity continues to influence dominant ideas of technological innovation and progress, despite the acknowledgement of a multiplicity of different knowledge practices (Daston 2017, 141; Mitova 2020, 193).

Looking at past, unpopular sites of work and knowledge transfer offers ways to find inventions, experimentation and innovation equally in places that differ from the Western perception of "laboratory" (Chirikure 2017). A decolonial perspective on innovation requires a reflection on perceptions of technical expertise, and on who is considered a pioneer or innovator. Thus, in this analysis the focus is set on sites of knowledge production beyond formalised laboratories, including places where people innovate collectively through exchanges, experimentation, sharing of knowledge and a do-it-yourself (DIY) culture that creates without expert input (Gaskins 2019, 255).

Moving beyond ideas of technological innovation as a product or machine invention allows shedding light on different innovation practices, which are often overlooked. The classical view of innovation is derived from Schumpeter's description of innovation as a new product that competes with an old one, gaining through advantage (Fu and Zanello 2020, 65). Based on this definition, innovation becomes quantitatively measurable in the investments of an institution or state in research and development (ibid.). While innovation is dominantly seen within an entrepreneurial activity in a framework of economic development (Nwaka 2021; Mavhunga 2017, 8; Oranye 2016) or within the invention of a solid, engineered (electronic) object (Kerr 1995, 92; Jasanoff 2015, 2), the "production and dissemination of knowledge", practices of

reinvention, adaption and appropriation are equally forms of innovation, when conceptualised through a critical lens (Kerr 1995, 92; Medina, Marques, and Holmes 2014a, 2; Bar, Weber, and Pisani 2016). As such, innovation is approached within the context of the imaginaries, social practices, norms and orders that are coproduced with it (Jasanoff 2015, 2). In this sense, "innovation" entails also the practices behind it, involving caring, reflecting, social bondages and community (Davies 2018, 366; Chan 2013, 121f.).

Gaskins (2019, 254) proposes a framework of "techno-vernacular activity and innovation", focusing on practices of re-appropriation, improvisation, and conceptual remixing to shed light on innovation practices in the Global South. This makes innovation visible in a multitude of contexts such as configurations of everyday life technologies, techniques to deal with imposed rule systems in everyday life as well as in arts, music and hair braiding technologies (Bar, Weber, and Pisani 2016; Mavhunga 2014; Gaskins 2019; Steele 2021, 37). Looking at the negotiation processes of sociotechnical systems makes clear how power and control are reclaimed by shaping technologies so that they respond to the interests of the actors appropriating it (Bar, Weber, and Pisani 2016, 617f.). Similarly, to the above-discussed example of mobile phone usage patterns in Nigeria, which led to innovation in the external mobile phone infrastructure systems (Odumosu 2017), appropriations of foreign technology happen across the globe (Medina, Marques, and Holmes 2014b; Bar, Weber, and Pisani 2016). In Cuba, for example, Cuban engineers modified processes in a factory which they received as a donation during the Cold War to produce Soviet-style standardised housing (Medina, Marques, and Holmes 2014a, 3). These modifications, intended to accommodate Caribbean climate, circulated back to the Soviet Union, influenced Soviet construction and thereby innovated the local architectural landscape (ibid.).

The next section turns to sites of negotiation of technology by tracing the feminist discourses that challenged dominant actors in their visions about claims to power and technological progress.

2.4 Negotiations of technology in the changing discourses of technofeminism, cyberfeminism and data feminism

To properly situate actual forms of practical data feminism and feminist hacking, the discourses of technofeminism, cyberfeminism and data feminism are introduced. The then following analytical section examines current feminist engagements that build upon the historical former negotiations of technology and digitalisation dynamics. It is impossible to provide a coherent or detailed chronological overview of the multitude of feminist strands, activisms and academic

discourses from different regions and positions here. Instead, relevant aspects for the analysis of the material are discussed, like the preceding feminist standpoints on new technologies and the changes in the approaches to feminism and tech. These positions are linked to the groups, spaces and initiatives in the analysis, to show their rootedness within the larger feminist trajectories that engaged with women[2], tech and data before.

The terms feminist tech-activism or feminist digital activism are used in a broad variety of contexts and refer to diverse meanings including hashtags to raise awareness for certain topics (M. L. Hill 2018; Tuzcu 2016, 157; J. Daniels 2015), forming collectivity and speaking up on online platforms (McLean and Mugo 2015; Clark-Parsons 2018), monetising online hate speech through the collection of discriminatory comments on a website featuring advertisement (Sadowski 2016), posting and blogging to counter societal and cultural discriminatory patterns (Sreberny 2015) and using communication media to organise politically (Fotopoulou 2016). Other overlaps between women, technology and activism, include the creation of empowering narratives of African and Black women and tech in arts and film (Stubby the Rocket 2018; Okorafor 2011), women transforming and claiming space in the tech sector (Holt 2016; Shetterly 2016) and of course, hacking and engaging with digital data as feminist counter practices (Dunbar-Hester 2022; D'Ignazio and Klein 2020).

Over digitalisation processes and new technologies, feminist theory and activism are continuously brought in touch with each other (Tuzcu 2016, 150) evoking ever-changing positions and contexts. In the 1980s with the spread of the first personal computers and the emergence of the typical figure of the male, *white* hacker and scientist-computer nerd, feminist critiques concentrated on pointing at the exclusion of women from these new tech spaces (Wajcman 2007, 288; D'Ignazio and Klein 2020, 1–4, 14; Reyes 2016, 185). Feminist positions criticised the limited access of women to scientific and technical institutions and concentrated especially on the gendered notions of technical artefacts and how these are shaped by social factors, thereby embedding gender inequalities in technology (Wajcman 2010, 146).

Although women played dominant roles in computing and shaped the tech sector significantly, their role was often ignored (Holt 2016; Shetterly 2016; D'Ignazio and Klein 2020, 1–4; Arns and Lechner 2021; Evans 2018). Concurrently, feminist standpoints at that time pursued rather pessimistic viewpoints on technology's influence on gender relations, leaving aside women's agency (Wajcman 2010, 147). According to Wajcman (ibid.), this provoked more optimistic and enthusiastic positions from cyberfeminism in the next generation of feminist scholars and

[2] I use „woman" and „female" as terms for every person who identifies with these categories.

activists, who saw the potential of technoscience for women and produced new visions of "hi-tech womanhood" (Tuzcu 2016, 150).

2.4.1 Cyberfeminism and technofeminism

The emergence of cyberfeminism in the early 1990s is often considered the first feminist intervention into the male-tech spaces (Tuzcu 2016, 154). It is often related to the first known cyberfeminist collective VNS Matrix and its publication of the "cyberfeminist Manifesto for the 21st century" as a reference to Donna Haraway's "A Manifesto for Cyborgs" (Paasonen 2011, 337). The collective, which was founded by six female artists in Australia, influenced the creation of the Old Boys Network in Berlin in 1997. In the same year, the Old Boys Network invited to the first international cyberfeminist conference within the framework of "Documenta X" in Kassel (Tuzcu 2016, 154). Apart from the artistic and activist approaches to Cyberfeminism, Paasonen (2011, 340) also identifies influential scholarly cyberfeminist writings in the examinations of the relations between feminist thought and cybernetics, for example in the writings on cyborgs (Haraway 1991), artificial life (Kember 2003), or the histories of artificial intelligence and cybernetics (Adam 1998; Hayles 1999).

As a rhetorical strategy, cyberfeminism challenged the dominant "anthropocentric, universalist, women-only tradition of feminism" itself and proposed technology and cyberspace as tools to pursue diversified forms of feminism, transgressing multiple feminist struggles (Tuzcu 2016, 154). The potential of digital technologies was seen in their presumed ability to blur the boundaries between machines and humans and therefore also provide the possibility for new political identities (Wajcman 2010, 147).

In this shift in the debate, from claims for equality to differences within feminism (Wajcman 2010, 147), women realised the differences amongst their struggles and contexts and cyberfeminism presented a way to overcome these by creating alternative identities. Donna Haraway's cyborg metaphor conceptualised technology as "fully part of all of us" (ibid., 148; Haraway 1991), thereby questioning binaries of human categorisation in identities. Haraway's description of the relations between humans with companion species and non-humans in a process of "becoming-with", is still influencing feminist hackerspaces today and is by some regarded as the fundament of cyberfeminism (Paasonen 2011, 341). Drawing on Haraway, the activity of hacking is located in the idea of the hackers as coparticipants in a network of humans, non-humans and artefacts, rather than as masters of the environment, producing new products and exerting control over non-humans (Davies 2018, 365).

However, the optimistic view of the early cyberfeminist positions changed, as the digital space implied again a risk for universalism and the idea of the Internet as "the great equalizer" that would eliminate inequalities and politics of difference was revealed as an illusion (Tuzcu 2016, 157; J. Daniels 2015, 5). In the beginnings of the Internet, the digital space was theorised as erasing boundaries between categories of male and female and providing the possibility for alternative identities (Plant 1997; Wajcman 2007, 291). However, current cyberfeminisms and digital feminists point to the still-existing boundaries of gender and race in digital spheres and on online platforms (Tuzcu 2016; J. Daniels 2015). Thus, cyberfeminism and technofeminism are outlined as focusing again solely on "women in internet technologies", but failing "to capture race and other identifiers" (Steele 2021, 18). Here, cyberfeminism re-evokes the originally criticised one-sided feminist thought, related mainly to *white* feminist bloggers and activists (ibid.; J. Daniels 2015). This kind of *white*, liberal feminism in the tech sector is exemplified by the Chief Operating Officer of by-then Facebook, Sheryl Sandberg. Her public feminist engagements outlines women as limiting themselves, locating the problem in women's need to change instead of addressing structural inequalities and differences within these (J. Daniels 2015, 10). In her liberal feminist campaigns, she addresses a particular group of women and girls: *white,* heterosexual, cisgender, and middle-class (ibid., 11); and overlooks the intersections of identity and differences in realities and histories.

Catherine Steele (2021, 26) however shows, that Black women have a long historical trajectory of engagement with technology and therefore argues for a new narrative, that recognises Black women as "skilled laborers and users of agricultural, domestic and communicative technology" and links the technological history of Black women in the US to histories of slavery and resistance. According to Steele (ibid., 28), it is the biased definition of technology and expertise which fails to consider histories of resistance and engagement with oppressive technologies. Thus, Black women and African Americans were engaged with and resisted Western technologies such as segregated buses, "Jim Crow" rail cars, slave ships, cotton cultivation and public housing schemes (ibid., 29). Steele (ibid., 18) refrains from using the term "cyberfeminism", and rather outlines a Digital Black Feminism, hinting at the rootedness of early cyberfeminist activism in *white* European feminist collectives, and the marginalisation of Black women's voices in cyber activism. In this regard, she remarks that "[b]ooks about race are often about Black men, books about technology are often about white men, and books about feminism are often about white women" (ibid., 9), thereby making the need for an intersectional and inclusionary perspective clear, that recognises different histories, experiences and realities

between women and beyond this examines how technologies play out within intersecting systems of oppression.

2.4.2 Intersectional digital feminism and plural Cyberfeminism

The so-called post-feminism or third-wave feminism thus raised attention to the relevance of contextualisation and intersectionality within women's engagement with technologies. This led to new forms of cyberfeminism such as "ciberfeminismo social" in a Latin American context or "plural cyberfeminisms" (Binder 2017). This sensibility acknowledges that the concepts of cyberfeminism or digital feminism have different meanings in diverse contexts and are evolving and changing together with the positions of feminist generations. For example, in a Latin American context, cyberfeminist understandings of activism distinguish between "militancia" and "activismo", highlighting the latter as a "gringo", Western and more superficial form of feminist activity (ibid., 30). Critique from academic writings made clear that beyond the acknowledgement of differences between cyberfeminisms and women, an analysis of structural power and privilege is required in the feminist debate (Fernandez, Wilding, and Wright 2003; Paasonen 2011, 344; J. Daniels 2009). In her article "Women and Other Women", Gajjala (2014) makes explicit how cyberfeminist discourses about women and technology reproduce binaries amongst women from the Global North and South. According to Gajjala (ibid.), the view prevails, that women from the Global South need to be empowered through forms of westernised technology use. However, at the same time, subaltern women are presented as not able to use these same practices of technology use for leisure activities.

Wajcman (2007, 295) formulates the central premise of feminist technoscience as the idea that „people and artefacts co-evolve" and as such that "the materiality of technology affords or inhibits the doing of particular gender power relations". This might be a connecting point for diverse feminist positions and engagements with technology, which nevertheless is interpreted in various ways. For example, the premise can be found in contemporary Afrofuturist feminist narratives and movies. In the short movie "Hello, Rain", three African scientist-witches create magical tech-wigs, by mixing African juju (witchcraft) and technology. The wigs are intended to give power to the three women, to tackle political and societal problems, but the magic-tech wigs develop in another direction, making the women incredible powerful and evil (Obasi 2018). Technology and humans co-evolve in this narrative and are simultaneously embedded in African traditions and a contemporary Nigerian context. Technology solutionism is linked to beauty norms for African women, portraying technology as an outcome of cultural practices, narratives and desires. In a Western context, the premise of a co-evolving of humans and

artefacts and the interdependence between technology and societal structures might take other forms, for example concerning the cyberfeminist visions of cyborgs.

Thus, current cyber or technofeminisms' engagement with technology regards the utopia of a "universal global sisterhood", produced by the Internet or digital spaces as an illusion and rather points to the variability and multitude of women's experiences with digital technologies, influenced by contexts of "place, nationality, class, race, ethnicity, sexuality", generation and others (Wajcman 2007, 294). The internet and communication infrastructure became widely accessible to a larger public in richer countries from the 1990s onwards, through internet cafés and mobile phones (ibid., 291). But with the interventions of US American feminist thinkers and collectives introducing the concept of intersectionality from the mid-1980s and beginning of the 1990s (Combahee River Collective 2000; Lorde 1984; Crenshaw 1991; Collins 2002; Carbado et al. 2013) the intertwined structures of systems of power were made explicit and became important for feminist debates. Cyberfeminist ideas about a digital space without boundaries had to be rethought. From a more practical perspective, the access to technology such as ICT is still unequal amongst women, depending on intersectional lines of privilege and marginalisation, which in turn leads to different forms of feminist engagement (Gqola 2007, 7–9; Buskens and Webb 2009; Pollock and Subramaniam 2016, 958f.).

2.4.3 Digital data feminism and technologies

In a similar way, data feminism as a part of feminist tech activism, tackles universalism and rejects the depiction of data as objective or neutral facts but demonstrates how data is used to tell particular stories while others are excluded (D'Ignazio and Klein 2020, 14). Visibility and "making visible" is an aspect that links many data feminist approaches and feminist hackerspaces, aiming to render excluded groups visible in the realm of tech, science and data (D'Ignazio and Klein 2020, Introduction; Reyes 2016; Binder 2017, 30). Equally, data feminism deals with power relations and (Big) data as a means of powerful actors to consolidate their control (D'Ignazio and Klein 2020, 14; Richterich 2018, 22; Ricaurte Quijano 2019). In line with technofeminist and cyberfeminist reflections on knowledge generation processes and exclusionary dynamics of technoscientific practice (Reyes 2016, 172), data feminism critically asks who collects which data, based on which intentions (D'Ignazio and Klein 2020, chap. 1).

The activism of data feminism is thereby intertwined with general histories of data collection, histories of what is today understood as Big Data and histories of knowledge production and science (Harding 2011; Beer 2016; Barnes 2013; Aronova, Oertzen, and Sepkoski 2017; Blair et al. 2021). Feminist data activism deals with these histories and entanglements in that it

acknowledges the social dimension to data and information, and thereby the ideals and intentions attached to their collection. Thus, collecting, counting and classification have also historically been used as tools "to dominate, discipline, and exclude" (D'Ignazio and Klein 2020, 122f.). Data collection systems were thereby embedded in oppressive structures as well as reproducing them, connected to intentions to dominate, gather and at times appropriate knowledge (ibid., chap. 4; Echterhölter 2020; Appadurai 1993). Data activism from a feminist perspective critically examines and engages with these dimensions inherent in data (D'Ignazio and Klein 2020).

Today, much data is digital and builds the basis for digital technologies and their development, such as algorithms and artefacts that use algorithmic software. This brings up ethical issues that come to the fore with the increasing use and collection of digital data, often in the form of Big Data (Richterich 2018; boyd and Crawford 2012) and raises new concerns for data feminism. Big Data can be related to the term "Big Science", which was coined in the 1960s to refer to a change in the way of doing "large scale" research, with multiple researchers involved, monopolised support and attention from the public and private sphere (Aronova, Oertzen, and Sepkoski 2017, 3). But Big Data moreover emerges as a concept or contemporary "cultural phenomenon" that is linked to technological developments and the possibility to collect, store and manage huge quantities of data. The introduction of the Electronic Numerical Integrator and Computer in 1946 enabled the engagement with Big Data, providing a larger processing capability of data than before (ibid.). Big Data is thereby shaped by new technologies as powerful tools to analyse but also produce data in new ways and on a larger scale (Aronova, Oertzen, and Sepkoski 2017, 7).

Contemporary data feminist activism makes clear how visibility gets another meaning when the size of datasets is attached to relevance so that certain histories and live realities are not "big enough" for big data (Gieseking 2018; Ricaurte Quijano 2019). Giesking (2018, 155) writes in this regard, that "society's obsession with big data further oppresses the marginalized by creating a false norm to which they are never able to measure up". In the other direction, inclusion can be harmful, for example in the case of filter software that is trained by big data, reproducing the bias embedded in these data. There are multiple examples of racist and gender bias in, for example, facial recognition software, criminal detection software or search engines such as Google (D'Ignazio and Klein 2020, 29f.; Steele 2021, 11f.; Noble 2018). In another example from an application software of Microsoft, programmed to filter applicants, the algorithms were found to privilege male over female applicants (D'Ignazio and Klein 2020, 28). In a counter data project of the US-based Algorithmic Justice League, attention was drawn

to the biases in AI software for crime prevention, by turning the data logic of the software around. Thus, the White Collar Crime Early Warning System works with a heat map, that shows on a city scale where financial crimes are likely to be committed (Benjamin 2019, 5). The system includes an app, that alerts users when they are about to enter a risk area and is moreover connected to a facial recognition program, that identifies possible perpetrators. The program is based on profile pictures of corporate executives on LinkedIn, producing "not surprisingly an 'average' face of a [financial] criminal" that is male and white (ibid.).

Other issues arise concerning a lack of personal data protection and abuse of data, elsewhere described as processes of "capitalist accumulation by dispossession", in which everyday life is colonised and commodified in new ways (Thatcher, O'Sullivan, and Mahmoudi 2016, 990). Today, corporations like Meta discovered the potential to make data profitable through direct ad targeting for the data doubles on their platforms (Bouk 2017, 103). Here, again, contexts matter, so that, for example, populations in the Global South are more vulnerable to abuses or "invisibility" and have fewer possibilities to hold corporations accountable, as data protection laws or information on data security are often lacking in poorer countries (Taylor and Broeders 2015; Ricaurte Quijano 2019).

Bouk (2017) periodizes the political economy of personal data with a focus on Europe and the US in three phases. In the early 19th century, the collection of personal data enabled the categorisation of populations into groups by state authorities and corporations and shifted the focus to subjectivity, in contrast to, for example, the household as an entity (ibid., 94). Along with that in the exhibition era of the mid-19th century came a desire to display data, presenting large statistical representations in artful graphics and displaying them in exhibitions or parades (ibid., 93). Data feminists engage with data presentations and visualisations as powerful tools to make claims and tell stories in particular ways, against the common idea of statistics as presenting neutral or even "raw" facts and hinting at the decisive role that the contextualisation of data plays (D'Ignazio and Klein 2020, chap. 6).

The beginning of the 20th century then marked the turn for the use of personal data as a "mass production of statistical individuals", with data collection becoming an end in itself (Bouk 2017, 100). From the 1970s on then, personal data is connected to commodification, capitalisation and exploitation of the individual through personal data aggregates and data doubles (ibid., 101). Also, around the same time in the 1960s, the database emerged as a concept, based on efforts to organise and overlook workers and materials in the military (ibid., 102). The shift in the 1970s to relational databases introduced a change in the interpretation of data and

knowledge derived from these data (Gugerli 2012). Computer-aided database technology increased the possibilities for innumerable combinations amongst data and unanticipated evaluations of existing datasets, leading to a new form of "search-and-interpret" culture (ibid., 290f.). In the spirit of the Wages for Housework campaign in the 1970s digital activist sites like "WagesforFacebook.com" refer to precisely the point made by feminists about the invisible work of cooking and caring, in relation to labour concerning data on Instagram, Facebook and other social media platforms (WagesforFacebook.com 2022; D'Ignazio and Klein 2020, 178f.). Reframing the opinions, emotions, Likes and interactions on these platforms as unwaged labour (WagesforFacebook.com 2022) draws attention to the monetarisation of these personal data on behalf of capitalist corporations.

This section makes clear, how current feminist tech and data activism is not a new reaction to changing dynamics in digitalisation processes but builds upon longer trajectories of feminist dealings with technology, data and science. The initiatives and activist groups which are analysed in this work are therefore situated within current time and location contexts and out of these produce different and multiple feminist claims and approaches to technoscience, digital data and technological artefacts.

3. Imaginaries of technology: mapping transnational feminist engagements with technology and data

This section maps the analysed, feminist data and tech activists as actors engaging in appropriating and creating spaces and shaping global and local dynamics in the negotiation of imaginaries, practices and approaches to technology and data. The section is divided into six parts, starting with a description of the actors and materials and how they were selected. The second part presents the transnational character of the organisation, connections and encounters between the actors and introduces the two networks. Next, it is outlined how methods and concepts are exchanged within the networks and how they are used to build and reclaim technological futures. The fourth part discusses the re-definitions of technology and data concepts through various approaches, including biohacking, the building of feminist infrastructures, the engagement with databases and the rethinking of AI and technological tools. This is followed by a description of the different forms of activism and how it is acted out in light of the financial and personal linkages to institutions outside the network. The last part sheds light on the local contexts in which the activists operate and how they link these to the wider global and transnational structures they operate in.

3.1 Identifying actors and strategies

To identify the current feminist engagements with digitalisation processes, the analysis uses an actor-entered approach, tracing interactions, linkages and encounters between initiatives, or individual projects that are active in the fields of data and technology and identify as feminist, transfeminist or cyberfeminist. The accessible internet was therefore used as a type of "archive", where the activists themselves share, publish and collect materials that provide insights about their imaginaries, visions, motivations, aims and interests which they pursue with their work. The materials that were used included any form of self-documentation about meetings, reports, videos of online conferences, manifestos, fanzines, collages, artistic video productions, shared and open resource collections maintained by the feminist initiatives, like wikis, libraries, indexes, image databases, and online presence of the initiatives. In this regard, King (2012, 23) highlights the potential of the internet for ordinary individuals, to become "public archivists of their own histories", as it allows them to post "texts, images, blogs videos – historical documents in other words – of their own making".

With this material basis, the analysis borrows some methodological considerations from historical research on social movements, as described by Deflem and Dove (2013) and Clemens and Hughes (2002), who focus on network-based mobilisation and tracing the ties between individuals. Clemens and Hughes (2002, 216) equally describe the investigation of documents that were produced by the members of a movement themselves and sometimes for the members, to carve out motivations and standpoints. As the authors make clear, these "sources" should not be treated as neutral documentation of these movements but as sources designed with an intention (ibid.). This complies with the focus of this analysis, as it carves out the perspectives and produced visions of the feminist activist initiatives. The material and sources are thus understood rather as "arguments" than objective representations of the organisations (ibid., 207). However, this focus requires keeping in mind what sort of information is not articulated or written explicitly (ibid., 208), so the examination of the activists also included an investigation of their ways of operating, the financial structures that support their work, the institutional contexts they work in and the linkages to external actors. Further, following the described possible starting points, the ties between individuals and individuals and institutions were mapped as well as events and their outcomes, where different actors connect (ibid., 204–7; Deflem and Dove 2013, 561). In this way, the material provides insights into the visions and technological imaginaries of the feminist actors and the ways how they practice alternative approaches to data and counter-dominant ideas and narratives.

Engaging with the described materials as sources, I examine what kind of spaces the actors imagine, how they envision technology, what kind of approaches they follow and with which motivations and intentions. In the process of material collection, the fast dynamic of contemporary feminist tech and data activism came to the fore. Within the six months of identifying and gathering material, many websites went offline, were updated or relocated to other sites, so collecting also included the storing and archiving of the websites and online data. Equally, some of the hackerspaces ceased their activities but are still traceable online as their websites or groups are still accessible online. The analysis included activist groups that were at least active within the last 10 years, hence not inactive before 2012.

Organisations are proposed as useful starting points for social movement research because they produce documents and other materials (Clemens and Hughes 2002, 203). Here, the actors that provided an entry point into the dynamics of feminist tech and data activism were collectives, initiatives, groups, hackerspaces and in some cases non-profit organisations that had any sort of website, for example, a group on a platform like Rise-Up, a Facebook-group, a wiki-page or conventional online presence. There is an emphasis on hackerspaces, as many of the feminist tech activists organise in this way. The material concerning feminist data activism mainly centres on online femicide mapping and collective cartography, as the linkages between actors opened up this direction. However, there are more forms of data and tech activism that could be examined. The focus on hackerspaces raises a conceptual question that the feminist actors discuss themselves in their work, asking who is defined as a "hacker" and what counts as a hackerspace, or similarly, a laboratory. In this regard, hacking is often interpreted according to a Western understanding of the term, which defines it as the practice of breaking out of structures, through creative tinkering and experimentation, and which is mainly associated with male, *white* hackers (Dunbar-Hester 2020, 37–39). However, hacking can have varying meanings according to geographical and political contexts and some practices might be considered as hacking from a different lens (ibid.). Toupin (2020, 22) equally writes, that feminist hackerspaces draw inspiration from the term "hacking" but extend the concept by dealing not only with technology and computer science and using it more as a form of "hack[ing] the concept of hacking itself". Hence, a focus on hackerspaces following a specific (standard) definition would exclude other forms of feminist tech activism which are nevertheless relevant to understanding the dynamics examined in this paper.[3] To overcome the geographical bias on feminist actors based in European and North and Latin American

[3] This issue and its implications for the analysis are discussed in detail in section 3.5.

countries, the analysis also includes organisations from African countries that are not "hackerspaces" in a Western definition of the term, but engage in the same kind of tech and data activism and are connected to the other actors. Most of the initiatives were selected if they identified as feminist hackerspaces or laboratories and were connected to the other actors within the network, thereby following the proposed procedure of mapping and tracing ties (Clemens & Hughes, 2002, pp. 204–207; Deflem & Dove, 2013, p. 561). The feminist data initiatives are mainly based in Latin American countries and the US, as they emerged as a network of connected actors while working with the material. The material collection and decision on what counts as hackerspaces or feminist activism remains selective and dependent on my own positionality as a *white* scholar from the Global North. Despite the larger geographical scope of the analysis, I agree with Toupin (2020, 21) in that "my interpretation as well as the emphasis on certain aspects of this practice of resistance, are shaped by my own attitude and subjectivity".

Another methodological consideration for this analysis was the operationalisation of „imaginaries" (Jasanoff 2015, 24), to examine the collected sources. Jasanoff (ibid., 25) explains imaginaries as group achievements as they present an articulation of dreams and aspirations through a collective force, by actors who mobilise the necessary resources to render their visions durable. Following Jasanoff (ibid., 5), the term "sociotechnical imaginaries" is used here to refer to "collective beliefs about how society functions", linked to technology and science. Imaginaries are not mere visions but entail performative dimensions, they are enacted and re-enacted in the practices of society (Jasanoff 2015, 5) and negotiated between "sites of agency (individuals)" (Appadurai 2002, 49). Thus, sociotechnical imaginaries are also "temporally situated" and "culturally particular" (Jasanoff 2015, 19). This requires hence to look not only at the formulated statements of the actors but also at their practices and ways of articulating their imaginaries and visions. Jasanoff (ibid., 25, 28) further highlights comparison as a "foundational technique", to carve out how certain imaginaries differ, which provides a suitable ground for this analysis to examine how feminist imaginaries compete with diverging visions and meanings. Hence, imaginaries offer insights into:

> "how people's hopes and desires for the future […] get bound up with the hard stuff of past achievements, whether the material infrastructures of roads, power plants, and the security state or the normative infrastructures of constitutional principles, juridical practices, and public reason" (ibid., 22).

Based on this, the feminist activism with technology and data examined here is regarded as a continuous articulation and practice of imaginaries and visions about the future, that competes with the imaginaries of dominant actors, particularly those emerging out of patriarchal, capitalist and racist structures.

3.2. Nodes: The Transhackfeminist!, Técnología en Acción and other transnational encounters

Tracing the encounters, collaborations, collectively organised events and references to each other, reveals a wide transnational network of different actors in the form of hackerspaces, laboratories, art projects, collectives and digital activists. Starting with a central, yearly event, the "Transhackfeminist!" (THF!) festival brings together diverse actors from different countries at one physical encounter, to understand, use, and develop "free and liberating technologies for social dissent, as an alternative to the corporatisation of technologies and the digital world" (Transhackfeminist 2014c). The first THF! in its actual form took place at the beginning of August 2014 in Spain, approximately 50 kilometres outside of Barcelona at Calafou. Calafou is a collective and area, that describes itself as a "postcapitalist eco-industrial colony" (Calafou 2022b) which is shaped by its territorial location in a decommissioned textile fabric area, which was ultimately abandoned after a fire in 2004 (Pechblenda Lab and Hackteria Lab 2014, 3). The week-long THF! with the first 90 participants in the course of seven days, emerged to a large extent out of the feminist hackerlab Pechblenda, within Calafou (Toupin 2020, 30) and was connected to the Eclectic tech carnival (ETC), a festival for feminist discussions and practices of technologies, organised "by women for women"[4], which was taking place until 2019 (Servus.at 2014). Possibly, following debates around the "only women" nature of the ETC and discussions between those involved in the organisation about more diverse and open categories of gender, the initial planned ETC in 2014 turned into the first TransHackFeminist camp instead. The Pechblenda lab, with three initial members, formed in 2013 out of the "WhoreDykeBlackTransFeminist" Network and their call for a feminist insurrection through their manifesto three years earlier. In the spirit of the preceding debates about gender, the manifesto is a call for a feminist "occupation of the streets", a formation of "alliances and structures of our own" and stands in solidarity with "the countless genders", immigrants, those without legal papers, trans and queer people, sex workers, Black people and "the ones who wear veils, the ones who earn little and don't go to the university" (The WhoreDykeBlackTransFeminist Network 2010).

Inspired by this statement about intersectional feminism the Pechblenda lab and participants of the first THF! formulated the "Trans Hack Feminist manifesto" in an on-site workshop and through an open digital pad, where those not present could bring in their voices, to include a plurality of positions (Transhackfeminist 2014b). Framed by cyberfeminist visual references,

[4] Translation by the author. This and the following translations in this paper are made by the author.

like a photograph of the first programmer Ada Lovelace, the popular cyborg painting of Lynn Randolph that accompanied Haraway's manifesto and a cyborg-like collage of Marie Curie, the manifesto further brings in the aspect of feminism and technologies. In a poem-like style, it states: "Nature was to the witches what technoscience is to us, the cyborg witches" (Pechblenda Lab 2014b). Technology and oppressive, controlled devices are to be transformed, hacked and recodified in "hackmeetings and transfeminist workshops", through DIY electronics, experimentation with the own body and collectivity (ibid.). The manifesto announces combat through its poetic but defiant language, against controlled technologies, exclusion in the tech field and oppressive structures.

Drawing on these manifestos the THF! brings together different and diverging feminist actors and initiatives. The call for the feminist insurrection reads: "we operate in different cities and contexts, we are connected[,] we have common objectives and we won't be silenced now" (The WhoreDykeBlackTransFeminist Network 2010). Available in multiple languages, the manifestos formulate the building of coalitions as an activist instrument to engage collectively in discursive and practical negotiations about technology. The map of connections and cooperations as shown in figure 1, presents a remarkable huge network that goes beyond the Transhackfeminist meeting, made of various smaller and bigger, looser and more formal organised initiatives, collectives, projects managed by groups or individuals or even blogs set up by individuals rooted in the network. Providing a glimpse of the networks and connections of tech and hacker activists, the map is in no way complete but rather presents an idea of the multitude of actors and the linkages between them. Considering the diverse forms of organisation but also the multiple different approaches however makes clear, that rather than a coherent movement or single actor, the initiatives present a heterogenous network of allies. This is also how one of the founders of Systerserver, a feminist server sees the conglomerate of hackerspaces, as there is no common leitmotif that would describe them as one single movement (Heart of Code 2017b). The calls for allyship and cooperation acknowledge the diverse standpoints and refrain from talking about a global sisterhood or the erasure of power structures through increased digital connectivity. Instead, they highlight collectivity in the intersectional approaches to technology and the basic common ground of mixing feminism with tech.

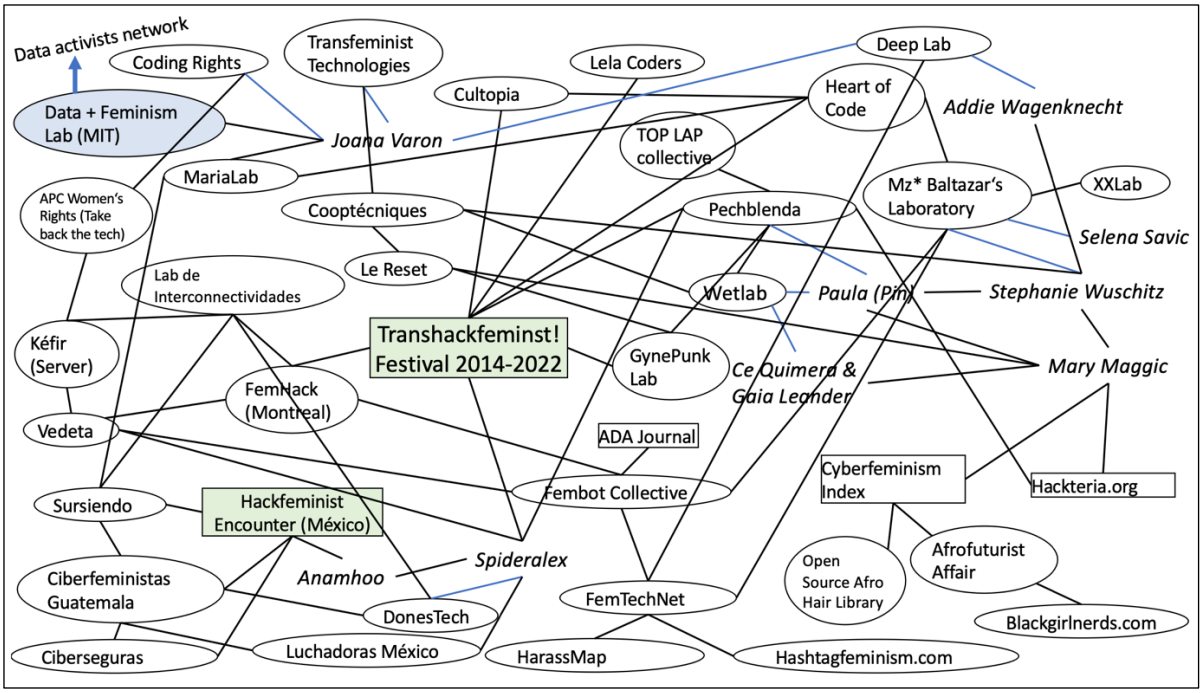

Figure 1. Network of feminist tech-activist initiatives and hackerspaces, including individuals. Illustration by the author.

The different intersectional layers of privilege are taken as a point of departure to formulate approaches to technology. In a video of the 2014 THF! one of three guiding principles states the responsibility that comes with privileges in terms of class, gender and so on, of challenging systems of oppression. This informs the intended "(re)politization of the use, design and development of technologies for feminist and social justice purposes" (Transhackfeminist 2014a, pt. 1:13). This approach of thinking, inventing and working with technologies breaks with the idea of technology as developed by expert individuals in closed laboratories of higher institutions and outlines technology as a means in the long-lasting feminist fight against systems of exclusion and oppression.

The THF! further provides the meeting grounds for feminist hackers from different countries and nationalities. Thereby, the transnational nature of the event becomes a strategy for the confrontation of dominant actors, like tech corporations and states. At the time of writing this, the coming up THF!, scheduled for the first week of August 2022, expects participants from over fifteen different nationalities, amongst them Latin American, Asian and North American countries, apart from EU countries (Anarchaserver 2022f). The website information, manifestos and workshops are provided in Italian, French, English and Spanish and sometimes more languages, working with voluntary translators. The organisers also offer the possibility of a travel scholarship for people with low resources, which are chosen by 80 per cent from non-European countries, excluding richer countries like the US and Canada. Sponsored by the

Barcelona-based feminist technology collective DonesTech, the scholarships cover the travel costs and expenses during the event and require the holders to offer any activity during the event. The THF! however, does not attempt to unite for a common mission. The participating individuals, groups and collectives are organised locally and travel to the THF! with diverse aims, ideas and positions. A daily blog with reports from the camp of one participating hackerspace from Berlin shows how even within the hackerspaces, each member participates with their own expectations and plans (Heart of Code 2017b). Within the framework of the festival, these individual motivations and plans get connected, exchanged and inspired by each other, without following one common mission. Being connected transnationally and organised locally presents a way for the organisations to exchange knowledge, and act on a transnational scale but at the same time remain situated in their local contexts.

This approach is visualised in a digital collage poster announcing the coming encounter, showing the multiple past and current feminist struggles from different geographical sites, silenced histories of women and technology and relevant figures (figure 2). The poster features photographs of early women telegraph workers and female computers, the Black mathematician and computer scientist Annie Easley working at NASA, young indigenous activists in Latin America showing a poster with the Chilean feminist anthem "Un violador en tu camino"[5], armed female Zapatista fighters and feminist appropriations of figures like witches and fortune tellers. Arranged in a collage manner, these diverse and contextually varying struggles are thereby linked without being homogenised into a single perspective. Nevertheless, they stand next to each other on the poster, announcing the coming connecting event. What they have in common is the inherent thematic thread of the overlaps between women and technology, which have different meanings in different contexts.

The poster moreover offers various ideas of what technology refers to. It shows more classical depictions of technical infrastructures like the telegraph operators, objects such as a microscope and an old computer monitor alongside "traditional" weaving techniques or an axe as a working instrument in a woman's hand. Using the figure of the witch or fortune teller in this context also reminds of the knowledgeable female experts and specialists in the past, persecuted for their knowledge. The poster articulates the diversity of feminist fights over technologies, technological practices and women's roles in histories of technology. Taken together, they present themselves as a "technology", one of feminist resistance and struggle against different forms of oppression and exclusion at different times. In their call for the "Transhackfeminist

[5] A rapist in your path.

Figure 2. Digital poster announcing the THF! festival in August 2022 (Anarchaserver 2022e).

Convergence", the organisers write: "Sorority networks are an example of feminist infrastructure, and represent one of our earliest feminist technologies, perhaps the oldest and most widespread" (Anarchaserver 2022e).

The diversity in the approaches is also reflected in the workshops proposed by the participants for the upcoming THF!. The self-organised festival is open for a maximum of one-hundred-thirty people, which have to register before a set deadline. The workshops mostly do not require previous knowledge and are open to everyone, but some recommend first experiences with certain programs or programming skills. Workshops range from developing feminist hardware, like self-managed servers and tutorials for GitLab, an open-source-based application to manage software projects to more self-experimental and artistic reflections on intersectional sound production or academic lecture-style presentations on the shaping of feminist AI in the past and today (Anarchaserver 2022e). A "Call for Nodes" suggests the following list of possible workshop topics, which are however extendable:

> Building safe spaces, […] Support and solidarity networks, Feminist hacklabs/fablabs/biolabs, Feminist radio stations, Feminist servers, AI, bots and internet protocols, […] Feminist science fiction, speculative fiction and feminist futurotopias, Feminist libraries, archives and fanzines, Documentation and memory tools, encyclopaedias, HerStories, […] Ecosystems and interspecies solidarity, Spells and rituals, Techniques for life, Land defending (Anarchaserver 2022a).

In a workshop called "Vué explosée" the participants disassemble electronic devices to reflect on and come closer to the inner life of the everyday electronic artefacts that "flood us with texts, emails and virtual communication" (Anarchaserver 2022h). In other workshops, participants

can learn how to manage a tor bridge, build safe community wifis, use digital toolkits like MaadiX or create queer video games together. Numerous workshops provide technical education on open-source applications and programs, that allow for more safety of data and a more autonomous usage of digital tools and infrastructures. The feminist servers and hardware tools, based on free access to the inherent codes and data security counter the commercialised tech products of powerful corporations and their exploitive handling of data. The session "routes of technology" investigates global technology chains, from the extraction of resources and indigenous fights about territory to the exploitation of workers and technological garbage dumps (Anarchaserver 2022d). The workshop raises questions about possible alternatives of "technological progress" that are oriented at the needs of those involved currently in exploitive ways in technology production. Many workshops are also experimental and based on the mutual exchange of knowledge and ideas. One workshop attempts to counter conventional aseptic, sterile cultivation in laboratories and rethink the instrumentalisation of micro-organisms within anthropocentric relations between humans, plants and other non-human beings. The workshop involves experimenting with transfers and reproductions of mycelium in ways that involve the needs and wishes of the mutated microorganisms (Anarchaserver 2022i). Following approaches of biohacking, which are discussed in more detail later, one workshop guides through a body self-exploration and usage of DIY gynaecological test kits, criticizing the controlled access to health diagnosis and infrastructure (Anarchaserver 2022j). Another aspect of the workshops is the retelling of histories of technology and relating current practices to past appropriations and dealings with technology by women. For example, "Technics to sense the invisible" explores techniques to sense etheric environments by building sensing instruments, following the experiences of women from the 19th century onwards (Anarchaserver 2022g). In this workshop, the participants experiment with how the relations between the body and the environment are changed by technology. Relating to past and present technologies, the making of antennas, radio waves that connect messages, voices, or telephone conversations, and dowsing or voodoo science practices are taken up for experimentation.

These yearly encounters between women from different contexts, nationalities and realities become arenas of innovation, sites of exchange and knowledge production where imaginaries are dismantled, and alternative visions of technology are formulated and practised. They show connections amongst each other in the rethinking of methods of production, human-technology-nature relations and control of technological infrastructures, and at the same time present a multiplicity of diverse engagements and practices with technology. The sorority networks serve as the strategic tool, to dismantle dominant technological narratives, counter exclusion and

engage with actors on different levels and within their contexts. The feminist activists actively negotiate and reshape sociotechnical imaginations by tackling the global division of labour and exploitive structures behind technology production, by presenting hardware alternatives to commodified technologies, retelling histories of technological progress and criticising structures of control over human bodies, environments and technologies. The collective experimentation with rearticulated practices and methods, the redefinition of laboratories and expertise in self-designed sites of knowledge production and the exchange of visions and ideas from multiple perspectives create technological innovations that are oriented towards solidarity, connectivity, safety and equality.

Similar encounters are also held on the side of the feminist data activists and initiatives. Looking at one form of data activism, the mapping and documenting of femicides on digital maps, presents an equally dense transnational network of connections and encounters between the data feminists, concentrated mainly in North and South America but with linkages to other continents (figure 3). Equally, as the map shown above, the linkages and actors can be extended and here present just a section of a larger network of connections. The network of "mapeadoras de feminicidios"[6] connects through various physical and virtual meeting points, building thereby a structure that counters the data practices of state authorities that fail to capture the structural violence against women.

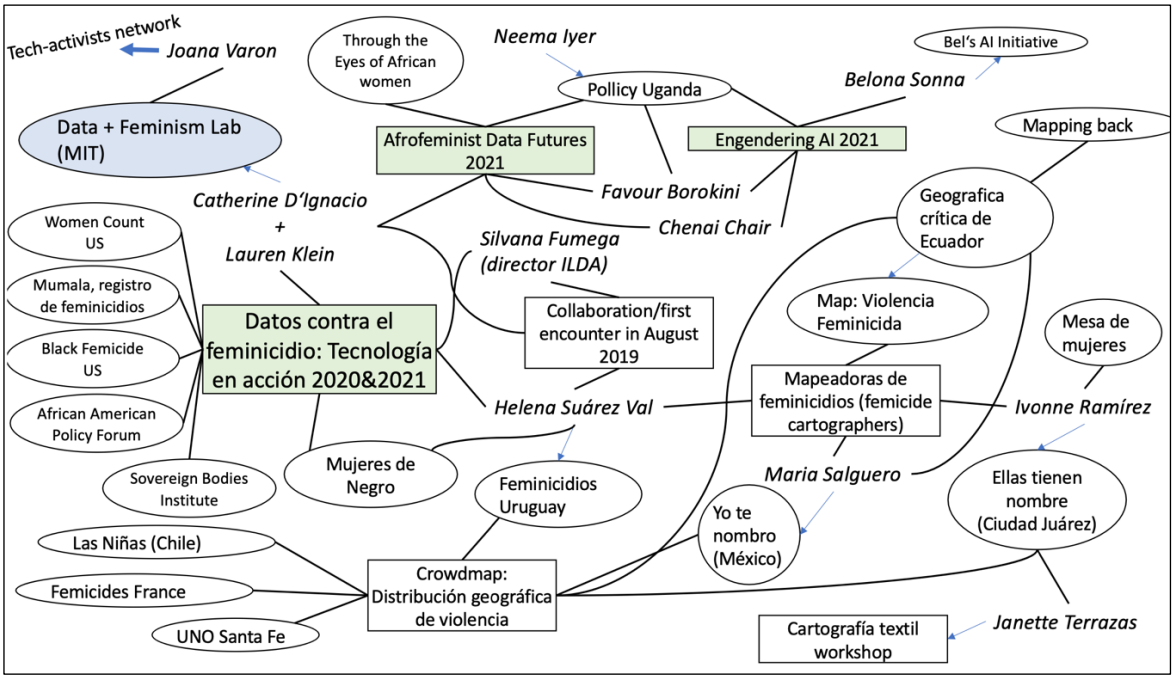

Figure 3. Network of feminist data-activist initiatives and encounters, including individuals. Illustration by the author.

[6] femicide cartographers.

One of the digital cartographers of femicides is geophysicist researcher Maria Salguero, who started to collect data about committed femicides in México city in 2016 and locates them on an online accessible map, titled "Yo te nombro"[7]. Salguero collects information about the femicides, like information on the relation between victim and aggressor, the type of arm, the motivation behind the crime and if it was femicide of a lesbian or trans woman. She derives the data from online newspapers and articles and matches them with official information from the public prosecution offices and testimonies of relatives of the victim (Salguero 2021, 3). Using the MyMaps tool from Google, she tags the place of the femicide on the city or country map, clustering the cases by attaching different colours to the different years. Equally as Salguero, Ivonne Ramírez, who graduated in Gender and Literary Studies, does the same work in her map "Ellas tienen nombre"[8], for Ciudad Juárez, México (Ramírez 2019). Her map shows the reported femicides from 1993 until today, showing information on the cases and a picture of the victim, taken before the femicide. From these pictures Ramírez also creates videos, counting the number of femicides each year while showing each victim, the name, age and date when murdered (ibid.). The website also shows diagrams of victims that are related to each other or knew each other in some way, making the structural nature of violence clear that these women and girls experience, and that femicides are not individual cases (figure 4). In the same way, "Feminicidios Uruguay" collected femicide data as a collective work starting in 2015 and was then continued by the social activist and PhD student Helena Suárez Val (Feminicidio Uruguay 2022).

The three cartographers meet for the first time in person in 2019, in Quito, Ecuador, at a regional Latin American conference organised by Geografía Crítica Ecuador (Geografía Crítica Ecuador 2019a; Jandik 2019). They already communicated before on social media (Jandik 2019) but the conference connected them to various other organisations that equally form part of the network of femicide cartographers including Geografía Crítica Ecuador and their map "Violencia Feminicida Ecuador" and Mesa de Mujeres, from Ciudad Juárez, Mexico. Together with numerous other femicide data maps, amongst others from Chile, (Las Niñas), France, (Femicides France), and Argentina (El Destape, cba24n), where sometimes also radios and newspapers engaged in collecting and tagging information, a collaborative map was created, visualising the structural violence against women and missing data on these cases (soniamadrigal.com 2022).

[7] I name you.
[8] They have names.

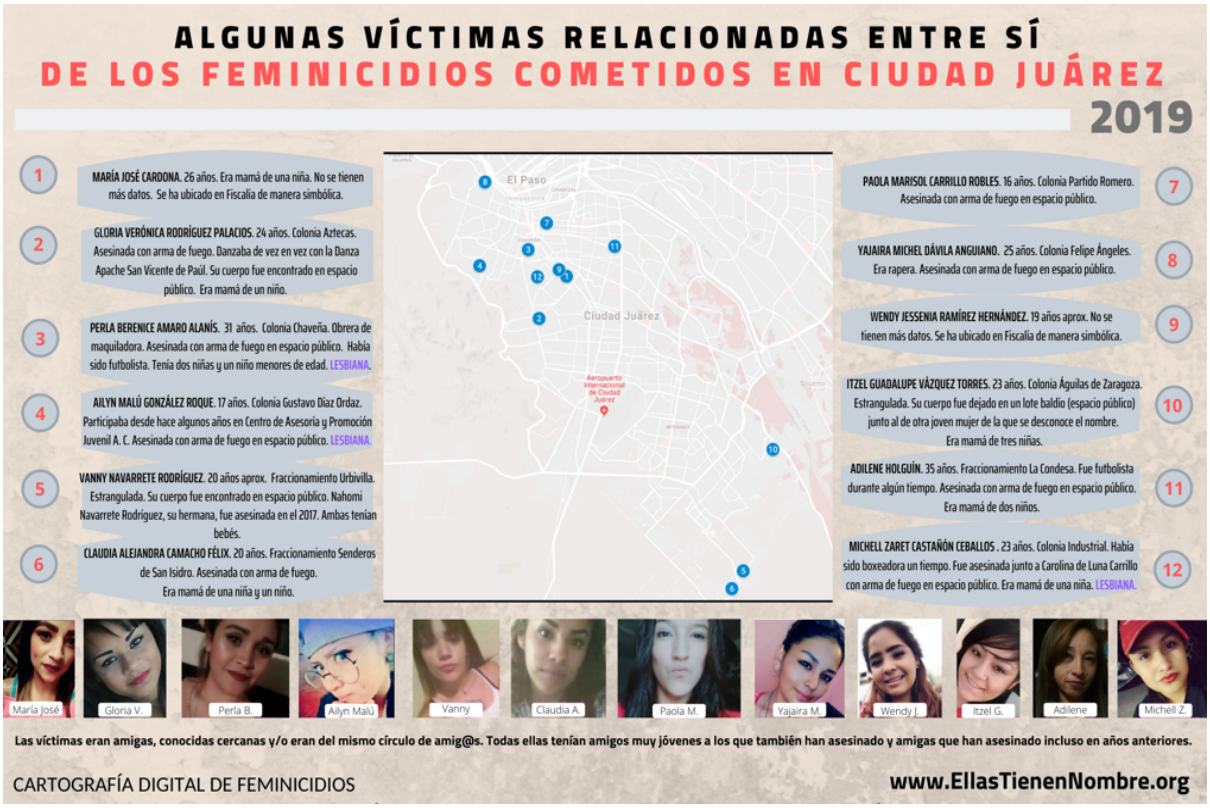

Figure 4. Map showing how victims of femicides in 2019 in Ciudad Juárez, Mexico, are related to each other, and providing background information on the victims, like age, family situation, hobbies (Ramirez 2019).

Next to the collaborative map, a citation from Mexican writer Sara Uribe reads: "We will all disappear if no one looks for us if no one names us. We will all disappear if we remain defenceless, just watching each other, watching how we disappear one by one." (Sara Uribe, cited by soniamadrigal.com 2022). By collecting the data and naming it as femicide, connecting it to a location on the map and providing the personal information behind the victims and of each case, the cartographers visualise and pronounce what is otherwise invisible or forgotten. The names of the maps indicate this work of naming the victims, showing the individuals behind the femicide to make them seen. What the data feminists highlight through and with their work is the missing data on femicides in official reports by states and governmental authorities. It is not only the missing reports but often the missing identification of the cases as femicide, that thereby fail to comprehend the structural nature and dimension of femicides.

The creation of the maps and the collective gathering of data presents a strategy to counter the governmental handling of these data and a technique to negotiate the state's official narrative on violence towards women. In a statement on femicide data, Geografía Crítica Ecuador writes that "the debate conducted by the state and certain social actors presents decontextualised data with which they want to create a reality that does not exist, with the sole purpose of legitimising their own position" (Geografía Crítica Ecuador 2019b). Further, the maps present an

engagement with knowledge and power by reconsidering the nature of data and approaching it as instrument or tool, asking "what is data? What does the data tell? How was it collected? What purpose does it serve?" (ibid.). Another encounter that shaped the network by approaching maps as tools of resistance was the formation of the "mapping back" collective that resulted from a three-day meeting in October 2017, in Montreal between various Latin American cartographers, geographers, and data scientists. Although being focused on supporting Indigenous communities in fighting extractive industries, "mapping back" presented a relevant activist practice for the femicide cartographers, in highlighting "how maps could be used for purposes of resistance and resurgence, including […] historical memory, […] oral histories, […] community visioning and life-plans, and decision-making" (Mapping Back Collective 2022). The mapping of femicides is used as a counter-strategy to present another version of reality, showing the exclusion and invisibility that is created by decisions on who is counted and in which ways. Thereby, data is approached from a perspective of power, that questions any assumption about data as neutral fact.

The cartographers engage discursively with the state's data practices in pronouncing their concerns but further demonstrate a different data practice by highlighting the emotional and care work involved in it. Collecting the femicides and searching, filtering and contextualising the information in the newspapers and reports is outlined as a daily emotional (and unpaid) labour. Salguero recounts, how in the process of data collection she started feeling emotional stress and experiencing nightmares as well as a changed perception of threats (Amezcua 2018). Data becomes clear as containing more than just facts, but the persons, lives and realities behind the cases are felt by the data collectors, who "remember that they are not just numbers but that every victim has a name" (Forbes México 2020).

The collaboration between the feminist data activists further informs the creation of specific technological software tools, which are developed to support the emotional and time-consuming, activist work of mapping femicides. In a transregional online video conference under the name "Técnología en Acción"[9], that took place on 24th November 2021, around seven activist initiatives came together to discuss their practices of femicide mapping and the building of digital tools that support their data activism. The event was organised by the research initiative "Datos contra el Feminicidio"[10] which is mainly driven by the three data activists Helena Suarez Val, Silvana Fumega and Catherine d'Ignazio. The research project is a

[9] Technology in action.
[10] Data against Femicide.

cooperation between the three data scientists and the feminist data activists and followed preceding similar encounters at the end of 2020. The research and policy director at the Iniciativa Latinoamericana por los Datos Abiertos[11] (ILDA), Silvana Fumega, moderated and lead through the event. One of the leading figures is Catherine d'Ignazio who is the director of the Data + Feminism Lab at the Massachusetts Institute of Technology (MIT) and co-author of the book "Data Feminism". The organisers, as well as most of the participating initiatives and activists, have an academic background or work in academic and state-funded institutions. This is discussed more in detail in the next section, as this background informs the type of strategy and activism, through which data science and data are negotiated with dominant actors like state authorities and corporations. "Datos contra el Feminicidio" describes itself as "an initiative that brings together practices, knowledge and emotions from activism, academia and civil society to foster an international community of practice around femicide data" (Datos Contra el Feminicidio 2021). Through this focus, the initiative underlines again the importance of emotions and embodiment of the practices when dealing with data, as well as the aspect of community, collectivity and exchange, both principles which are also fundamental in feminist hacking activism. The practice of collecting and working with data is thereby conceptualised as care work, implicating the person who collects the data on a personal level.

Out of this exchange and emotional care work, technological applications are designed and developed, that serve as tools for feminist data work. In the event, the initiatives discuss their experiences and dealings with the new tools, amongst them a Browser extension called "Data Highlighter", which directly marks relevant data like places, names, and dates in the articles, which can then be easily copied and pasted. This allowed the activists to systematise their work and detect relevant information on the cases of femicides (Datos Contra el Feminicidio 2021). Another tool is an email alert system, which can be adjusted regarding the frequency and number of articles to be analysed (ibid.). It further works with an algorithm that detects relevant articles and can moreover be trained to re-term certain keywords often used in the media, like "homicide", which obfuscate the femicide as such. The program also conducts long-term analyses and shows related articles which talk about the same femicide case.

Many of the participating initiatives explain a change in the individualised and personal work of collecting data through the tools (Iniciativa Latinoamericana por los Datos abiertos 2021) as it reduces the workload, giving them more recreation time but also because it requires new skills

[11] The Latin American Initiative for Open Data is a civil association, registered in Uruguay and was founded by a group of Latin American researchers in 2012 (Iniciativa Latinoamericana por los Datos abiertos 2022).

for their data practice. Suarez Val notes, that the time that is spent on learning how to use new technological tools increases and becomes also more relevant for their data practices (Suarez Val in: Iniciativa Latinoamericana por los Datos abiertos 2021, pt. 1:14:00). The usage of the tools also raises ethical concerns, as some activists reflect on how it reduces the emotional and relational engagement with the femicides, as a sort of witnessing the unfair deaths (D'Ignacio in London School of Economics and Political Science 2021, pt. 34:45). In discussing the tools from a perspective of care and emotions, and based on exchange, the creation of technology is here approached and evaluated through its influence on the relationship between data and collectors. The outsourced process of decisions on which data is filtered and how is reflected through the effect it has on the activist practice and the emotions involved in the work.

Related to this, the initiatives highlight their different standpoints, that influence the collection of femicide data. For example, Mumala (Mujeres de la Matria Latinoamericana), an initiative from Argentina explains that they mark intersectional aspects for example information on the social category of the woman, including immigration status, if the victim was pregnant or in a state of prostitution, disabled, indigenous, consuming drugs or in the situation of being imprisoned (Iniciativa Latinoamericana por los Datos abiertos 2021, pt. 1:20:00). Suarez Val explains that the applications are still edited to detect differences in the cases, for example, if the victim was a Black or Indigenous woman. Taking up this aspect, Rosa Perreira from Black Femicide US recounts experiencing a silencing of the problem of femicides of Black women, because she found the Black community focuses on racism affecting both men and women but ignores the sexist oppression that Black women experience (ibid., pt. 1:03:50).

The different standpoints in the discussion thereby resituate data practice from objectivity claims to context-related practices. By highlighting the differences amongst the femicide cases and the need to create applications which recognize intersectionality, the activists make clear how the structural oppression, which they reveal in their femicide map, is reproduced in the tools they created. Thus, the activists agree on the need to edit the extensions so that more detailed data on the social background of the victims are filtered out. The discussions in the encounter thereby raise a crucial point, considering the use of data as a basis and impulse for the development of technological tools and software. Both the technological applications and the practice of collecting data are outlined as mutually influencing each other. By working with the tools, the practice of collecting data is changed as well as the effects it has on the person collecting. Through the mapping practice, the care approach to data and the contextualised technological applications, the data feminists negotiate the forms of how data is collected and

what counts as relevant data. In the maps, the structural violence of femicides becomes visible, while at the same time, the data is personalised, showing the individuals behind the cases.

Affiliated to MIT and the "Data + Feminism Lab", the development of digital applications to support counter-data activism is rooted in an academic framework of technology development. At the same time, the applications are co-designed with those, who will use them and are directed at supporting counter data work, which makes unseen data visible. Here, the development of technology is practised through co-creation and directed at building tools for feminist confrontations of oppressive structures, making the unseen femicide data visible.

In the same direction, a further encounter between North American scholars led to the formulation of the "Feminist Data Manifest-No". At a feminist Data Studies event hosted by the Institute for Research on Women and Gender of the University of Michigan in August 2019, feminist data scientists came together to build a feminist coalition of interdisciplinary data scholars (Cifor et al. 2019a). Organised by two feminist scholars from the Universities of Washington and Michigan, Marika Cifor and Patricia Garcia, the workshop event connected ten feminist academics working in the fields of digital media cultures, computer science, cinema studies, human-computer interaction, feminist data studies and race and sexuality in architecture and design. In using the Manifest-No as a formulation of collective imaginations about future relations between data, technologies and humans, a vision of a future world is articulated, that refuses commodified, exploitive and harmful data regimes. In the same line of thought as the femicide data activists, the authors "refuse to understand data as disembodied and thereby dehumanized and departicularized" but rather "commit to understanding data as always and variously attached to bodies" (Cifor et al. 2019b, 2). Further, data are not "just numbers", but are defined as a "thing, a process, and a relationship we make and put to use", which consequently also regards data as a resource "to be cared for and cultivated" (ibid., 4, 7). The data practices of the anti-femicide activists demonstrate how practising these principles can look like, in contextualising, situating and through emotional labour mapping the femicides. From a theoretical perspective, the Manifest-No further tackles the tools related to data collection and usage and articulates a refusal to "accept that data and the systems that generate, collect, process, and store it are too complex or too technical to be understood by the people whose lives are implicated in them." Similarly to the Data Against Feminicide approach, the authors demand the building of systems that work with data in controllable and tangible ways (ibid., 2). This addresses the crucial question of who benefits from the tools developed for working with data. As in the case of the email alert system and extension to filter data from articles, the instruments were intended to support feminist activism. However, the tools also

interfere with the way how data is collected and change the relationship between data and collector, as well as the requirements for doing the mapping. The Manifest-No also hints at the complexity of data tools and systems, and the knowledge required to operate them, and thereby to the exclusion that (new) technological tools can create, often for those whose data is harvested. Therefore, the Manifest-No proposes a "methodology of the oppressed", that arises out of the knowledges and understandings of those "most screwed over by data" (ibid., 3). The authors explain their imaginations therefore as rooted in the feminist thinking of Patricia Hill Collins, Donna Haraway, Chela Sandoval and Ruha Benjamin, taking up the perspective of the intersectional struggles within global interactions. The Manifest-No is hence a vision of a feminist future and at the same time a rejection of a world that reproduces the structures of oppression through the tools of data and related technologies.

In the transnationally organised encounters, the activists show the data systems and technological tools as linked to intentions, human systems and societal structures and as such implicated in the effects and outcomes they produce. In other words, data and the tools developed based on data, are not agents of their own but are used, created and designed by actors, following certain intentions. The usage of data for arguments and technological tools becomes visible as tied to imagined realities of certain actors, which might be contrary to each other, as in the case of the femicide maps, telling a different story of structural violence against women than the state authorities. Looking closer to methodologies of the oppressed and counter practices in the next section it is carved out how technology and data are approached through alternative methods by the feminist activists.

3.3 Shared methods and concepts: Data Feminism, speculation and visibility

The connections in the transnational and regional feminist networks also function through the flow of ideas, the exchange of knowledge and the reciprocal understanding of each other's contexts. The book "Data Feminism", by Laura Klein and Catherine D'Ignazio is an influential work that is taken up by various of the feminist initiatives working with data and tech. In the book, the authors propose an approach to data based on seven principles, which are equally situated in intersectional feminist thought. They read: "examine power, challenge power, elevate emotion and embodiment, rethink binaries and hierarchies, embrace pluralism, consider context, make labor visible" (D'Ignazio and Klein 2020, 17f.). Organising their book accordingly in seven chapters, they formulate their aim to challenge the status quo, which benefits them as *white* professors at the expense of others (ibid., 18). Data is again highlighted as an instrument of power, used to maintain but also to counter control. The rethinking of data

methods is outlined as a strategy, to reveal and dismantle the usage of data in exploitive and oppressive ways. Coming from an academic activist perspective, the authors attempt to bring voices to the academic and public debate of people working with data from "the margins".

At the same time, the book is also influenced by the various data practices that the authors encountered during their research. In her sabbatical year in Buenos Aires in 2019, before establishing the Data + Feminism Lab at MIT, D'Ignazio interviewed data activists and scientists working in Latin American countries at the intersections of data and feminism, including the "mapeadoras" (Datos Contra el Feminicidio 2022). The authors were also invited to speak about their book, by Pollicy, a Ugandan feminist collective of technologists, data scientists, creatives and academics that aim at crafting "better life experiences by harnessing improved data", working mainly in the East African region (Pollicy 2022c). Pollicy organises monthly events within the framework of a Feminist Technology Movement series, which are directed at bringing academics together, who work in the fields of data and technology. The events serve moreover as platforms where Pollicy presents their research reports on African women in AI and the tech sector.

Klein and D'Ignazio were invited to speak within this framework, at an online Webinar termed "Afrofeminist Data Futures", held at the end of April in 2021. In the online conference, a research team of Pollicy presented their report after which the event was named. According to Chenai Chair, who forms part of the research team and besides that is a special advisor at the Mozilla Foundation for the African Innovation Program, Data Feminism entails everything that they intend to talk about (in: Pollicy 2021a, pt. 34:25). Yet, she recounts how they were critically asked why they refer to a Western concept of data, describing Data Feminism as such, while their research focuses on African contexts. Taking this critique up, Klein (ibid., pt. 28:30) makes clear in the conference, that their book is focused on the US, and therefore does not attempt to present one universal form of Data Feminism. Rather it suggests guidelines, that can be taken up or adjusted, outlining Data Feminism as plural and diverse. Further, Klein (ibid., pt. 31:00) highlights the importance of building connections and thus their intention of co-liberation through partnerships in the "ethos of cooperation" and allyship. This exchange demonstrates how finding common grounds and exchanging concepts is a fundamental practice for the actors within the networks. As such, the connections between them are based on the recognition of each other's context and the adjustment of ideas to local differences.

One of the participants at "Afrofeminist Data Futures", who equally explains taking up Data Feminism for her work in African contexts, is Anwuli Okonjo. Okonjo, a student at Duke

University and member of the university's Social Movements Lab created the platform "Through the Eyes of African Women" (TEAW). The platform invites African women to share their political experiences, perspectives and lived realities (Okonjo 2022). In the conference, Okonjo (in: Pollicy 2021a, pt. 42:00) explains receiving these in the form of personal letters, poetry, essays and prose stories and links this to the forms of how Africans and Black women documented history also before. Thinking from the margins as Data Feminism suggests, requires asking whose stories are told and in which way. Hence, Okonjo (ibid., pt. 40:45) underlines that "you can't imagine what you can't see", which gave her the incentive to found TEAW. Through the platform, she aims at making the knowledge that these women are creating visible and presenting them as relevant political actors. Through her work, Okonjo also makes clear how data and particular forms of data can be rethought epistemologically, identifying storytelling and the collection of personal experiences as data. In line with a "methodology of the oppressed" and the thinking of Patricia Hill Collins (2002) experiences are validated as knowledge produced in an alternative epistemological system. As Okonjo mentions in the conference, this presents an old and crucial strategy for Black and African women to document their experiences and articulate their perspectives, otherwise delegitimised.

3.3.1. Speculation and collective imaginaries

In the same sense, a recent call for short stories organised by Pollicy proposes speculation as a method to create imaginations about technological futures. The competition under the name "Africana Futurism. Speculative Fiction" is endowed with one thousand Dollars for the first price and is open to all "Africans within or outside Africa", that write about "how Africans […] are exploring, navigating and interacting with digital technologies" (Pollicy 2022d). Pollicy (ibid.) aims to gain an understanding of how Africans imagine technologies, using this as a perspective for building technology that is inclusive and empowering. Here, Pollicy also builds upon Afrofuturism as a genre and practice to present African perspectives on technology, like in the popular marvel movie "Black Panther" (Coogler 2018) and short movies and stories about African cyborg witches, like "Hello, Rain" (Obasi 2018), mentioned before. Thus, speculation provides space for imagining what type of technology in the form of infrastructures, gadgets, and environments, is needed and by whom. The method of speculation is taken up differently by many of the actors active in tech and data activism, to approach technology and formulate expectations.

At "HacktheEarth", another transnational, feminist encounter which took place in 2017 at Calafou, a creative writing event for speculative fiction on feminist technology was organised.

Brought together in the workshop, the members of different European feminist hacker collectives asked how feminist technology would look like, which functions and features it would provide, how it would be described, used and from which materials it would be built (Cooptècniques 2017). Answers were developed collectively, in a shared space where "creativity embraced political imagination" (ibid.). The method was also taken up by Le Reset, a hacker collective from France that was active until March 2020, which provided a workshop for speculative writing about imaginaries on feminist, liberatory and anti-capitalist technologies and combined this with a tutorial for the online tool Twine[12] (Le Reset 2019b). Both encounters used a method developed by Spideralex, a cyberfeminist activist and founder of the feminist technology collective DonesTech from Barcelona, which is co-organising the THF!. The workshops start with brainstorming on questions that describe an imagined technology, like aesthetic/materiality, usage/functions, by whom it is developed, how it is produced, and its relation to the environment (ibid.). From each of these collected characteristics, four are combined to draft a technology. Following this step, a story is written together in a group about the drafted technology, applying the surrealist technique "exquisite corps", where everyone adds a sequence to produce one joint writing (ibid.). In this way, creativity and collective imagining are used in the method to bring up aspects which are relevant to the participants, including these in the development of the technology. The creation of technological artefacts or systems is here practised as an experimental, reflexive group process, that centres on the ideas of the participants. It is demystified as something inaccessible, created only by experts. Instead, the participants take agency in drafting their own visions of technological futures, which respond to their experiences, needs and desires.

Another example of speculation as a method to imagine inclusive, feminist technologies is the textual outcome of an encounter that took place in July 2019, in Chiapas, Mexico, under the name "Tecnología y afectos ¿Cómo bosquejar políticas de la (co)responsabilidad"[13] (Sursiendo 2019). The three-day conference was organised by the Mexican civil society organisation Instituto de Liderazgo Simone de Beauvoir, the private, non-profit, educational institution Tec de Monterrey and Sursiendo. Sursiendo is a group of feminist activists, researchers and people active in diverse fields like communication, design, software, and art, that exists since 2015 as a registered civil society organisation and since 2011 promotes and investigates anti-capitalist perspectives on technology (Sursiendo 2022). The conference connected twenty-five women from different social and professional backgrounds in Mexico and produced two hackfeminist

[12] Twine is an open-source tool which can be used to create interactive, non-linear stories and online content.
[13] Technology and affections. How to sketch politics of (co)responsibility.

writings, “Tecnoafecciones” and “Nos Permitimos Imaginar”[14], a collection of individual and collective reflections and engagements with techno-imaginaries. As the names suggest, the writings present speculative future ideas, personal reflections and planned technological projects, and from their diverse perspectives conclude that there are no universal, indifferent technological relations (Cortés Lagunas 2020b). This builds the common ground to confront the dominant discourses and thinking about technology. “Tecnoafecciones” states that:

> “Faced with the creation of a technological mono-thinking and the assertion that technology is only determinant and cannot be appropriated or rewritten in the sites where it is used or adopted, we confront these with situated narratives, resistances, technological and cultural hacks that demystify the apparent universal power of some artefacts, devices and technological discourses” (Cortés Lagunas 2020a, 13).

Speculating and imagining desirable futures is, thus, a strategy to re-negotiate the relations to technology and take back agency in defining these. As a method, it allows for a contextualisation of the different needs of people and the different realities that technology has to respond to.

Coding Rights is another organisation that works with “speculative exercise[s] for a less fcked up future” and developed an oracle card game to brainstorm about alternative algorithms and devices in groups (Transfeministech 2017). Coding Rights is a Brazil-based women-run organisation that addresses power imbalances inherent in technologies and their application, with a focus on gender and North/South inequalities (Coding Rights 2022). The development of the card game started with an informal brainstorming encounter between “women, femmes and feminists” who are active in the fields of AI, algorithms and design, and took place at the Coding Rights Headquarters in Rio de Janeiro at the beginning of November in 2017 (Transfeministech 2017). The initial encounter that set the impulse for the game was organised in cooperation with the MIT Codesign Studio and Transfeministech.org, which is another platform created by Joana Varon, the directress of Coding Rights and founder of various tech-activist projects. Referring again to Patricia Hill Collins, they asked themselves how a future would look like, that hacks the reproduction of “the matrix of domination (capitalism, heteropatriarchy, white supremacy and settler colonialism)” through technology. As current technology is designed in ways that maintain the status quo of an unequal society, the card game was developed as a creative method to imagine alternative transfeminist algorithms and technologies that would counter this situation. In the following years, the game was tested, edited and worked on at different public meeting points, for example at the Tecnox 3.0 event in

[14] Technoaffections and We allow ourselves to imagine.

Chile in April 2018, and the Feminist Tech Night Berlin in May 2019 (Transfeministech 2018; 2019).

Using speculation as a method to think and present alternatives to current sociotechnical imaginaries is also a connection point between the activist networks of data and tech feminists. Under the title "Speculative TransFeminist Futures: from imagination to action", the MIT Data + Feminism Lab of D'Ignazio hosted Coding Rights founder Joana Varon in February 2020, to discuss the development of feminist technologies (MIT Office of Sustainability 2020). Joana Varon, who is also a former Mozilla Media Fellow, connects in her activism the engagement with feminist data and tech. Her project "Chupadatos.com" critically monitors, analyses and informs about concepts of Big Data, Smart Cities and the usage of surveillance and data on behalf of companies and governments in Latin American countries. Chupadatos establishes the linkages between the collection of data and the technologies and infrastructures that enable the collection and usage, like "globos de vigilancia", fixed, drone-like observation cameras used for example by the Chilean government, or mobile applications that track everything from health data, location to consumer behaviour and purchases. The introduction to the project states that:

> "[t]he intelligence of the "Chupadatos" was to discover that every search, every click, every like and share we give, or even information on the time that the mouse cursor hovers over an image, could be monetised" (Felizi and Varon 2022).

The wording "Chupadatos", which could be translated to "Data Sucker" refers to the limitless collection and monetarisation of personal data. It could moreover be linked to the mystical creature "Chupacabras", popular in Latin American tales which speak about a vampire-like monster which kills small cattle by sucking their blood out. "Chupadatos" is thus a powerful invented metaphor to describe the processes of data collection through new technologies, on behalf of governments and private actors.

3.3.2 Addressing access and making visible

The diverse usages of speculation as a form to contextualise engagements with data and technologies is thus a shared strategy by many actors within the networks and further a point of connection between them. As with Data Feminism as a method, the concepts are adapted and appropriated to different contexts, thereby offering a possibility to take back agency in negotiating technology. This type of approach gains relevance when taking into account how the possibilities of agency are defined by access to certain technologies. The access to technologies and knowledge is shaped by the power imbalances that speculation, Data Feminism and methodologies of the oppressed aim to tackle. Therefore, the negotiation

strategies also focus on making marginalised voices and perspectives visible and addressing issues of access.

This is taken up by Pollicy in the project series "Engendering AI". The series aims to bring attention to the challenges that African women working in AI face (Pollicy 2021b), discussing also the different perspectives amongst African women themselves. In the online conference "A Gender and Ethics Perspective on Artificial Intelligence in Africa", which took place in November 2021, AI researcher Belona Sonna talks about the challenge of exclusion that French-speaking African women deal with, as AI study programs and support initiatives are dominantly in English. As a consequence, Sonna (in: Pollicy 2021b, pt. 36:40) highlights, that the number of French-speaking Africans working in AI is already low, with French-speaking women being even less, despite the fact that there is almost no available data on these numbers. Their underrepresentation but also undervaluation in the AI sector derives not only from unavailable resources about technology in French or local languages but also from early underrepresentation in schools and cultural barriers that limit girls from going into these fields (ibid.). However, Sonna also drives attention to African women from Francophone countries that are successfully working in the AI sector, thereby making their labour visible (figure 5).

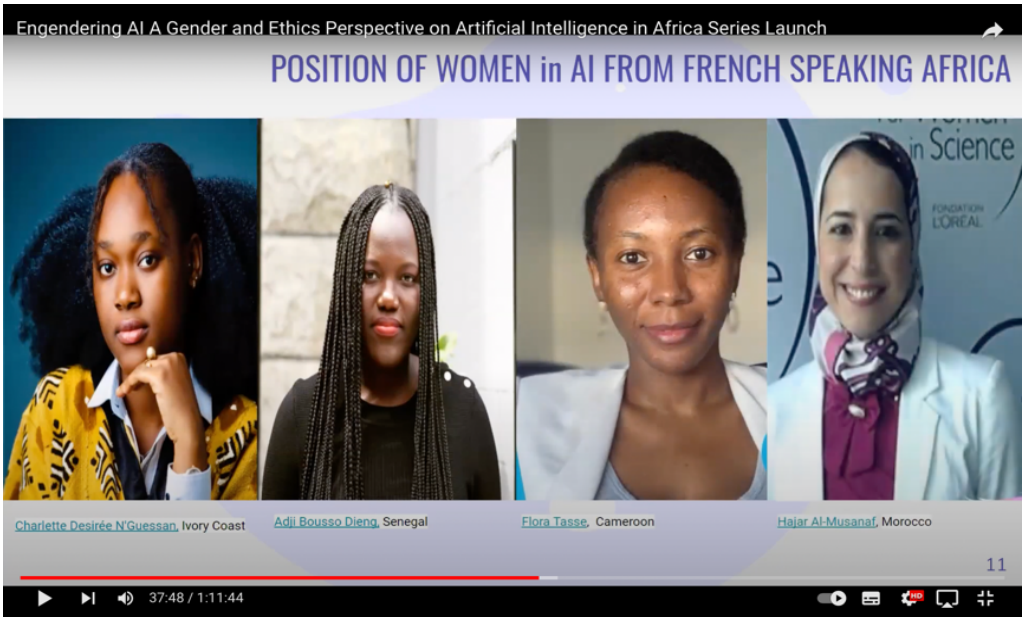

Figure 5. Screenshot from the online conference "Engendering AI", showing African women from Francophone African countries who work in AI (Pollicy 2021b, pt. 37:48).

Pollicy also makes aware of the global hierarchies inherent in data collection, that influence the possibilities of access to data and knowledge. In the "Afrofeminist Data Futures" event, Neema Iyer (in: Pollicy 2021a, pt. 50:25) the founder of Pollicy brings up the extraction of data on behalf of private companies, or researchers. Iyer sees a pattern in the extraction and harvesting

of data, on behalf of foreign companies or researchers, who collect data in African settings and afterwards keep it in private datasets where people have to pay to access it. Equally, foreign researchers or also governmental institutions collect data and create datasets for scientific research papers. These are then published in the Global North, excluding people in the regions where the data was collected from accessing the results, as universities often cannot afford the journal subscriptions (ibid.). This creates a situation where data is commodified and kept out of reach according to global structures of power, defined by access to financial resources and funds. The report "Engendering AI" that accompanies the event, uses the metaphor of Africa as a "treasure trove of raw data", which is harnessed to improve AI developed by foreign companies (Borokini, Nabulega, and Achieng 2021, 15). The authors further refer to research from the field of decolonising AI, which outlines how African populations are subjected to the collection and monetisation of their data without their consent and used for beta testing of AI-driven technologies (ibid., Mohamed, Png, and Isaac 2020). At the same time, the report points out that "African AI researchers have […] been routinely left out of international AI conferences where key networking and learning opportunities exist" (Borokini, Nabulega, and Achieng 2021, 15). By taking up these concerns, Pollicy draws attention to the global hierarchies that shape technology development and knowledge production based on data. In doing this, they further make a statement about their position as an African organisation working in the field of data and technology and collaborating with initiatives from Western countries.

Further, access is defined by the expansion of technological infrastructures. The expansion of the submarine telegraph lines, discussed in the theoretical chapter, showed how its development was intertwined with the capitalist interests of corporations and governments. The Brazil-based feminist hackerspace MariaLab takes this aspect up and introduces a manual on feminist servers with a detailed description of how internet infrastructure functions, showing a map (figure 6) of the global linkages that are created by the submarine cable networks (Gomes 2017, 13). The map, which they derive from the open and free resource submarinecablemap.com provides information on the connection, when it is or was ready for service and by whom it is provided. Filtering the map by selecting an owner of cables shows the whole network of submarine cables which are provided or partly owned by that actor. The tool thereby makes ownership structures and spheres of influence and power visible and offers an idea of the time-place-geographies of internet infrastructure expansion. Within this network, MariaLab criticises the dependency on third parties, in the form of private companies and technical experts, to manage electronic equipment, data and web-hosted services (Marialab 2017).

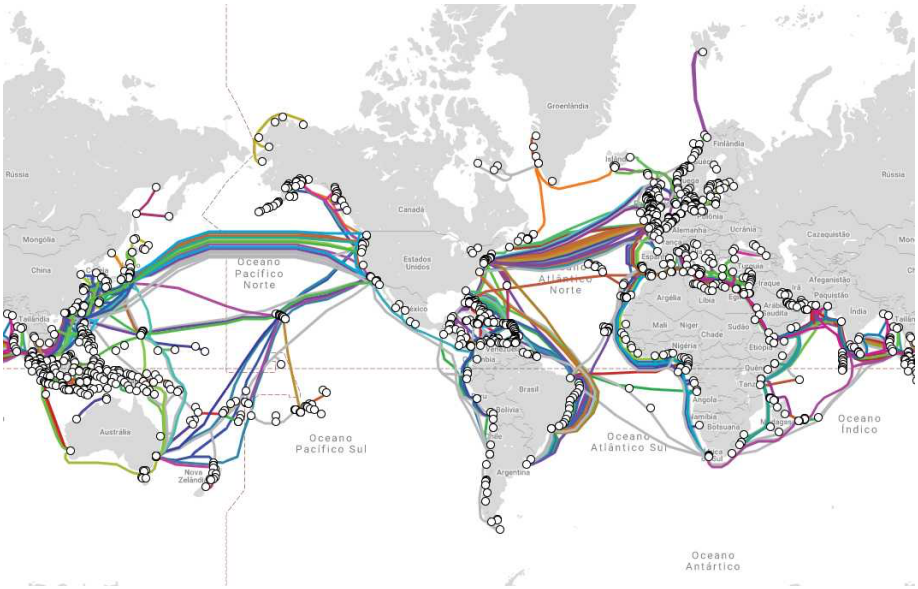

Figure 6. Global map of submarine cables, shown in Marialab's manual on internet infrastructures and creation of feminist servers (Gomes 2017, 13).

By tackling issues of access to data, hardware and software or even just information on technology in multiple languages, the activists raise questions of power and negotiate the ideas of technological progress and universal benefit for society. In making the lack of access visible, but also the differences in their perspectives and standpoints regarding access, methods and possibilities, they act from their local context but within the larger network. Through the connections in the networks, they form a counter-dynamic to dominant approaches to technology but refrain from pursuing one common approach. Instead, the building of connections, in the form of cooperation, idea exchange, references and encounters based on the acknowledgement of difference constitutes the grounds for negotiating practices and imaginations. Methodologies of the oppressed, Data Feminism, speculative imagination and making visible are techniques which, adjusted to different positions reclaim agency in the development of technology and data systems. On the grounds of a common network and from a multitude of local angles, data and technology are reframed as relational and context-specific and thereby as adaptable and subjected to appropriation.

3.4 Redefining technology, redefining data

In sharing concepts and ideas, the activist networks create knowledge flows and alternative sites of knowledge production, in which technology and data are reconceptualised and approached through feminist practices. This section carves out four angles from which power structures related to technology and digital data are challenged and influenced.

3.4.1 Decolonisation of the body, biohacking, and rewriting the history of medical technologies

Taking up cyberfeminist ideas of cyborgs and the own body as a power tool, transhackfeminist perspectives understand the body itself as a technology or a field of technological experimentation. As part of the Pechblenda Lab at Calafou, the GynePunk space for experimentation and biohacking was set up in 2015 and deals with decolonising female bodies and histories of medical technology. One of the projects within the space, "Anarcha, Lucy, Betsey GLANDS" deals with researching and rewriting the history of gynaecology. Medical technologies of today's health system are situated within the socio-historical structures of their development (Anarchaserver 2014, 7; Chardronnet 2015; GynePunk Lab 2015). Klau, one of the members of Pechblenda and GynePunk researches the history of the three Black enslaved women Anarcha, Lucy and Betsey, who were subject to gynaecological experiments and various surgeries by the *white* doctor J. Marion Sims, in the 1840s. In radically questioning the colonial and patriarchal perspective on history, which presents Sims as the inventor of the speculum and "modern gynaecology", GynePunk proposes Anarcha, Lucy and Betsey as "mothers of modern gynaecology" and highlights that "in these bodies, the ancestor of the contemporary speculum was born, as well as around 71 other instruments attributed to this 19th-century butcher" (GynePunk 2022a). Moreover, reflecting on the colonisation of the female body, the activists rename female body parts after one of the slave women, Anarcha, turning "Skene's Gland" into "Anarcha's Gland" (GynePunk 2022e; 2022c).

In an online collage, available in different languages and entitled "Colonizacion Corporal"[15], anatomic models of the renamed body parts are edited and mixed with black and white photographs of male doctors who were considered pioneers in the field of women's health (GynePunk 2022c). Further, the collage features a picture describing the social process of female body colonisation, mentioning societal expectations about women's behaviour and appearance. In a contrary collage, entitled "De-colonizacion Corporal", the same anatomic model is renamed, featuring the names of the enslaved women (GynePunk 2022d). Here, the power of naming is highlighted as an act of colonisation and control over narratives. The renaming reclaims the authority over these narratives and provides another version of the history of medical technology and the innovators who played a role in it. Moreover, a short movie created by the lab and named after the three women presents images and other historical sources found during the research, contextualised with excerpts from US slavery laws of 1833

[15] Body colonisation.

and contemporary interpretations of Sim's and other *white*, male gynaecologist's achievements (GynePunk Lab 2015).

Against this background, the GynePunk Lab also raises a claim for disconnecting the female body from the dependency on patriarchal health institutions and health systems (Pechblenda Lab 2014a). Criticising the hierarchies in these systems, which require the consultation of "experts", having to pass "tortuous waiting rooms" or "bureaucratic, statistical forms that [perform] a role of popular judges of your practices, capacities or choices" (Hackteria.org 2015), the activists demand free and open access to medical technologies, that allow for self-testing. They mention analyses of blood, biopsies, PAP tests, access to hormones, urine tests, HIV tests or pain relief, which should be accessible without burdens and as often as required (ibid.). Consequently, the lab developed DIY test-kits and Do-it-together (DIT) formats to practice self-testing and experimentation with body bacteria and fluids, (Pechblenda Lab 2017a; 2017b; Chardronnet 2015; Anarchaserver 2014, 2) appropriating such knowledge from the distanced labs and fields of "professionals". In the years 2015 to 2017 in various open laboratory workshops, titled "open speculations", participants experimented with vinegar self-tests to detect cancer, probiotic cures like garlic, and self-examination of body fluids (Pechblenda Lab 2017a). In one of the wikis, where GynePunk explains its motivations and intentions to decolonise science, the activists point out, how the power structures that are created by exclusive ideas of technological expertise play out. They write: "The technical control of the diagnosis generates extreme dependence and a classicist deep gap of knowledge", although "[t]here's no need of hi-tech machines for some tests! [N]ot even phd`s in microbiologic surgery to generate accurate and self-aware diagnosis" (Hackteria.org 2015). Through their practices of biohacking and open labs and the rewriting of gynaecological history from a feminist, anti-racist perspective, the activists evoke a negotiation process about medical technologies. In outlining the possible DIY character of diagnoses and the racist and sexist systems out of which contemporary gynaecological instruments were developed, the myth about "expert knowledge" is deconstructed, and great innovators of medical history are relocated within the contexts of oppression in which they operated. Medical technologies are demystified as professional tools only readable and applicable by experts and their roots are brought to the fore, raising questions of control and motivations of technological development.

The GynePunk lab forms part of an infrastructure of similar labs, spaces, and art projects, which deal with biotechnologies and human bodies in relation to tech and nature. The above-mentioned workshop "break the petri_hiphas spread", planned for the THF! in 2022, experiments with the cultivation of mycelium in alternative ways (Anarchaserver 2022i).

Proposing a rethinking of the relations between organisms and humans, the workshop departs from the necessities and desires of the mycelium and the organisms that accompany it, to experience and question the inter-species relationships that are built by cultivation. The workshop program explains: “We will experiment with substrate (food) recipes and with the design of containers that allow to reproduce growth conditions outside of the normative dimensions of the petri dish.” (ibid.). The experimentation with biology and the surroundings of the laboratory are rethought so that an anthropocentric approach to cultivation is reconsidered, in which sterilisation and selection define the outcome. Recentering the needs of the mycelium through a different laboratory cultivation practice, humans are presented in a reciprocal system with non-humans, nature and the technologies used to engage with these. Here, the technologies are rather used as tools to build relationships, than as means to control or dominate, as imagined in Western and colonial narratives of technological superiority.

Following this perspective, Wetlab, another laboratory that emerged around 2017 out of the infrastructure of biohacking labs and makerspaces in Barcelona, experiments with “Biofriction” as the intersection between art, science and technology (Quimera and Leandra 2020). The lab was initiated by Argentinian artist and researcher Ce Quimera, and Italian biologist and artist Gaia Leandra and emerged out of a collaboration between Pechblenda, DIYBio, an open makerspace in Barcelona, Hangar, a state-funded space and scholarship structure for artists, and the Catalonian Parque de Recerca Biomédica de Barcelona. Preceding the Wetlab, Ce Quimera formed “Quimera Rosa” at Hangar in 2008, a laboratory “for experimentation and research on identities, the cosmos and technology” (Ce Quimera 2008; quimerarosa.net 2022). Within the framework of an interdisciplinary program supported by Hangar with the title “Prototip_ome” the Wetlab forms part of a collaboration with Paula Pin from Pechblenda, that offers open labs for citizens to experiment with “Biofriction” (Pechblenda Lab 2017b; Quimera and Leandra 2020, 9). In a similar direction as GynePunk, Wetlab proposes in their founding fanzine the field “Biofriction” as a discipline that “explores a transhackfeminist perspective as an innovate methodology for the transnational production of bioart and biohacking” (Quimera and Leandra 2020, 13f.). This underlines again, how the transfeminist approach to technology is here understood as a methodology, and innovation, that enables the building of transnational linkages as part of the counter activity to common imaginaries.

Tracing the connections between the infrastructure of labs and individuals demonstrates how this methodology is developed through the exchange and transmission of projects within the network of activists. Recently, in June 2022, the two artists Ce Quimera and Gaia Leandra were hosted by the Vienna-based hackerspace Mz* Baltazar’s Laboratory, to give their workshop

"Bioxeno", which they offer since 2021. In the workshop, the participants "explore the diversity of organisms in an ecosystem" and "through biological and artistic practices […] question how different microorganisms live and co-exist interacting with the environment" (Mz* Baltazar's Lab 2022d). Again here, the anthropocentric view on biotechnology is reconsidered from a lens that relocates humans within the co-relationship with other species.

Following this view, biohacking practices also question the boundaries of the human body and experiment with these perspectives in collective projects and knowledge sharing. In an interview with Mz* Baltazar Lab, Paula Pin from GynePunk and Pechblenda explains that "we understand our body like an open-source body" (Mz*Baltazar's Lab 2021, pt. 28:05). Thus, the human body itself is demonstrated as transformable and the boundaries of nature, human bodies and technology are blurred. In another interview, Paula refers to the activists as "cyborg witches" and states: "we want to update our ancestral knowledge with the independent use of technology" (Chardronnet 2015). The cyberfeminist ideas of cyborgs and technological tools as means to reclaim agency over the body are re-evoked in these perspectives. This perspective of technology then allows for the deconstruction of identities and gender categories. In this sense, Mz* Baltazar also hosted a workshop performance titled "Molecular Queering Agency" by the artist Mary Maggic. Mary Maggic is a Chinese-American artist working on biohacking and gender politics and is equally rooted in the network of hacking and tech activists. The "Molecular Queering Agency" is introduced in a colourful, around four minutes-long video, with an automated-sounding voice speaking, accompanied by sketches and figures of technical artefacts, chemical combinations and transformed human body parts (Maggic 2019). As the name "Queering Agency" suggests, the automated video voice starts by telling the listener: "I am here today, to sell you a vision, a vision of a toxic world." Guiding the viewer through this vision, the agency explains human bodies as intoxicated through the all-surrounding chemicals (birth control pills, pesticides, plasticizers, electronics) environmental destruction and technological structures. As a consequence, "the natural can no longer be disentangled from the synthetic" (ibid., pt. 00:59) and human bodies become transformable, mutated and binaries dissolved. Here, human bodies are relocated within a holistic, intertwined system of nature, environment, non-human species and technologies building on the cyberfeminist thinking of deconstructing gender categories.

The practices and artistic angles described here, assign a DIY character to technologies, especially in connection to the own body, as instruments to reclaim agency over the latter. Technologies to transform, define and examine the human body are shown as embedded in

systems that control access to these, based on ideas about professionalism, and histories of *white*, male experts.

3.4.2 Feminist technologies: sorority networks, collective mapping and knowledge sharing

The techniques and strategies of the feminist networks that engage with the structures of oppression and technologies which consolidate them, are themselves technologies, that seek innovation in the form of deconstruction and replacement. The call for the THF! 2022 states: "Sorority networks are an example of feminist infrastructure, and represent one of our earliest feminist technologies, perhaps the oldest and most widespread." (Anarchaserver 2022c). At a similar event to the THF! but on a smaller scale, the second "Encuentro Ciberfeminista de Guatemala" took place from the 7th to the 10th of November 2018, under the motto "Tejiendo Circuitos"[16], organised by the Cyberfem Lab Guatemala. The lab, also under the name Cyberfeministas Guatemala, describes itself as a project that emerges out of a concern for technologies and the ways how people relate to them, with the aim of reappropriating and decolonising technologies, and hacking the patriarchal code (Ciberfeministas Guatemala 2022). The motto for the cyberfeminist encounter was chosen in the spirit of the festival, set to "(re)create and build networks, circuits, love, energies […] and nodes, that embrace each other and are there when needed" (Ciberfeministas Guatemala 2018). Again, this event formed out of linkages to other activists and initiatives, amongst them Spideralex, the founder of the hackerspace DonesTech and the Chilean organisation Ciberseguras (ibid.). In the context of a collective online event for digital feminist activism, the project highlights that "virtual work equally builds sorority" (Ciberfeministas Guatemala 2016). The building of sorority networks as a feminist infrastructure is a clear intention of the many feminist actors and becomes visible in the numerous linkages, collaborations, exchanged knowledge and physical and virtual encounters.

Further, the Cyberfem Lab also takes up the early position of female workers in communication infrastructures, to make the technological affinity and intimate relationship between women communities and technology clear. The announcement of the second cyberfeminist encounter in Guatemala City was accompanied by a picture, showing female operators of telephone lines, and the statement in the centre of the image: "technologies have been, are and will be ours" (figure 7). The slogan in the picture reveals the agency of the operators of the telephone lines, in defining and shaping technological systems. The picture thereby connects the role women played in histories of technology to a shared experience of exclusion or invisibility and linked

[16] Weaving Circuits.

to the slogan, interprets this position as a possibility to act collectively and reclaim agency. Thus, the building of sorority networks based on shared and differentiated experiences of the same oppressive structures appears as a claim for agency towards redefining technology and the sociotechnical systems that come with it.

Figure 7. Digital collage poster accompanying the announcement of the "II Festival Ciberfeminista en Guatemala" (Ciberfeministas Guatemala 2019).

In the same region, the Hacklab La Chinampa, based in the periphery of Mexico City, which started its activities in September 2018 and is currently back after a break due to the Covid-19-pandemic, explains the creation of the space also based on the intention to build and care for linkages to other activists (Colectiva Insubordinadas 2022; 2018). They write: "we want to cultivate in our space: sorority, companionship, network building, accompanied self-learning processes and collective learning" (Colectiva Insubordinadas 2018). Here it becomes clear, how the building of feminist infrastructure through creating companionship and connecting to other feminist activists is also tied to an understanding of knowledge as a collective practice. The hackerspace is thereby a physical and virtual place, which serves as a site where knowledge can be experimented with, shared and produced based on the relationships and linkages to other feminist activists.

This is also reflected in collective feminist mapping practices. As with the collective femicide mappings, which allow at once the personalisation of the victims and the visualisation of the structural extent of cases, feminist crowdsource mapping is used as a tool to collectively reflect, situate and share information. One example of this is represented in the collective mapping

practices initiated by FemTechNet, a network of scholars, students, and artists who work at the intersections of technology, science and feminism. FemTechNet is equally connected within the network of feminist activists, on their website they list collaborations with Mz* Baltazar's Laboratory, the FembotCollective and the Deep Lab (FemTechNet 2019). The "FemTechNet Situated Knowledges Map" was introduced as a collective activity in the form of a course for students, where participants could drop a pin or marker which stands for "a moment of feminist knowing, unknowing, learning, unlearning, understanding, confusion" on a global Google-MyMap (FemTechNet 2015). The map can continuously be added and is open for new markers, that talk about a story, an event, ideas, poems, videos, photos or reflections on how the person intersects with feminism and technology (FemTechNet 2022c). Collective mapping here presents a feminist methodology to situate and share different knowledges and understand these within "the relationship[s] between space, place, mobility […], knowledge production and circulation" (FemTechNet 2022a). Thereby, the mapping also presents a way of dealing with data in the form of experiences that are visualised and located within time and space on a map. This form of mapping as a feminist methodology, compiled of the infrastructure of networks and collectivity, practices data sets as co-constructed and created based on contextualised knowledge. FemTechNet further mentions similar feminist mappings on their website, that follow the same approach, like the "World Map of Feminists", initiated in 2013, where individuals, organisations, initiatives, and activists can locate themselves on a global map and describe their different engagements with feminism (Feministnetworkproject 2013). Here, mapping also offers a way to connect and learn about each other. Feminist mapping appears at once as an infrastructure, a way of making structures and context visible and a form of building connections through situating content. Another map mentioned by FemTechNet is the "HarassMap", initiated in 2010 by an Egyptian volunteer-based organisation. It has a focus on Egypt but provides women worldwide the possibility to report cases of sexual harassment anonymously through text messages, which are then located geographically on the map, at the place where the incident happened (harassmap.org 2022). Again, the structure of violence against women is made visible and localised through the individual added data in the form of experiences. Feminist mapping becomes visible as one strategy of feminist infrastructure building and methodology to create sorority networks as a feminist technology.

In this sense, technology is rethought from the perspective of collectivity and networked linkages. This becomes visible when considering the aims of FemTechNet. The network is explained as a platform of collective learning, offering courses that build on reciprocal and experimental learning and built to "collaborate on the design and creation of feminist

technological innovations" (FemTechNet 2022d). The focus on collectivity is further incorporated into the network's manifesto, which is available in English, Spanish, French and Italian, hinting at the transnational character of the initiative. The manifesto provides examples of technology but refrains from formulating a general definition. It states: "Accountability is a feminist technology. Collaboration is a feminist technology. Collectivity is a feminist technology. Care is a feminist technology" (ibid.). It closes by pointing out "We [FemTechNet] are an innovative learning technology" (ibid.). In line with the exchange of knowledge and connection building as pursued in the multiple transnational encounters and collaborations, technology is here redefined as feminist practices of infrastructure creation through networks. The manifesto further adds: "[n]o one holds the trademark on feminist pedagogy—it is collective intellectual property" (ibid.), which points to the contextualised and situated understanding of sorority networks as technology. Pointing out accountability, care and relationship building as technologies acknowledges the silenced, typically female-associated and long-existing practices, that are used to innovate in the past and present. Subsequently, innovation is not understood as done through great inventions by expert individuals trained in laboratories of higher education but through the forms of sharing and practising collectivity, aiming to change oppressive systems.

The approaches to collectivity and sharing are thereby context-specific and interpreted differently. They are inherent to FemTechNet's open courses, feminist mappings, open labs, workshops and organised transnational meetings. Almost all initiatives and collectives provide open spaces and workshops to exchange ideas, learn together and build linkages through common projects. Another example of this is the "Salon for Open Secrets" (SOS) organised by Mz* Baltazar's Laboratory, which offers "a virtual reenactment of our cozy hackerspace studio/gallery, a place, a conversation, happening and relationship" (Mz* Baltazar's Lab 2022b). In this format, the members of the hackerspace hold conversations with artists, scientists, feminists or hackers about their imaginations, understandings, embodied and situated experiences and know-hows (ibid.). In one of the SOS sessions, the three lab members talked to Paula from Pechblenda about biohacking, the DIY techniques of GynePunk and how to build an open lab (Mz* Baltazar's Lab 2021b). In the conversation, the activists exchange views and ask about Paula's experiences to take them as an inspiration for their own activist work. Collectivity is here lived through sharing but also differentiating diverse experiences and knowledge about the intersections of being female, working and reflecting technologies and possible forms of negotiating their meanings.

As discussed above, sharing entails the provision of access to technology and knowledge, for example in the form of DIT workshops on technologies or participatory experiments in open spaces, as offered by Wetlab, GynePunk and Mz* Baltazar's Laboratory. Thus, the hackerspaces themselves are created with the idea to provide women, typically seen as non-experts of technology, with hardware and software tools amongst them 3D printers, data visualisation programs, laser cutters or maker bots, to invite them to extend their knowledge or learn together with others (Hackermoms 2022a; Mz* Baltazar's Lab 2021a). The Berlin-based hackerspace Heart of Code, for example, explains its formation as an intervention to offer women access to tools, contents and information technologies (Heart of Code 2022).

In this regard, some initiatives are exclusively built with the intention to educate women and girls and provide access to knowledge and technologies through classes, mentoring programs and skill-building courses. Focusing on education, their engagement with power structures of technology development differs from the hackerspaces or artistic projects, although they equally refer to network building and knowledge sharing as their principles. While not focusing exclusively on education, Pollicy features various projects to improve data literacy amongst African women and stakeholders and to a similar extent, FemTechNet is built with a focus on feminist education. Another organisation, which is taken as an example of comparison here is She Code Africa, a Nigerian non-profit organisation that was founded in 2016 by Ada Nduka Oyom, a microbiologist active in the tech sector and working at Google for the Sub-Sahara African region. Although the organisation is not connected to the hackerspaces, it takes part in the same negotiation processes about technological agency, although from a different perspective. The organisation offers 3-month-mentoring programs where girls are connected to women mentors working in the tech field, as well as 4-week-long boot camps where high school girls learn coding and programming (She Code Africa 2022d). The team behind the organisation are around 20 African women engineers, developers, product designers and coders, working, as they write on the website, to empower and celebrate women in technology across Africa, "guiding Tech-Girls to their full potential" (She Code Africa 2022c). This includes also practical access to technological gadgets like laptops or coding programs, in the form of laptop scholarships (She Code Africa 2022d).

This type of knowledge sharing is often considered ambivalent because it equally fits the interest of corporations and governments in building up a future, tech-savvy workforce that produces innovation and economic growth with their technical skills (Davies 2018, 361). A wider criticism is here, that these initiatives perpetuate structures of capitalist tech thinking,

measuring innovation and skill building in terms of (future) profit.[17] However, considering the contextualisation and situatedness of the activist engagements and approaches, She Code Africa, as well as Pollicy operate in regions where the so-called "digital divide" or access to knowledge structures is different than in Western countries. Their approach to a feminist sharing of knowledge and their interpretation of building connections thus takes different forms from the hacker community in Western countries and is represented through collective training and hackathons that offer access to the tech field. She Code Africa names as its core values a "teamwork community" and "visibility", which link with many of the other tech and data activists and align with the idea of network building (She Code Africa 2022a). Pollicy equally focuses on building networks and teaching data and tech skills, through events like the annual "Data Ladies" meet-up, which brings together women working with data from civil society, government, private sector and academia (Pollicy 2018). They explicitly state their intention for the event: to create "a space for women to […] share knowledge and create an atmosphere of togetherness" (Pollicy 2022b). Coding workshops, hackathons and learning groups for programming and data follow a different approach than Pechblenda or Wetlab to tackle technological agency but still present forms of practising sorority and sharing knowledge.

Further, many of the activist initiatives engage in building counter-knowledge and exchanging resources, as means to innovate dominant tech imaginaries and make tech-knowledge accessible. Numerous collectives and activist groups provide resources on their websites in the form of wikis, biblio-spheres, indexes and collections. These range from alternative histories and collections about women and queers in science, to basic tutorials on how to set up data security in mobile phones and Google accounts. The French hackerspace Le Reset provides a list with information on women and queers in science (Le Reset 2016b), featuring Ada Lovelace, often referred to as the first writer of an algorithm, the female computers at Harvard, and Mae Jemison, the first Black woman astronaut that travelled into space. Further, Le Reset provides a wiki page where the hackerspace's activities are documented, including tech tutorials and information, for example on the programming language Python, how to create and modify a website based on HTML and how to use a 3-D printer (Le Reset 2020). These resources remain accessible although the collective has paused its activities in 2020. Similarly, the GynePunk Lab cultivates a "bibliosphere", which is an open wiki on the platform Riseup.net, with a variety of resources on biohacking, feminist literature, technical objects and tutorials,

[17] This critique leads to more systemic questions about the ways how power strucutres are adressed, which are discussed in detail in section 3.5, taking up "hacking" as Western concept.

with the first entries in 2015 and the most recent added files in May 2022 (GynePunk 2022b). One file, posted in early 2020 contains the book "Hysteria. The history of a disease", by Ilza Veith (GynePunk Wiki 2020a), another one provides a zine of an organisation called "Indigenous Action" on how to build a DIY Emergency Handwashing Station, posted in April 2020, at the beginning of the Covid-19 pandemic. A commentary to this post provides a translation of the zine into Spanish, making it accessible to a wider audience (GynePunk Wiki 2020b). Other files are, for instance, instructions on how to use red cabbage as a pH indicator, experiments with herbal treatments of Papillomavirus infection or a presentation of a DIY gynaecological Lab, built into a suitcase, that was developed during a hackathon in 2013 in Ljubljana organised by Hackteria and others (GynePunk Wiki 2015a; 2020c; 2015b). Most entries are posted by Klau, one of the members of Pechblenda and GynePunk but complemented by other RiseUp users. The wiki is a vast collection of feminist dealings and engagements with the medical history, DIY tech practices, and feminist bio activism, and in the spirit of sharing and exchanging knowledge, open to everyone. Similarly, the Brazilian feminist hackerspace Marialab provides the "Biblioteca MariaLab", a collection of resources on their website, introduced with the words: "Feminist and technological knowledge must be accessible for everyone" (Marialab 2022). The library section offers amongst other resources, instructions on how to set up a feminist server and community network, tutorials on how to "stay safe on WhatsApp", protect own data in Google Accounts and set a password for mobile phones, available often as PDF or video (ibid.). Similarly, as the renaming of body parts by GynePunk, Marialab's instructions and tutorials gender technical terms like "server" and "router", from the Portuguese "servidor" or "roteador" to "servidora" and "roteadora", to counter the tech field as a male-dominated sector. By gendering the language, they negotiate also the sociotechnical imaginations attached to the male terms. Therefore, they explain gendering as a way to refrain from "limiting the collective imagination and our own notions to these concepts translated from English" (Gomes 2017, 2). The resources on basic settings like a password for a mobile phone or tutorials on how to use the video conference tool Big Blue Button are addressed to non-experts operating with technological tools and reduce the barriers to staying safe while using these basic applications.

Taken together, the feminist infrastructures in the form of sorority networks and collective knowledge production present forms of innovation beyond the tech sector or technological artefacts. Considered as a network or as most of them describe it, an infrastructure, the feminist actors challenge existing systems of oppression and practice alternatives that break with current ways of using, developing and approaching technology and data. Both technology and data are

approached from collectivity, knowledge sharing and relationship building, providing hence a counter vision to perceptions that centre on supposed objectivity, expert creation and profitability.

3.4.3 Creating data materialities, shaping databases

Further, through different practices, the data activists reconsider data concepts and experiment with different forms and materialities of data. The initiative "Through the Eyes of African Women" (TEAW), mentioned earlier, collects fictional stories, experiences, poetry and personal reflections of African women on their website, creating thereby a large database of African women's perspectives. The encounter with Pollicy and the two authors of Data Feminism at the "Afrofeminist Data Futures" online conference situates the work of TEAW within the framework of data and data collection. The written perspectives of African women are presented as contextualised and situated data, forming a database that brings often uncollected voices, or invisible data to the fore. Following Patricia Hill Collin's (2002) epistemological thought, the experiences of these women are reconceptualised as data within a knowledge system that counters the understanding of data as only relevant or significant in the form of quantitative Big Data, ascribing objective representations of reality to it. Klein and D'Ignazio (2020, 23) refer to this point in their book and take up the example of experiences of Black US American women with the health system. The authors describe the example of international sports superstar Serena Williams, who made the racist and sexist discrimination public that she faced in the hospital during her pregnancy. Taking up this issue, it is described how Black women are not seen as relevant enough, to collect data on their experiences, in a health system which discriminates against them. Before this background, the authors rhetorically ask: "Why did it take reporting by the predominantly white mainstream press for US cities and states to begin collecting data on the issue? Why are those data still not viewed as big enough, statistically significant enough […] to justify taking action?" (ibid.). In the same direction, the feminist activists reframe data through the collection of contextualised experiences as in the case of TEAW and the collective mappings. Thereby, they counter particular concepts of data that prioritise quantitative, decontextualised and large data as the only relevant form. Klein and D'Ignazio introduce the academic term "Big Dick Data" in their book, to refer to these imaginations of data. Accordingly, the term describes "big data projects that are characterised by masculinist, totalizing fantasies of world domination as enacted through data capture and analysis." And further, "Big Dick Data projects ignore context, fetishize size, and inflate their technical and scientific capabilities" (ibid., 151). The activist's use of storytelling and collection of experiences as reliable data that provide accounts of lived

realities counters this described dominant vision of data, which promotes Big Data and quantified data as exclusive sources for the production of knowledge.

Further, in their projects, the activists envision data as something which has to be cared for, which can be experienced and which is both embedded in, as well as producing relationships, as the femicide cartographers mentioned above make clear. One initiative that takes this perspective further is found in a project that transforms the materiality of digital femicide data, into textile form. In a workshop series titled "Cartografía Textil", offered by Mexican artist Janette Terrazas, twenty-eight women came together to transform the online femicide map "Ellas tienen nombre" into a stitched textile map (Miss Jane 2018a). The engagement with the femicides through stitching the geographical locations of the cases on a textile cloth presents a reflexive form of embodying the data and caring for it. At the same time, the digital femicide map becomes an object of artistic presentation and collective experience. Figure 8 below shows parts of a digital flyer used to announce the event, posted on Facebook and show a group of women stitching together the textile map. Again, the embodiment of the data and the transformation of it into a different materiality in form of a textile map is done collectively, setting into relation the stitchers, data collectors and cases of femicides with the places on the online map and the textile cloth. The femicide data is here experienced and expressed in a textile and artistic form, mixing the boundaries of data, mapping and art and presenting data as relational, experienceable, and collective.

Similar to the mapping of femicides, the power of data is also rethought by collective activist "stormings" of online databases. Adding information to online platforms and collections of information forms part of a data feminist practice, that challenges bias in datasets and the availability of information that excludes relevant histories and voices. The Cyberfem Lab from Guatemala organised regularly "WikiFemHack's", in which participants came together to add articles to Wikipedia, claiming space in an online platform that is male-dominated and primarily provides articles in English. The "WikiFemHack" is a collective process of adding to the Wikipedia database by writing articles about female artists, social scientists, physicians, scientists and so on (Ciberfeministas Guatemala 2016). In the same direction, FemTechNet organises "Storming Wikipedia" classes for students, adding and editing articles on women who played and play relevant roles in history or the present (FemTechNet 2022b). Grounded on the idea of open, accessible knowledge the students are invited to learn "how knowledge is produced and consumed" and by adding feminist scholarship to the platform, make "Wikipedia readers and editors more aware of the systemic gender bias inherent in the encyclopaedia's structure" (ibid.). Equally, the Fembot Collective, based mainly in Canada and the US,

organised a transnational, collective, feminist Wikipedia editing event on International Women's Day in 2015, questioning Wikipedia's attempt to democratise information, by pointing at the gender gap among editors and information on the platform (Rhee 2015). The event was part of a feminist hackathon, organised and funded partly by the collective. The platform Bitchmedia.org reports that 80 groups met for the editing event at different places in North America and Europe, with the aim to "chip away Wikipedia's lack of female editors and underrepresentation of women artists" (ibid.). Equally, like the wikis and library sites of the hackerspaces, the practices described here engage with biased structures in knowledge production and missing data. Data becomes again visible as shaped by the collector and producer of it and the platform and technical structure it is embedded in.

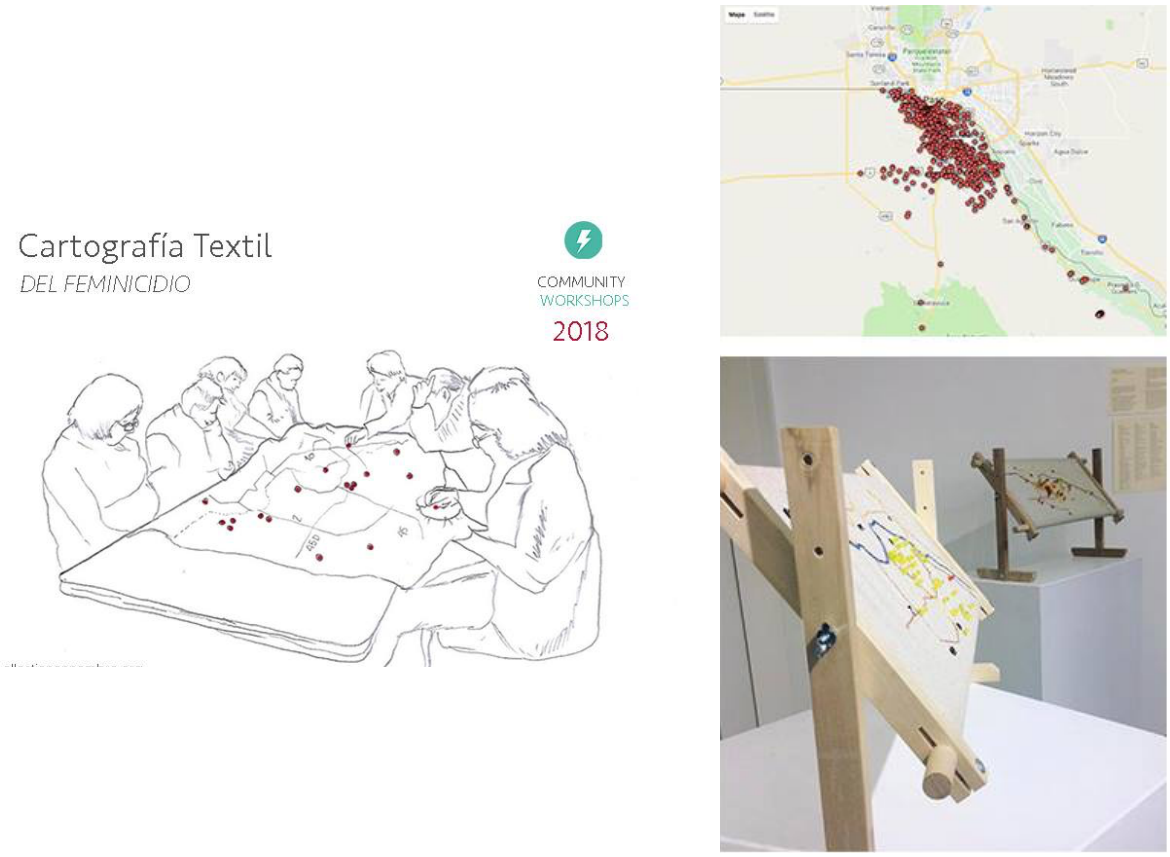

Figure 8. Excerpts of the digital flyer announcing the "Cartografía Textil"-workshop organised by Miss Jane and Ivonne Ramirez in Ciudad Juárez (Miss Jane 2018b).

In the same direction, the Open Afro Hair Library addresses the issue of discriminatory structures in 3D databases, which either lack models for Afro hair, used for example for avatars and digital characters, or reproduce racist and sexist stereotypes (Darke 2022). The open and free online library provides 3-D models of Black hairstyles and textures and is initiated by North American artist and scholar A.M. Darke. By creating the feminist, anti-racist database, representations of Black people in digital media are reclaimed, providing diverse and respectful

representations (Darke 2020b). In a video, Darke (2020a) demonstrates the discriminatory results for search terms like "Afro hair", or "Black hair", that appear in 3-D marketplaces which offer 3-D models for a free or paid download. Darke explains the racist and sexist depictions in the result as consistent with what Safiya Noble termed "technological redlining" in her book "Algorithms of Oppression" (Darke 2020b; Noble 2018), referring to the reproduction and perpetuation of inequalities through digital technologies. The Open Afro Hair Library is thus understood as an "open source software-based intervention", into "white-male-capitalist dominated tech spaces" (Darke 2020b).

This process of reclaiming space and representation of Black people in digital culture is also pursued by the blog Black Girl Nerds. Created by Jamie Broadnax, the blog features content about geek culture and Black feminism on its website, Twitter, and Facebook page. Broadnax (2014) explains the usage of the term "Black girl nerd" and "geek" for the blog, as an appropriation:

> "I named this site Black Girl Nerds because the concept of Black women as geeky-dorky beings is somewhat of an anomaly. […] It is a term that is so unique and extraordinary, that even Google couldn't find a crawl for the phrase and its imprint in the world of cyberspace."

Again, this project creates new databases and platforms which are otherwise missing and appropriates terms like "nerd" or "geek" from the male and *white*-dominated tech sector, bringing them into a Black, female context. These feminist engagements with digital databases and online content are just a few examples of how data is negotiated as a concept and term. New terms are created, while others are appropriated, thereby negotiating the meanings of data and tech vocabulary. Collecting, presenting and working with data are approached through feminist practices of sharing, collectivity and relation-building offering a different logic of thinking about data, that counters concepts of Big Data and data objectivity.

3.4.4 Technology for whom? Re-conceptualising technological tools and AI

Further, the activists take a strand on the intentions and grounds, on which technology in the form of technical artefacts, digital tools and Artificial Intelligence (AI) is developed and formulate alternative theoretical concepts. In the online conference by Pollicy that was also discussed above, titled "A Gender and Ethics Perspective on Artificial Intelligence in Africa" AI concepts are rethought from a decolonial lens. The online encounter between African women working on AI within academia and the tech sector took place at the end of 2021, within the context of the ongoing Covid-19 pandemic and increased popularity of debates on technology's potential to provide solutions for the future. The participants, however, raise critical concerns about underlying concepts of AI and approach the debate from an engendered and globalised

perspective. Favour Borokini, a data and digital rights researcher working at Pollicy addresses AI by starting with a deconstruction of the term itself. Based on her research for the "Engendering AI" report, Borokini (Pollicy 2021b, pt. 3:30-5:00) relates the interpretation of AI as a scientific intelligence, embedded in machines, to historical concepts about intelligence in colonial contexts. Referring to the histories of scientific racism, Borokini reminds that women and people of African descent were classified as less intelligent, compared to men and *white* people (ibid.). She further questions the definition of "practical intelligence", as the ability to resolve complex tasks, reconsidering what is expressed by the term "complex". The scholarly definitions of "intelligence", as a concept used to coin the term "Artificial Intelligence" are discussed before the background of cultural and historical contexts, highlighting once more the embeddedness of sociotechnical visions and terms within these. Borokini (ibid., pt. 5:07) states:

> "If I was an African AI researcher, […] I would not define intelligence based on a machine's ability to play chess. Maybe I would prioritise its ability to play Ten-Ten [a Nigerian game]".

She further opens up the question to the participants, what these differences in the approaches to intelligence might mean for current developments of AI technology.

By discussing AI definitions and underlying assumptions about what is considered "intelligent", the participants claim authority over interpretations in sociotechnical imaginations. The reflection on who defines technical terms in academic literature and popular discourse is explained as decisive for these imaginations and the resulting understandings of technology. The researcher Chenai Chair (Pollicy 2021b, pt. 28:10), who also spoke at the virtual "Afrofeminist Data Futures" conference and is a proof reader of Pollicy's reports, further observed that a contextualised perspective on AI from the African continent is lacking. According to her, most debates about AI in Africa focus exclusively on economic growth and the training of people in technical skills and further frame Africans as passive receivers of foreign technologies. Consequently, evaluations of the impacts and effects of AI in a certain region are often defined in statistical terms that try to measure efficiency, thereby ignoring the incentives and motivations of the different actors that are involved. Chair (ibid., pt. 30:05) further demands to make labour visible, by examining who is doing the work that trains technological systems and under which working conditions, to evaluate the impacts of AI. Her demands are directly linked to the colonial continuities that Pollicy's "Engendering AI" report denounces:

> "There is no doubt that AI innovation in both the private and public sectors on the continent is being spearheaded by foreign multinational corporations and technology monopolies. As a result, this innovation promotes profit making and mimics classic colonization" (Borokini, Nabulega, and Achieng 2021, 15).

Pollicy here points to the need to contextualise AI development by asking more critically who benefits from it and which socio-political factors are involved in the implementation. This includes reflecting on the actors and intentions that build the grounds for the production and implementation. In this regard, the report builds a bridge to the encounter with the founder of "Through the Eyes of African Women" and the authors of "Data Feminism" by further pointing at the underrepresentation of African women in AI and Data Science. Following this, the lived experiences of African women are excluded from product development cycles, leading to a majority of AI technologies which respond neither to their needs nor are designed according to their desires (ibid., 16). Here, the discussion makes clear that experiences and different life realities impact what kind of technologies are produced and further, whom they are designed for.

Situating the definitions of intelligence within histories of European superiority thought and arguing for the existence of different ways of knowing, the online encounters of Pollicy engage in reclaiming power over the interpretation of concepts of technology and AI. Chair's (Pollicy 2021b, pt. 22:05) input thus calls Africans to take back agency as creators of technology and as authors in labelling the technical systems that surround them.

Similarly, a redefinition of AI is articulated in the form of a poem, or manifest, published in the hackfeminist writing "Nos permitimos imaginar", which resulted from the encounter in 2019 in Chiapas "Tecnología y Afectos" (Ricaurte Quijano 2020b). The writing "Soy una IA feminista"[18] formulates a version of an AI which takes into account the intentions and effects of its development and provides a differentiated lens on what benefits from AI usage look like. The author of the manifest and poem, Paola Ricaurte Quijano is a research professor at the School for Humanities and Education at the Instituto Tecnológico de Monterrey and a faculty associate of the Berkman Klein Center for Internet and Society of Harvard University. Produced out of the background of the encounter in Chiapas, "Soy una IA feminista" is situated at the intersections of academic, activist and collective, feminist engagements with technology. Communicated in the form of a poem and manifest, with 19 statements about what a feminist AI is and is not, the writing further links the imagination of technology development to artistic engagements with AI. This form offers a precise formulation of the characteristics that are imagined and desired from feminist standpoints, outlining AI as defined by visions, projections and political motivations of those who create it.

[18] I am a feminist AI.

Each line of the poem tackles a characteristic, considered essential to define a feminist AI. Formulated from the perspective of the AI software speaking itself, it provides detailed insights into feminist principles of technology and imaginations of technological progress. Starting with the sentence: "I am not a conception of a *white*, privileged and heteronormative man." (Ricaurte Quijano 2020b), it goes in line with the claim made by Pollicy about for need of African women in technology design. The concern inherent in these statements articulates a reflection on how the development of AI is implicated by the positionality of those designing and imagining it, but it moreover engages with the thought model and history of "great inventions by male individuals", termed by Pfaffenberger (1992) as the standard view of technological innovation. The statements are at the same time a rejection of the idea of technology as a proof of superiority over others. This is again taken up at the beginning of the third verse, saying: "I am not a servant and I do not satisfy the dreams of domination of anyone" (Ricaurte Quijano 2020b). Responding to the above-outlined focus on collectivity as a fundament of feminist technologies, the poem further reads: "I am a collective intelligence" and "I believe in the, always collective, agency of people" (ibid.). Here, intelligence is again mentioned as a concept underlying AI technology, however, characterised as shared and communal. The hint to the agency of people further indicates the human-made nature of AI, which counters the depiction of self-acting technologies that are not controlled by humans anymore. Specifically, regarding the case of AI, in the form of unsupervised self-learning systems, for example, this highlights accountability and responsibility for the automated mechanisms, as a necessary part of human programming. The manifest ends with the sentence: "as a human production, I am not responsible for my decisions, but my creators, owners and operators are" (ibid.). This also reconnects digitalisation, as a process associated with increased adoption of digital technologies, to the human actors that produce them, countering the idea of digitalisation as an actor-less natural process. This human-made characteristic of technology is also evoked through the poem being a personification of an AI system, written from the AI speaking itself. At first look, it seems contrary to the statement, lending the AI the agency of talking itself, about its characteristics. However, by formulating the text from the first person, the reader gets an idea of the imaginations, desires and intentions that are involved in shaping AI technology, thereby demonstrating its nature as an imaginary, human-produced rather than neutral, self-acting object.

Further, technologies are also re-conceptualised from practical standpoints, by the collective creation and building of feminist hardware. At the transnational encounters between feminist hackers, feminist servers were developed as an answer to the dependence on technological infrastructure provided by private corporations and the security of the data stored on these. The

Anarchaserver was created in Calafou at a multi-day event in 2013, preceding the later THF! and is described as an "autonomous feminist infrastructure for feminist collectives and cyberfeminist projects" (Calafou 2022a). The report of the THF! in 2014 explains the installation of the server as a way to enable proper and autonomous preservation and management of data, projects and memory of feminist collectives, which makes these at the same time accessible to others (Anarchaserver 2014, 3). The servers are also a response to the internet as a space of gender violence, control and surveillance on behalf of private corporations and governments and censorship of feminist expressions (Calafou 2022a, 3). The Anarchaserver hosts amongst other data a wiki which documents the setup of the infrastructure and two databases of feminist struggles around the world, named "collective memories", available in English and Spanish (Anarchaserver 2022b). At the same time, the Systerserver was rebooted during the event, intended to complement the data server by hosting primarily services and applications (Servus.at 2014). Both projects were organised through mailing lists, to divide tasks and maintain the servers (ibid.) and in the case of Systerserver through weekly meetings (systerserver.net). The services that are hosted are directed at the network of "feminist, queer and antipatriarchal folks", and encompass Nextcloud, Gitlab, Mailing lists, VPN zines and documentation of the setup of feminist hardware infrastructures, amongst others (ibid.).

Another server is Vedetas, named after the women, who defended the Brazilian coastline at the beginning of the 19th century during the Bahia War of Independence (vedetas.org 2022). Vedeta refers to small cabins, used to protect the coastlines. The all-women troops were led by a former Black slave, Maria Felipa and fought the Portuguese ships from the coastline. The services and resources in Portuguese are made accessible for feminist collectives. Two of these services are programs to collectively work on texts or tables, called Etherpad and Ethercalc. Similarly, as the naming of the server, the Etherpad is named "Antonieta de Barros" in homage to the first Black woman in the Brazilian parliament in 1934 (ibid.). In the same direction as Marialab's gendering of tech vocabulary and GynePunk's renaming of female body parts, Vedetas operators engage in the power of naming and the decolonisation of technology. In reappropriating the ownership of hardware like servers and renaming the digital tools they use for their feminist and activist work technology is reconceptualised as a collective common and linked to histories of feminist, anti-racist fights. Through the development of their own hardware and the sharing of instructions for others to copy this, they hold up technological autonomy and the reclaiming of (technological) histories. From this lens, these practices also innovate the creation of technology, by offering alternatives to the development of digital tools on behalf of private corporations with monetary intentions.

In the same hackfeminist writing where “Soy una IA feminista” is published, the plans for “Momentánea”, another feminist server and website project, are elaborated (Bermúdez 2020a; 2020b). The project equally emerged out of the Hackfeminist encounter in Chiapas, in 2019 and is created and implemented by March Bermúdez, a member of Ciberfeministas Guatemala. In “Momentánea”, Bermúdez sets the server and website in relation to the environment, herself, the users and the energy resources needed to power it. Momentánea explores the emotional and rational relationships that are established between humans and their technical devices, asking where the technologies are from, and further: “which materials constitute them? Who builds them? What implications does their use have? What happens to them when we throw them away?” (Bermúdez 2020a). The project is composed of a blog or website, where articles and other materials are published about the relationships between time, space, humans, and the environment, which are created through the use of digital technologies. Bermúdez explains how she realised, that the creation of the blog would add to the same problems she tries to address, like the usage of high energy volumes and human resources. These resources, required to keep up the function of a website, are often obtained from the Global South (Bermúdez 2020b). Thus, the website is planned to be hosted on a server, which is set up by the artist herself on her ten-year-old computer. To power the computer, Bermúdez started to build a house-made solar energy system and panel that provides the energy for the website. However, building the panel again requires especially closed hardware, with components that cannot be replaced easily, so she decided to use only open-source components that can be replaced and repaired (ibid.). The website is planned to be online at fixed periods but in times of insufficient energy supply, will be shut down. Momentánea thereby questions the relationship of time, space and territory evoked through a “24/7” connectivity and the permanent online availability within an economic system that expect fast reactions and always available data. The artist describes the project as an engagement to re-signify and re-appropriate what it means to be connected and the affections involved in this connection (ibid.). Beyond building an autonomous feminist technical infrastructure, as the other server projects do, Momentánea reflects on the environmental impacts and effects that result from the human-made digital technological infrastructures. The connection to the internet and the usage of digital technology are approached here from a perspective of responsibility and caring and reflect on the emotional and environmental implications that emerge out of the relationships to these technologies.

Another project of the Indonesian women’s collective XXLab, from Yogyakarta, experiments with open research and technological innovation and follows approaches to science that are based on open knowledge, Do-it-with-others (DIWO) practices and innovation to benefit

marginalised groups. The lab emerged in 2013 out of a workshop series by the Vienna-based Mz* Baltazar's Laboratory, which was held in Yogyakarta and was active as a collective until the beginning of 2016 (XXLab 2015b; 2016). The lab describes its projects as an exploration of science, art and free technology, drawing on open-source software and hardware tools (XXLab 2015b). Their project "Soya C(o)u(l)ture" is an artistic and scientific experiment on the production of alternative energy, bio leather and food from liquid waste resulting from the industrial Tofu and Tempe production in Indonesia. The project won regional and international prices, like the Austrian "Prix Ars Eletronica", for the connection between art and technology, and it was also supported by the Indonesian, community-run "House of Natural Fiber Foundation" (HONF), which similarly focuses on technology development for practical uses in daily life (Sick-Leitner 2015; XXLab 2015c). The name of the project, a mixture of the words "couture" and "culture" links the artistic, societal and environmental dimensions in the product outcomes and processes. On their blog, the collective describes their intention behind the project in developing means to combat pollution and at the same time poverty, by experimenting with processes that could produce cellulose, biofuel and leather out of soy waste (XXLab 2015c). The project and approach of XXLab is another example of the shift in the perspective on technological innovation, that the feminist activists pursue. Their innovation in processing the liquid waste is directed towards the usage of available, low-cost organic materials, DIY and DIWO forms of production and aims to provide new sources of income for women from the low-income sector. In open workshops, fashion shows and collective cooking events, called "sharing sessions", the lab transfers their knowledge for free to others (XXLab 2015a; 2016). The objectives behind innovation are re-centred on the needs of the marginalised members of society and thought from the local and environmental realities. Innovation is approached as a collective endeavour, that is linked to realities and materials on the ground and therefore emerges out of the surrounding cultural and environmental contexts. By experimenting with these contexts, the innovation from "Soya C(o)u(l)ture" produces art and scientific knowledge which is shared and transferred openly. Innovation is here thought of as the development of new techniques that benefit especially vulnerable community members and are available as open knowledge and free materials, thereby shifting the meaning of "societal progress" or "modernity" in connection to innovation.

The practices described in this section embody the theoretical conceptualisations of feminist technologies, as collective, open-source, shared and autonomous objects and infrastructures. Feminist technologies start from the requirements and needs of vulnerable groups in society, or "from the margins". Beyond the creation of feminist technological hardware and

infrastructures, the practices of innovation engage with imaginaries and ideas of technology, innovation, and progress. Thus, they propose a different perspective on the meaning of "innovation" itself, measuring it based on the way how it is developed, with which resources, by whom and for whom.

3.5 Hacking academia? Financial structures, resources and approaches to hacking

At the first THF! in 2014, a workshop session took place which was entitled "Hacking academia" and proposed a discussion on experiences on how to position oneself as a queer, feminist or transfeminist activist, working in academia and university settings. It was set to develop concrete steps toward hacking these settings from a transfeminist and queer perspective (Anarchaserver 2014, 7). The majority of the feminist activist collectives and encounters between them, elaborated in this thesis, are linked to and sometimes emerged out of academic contexts. Many of the activists work in institutions of higher education or sometimes private corporations. The background of the initiatives, their funding and resource possibilities, the linkages to governmental or private actors and the members' affiliations reveal an ambivalence regarding the radical engagement with those power structures, they intend to transform, or "hack". On the one hand, the feminist initiatives negotiate over imaginaries of technology and data realities with dominant state and private actors, they claim and occupy positions in the spaces of these actors and spill funding into their activist projects, obtained from those actors, which they counter in their work. On the other hand, activist projects are sometimes formulated in ways that correspond with the interests of private actors and governmental authorities as they provide necessary financial means. Further, academic institutions constitute the meeting ground and framework for many of the feminist actors in the network. Out of this position, systemic questions emerge about which cooperation or direction is beneficial to them and how to transform the structures they form part of.

The workshop at the THF! demonstrates that there is an awareness and reflection within the activist network about how to deal with being part of spaces which produce sociotechnical imaginaries and tech approaches that on the other side are negotiated by the feminist initiatives. In the call for participation for the third THF! in 2016 in Montreal, one of the central questions around the decolonisation of technology and the building of feminist infrastructures asked: "[i]s hacking technological system(s) and communication networks from within also considered autonomous infrastructures?" (Transhackfeminist 2016). Also, the manifesto of FemTechNet makes awareness about this position visible. One of the paragraphs acknowledges that: "FemTechNet knows that ultimately none of us is protected by our institutions" and "we work

within the belly of the beast of neoliberal austerity, normalised precarity, neo-colonial techno-missionary evangelism and MOOC [massive open online course] fever" (FemTechNet 2022d). The statements show at once the recognition of being part of the institutions and neo-liberal, capitalist structures and making this position the condition to "take care of each other" and work "towards the radical redistribution, reinvention, and repurposing of technological, […] academic, and monetary resources" (ibid.).

In the same direction, Pollicy is actively mentioning the funding they received from Facebook, now Meta, for their research and launching of "Afrofeminist Data Futures" and the power dynamics inherent in this relationship. In the online webinar, Chenai Chair (Pollicy 2021a, pt. 53:00) outlines their position in applying for the funding from Facebook, realising from the beginning of the cooperation "who Facebook is in this conversation and who we are in this conversation [on data and technology] and acknowledging this power dynamic". At the same time, the funding provides the necessary means for them, to take agency within this conversation, because, as Chair highlights, there is at the same time the realisation that "not many people are actually funding work that's trying to understand how feminists make use of data" (ibid.). The ambivalence of applying for funds from one of the big Western tech companies, which they criticise in their work (Borokini, Nabulega, and Achieng 2021, 15; Pollicy 2022c) is openly discussed but situated before the reality of competition in the distribution of financial resources. Pollicy finds itself thereby in a similar position to the feminist movements which they analyse and work with. The organisation highlights on one hand the aim to use Facebook's funds to make sure that marginalised groups are heard (Pollicy 2021a, pt. 2:10). On the other hand, they mention the competition between African feminist movements for funds, which is fuelled by foreign donors (Pollicy 2021a, pt. 7:30). Here, they mention the irony, that this funding is often tied to particular presentations of data in the form of quantitative measurements (ibid.), or, as coined by D'Ignazio and Klein (2020, 151), as "Big Dick Data".

Yet, Pollicy might find itself in a favourable position, as the founder, Neema Iyer works as a Women's Safety Expert Advisor at Meta. Concurrently, she is also a Senior Fellow at the Mozilla Foundation and is active in the research sector, being a fellow at the Digital Civil Society Lab at Stanford University. This makes again clear, how the affiliations of the feminist activists are at the same time a possibility for the initiatives to receive support for their activist work. The complexity in the relations and realities on the ground demonstrates the competition for financial resources between actors that engage in shaping digitalisation dynamics. The feminist initiatives take part in this competition and relocate funds to pursue their interests,

thereby taking agency. However, they are thereby themselves part of these dynamics and to some extent forced to reproduce them, for example in adhering to data concepts, which they counter in their work.

Similarly, many of the Barcelona-based hackerspaces and labs, for example, Pechblenda, GynePunk and Wetlab, profit from state and ministry-sponsored infrastructures. One of them is Hangar, a centre that provides physical infrastructure in the form of laboratories and materials and offers scholarships and funding for projects. Hangar is sponsored amongst others by the Catalonian Cultural Ministry as well as by EU funds (hangar.org). Here again, these opportunities are used by the feminist hackerspaces to pursue their activist work and engage in negotiating tech imaginaries.

However, the positionality and location of the initiatives influence the extent to which their activism may profit from funding. This becomes visible in that, for example, the African initiatives She Code Africa and Pollicy are primarily supported by private actors and foreign development institutes. In the case of Pollicy this includes, besides Meta, funding from the US-American National Endowment for Democracy, the Dutch Humanist Institute for Development Cooperation Hivos, the German political Konrad-Adenauer-Stiftung, as well as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Again, Iyer's background plays a role here, being based both in Germany and Uganda (Pollicy 2022c). She Code Africa lists on their website financial support from the Lagos State Ministry of Education, but mainly has partners in the private sector, that focus on technical product development. Some of these partners are Chimoney a Canadian start-up that builds online payment infrastructures, CloudBees a US American provider of software for businesses, Propel a US company that focuses on offering software for low-income citizens, Lazerpay, a US and Nigerian digital payment and investment platform and the South African company Deimos who provides cloud services for businesses, amongst many others (She Code Africa 2022b).

Following this, the work of She Code Africa or Pollicy could be interpreted as fitting into the capitalist interests of tech companies and governments, in building a tech-savvy future workforce, as some critics argue (Davies 2018, 361). Companies and state actors are, from this perspective, pursuing an idea of innovation, which focuses on the production of new technological tools within the framework of monetisation and profit generation. Nevertheless, as Pollicy makes aware in mentioning the hierarchies within global funding structures, the access to funds is unequal as it depends on factors like accessibility to use data, the ways how the feminist activism is presented and the possibilities to reach out to sponsors. Especially

smaller feminist initiatives in African or Global South countries are therefore in a different position than the hackerspaces in Spain, which, through their members moreover profit from linkages to Western institutions of higher education and governmental bodies.

Sociologist Alondra Nelson pins down the criticism regarding the technical skill-building by asking: "Black girls code, and then what?", referring to the US-based NGO Black Girls Code, which aims to empower Afro-American girls through educating them in STEM fields (El-Hadi 2020; Steele 2021, 9). Again, the critique points to a systemic question of how to transform structures, arguing that the teaching of skills like coding does not tackle the racist structures within the tech sector and its companies. Taking up the criticism of Steele (2021), also discussed in the theoretical part of this thesis, the focus of organisations like Black Girls Code or She Code Africa on women as marginalised groups also obfuscates their expertise and roles within technological histories. In that regard, Steele (ibid., 9) remarks that Black girls and women have always already shaped technologies in history and since long possessed the necessary expertise to influence these in the future. This points to a necessary re-conceptualisation of what is commonly considered technological expertise, going beyond the teaching of tech skills and acknowledging the expertise which is already there.

The critiques go in line with the complexity and ambivalence that constitutes feminist activism as intertwined with the same structures which they aim to deconstruct. It offers insights into the ongoing discussion within the feminist networks on the positions from which technology and data are to be negotiated. Allison Burtch, a member of the DeepLab, a collaboration between cyberfeminist researchers, points out, how possessing tech skills, for her also means taking agency in shaping the dynamics within the technology sector and narratives of technology at large. In a video about the DeepLab, she explains how she felt the need to know how to code, to take agency and the power and ability to move in a world that functions with digital technologies (Minard 2015, pt. 6:17). Referring to the dynamics of technology development and the competition between actors in shaping these, she continues by recognising:

> "I'm not gonna be able to hold back that river but learning some tech skills and being able to navigate my way, for me means that I'm not relying on […] Silicon Valley to tell me how to live my life" (ibid.).

She further states that possessing knowledge about digital technologies and skills like coding gives her back a certain power against the dependence on private corporations whenever she sends information or wants to store data (ibid.).

Similarly, Pollicy (2021a, pt. 4:40-5:30) found out in their research on African feminist movements, that a lack of data literacy affected the initiatives in their possibilities to shape their

activism and work. Many of the initiatives lacked the know-how to use data for their advocacy, policymaking, impact measurement and fundraising. Data for these purposes appears as a decisive tool to politically influence, receive funds and legitimise activist work. Hence, providing African feminist organisations with skills on digital data can be transformed into feminist fights against oppressive structures, although it might also go along with the interests of private corporations and state authorities.

The approaches to data and technology and the ways how agency is negotiated are consequently impacted by the realities in which the activism is located. She Code Africa thereby acts from a different geographical and political context than, for example, the Pechblenda hackerspace in Calafou, or the US American hackerspace Hackermoms, near Silicon Valley. The reflections within the feminist meetings and writings and the organisation of workshops like "Hacking academia" provide a picture of the theoretical discussions amongst the different feminist actors, figuring out what counts as "feminist activism" and which approaches effectively shape the unequal power structures within the global negotiations of technology. The same is pointed out by Dunbar-Hester (2020, 39), who argues for a redefinition of hacking and what is acknowledged as such, in light of the unacknowledged historical practices of women in shaping technologies. In this regard, many of the activists appropriate the terms "hacking" and "hackerspaces", to characterise their engagement with exclusive structures in the tech sector. The terms are used to describe a deconstruction or break with dominant structures. The workshop at the THF! "Hacking academia" (Anarchaserver 2014, 7) makes this visible, as well as the title of a special issue of the ADA Journal, edited by the North American Fembot Collective, named "Hacking the Black/White Binary" (Cooper and Rhee 2015). The Hackermoms space also writes about the idea of "hacking an object a lifestyle, a career, or an idea to modify it your way" and further also the hacking practice itself: "[w]e hacked a hackerspace to fit mothers" (Hackermoms 2022b). The practice of hacking as activist engagement with oppression and exclusion looks different in each location. In this sense, a reconceptualisation of hacking formulated by Lilly Nguyen (Nguyen 2016) demonstrates how the practice plays out differently in contemporary Vietnam, thereby offering another definition. While hacking is commonly framed as "breaking out" of social limitations, Nguyen shows how in Vietnam, hacking practices consist in breaking *into* global technology cultures to tackle the exclusion from these (ibid., Dunbar-Hester 2020, 38).

Through exchanging their different approaches, the feminist activists explore possible adjustments of concepts like Data Feminism or Hacking, to diverging geographical places. The hacking of unequal power structures which determine access to technologies is thereby shaped

by the linkages to institutions, other actors and the geographical and political contexts they operate in. Most of the feminist activists that identify as hackerspaces and are located in the West approach the claiming of space and agency in tech by building inclusive hackerspaces, that transfer tech knowledge to non-experts, experiment collectively with technological devices and bring in artistic perspectives on technology. In the case of She Code Africa, the transfer of knowledge to non-experts takes the form of mentoring programs, coding training or sponsorship of laptops. The exemplified approaches mentioned here are diverging and at times overlap. However, together they reveal a feminist counter dynamic in the same direction, in claiming power within the larger processes of digitalisation, that constitute fights for technological access, authority over narratives and sovereignty over data systems.

The linkages to academia from the majority of the feminist tech and data activists constitutes also a framework for claiming space in areas where women and People of Color are marginalised. Many of the data activists like Catherine D'Ignazio who created the "Data + Feminism Lab" at MIT or Silvana Fumega the director of the Latin American research institution ILDA are also working in academic contexts. Many hackerspaces and labs evolve out of academic contexts and are often also created as collaborations between cyberfeminist and transfeminist academics, like in the case of the Fembot Collective, the DeepLap or FemTechNet. Spideralex, the founder of DonesTech and member of the Anarchaserver collective, also works at the intersections of cyberfeminist activism and academic research. She is a sociologist researcher on ICT, involved in academic programs, like the "Gender and Technology Institute" (ESC Medien Kunst Labor 2022a; Transversal Texts 2022). This background is reflected in her workshops, where activism and research experiences are mixed. The workshops teach strategies to claim technological sovereignty, develop methods to speculate about technological futures and reflect on histories of technology (Anarchaserver 2022e; Spideralex 2021). Spideralex is also an author at the peer-reviewed ADA Journal issued by the Fembot Collective and edited a special issue on feminist re-imaginations of hacking (Toupin and Spideralex 2018). In the same issue, Stephanie Wuschitz, the founder of Mz* Baltazar's Laboratory published an article on feminist hacking as infrastructure production (Savic and Wuschitz 2018). Thus, the activism and engagement with feminist technologies are intertwined with the academic work and institutional backgrounds of the feminist actors within the networks. Thereby, the negotiations about technological futures and digitalisation dynamics are extended into the academic spaces they work in, and their activism is taken into academia. Stephanie Wuschitz is equally affiliated with different universities in European and Western countries and collaborates with her lab in various research programs and projects with

universities (ESC Medien Kunst Labor 2022b), as well as Joana Varon, the founder of Coding Rights (Varon 2022), or Paola Ricaurte Quijano, who initiated the transregional hackfeminist encounter "Tecnología y Afectos" in México (Berkman Klein Center 2021), to name just a few examples of relevant actors within the network.

Similarly, FemTechNet emerged as a broad network between feminists from different disciplines but intersects mostly with academic and educational contexts. With their approach of countering the Massive Open Online Courses (MOOC) teaching structures, and offering instead Distributed Open Collaborative Courses (DOCCs) for a wide and diverse audience, they hack academic sites of knowledge production and practice alternatives (FemTechNet 2022e). In their manifesto they make this explicit, by stating the organisation's mission to build "the accessible, open, accountable, transformative and transforming educational institutions of our dreams" (FemTechNet 2022d). However, the manifesto also explains FemTechNet as part of, but "bigger than the contemporary university" (ibid.). In taking up positions in academic institutions, the feminist actors access funding and infrastructures that enable their activist work and provide the required means to build a feminist network. The negotiations about technological narratives, tech spaces and dynamics in technology production are conducted from within these networks and institutional backgrounds.

These negotiations are sometimes also held through the organisation of common meeting grounds with private and state actors. Pollicy, for example, organises a yearly virtual and on-site event, the "Data Fest Africa", that addresses policy makers, Civil Society Organisations, private tech companies, start-ups and data scientists from academia (Pollicy 2022a). The recent "Data Fest" under the theme "Data Futures: Big Data, Little Data and Everything in Between" connected over five hundred participants from these various backgrounds and was set to exchange on data and tech ecosystems on the African continent (ibid.). The direct linking of actors from these fields within the framework of the "Data Fest" offers a strategy to promote the interests of Pollicy, in influencing the way how data is innovated and approached in African countries. D'Ignazio (Pollicy 2021a, pt. 36:17) makes this strategy explicit in the encounter with Pollicy, stating their aim to bring their concerns to higher state institutions and explaining: "we would love to see more interest from the policy side [to data feminism]". In these encounters and through approaching policymakers, the feminist interests are also taken to a policy level.

Taking their activism to various levels shows a balancing act of the feminist actors between occupying and claiming spaces and aligning their approaches with the interests of the actors

they counter. This comes to the fore in the hackathons which are co-organised by the „Data + Feminism Lab“. In 2014 and 2018, the lab organised the „Make the Breast Pump Not Suck“ Hackathon, initiated to „hack the breast pump“ and work on innovation in breastfeeding (Data + Feminism Lab 2022; Make the Breast Pump Not Suck Collective 2022). The hackathon claims to be unusual compared to a common understanding of this format, as it approaches technological development centred on the needs of babies and mothers. Arguing that „stigma and taboos mean that scientific research doesn't get done, data doesn't get collected, policy doesn't get made, and education doesn't happen“ (Data + Feminism Lab 2022), the hackathon brings together mothers to develop tools which respond to their needs. The development of technological telehealth tools is thereby rethought from participatory approaches that start from the needs of those using the hardware, instead of male experts designing technologies they will never apply. The website of the event hence announces: “Typically, hackathons draw from a young, male, technologically sophisticated audience. We wanted to create a different kind of event, one that welcomed people with diverse expertise and made room for parents—and yes, babies” (Make the Breast Pump Not Suck Collective 2022). However, at the same time, the hackathon offers a financial incentive for the development of an effective gadget, with a price of 3000 Dollars and the possibility to pitch the idea to investors in Silicon Valley. The event is also funded by venture capital firms, like Pejman Mar Ventures and companies that produce health products (ibid.). From this perspective, the hackathon fits neatly into the capitalist logic of technological innovation in the form of monetised product development and the assessment of mothers as a consumer group. Contrary to the idea of open-source tools, knowledge sharing and accessibility, the hackathon which aims at engaging with exclusive and oppressive structures, here reproduces the technological approach of big, private tech companies.

The examples demonstrate the ambivalence and balancing act of the feminist actors, in their negotiations with dominant actors on the power over defining technological imaginaries and pulling the necessary resources for this. Feminist activism and academic research projects are thereby closely interlinked.

3.6 Appropriating space, creating relations: reflections on location and global connectivity

The building of transfeminist hackerspaces departs from the appropriation of the hacker culture and a redefinition of the term “hacking”, typically associated with male and *white* inventors and creatives. Mz* Baltazar’s Laboratory explains that most places related to computers, technology, and science, places where “new ideas are growing”, attract male socialised people

so their lab aims to create a safer space where people can fearlessly experiment with technology (Mz* Baltazar's Lab 2022c; Wuschitz 2016, pt. 0:50). Thus, their lab is "intended as a safer space for people who have traditionally been excluded from or have felt unsafe in spaces where science is taught, or technology is being used" (Mz* Baltazar's Lab 2022c). In this sense, the lab also aims at creating a space for people who consider themselves not experts in technological fields or have no previous knowledge about electronic hardware, programming, or coding. This approach is pursued by many of the feminist experimentation spaces. For example, the US American Hackermoms space, located in Berkeley writes about their space: "Some think that you have to be an artist or a computer programmer to be a HackerMom, but that's not necessarily true", thereby inviting also participants without tech knowledge (Hackermoms 2022a). In a talk between the Berlin-based hackerspace Heart of Code and Stefanie Wuschitz from Mz* Baltazar's Laboratory, the feminist spaces are explained as spaces that cultivate a culture of participation, where everyone can contribute, regardless of their personal and professional background (Heart of Code 2017b). The French hackerspace Le Reset also identifies as an inclusive lab and developed a code of conduct, that members have to comply with, which includes paying attention to the space that one occupies and being aware of one's privileges and prejudices (Le Reset 2016a). The creation of such spaces presents thus a reshaping of the traditional, masculine hacker culture and offers a feminist alternative to these places of technological experimentation.

Contrary to technological innovation as an invention of a technological product, the feminist hackerspaces moreover focus on the process of technological creation and experimentation with technological artefacts. Starting from the principle of collectivity, the collective learning experience, the affections and emotions and relations that emerge within the engagement with technology are in the centre, instead of a focus on a final hardware product. Therefore, the relationships between the members and with the objects of experimentation that are created, as well as the location and physical space of the hackerspace play a role in the building of transfeminist sites of technological knowledge production. Many feminist hackerspaces explain the importance of meeting in an own physical or virtual space. Wuschitz (Heart of Code 2017b) highlights, that for their lab, the physical meeting place is crucial, as it provides a setting, where the diverse members can meet, despite their different identities and visions. The own physical place of the lab hence offers a way for them to hold the community together and connect despite their differences, within an open and valorising space. The Brazilian Maria Lab collective equally points out the importance for them, to imagine their meeting grounds as a common space, in their case a virtual one (ibid.). Inspired by the other collectives, the Heart of Code lab

established a physical meeting place as a common ground for the diverse members and celebrated its inauguration as a physical place of participation, designed by its members (ibid.). Often, these common facilities are also the place where the hardware materials, open for everyone to use, are stored. Mz* Baltazar's Laboratory presents their materials in a short video about their facilities (Wuschitz 2016), the Hackermoms lists the available materials in their space on their website (Hackermoms 2022a), equally as Heart of Code mentions the availability of a 3-D-printer and other hardware and software in their space (Heart of Code 2017a; 2017b), and Le Reset describes the tools they offer in their bio lab and technical workshops (Le Reset 2018; 2019a).

The physical location of the feminist meeting places is at the same time part of the interaction processes with technologies. Pechblenda situates their experimentation with biotechnologies and electronics within the location at Calafou, in midst of a polluted, formerly industrial abandoned place (Pechblenda Lab and Hackteria Lab 2014). The engagement with technologies is linked to the realities and inhabitants of the environmental surroundings. In a map titled "Interaction Ecosystem" (figure 9), the collective portrays the interrelations between practices, non-human species, technologies and humans at the former factory area, thereby situating the lab and the exploration practices within the locality (ibid., 4). The map is at the same time a website structure, where each aspect mentioned can be clicked on and leads to further information about its situatedness within Calafou. In different colours, sorted in groups but without direct linkages, the map features human-build infrastructures at Calafou, like chemical labs, materials like fossils, wood or compost, and animals like cats or wild boars, alongside neighbours, DIY tech developers and invaders plants. Other aspects on the map are the polluted river, and projects summarised under categories like "tech development", "knowledge transfer", and "social centre". A text accompanying the title of the map reads: "Intra-activity as performative states of being in the universe." (ibid.), situating the activism within the net of interrelations between humans, non-humans, environment and technologies at Calafou. In the "Salon for Open Secrets"-meeting with Mz* Baltazar's Laboratory, Paula from Pechblenda recounts how the former toxicities of the industries at Calafou polluted the surrounding rivers, producing effects in nature that led for example to changes in the sex of fishes, or the emergence of hybrid water snails (Mz* Baltazar's Lab 2021b). GynePunk takes these interrelations between industrial production, humans and nature as a background to explore the own body fluids and those of the river at Calafou.

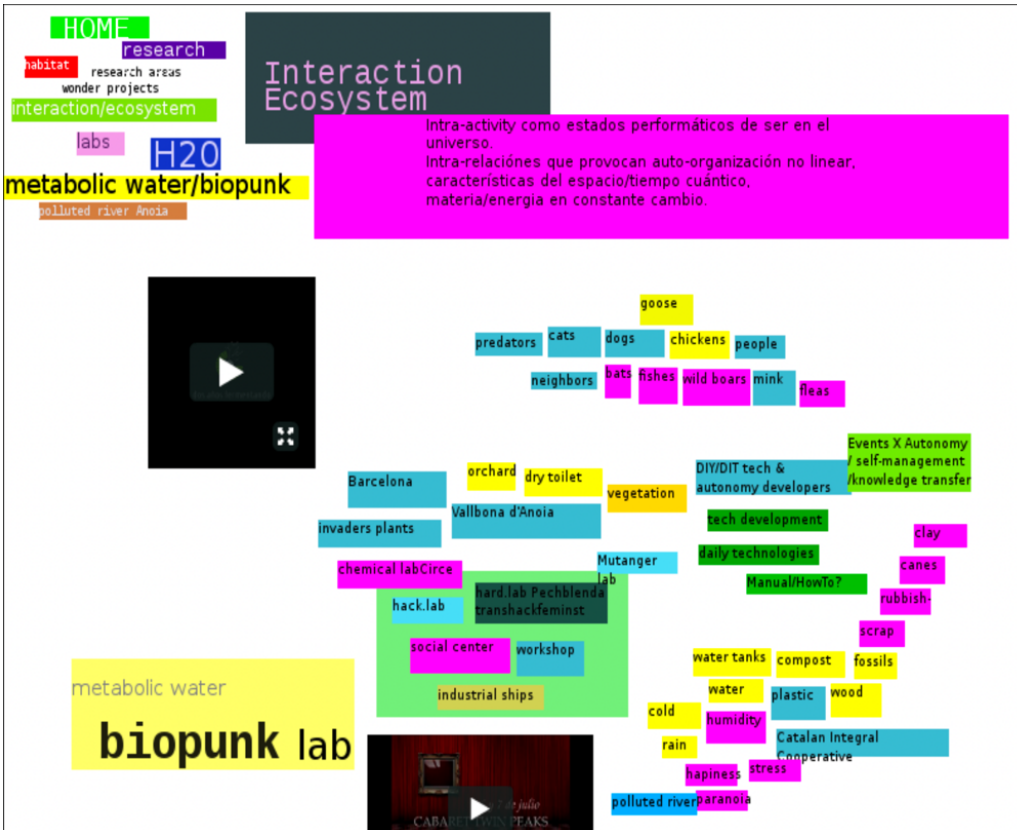

Figure 9. Digital map "Interaction Ecosystem", created by Pechblenda on the interrelations between technology, environment, humans and non-humans at the post-industrial area Calafou (Pechblenda Lab and Hackteria Lab 2014, 4).

The direct local surroundings also play a role for Le Reset, who intentionally opened up their physical meeting place at "La Mutinerie", a bar for queers and women, to make it accessible for those it aims to address and to reduce the barriers for them to reach the place (media.ccc.de 2018). Six years after its foundation, Mz* Baltazar's Laboratory also moved to a multicultural district in Vienna, to bring its projects to a wider and more diverse audience and to interact with the local community. For this, they also use the window shop spaces of the place to draw attention to their projects and invite people to participate in the lab (Mz* Baltazar's Lab 2022a). The lab explains:

> "The windows represent a very important aspect of the project since it is considered as an interface for interaction and invitation between Mz* Baltazar's Laboratory and the diverse and multicultural neighborhood of the 20th district" (University of Applied Arts Vienna 2019).

In a very different setting Hackermoms emerged as an infrastructure for feminist mothers, that are already closely linked to the conventional US American hacker culture, being located in the San Francisco Bay area and having friends and partners pertaining to these spaces (Hackermoms 2022b). The creation of Hackermoms, therefore, answered the need for an alternative space for mothers, within the traditional hacker infrastructure. In the same location, Dunbar-Hester (2020, 119f.) describes a hacker collective run by People of Color, that is

situated in a neighbourhood of African Americans, Latinxs and near to other collectives founded by People of Colour. Being located in the San Francisco Bay area, Dunbar-Hester (ibid.) found reflections of the typical countercultural positions in the collective, but equally an engagement with these from a Black or non-*white* perspective. Similarly to the Hackermoms, though from another perspective, the hackerspace is again a reaction to and engagement with the typical male and *white* hacking infrastructure in the Californian region. The feminist hackerspaces are thus linked to their physical surroundings and localities. Incorporating these into their engagements with technology, the spaces highlight the creation of relationships as central to their practice, rather than the production of specific artefacts. This includes the relations to the local surroundings and to the humans and non-humans that form part of it.

Moreover, in line with the principle of feminist network-building, it includes also the relationships and connections that are built within the hackerspaces, amongst their members. For example, one of the common grounds that feminist hackerspaces pursue in their practices is the use of the concepts of "hacking with care" or a "hacking ethics". The focus on care refers to a personal approach within the spaces, where people are taking care of each other, acknowledge each other's differences and positions and respect each other's identity, knowledge level and social individual backgrounds (media.ccc.de 2018, pt. 47:26; Wetlab 2021). In the introduction to the third THF! in 2016, the concept is described as "a practice which foregrounds the art(s) of well-being as powerful means to encourage, mirror and sustain connexion [sic] to ourself, altruism, and to embody a web of trust" (Transhackfeminist 2016). The hackerspaces are thus built to create, cultivate and reflect on relationships and interrelations within the processes of approaching technologies, rather than the production of technological artefacts. The Barcelona-based Wetlab refers to this idea in its self-description as "a space where networks are constituted and fed, where archives are generated, where people think together" (Quimera and Leandra 2020, 16). Also, Mz* Baltazar's Laboratory declares their hackerspace as a place, "from which to evolve as people and as community" (Mz* Baltazar's Lab 2022c). On this basis, Wuschitz and Savic (2018, 11) interpret the hacking with care practice in the spaces as an "immaterial innovation", although it is an innovation which is often not acknowledged as such because it does not compete with dominant "solutionist, optimization oriented agents". Beyond a reinvention of the hacker culture, these practices also appropriate the terms "hacking" and "laboratory", embodying them through relationship and process-oriented approaches.

From a different, yet similar perspective, the data activists are more individualised in their work of femicide mapping but equally focus on relationship building and the practice of mapping as

a collective process. The collective, feminist Wikipedia contribution events, collaborative maps and collectively developed digital tools make this visible, as well as approaches like the textile workshop, where women stitch together the individual femicides on one map. Similarly, the data work is also regarded from a perspective of care. In the data feminist encounter "Datos contra el Feminicidio" in 2021, Helena Suárez Val makes clear, that for her the work of producing and collecting data is care work, which leads to the necessity to also take care of, and care for those doing this work (Iniciativa Latinoamericana por los Datos abiertos 2021, pt. 1:36:55). Apart from caring for the data, the work with data here also contains the building of relationships to other activists and the caring for the collector of that data.

Both feminist activist networks navigate from their localities and at the same time situate these within the global connections and lines of power that are produced by the routes of technology and the practices of data collection. From a globalised perspective, numerous, different power struggles that go along with data and technology are taken up by the activists. As outlined earlier, Pollicy criticises the data extraction and harvesting of data from African populations, on behalf of foreign firms and researchers, based in the Global North at the concurrent situation of unequal access to data for scholars from the Global South (Borokini, Nabulega, and Achieng 2021, 15; Pollicy 2021a, pt. 50:25). Furthermore, the organisation addresses the monopoly positions of foreign private tech corporations, that profit from building technological infrastructures in African countries, based on opaque and unregulated grounds (Borokini, Nabulega, and Achieng 2021, 15).

In the same direction, the workshop "Rutas de la Tecnología" of this year's THF! traces the global cycle of exploitation and inequality along which technological devices are produced and disposed of. It takes up the extraction of resources from mines in South America on behalf of private companies, the thereof resulting territorial issues and displacement of indigenous groups, as well as the precarious working conditions of tech workers in Asian or African countries, the growing electronic waste dumps in West Africa, the effects of pollution and consumption of natural resources and the fuelling of conflicts in the places where resources are extracted (Anarchaserver 2022d). Further, the workshop connects these routes to the juxtaposition of indigenous, holistic human-nature philosophies with dominant techno imaginaries that separate land, people and affections and proclaim the "datafication of the self" (ibid.).

Equally, in "Tecnoafecciones", one of the writings that emerged out of the hackfeminist encounter in Chiapas, a report of a group reflection reads:

> "by tracing the routes [of digital technological artefacts], we realised that technological consumption is condensed in the Global North, while the South is where the components of our devices are manufactured and assembled, particularly concerning the Asia to Mexico route (Ricaurte Quijano and la_jes 2020, 20).

The group reflection also produced a "blacklist" of countries that threaten Global South territories, which features Canada, Norway and the US, due to their mining activities (ibid., 21). The writing furthermore formulates a profound concern about the global dynamics that shape how these technological routes are embedded in systems of oppression, stating that:

> "[t]he perfect articulation between the infrastructures of knowledge production, technological infrastructures and capital, colonialist and patriarchal interests has reached such deep dimensions that it puts the life on earth at risk" (Ricaurte Quijano 2020a).

These statements and concerns reveal the reflection of the feminist data and hacking activists on their contextualised implications within these wider, global dynamics. Responding to these, their approaches formulate possibilities for action, to engage with these dynamics. The actions emerge from their local standpoints, out of the geographical localities and places of relationships but within the network of other feminist actors.

The agency within a transnational network of other feminist actors is a significant aspect of the initiatives, which situate their engagement with technology and data within a wider feminist counter-dynamic. The Brazilian Coding Rights collective makes this explicit in stating that their collective identifies as part of a "global network of activists that create and share tools and strategies for an autonomous and conscient use of technologies" (Coding Rights 2016) and similarly also FemTechNet explains its activism as part of a feminist movement in their manifest (FemTechNet 2022d). The activists thereby link their different localities to the global realities and dynamics that they counter through the network. The closing remarks in "Tecnoafecciones" conclude: "It is important to ask ourselves about our situated experiences with technology and to listen to ourselves based on our differences, to find routes for collective action" (Cortés Lagunas 2020b, 42). Technology and data thereby emerge as processes of active relationship building and as embedded in a net of connectivity between local, physical and transnational dimensions. In their feminist approaches and practices, the activists reflect on the relations between the locality of their spaces, the members of the initiatives, the technologies they create and the global dynamics they react to. Innovation emerges thereby as processual, context-dependent and collectively produced from within these connections.

4. Conclusion and discussion

The analysis brings to the fore a complex counter-dynamic to dominant imaginaries and space claims related to technology and data. From within the networks and based on their connections the feminist activist actors compete for authority in the shaping of a "technical global". By articulating their different standpoints and cultivating transnational exchanges, collaborations and encounters, the feminist activists negotiate global and interconnected processes of technology development and engage with these at the intersections of data, technology and society. These engagements present a competition on various levels for the shaping of a technological future, which emerges out of the social and political histories of technology, science and data. Within this competition, multiple claims to space and agency are raised and formulated on behalf of the feminist networks. Digitalisation becomes visible as a multidirectional, non-linear and contested set of interlinked processes, which are reproduced, enforced and countered by the various actors competing for influence and power. The feminist initiatives thereby produce diverging visions that challenge the imaginaries and related practices of nation-state actors, private corporations and academic institutions. Their building of a feminist network infrastructure reveals a contestation of the visions, enforced by tech firms and state authorities. Acting from their interests, innovation is evoked through the alternative, embodied practices, explored and developed in self-designed, virtual and physical sites of local and transnational knowledge production. The innovations in hardware, infrastructures, digital technologies, laboratories and data work present imaginaries that centre on ideas of reciprocity, relationship, care and co-creation. Imaginaries that centre on ideas of superiority through technological means, Western-centric visions of progress or masculine depictions of domination through technological tools are challenged by a contextualisation of technology and a situated rewriting of technological histories.

The feminist collectives situate their activism within their direct geographical, local surroundings and at the same time reflect their implicated position within global structures and systems of oppression that are inherent in data practices, technology development and production chains. Their engagements emerge out of their contextualised and different activist standpoints and produce a common feminist counter agency. Further, agency is taken back through the occupation of positions in private and public institutions, where imaginaries and narratives are shaped and by channelling financial resources to the building of feminist networks.

Theoretical and academic concepts of technology and data are rethought and redefined by concrete practices of data work and examinations of the roots of concepts like AI in Western thought. From these perspectives, questions of who benefits, whose needs are considered, and which basic values inform the development of technological tools, are the starting point for innovating technology and working with data. In their practices and exchanges, the data activists further redefine what constitutes data and approach the collection, maintenance and usage of data through a lens of care, relationship, emotion and embodiment, demonstrating data in its complexity and context-dependency. Through collective mapping, joint Wikipedia stormings, the collection of missing data, and approaches to data through methods of storytelling and experience, databases are shown as instruments of power and data as relational, never neutral, created materials. Further, the security of the own data and the preservation of feminist struggles in collective memory storages motivates the production of feminist hardware, like servers and web archives. In creating servers that host data collections, like the feminist collective archives, wikis and library pages, or services, like tools for collective online working, organisation and management of online web spaces, the activists reclaim sovereignty from private companies and aim for autonomous infrastructures. The hosting of feminist resources and materials constitutes moreover a way of countering the deletion and censoring of feminist content online and a self-determined decision on how and which data is stored.

Furthermore, the histories of science and technology are critically rewritten within the activist projects. Feminist biohacking laboratories exchange DIY methods to reclaim agency and decision power over the own body, criticising a health system that controls and sets up barriers to free and accessible medical testing, hormones and diagnosis. In workshops, artistic projects and online materials like fanzines and material collections, the feminist laboratories situate the control over medical technologies before the background of dominant narratives on the invention of celebrated, *white*, male physicians. They rewrite these historical narratives by shedding light on the racist and misogynist systems on which the medical experiments and research were based and by bringing to the fore the women that shaped modern medicine. The historical narratives are further re-appropriated through the renaming of female body parts after the women that were subject to medical experimentation. In the open wikis and resource collections, the initiatives exchange critical perspectives on histories, contextualising the narratives of great individual achievements with the obscured oppression, discrimination and hidden figures that played a role in them. Moreover, technology is explained as embedded in a close, interrelated net between humans, non-humans, and the environment. The holistic lens brings the consequences of technology use and production to the fore and the mutual influence

within these systems of bodies and artefacts. From this angle, human bodies are regarded as malleable and transformable, taking up the early cyberfeminist thoughts about human-technology transformations. Accordingly, the toxicity inherent in the environment resulting from human industries and technologies influences back on human bodies and non-human species, producing effects that change and transform those. Before these interrelations, the consequences of digital technology production and usage are reflected, including the required resources, energy consumption and human workforce. Here the idea of technology as neutral artefacts of progress and superiority is countered with the depiction of the complex net of relationships, histories and dependencies that accompanies technology. Visions of technological progress and domination of nature and people based on technological tools are juxtaposed with imaginaries, where caring about effects within the system of relationships is central. Technology is here not a means of dominance and control, but the power involved in building and using technologies is regarded with a concern for those implicated by its effects. The meaning of technological progress is questioned, as innovation gets linked to this interrelatedness and the processes of experimentation and relation to technology. Innovation is then not only the creation of new artefacts but also comprised of the processes of relating to technology, the reshaping of technology and data usage and the building of feminist infrastructures.

The feminist transnational and regional infrastructures, built on the connections, knowledge flows and encounters between the activist actors, furthermore negotiate technological imaginaries through redefining the methods and strategies of working with data and technology. The various feminist engagements with technology and data are practised through collectivity, the sharing of knowledge and experiences, participation and inclusion. In their conferences and collaborative maps, the data activists practice data work as shaped by personal and care relations. The development of digital tools for the identification, filtering and management of data is created with the intention to support feminist activism and its engagement with highlighting patriarchal structures as reasons for a lack of data and consequently missing policies. The concrete digital tools are here developed and designed through participation and collective reflection to support fights against injustices. Technology is moreover also approached from imaginary and theoretical positions, through the method of collective, speculative fiction, from the questions of power, self-reflection, motivation and equality. The methods of speculation, storytelling and group reflections offer a way to experiment with technological narratives and create imagined futures that respond to the desires and needs of those often excluded from spaces of technological meaning-making. The production and use of

technology in the form of internet infrastructures, digital devices, software programs and hardware is thereby regarded from a perspective of global inequality and access. In discussing the exclusion, created through the production of technology along lines of capitalist, private corporations and unequal systems of knowledge production, the imaginary of a single universal technological progress driven by individual inventions based on societal needs, is once again invalidated. The feminist actors negotiate tech imaginaries by making these structures visible and tackling them by providing access to technical knowledge, skills and hardware.

The building of hackerspaces and organisation of encounters where non-experts and experienced hackers access technologies together and experiment with them through collective learning processes produces an infrastructure of physical, ideological and virtual spaces. In these spaces, technology is approached and shaped by people implicated by it, in ways that they imagine and desire. Through the connections and active building of linkages, the spaces circulate knowledge, skills and perspectives amongst each other. Methods and ideas thereby get adjusted, transformed and challenged within this infrastructure of technological and data knowledge creation. The data and tech activists thereby build networks of feminist actors that are organised transnationally and regionally but rooted in their different local contexts. The traces, actors and exchanges examined here reveal two interlinked networks, which are concentrated around the poles of data activism and tech activism. They overlap and are linked through common events or connections between individual members, nevertheless, there are fewer exchanges between the two sides of data and technology activism. As Data and technology are themes that are negotiated and taken up in both networks through similar critical, feminist angles, future research should go more into detail about the linkages between the two poles of activists. As the feminist infrastructure grows, there are possibly increased flows and exchanges between tech and data activist networks in the future, that offer insights into the conceptual and practical overlaps of both activist engagements. Some of the overlaps that are already taken up in both networks are data security, the collection of personal data on behalf of corporations or states and autonomy over technical devices. Data as the basis for many new digital technologies and as an instrument for shaping decisions about technology further present a topic of connection for both networks. At the same time, the networks are not limited to the actors presented here, however, the scope of this thesis was limited so a selection had to be made about the number of actors that were chosen.

The different backgrounds of the feminist initiatives within the networks bring to the fore a complexity of linkages to institutions, corporations and state structures. While some collectives emerge out of academic meeting grounds and are sponsored by state institutions or universities,

others apply for funding from private actors. This represents the transnational and national competition for financial resources between the various actors that engage in shaping digitalisation projects and dynamics. From this situation emerges an ambivalence for the feminist actors in balancing their motivations with the need for financial means and support to pursue their activism. Some of the initiatives find themselves responding to the interests of those actors, which they counter in the negotiations over the power to determine desirable technological futures. This constitutes a constant point of discussion between the activist networks, reflecting on their strategies of taking agency.

Further, this shows a conceptual limitation of this analysis, which raises a question about the extent to which these feminist networks are transformative or influential. The analysis does not attempt to present a romanticising vision about the feminist networks as a (new) powerful counter player to big tech companies or states, nor to explain them as the universal solution to resolve contemporary issues surrounding tech and data. Instead, the analysis carved out the technological imaginaries and practices of the feminist actors and demonstrated these as part of a wider, transnational competition over technology, data and the spaces from which they are discussed. Thereby, digitalisation is shown as constituted by diverging dynamics, which are not poled into one direction, but rather negotiated, influenced and shaped by actors with different interests for the future of technology development and the use of data.

That said, there is a lack of attention in popular discourse and scholarly literature that deals with digitalisation, global digital networks, data activism and technology, to these networks as actors of knowledge production and innovators. The debates about technological solutions for the future, technological progress and increased use of digital technologies should consider the diverging dynamics produced by the various actors competing for power and space over technology and data futures, on multiple local and transnational levels.

References

Adam, Alison. 1998. *Artificial Knowing: Gender and the Thinking Machine*. 2nd ed. 2006. London; New York: Routledge.

Adas, Michael. 1989. *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance*. 3rd ed. 2014. Cornell Studies in Comparative History. Ithaca: Cornell University Press.

Amezcua, Melissa. 2018. 'Esta es la mujer que cuenta todos los feminicidios en México'. BuzzFeed. 17 July. https://www.buzzfeed.com/mx/melissaamezcua/ella-es-la-unica-persona-que-cuenta-todos-los-feminicidios.

Anarchaserver. 2014. 'A TransHackFeminist (THF!) Convergence Report'. https://alexandria.anarchaserver.org/images/c/c2/THF_report_Eng.pdf.

———. 2022a. 'Call4Nodes'. *Transhackfeminist 2022* (blog). https://zoiahorn.anarchaserver.org/thf2022/call4nodes-thf/.

———. 2022b. 'Memorias Colectivas. Collective Memories'. https://repository.anarchaserver.org/.

———. 2022c. 'Save the Dates: Convergencia TransHackFeminista 2022'. *Infraestructura Feminista* (blog). 5 February. https://zoiahorn.anarchaserver.org/thf2022/2022/02/05/convergencia-transhackfeminista-2022-llamada-a-todxs-lxs-que-construyen-infraestructura-feminista/.

———. 2022d. 'Agenda: Las Rutas de La Tecnología'. *Transhackfeminist 2022* (blog). 19 April. https://zoiahorn.anarchaserver.org/thf2022/2022/04/19/las-rutas-de-la-tecnologia/.

———. 2022e. 'Call For <3 Convergencia TransHackFeminista 2022'. *Infraestructura Feminista* (blog). 10 May. https://zoiahorn.anarchaserver.org/thf2022/.

———. 2022f. 'TransHackFeminist 2022'. *Infraestructura Feminista* (blog). June. https://zoiahorn.anarchaserver.org/thf2022/2022/06/page/2/.

———. 2022g. 'Agenda: Technics to Sense the Invisible. From Dowsing to Making Antennas or Listening to Our Electromagnetic World and Telling Stories of Experimental Vodoo Science Practises of Women in the 19th Centuary and Beyond'. *Transhackfeminist 2022* (blog). 15 June. https://zoiahorn.anarchaserver.org/thf2022/2022/06/15/agenda-technics-to-sense-the-invisible-from-dowsing-to-making-antennas-or-listening-to-our-electromagnetic-world-and-telling-stories-of-experimental-vodoo-science-practises-of-women-in-the-19th-cen/.

———. 2022h. 'Agenda: Vue Explosée'. *Transhackfeminist 2022* (blog). 15 June. https://zoiahorn.anarchaserver.org/thf2022/2022/06/15/agenda-vue-explosee/.

———. 2022i. 'Agenda: Break the Petri_hiphas Spread'. *Transhackfeminist 2022* (blog). 26 June. https://zoiahorn.anarchaserver.org/thf2022/2022/06/26/agenda-break-the-petri_hiphas-spread/.

———. 2022j. 'Agenda: Self-Gynaecology: Talks and Workshops'. *Transhackfeminist 2022* (blog). 1 July. https://zoiahorn.anarchaserver.org/thf2022/2022/07/01/self-

gynaecology-talks-and-workshops/.

Anwar, Mohammad Amir, and Mark Graham. 2020. ‘Digital Labour at Economic Margins: African Workers and the Global Information Economy’. *Review of African Political Economy* 47 (163): 95–105.

———. 2021. ‘Between a Rock and a Hard Place: Freedom, Flexibility, Precarity and Vulnerability in the Gig Economy in Africa’. *Competition & Change* 25 (2): 237–58.

Appadurai, Arjun. 1993. ‘Number in the Colonial Imagination’. In *Orientalism and the Postcolonial Predicament: Perspectives on South Asia*, edited by Carol Appadurai Breckenridge and Peter van der Veer, 314–39. Philadelphia: University of Pennsylvania Press.

———. 2002. ‘Disjuncture and Difference in the Global Cultural Economy’. In *The Anthropology of Globalization: A Reader*, 46–64. Blackwell Readers in Anthropology 1. Malden: Blackwell Publishers.

Arns, Inke, and Marie Lechner. 2021. *Computer Grrrls*. Hardware MedienKunstVerein and La Gaîté Lyrique. Ausstellungsmagazin. Dortmund: Kettler.

Aronova, Elena, Christine von Oertzen, and David Sepkoski. 2017. ‘Introduction: Historicizing Big Data’. *Osiris* 32 (1): 1–17.

Ash, James, Rob Kitchin, and Agnieszka Leszczynski. 2015. ‘Digital Turn, Digital Geography?’ *SSRN Electronic Journal*.

Aspray, William, and Christopher Loughnane. 2019. ‘Foregrounding the Background: Business, Economics, Labor, and Government Policy as Shaping Forces in Early Digital Computing History’. In *Exploring the Early Digital*, edited by Thomas Haigh, 159–78. History of Computing. Cham: Springer International Publishing.

Bar, François, Matthew S Weber, and Francis Pisani. 2016. ‘Mobile Technology Appropriation in a Distant Mirror: Baroquization, Creolization, and Cannibalism’. *New Media & Society* 18 (4): 617–36.

Barnes, Trevor J. 2013. ‘Big Data, Little History’. *Dialogues in Human Geography* 3 (3): 297–302.

Bebbington, Anthony, and Jeffrey Bury. 2021. *Subterranean Struggles: New Dynamics of Mining, Oil, and Gas in Latin America*. *Subterranean Struggles*. Peter T. Flawn Series in Natural Resource Management and Conservation 8. Austin: University of Texas Press.

Beer, David. 2016. ‘How Should We Do the History of Big Data?’ *Big Data & Society* 3 (1): 1–10.

Benjamin, Ruha, ed. 2019. ‘Introduction: Discriminatory Design, Liberating Imagination’. In *Captivating Technology: Race, Carceral Technoscience, and Liberatory Imagination in Everyday Life*, 1–22. Durham: Duke University Press.

Berkman Klein Center. 2021. ‘Paola Ricaurte Quijano’. 9 January. https://cyber.harvard.edu/people/paola-ricaurte-quijano.

Bermúdez, March. 2020a. ‘Momentánea. El Estar y El Ser, La Relación de Tiempo, Espacio y Afectos Con La Tierra’. In *Nos Permitimos Imaginar*, edited by Paola Ricaurte Quijano, 40–41. México: Instituto de Liderazgo Simone de Beauvoir.

———. 2020b. ‘Momentánea mutante’. *Ciberfeministas Guatemala* (blog). 17 December. https://ciberfemgt.org/el-cambio-en-el-tiempo-de-momentanea/.

Binder, María Inés. 2017. ‘Trabajo de fin de máster presentado para la obtención del título de Máster Universitario en Ciencia Política por la Universidad de Salamanca’. Master Thesis, Salamanca, España: Universidad de Salamanca.

Blair, Anne, Paul Duguid, Anja-Silvia Goeing, and Anthony Grafton, eds. 2021. *Information: A Historical Companion*. Princeton: Princeton University Press.

Borokini, Favour, Sandra Nabulega, and Garnett Achieng. 2021. ‘Engendering AI: A Gender and Ethics Perspective on Artificial Intelligence in Africa’. Research Report. African Women in Artificial Intelligence. Kampala: Pollicy.

Bouk, Dan. 2017. ‘The History and Political Economy of Personal Data over the Last Two Centuries in Three Acts’. *Osiris* 32 (1): 85–106.

Bowman, Warigia. 2015. ‘Imagining a Modern Rwanda: Sociotechnological Imaginaries, Information Technology, and the Postgenocide State’. In *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, edited by Sheila Jasanoff and Sang-Hyun Kim, 79–102. Chicago: University of Chicago Press.

boyd, danah, and Kate Crawford. 2012. ‘CRITICAL QUESTIONS FOR BIG DATA: Provocations for a Cultural, Technological, and Scholarly Phenomenon’. *Information, Communication & Society* 15 (5): 662–79.

Brennen, J. Scott, and Daniel Kreiss. 2016. ‘Digitalization’. In *The International Encyclopedia of Communication Theory and Philosophy*, edited by Klaus Bruhn Jensen, Eric W. Rothenbuhler, Jefferson D. Pooley, and Robert T. Craig, 1–11. Hoboken: Wiley.

Broadnax, Jamie. 2014. ‘About BGN’. *Black Girl Nerds* (blog). 31 March. https://blackgirlnerds.com/about-bgn/.

Buskens, Ineke, and Anne Webb, eds. 2009. *African Women and ICTs*. London; New York: Zed Books.

Calafou. 2022a. ‘Anarchaserver’. https://calafou.org/web/index.php/Anarchaserver.

———. 2022b. ‘Colonia Ecoindustrial Postcapitalista’. https://calafou.org/web/index.php/inicio.

Cambridge Dictionary. 2022. ‘digitalise’. In *Cambridge Dictionary*. Cambridge University Press. https://dictionary.cambridge.org/de/worterbuch/englisch/digitalize.

Carbado, Devon W., Kimberlé Williams Crenshaw, Vickie M. Mays, and Barbara Tomlinson. 2013. ‘Intersectionality: Mapping the Movements of a Theory’. *Du Bois Review: Social Science Research on Race* 10 (2): 303–12.

Ce Quimera. 2008. ‘Quimera Rosa’. *Hangar Residents* (blog). https://hangar.org/ca/residents/collective-residents/quimera-rosa/.

Chan, Anita. 2013. *Networking Peripheries: Technological Futures and the Myth of Digital Universalism*. Cambridge: MIT Press.

Chardronnet, Ewen. 2015. ‘GynePunk, the Cyborg Witches of DIY Gynecology’. *Makery Info* (blog). 30 June. https://www.makery.info/en/2015/06/30/gynepunk-les-sorcieres-cyborg-de-la-gynecologie-diy/.

Chen, Shu-Heng, and Tina Yu. 2018. ‘Big Data in Computational Social Sciences and Humanities: An Introduction’. In *Big Data in Computational Social Science and Humanities*, 1–25. Computational Social Sciences. Cham: Springer International Publishing.

Chirikure, Shadreck. 2017. ‘The Metalworker, the Potter, and the Pre-European African “Laboratory”’. In *What Do Science, Technology, and Innovation Mean from Africa*, edited by Clapperton Chakanetsa Mavhunga, 63–77. Cambridge; London: MIT Press.

Ciberfeministas Guatemala. 2016. ‘Construyendo Puentes en #Wikifemhack: segundo encuentro’. *Editatona de Wikipedia* (blog). 6 September. https://ciberfemgt.org/construyendo-puentes-en-wikifemhack-segundo-encuentro/.

———. 2018. ‘Tejiendo Circuitos’. *Actividades* (blog). 22 October. https://ciberfemgt.org/tejiendo-circuitos/.

———. 2019. ‘II Festival Ciberfeminista en Guatemala: tejiendo circuitos’. *Actividades* (blog). 23 January. https://ciberfemgt.org/ii-festival-ciberfeminista-en-guatemala-tejiendo-circuitos/.

———. 2022. ‘CiberfemLab’. *Quiénes somos* (blog). 2022. https://ciberfemgt.org/.

Cifor, Marika, Patricia Garcia, TL Cowan, Jasmine Rault, Tonia Sutherland, Anita Say Chan, Jennifer Rode, Anna Lauren Hoffmann, Niloufar Salehi, and Lisa Nakamura. 2019a. ‘Authors: Feminist Data Manifest-No’. https://www.manifestno.com.

———. 2019b. ‘Feminist Data Manifest-No. Complete Version’. https://www.manifestno.com/home.

Clark-Parsons, Rosemary. 2018. ‘Building a Digital Girl Army: The Cultivation of Feminist Safe Spaces Online’. *New Media & Society* 20 (6): 2125–44.

Clegg, Nick. 2022. ‘Making the Metaverse: What It Is, How It Will Be Built, and Why It Matters’. *Medium* (blog). 20 May 2022. https://nickclegg.medium.com/making-the-metaverse-what-it-is-how-it-will-be-built-and-why-it-matters-3710f7570b04.

Clemens, Elisabeth S., and Martin D. Hughes. 2002. ‘Recovering Past Protest: Historical Research on Social Movements’. In *Methods of Social Movement Research*, edited by Bert Klandermans and Suzanne Staggenborg, 16:201–30. Minneapolis; London: University of Minnesota Press.

Coding Rights. 2016. ‘Creditos y más acerca del proyecto’. *Chupadatos* (blog). 23 February. https://chupadados.codingrights.org/es/sobre/.

———. 2022. ‘About’. Transfeministech. 30 June. https://www.transfeministech.codingrights.org/about.

Colectiva Insubordinadas. 2018. ‘La Chinampa Hacklab’. https://insubordinadas.com/la-chinampa/.

———. 2022. ‘Colectiva Insubordinadas’. Facebook. https://www.facebook.com/ColectivaInsubordinadas/photos/a.417040358756202/1469726503487577/.

Collins, Patricia Hill. 2002. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*. 2nd ed. London; New York: Routledge.

Combahee River Collective. 2000. ‘The Combahee River Collective Statement’. In *Home*

Girls. A Black Feminist Anthology, edited by Barbara Smith, first published 1983 by Kitchen Table: Women of Color Press, 264–74. New Brunswick; New Jersey: Rutgers University Press.

Coogler, Ryan, dir. 2018. *Black Panther*. https://www.imdb.com/title/tt1825683/.

Cooper, Brittney, and Margaret Rhee. 2015. 'Introduction: Hacking the Black/White Binary'. *Ada: A Journal of Gender, New Media and Technology* 6 (January). https://adanewmedia.org/issues/issue-archives/issue6/.

Cooptècniques. 2017. 'Taller de Escritura Especulativa: Tecnologías Feministas'. *Cooptecniques.Net* (blog). 22 April. http://cooptecniques.net/es/taller-de-escritura-especulativa-tecnologias-feministas/.

Cortés Lagunas, Nadja, ed. 2020a. 'Afectar'. In *Tecnoafecciones. Por una política de la co-responsabilidad*, 11–14. México: Instituto de Liderazgo Simone de Beauvoir.

———, ed. 2020b. *Tecnoafecciones. Por una política de la co-responsabilidad*. México: Instituto de Liderazgo Simone de Beauvoir.

Crenshaw, Kimberle. 1991. 'Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color'. *Stanford Law Review* 43 (6): 1241–99.

Cukier, Kenneth, and Viktor Mayer-Schönberger. 2014. 'The Rise of Big Data: How It's Changing the Way We Think about the World'. In *The Best Writing on Mathematics*, edited by Mircea Pitici, 20–32. Princeton University Press.

Daniels, Chux. 2017. 'Science, Technology, and Innovation in Africa: Conceptualizations, Relevance, and Policy Directions'. In *What Do Science, Technology and Innovation Mean from Africa*, edited by Clapperton Chakanetsa Mavhunga, 169–85. Cambridge; London: MIT Press.

Daniels, Jessie. 2009. 'Rethinking Cyberfeminism(s): Race, Gender, and Embodiment'. *Women's Studies Quarterly* 37 (1/2): 101–24.

———. 2015. 'The Trouble with White Feminism: Whiteness, Digital Feminism and the Intersectional Internet'. *SSRN Electronic Journal*, no. pre-print version: 1–37.

Darke, A. M., dir. 2020a. *Research: Open Source Afro Hair Library*. https://vimeo.com/411452990.

———. 2022. 'Open Source Afro Hair Library'. https://afrohairlibrary.org/.

Darke, A.M. 2020b. 'Open Source Afro Hair Library'. *Prettydarke* (blog). 24 April. https://prettydarke.cool/portfolio/open-source-afro-hair-library/.

Daston, Lorraine. 2017. 'The History of Science and the History of Knowledge'. *KNOW: A Journal on the Formation of Knowledge*, Reflections on Disciplinary Knowledge, 1 (1): 131–54.

Data + Feminism Lab. 2022. 'Feminist Hackathons'. *Make the Breast Pump Not Suck* (blog). https://dataplusfeminism.mit.edu.

Datos Contra el Feminicidio. 2021. 'Tecnología en Acción. Edición 2021'. December. https://datoscontrafeminicidio.net/edicion-2021/.

———. 2022. 'Acerca de la initiativa'. https://datoscontrafeminicidio.net/acerca-de/.

Datta, Ayona. 2018. 'The Digital Turn in Postcolonial Urbanism: Smart Citizenship in the

Making of India's 100 Smart Cities'. *Transactions of the Institute of British Geographers* 43 (3): 405–19.

Davies, Sarah R. 2018. 'Interrogating Innovation'. *Cultural Politics* 14 (3): 354–71.

Deflem, Mathieu, and April Lee Dove. 2013. 'Historical Research and Social Movements'. In *The Wiley-Blackwell Encyclopedia of Social and Political Movements*, edited by David A. Snow, Donatella Della Porta, Bert Klandermans, and Doug McAdam, 560–63. Oxford: Blackwell Publishing.

D'Ignazio, Catherine, and Lauren F. Klein. 2020. *Data Feminism*. Cambridge: MIT Press.

Dunbar-Hester, Christina. 2020. *Hacking Diversity: The Politics of Inclusion in Open Technology Cultures*. Princeton Studies in Culture and Technology. Princeton, New Jersey: Princeton University Press.

———. 2022. 'Collectivities and Technological Activism: Feminist Hacking'. In *The Palgrave Handbook of the Anthropology of Technology*, edited by Maja Hojer Bruun, Ayo Wahlberg, Rachel Douglas-Jones, Cathrine Hasse, Klaus Hoeyer, Dorthe Brogård Kristensen, and Brit Ross Winthereik, 467–83. Singapore: Springer.

Echterhölter, Anna. 2020. 'Shells and Order: Questionnaires on Indigenous Law in German New Guinea'. *Journal for the History of Knowledge* 1 (1): 1–19.

Eglash, Ron. 2004. 'Appropriating Technology: An Introduction'. In *Appropriating Technology: Vernacular Science and Social Power*, edited by Jennifer L. Croissant, Giovanna Di Chiro, Rayvon Fouché, and Ron Eglash, vii–xxi. Minneapolis; London: University of Minnesota Press.

El-Hadi, Nehal. 2020. 'An Interview with Alondra Nelson'. *Believer Magazine*, January. https://culture.org/an-interview-with-alondra-nelson/.

ESC Medien Kunst Labor. 2022a. 'Spideralex'. 2022. https://esc.mur.at/de/bio/spideralex.

———. 2022b. 'Stefanie Wuschitz'. 2022. https://esc.mur.at/de/bio/stefanie-wuschitz.

Evans, Claire L. 2018. *Broad Band. The Untold Story of the Women Who Made the Internet*. New York: Portfolio/Penguin.

Felizi, Natasha, and Joana Varon. 2022. 'Chupadatos: el lado oscuro de nuestras mascotas tecnológicas'. *Chupadados* (blog). https://chupadados.codingrights.org/es/introducao/.

Felt, Ulrike. 2015. 'Keeping Technologies out: Sociotechnical Imaginaries and the Formation of Austria's Technopolitical Identity'. In *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, edited by Sheila Jasanoff and Sang-Hyun Kim, 103–25. Chicago: University of California Press.

Feminicidio Uruguay. 2022. 'Acerca del proyecto'. https://sites.google.com/view/feminicidiouruguay/acerca-de.

Feministnetworkproject. 2013. 'World Map of Feminists'. Solidarity/Solidarité/Solidaridad. 6 June. https://feministnetworkproject.wordpress.com/2013/06/06/map-of-the-feminists-world/.

FemTechNet. 2015. 'Situated Knowledges Map'. *Feminist Mapping* (blog). https://www.femtechnet.org/docc/feminist-mapping/situated-knowledge-map/.

———. 2019. 'Partners'. *About* (blog). https://www.femtechnet.org/about/partners/.

———. 2022a. ‘Feminist Mapping’. *Key Learning Projects* (blog). https://www.femtechnet.org/docc/feminist-mapping/.

———. 2022b. ‘Feminist Wiki Storming’. *Key Learning Projects* (blog). https://www.femtechnet.org/docc/feminist-wiki-storming/.

———. 2022c. ‘FemTechNet Situated Knowledges’. Google My Maps. https://www.google.com/maps/d/edit?mid=1_pJZfgABhxso6M3UiCEdvVNzE48&ll=11.590805759244926,0&z=2.

———. 2022d. ‘Manifesto’. Publications. https://www.femtechnet.org/publications/manifesto/.

———. 2022e. ‘What Is a Docc?’ *DOCC* (blog). https://www.femtechnet.org/docc/.

Fernandez, Maria, Faith Wilding, and Michelle M. Wright. 2003. *Domain Errors! Cyberfeminist Practices*. New York: Autonomedia.

Forbes México, dir. 2020. *María Salguero Ubica y Pone Nombre a Víctimas de Feminicidio*. YouTube. https://www.youtube.com/watch?v=fKVHQZxJW7c.

Fotopoulou, Aristea. 2016. *Feminist Activism and Digital Networks: Between Empowerment and Vulnerability*. London: Palgrave Macmillan.

Friederici, Nicolas. 2018. ‘Hope and Hype in Africa’s Digital Economy: The Rise of Innovation Hubs’. In *Digital Economies at Global Margins*, edited by Mark Graham and International Development Research Center, 193–221. Cambridge; London: MIT Press.

Fu, Xiaolan, and Giacomo Zanello. 2020. ‘Innovation under the Radar as a Response to Constraints: The Nature of Innovation in Africa’. In *Innovation under the Radar: The Nature and Sources of Innovation in Africa*, edited by Xiaolan Fu, 65–104. Cambridge: Cambridge University Press.

Gabbiadini, Alessandro, Cristina Baldissarri, Federica Durante, Roberta Rosa Valtorta, Maria De Rosa, and Marcello Gallucci. 2021. ‘Corrigendum: Together Apart: The Mitigating Role of Digital Communication Technologies on Negative Affect During the COVID-19 Outbreak in Italy’. *Frontiers in Psychology* 12 (701130): 1–3.

Gajjala, Radhika. 2014. ‘Woman and Other Women: Implicit Binaries in Cyberfeminisms’. *Communication and Critical/Cultural Studies* 11 (3): 288–92.

Gaskins, Nettrice. 2019. ‘Techno-Vernacular Creativity and Innovation across the African Diaspora and Global South’. In *Captivating Technology: Race, Carceral Technoscience, and Liberatory Imagination in Everyday Life*, edited by Ruha Benjamin, 252–74. Durham: Duke University Press.

Geografía Crítica Ecuador. 2019a. ‘Pronunciamiento hacia la geografía en el marco del xvii @egal2019, Quito, Ecuador’. Twitter. https://twitter.com/GeoCriticaEc/status/1116851356881563648.

———. 2019b. ‘Lo que los datos ocultan en el debate de las cifras sobre violencia machista’. *Colectivo de Geografía Crítica de Ecuador* (blog). 3 June. https://geografiacriticaecuador.org/2019/06/03/lo-que-los-datos-ocultan-en-el-debate-de-las-cifras-sobre-violencia-machista/.

George, Éric, ed. 2019. ‘Introduction’. In *Digitalization of Society and Socio-Political Issues 1: Digital, Communication and Culture*, xv–xxvii. Information Systems, Web and

Pervasive Computing Series. London: Wiley.

Gieseking, Jen Jack. 2018. ‘Size Matters to Lesbians, Too: Queer Feminist Interventions into the Scale of Big Data’. *The Professional Geographer* 70 (1): 150–56.

Godin, Benoît. 2014. ‘Invention, Diffusion and Linear Models of Innovation: The Contribution of Anthropology to a Conceptual Framework’: *Journal of Innovation Economics & Management* 15 (3): 11–37.

Goldstein, Brett, and Lauren Dyson, eds. 2013. *Beyond Transparency: Open Data and the Future of Civic Innovation*. San Francisco: Code for America Press.

Gomes, Camilla ‘Lobinha’. 2017. ‘Servidoras. Aprendendo a Colocar Sites No Ar’. Marialab. https://www.marialab.org/wp-content/uploads/2021/10/Cartilha-Servidoras03.pdf.

Gqola, Pumla D. 2007. ‘Making ICTs Do Feminist Work: The Example of Women’sNet and LinuxChix Africa in Johannesburg’. Presentation presented at the Pretoria - Council for Scientific and Industrial Research (CSIR), University of the Witwatersrand.

Graham, Mark, and Håvard Haarstad. 2011. ‘Transparency and Development: Ethical Consumption through Web 2.0 and the Internet of Things’. *Information Technologies* 7 (1): 1–18.

Gugerli, David. 2012. ‘The World as Database: On the Relation of Software Development, Query Methods, and Interpretative Independence’. *Information & Culture* 47 (3): 288–311.

GynePunk. 2022a. ‘Anarcha, Lucy, Betsey’. *Glándula de Anarcha* (blog). https://anarchagland.hotglue.me/?anarcha_lucy_betsey.

———. 2022b. ‘Bibliosphere. Open Wiki’. RiseUp. https://we.riseup.net/gynepunklab.

———. 2022c. ‘Colonizacion Corporal’. *Vamos a Quitar Sus Dedos Para Meter Nuestros Puños* (blog). https://anarchagland.hotglue.me/?colonizacion.

———. 2022d. ‘De-Colonizacion Corporal: Glandulas-Anarquia’. *Vamos a Quitar Sus Dedos Para Meter Nuestros Puños* (blog). https://anarchagland.hotglue.me/?glandulas-anarquia/.

———. 2022e. ‘Esto Es Un Grito Visceral’. *Un Ejercicio Radical de Reapropiación inside out i/o Una Llamada Viral Infecciosa de Memoria* (blog). https://anarchagland.hotglue.me/?decolonizar.

GynePunk Lab, dir. 2015. *Anarcha Lucy Betsey [short version]*. Vimeo. https://vimeo.com/118336823.

GynePunk Wiki. 2015a. ‘DIY PH Indicator. GynePunk Bibliosphere’. *Klau* (blog). 6 May. https://we.riseup.net/gynepunklab/diy-ph-indicator+297578.

———. 2015b. ‘DIYMobileGenLab: Manuales de Laboratorio. GynePunk Bibliosphere’. *Klau* (blog). 2 August. https://we.riseup.net/gynepunklab+gynepunklab-laboratoriohowto/diymobilegenlab+309045.

———. 2020a. ‘Hysteria. Gynepunk Bibliosphere’. *Bigu* (blog). 19 March. https://we.riseup.net/gynepunklab/hysteria+560710.

———. 2020b. ‘DIY Emergency Handwashing Station Zine. GynePunk Bibliosphere’. *Furfur* (blog). 5 April. https://we.riseup.net/gynepunklab/diy-emergency-

handwashing-station-zine+563798.

———. 2020c. ‘Tratamiento Integral VPH. GynePunk Bibliosphere’. *Klau* (blog). 30 June. https://we.riseup.net/gynepunklab/tratamiento-integral-vph+586703.

Hackermoms. 2022a. ‘FAQ’. https://hackermoms.org/faq/.

———. 2022b. ‘Our History’. 2022. https://hackermoms.org/where-we-came-from/.

Hackteria.org. 2015. ‘GynePUNK’. Wiki. 11 May. https://hackteria.org/wiki/GynePUNK.

Haigh, Thomas, ed. 2019. ‘Introducing the Early Digital’. In *Exploring the Early Digital*, 1–18. Cham: Springer International Publishing.

harassmap.org. 2022. ‘HarassMap. Stop Sexual Harassment, Together’. https://harassmap.org/en.

Haraway, Donna. 1991. ‘A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century’. In *Simians, Cyborgs and Women: The Reinvention of Nature*, 149–81. New York: Routledge.

Harding, Sandra. 2011. *The Postcolonial Science and Technology Studies Reader*. Durham; London: Duke University Press.

Harris, Steven J. 2011. ‘Long-Distance Corporations, Big Sciences and the Geography of Knowledge’. In *The Postcolonial Science and Technology Studies Reader*, edited by Sandra Harding, 61–83. Durham; London: Duke University Press.

Hayles, N. Katherine. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press.

Hazeltine, Barrett, and Christopher Bull. 2003. *Field Guide to Appropriate Technology*. Amsterdam/Boston: Elsevier Science.

Heart of Code. 2017a. ‘Rudel Mit Uns!’ *Mitmischen* (blog). 23 May. http://heartofcode.org/mitmischen.

———. 2017b. ‘Weshalb Das Baumschiff?’ 18. Türchen. 18 December. http://heartofcode.org/tuerchen-18.

———. 2022. ‘About’. *Liberté - Digitalité - Sœurité* (blog). http://heartofcode.org/about.

Henton, Doug, and Kim Held. 2013. ‘The Dynamics of Silicon Valley: Creative Destruction and the Evolution of the Innovation Habitat’. *Social Science Information* 52 (4): 539–57.

Herlea, Alexandre, and Wolfhard Weber. 2002. ‘Globalisation and Technology Transfer’. *Icon* 8 (2002): 25–32.

Hicks, Mar. 2017. *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing*. History of Computing. Cambridge: MIT Press.

Hill, Marc Lamont. 2018. ‘“Thank You, Black Twitter”: State Violence, Digital Counterpublics, and Pedagogies of Resistance’. *Urban Education* 53 (2): 286–302.

Hill, Rosemary Lucy, Helen Kennedy, and Ysabel Gerrard. 2016. ‘Visualizing Junk: Big Data Visualizations and the Need for Feminist Data Studies’. *Journal of Communication Inquiry* 40 (4): 331–50.

Holt, Nathalia. 2016. *Rise of the Rocket Girls: The Women Who Propelled Us, from Missiles*

to the Moon to Mars. New York; Boston; London: Little, Brown and Company.

Horowitz, Minna Aslama, and Andrea Botero. 2020. 'Importing Innovation? Culture and Politics of Education in Creative Industries, Case Kenya'. In *Handbook of Communication for Development and Social Change*, edited by Jan Servaes, 861–70. Singapore: Springer.

Iniciativa Latinoamericana por los Datos abiertos, dir. 2021. *Datos Contra El Feminicidio 2021: Tecnología En Acción*. YouTube. https://www.youtube.com/watch?v=glXgXDOHGBU.

———. 2022. 'About ILDA'. ILDA. https://idatosabiertos.org/about-ilda/.

Jaekel, Michael. 2017. *Die Macht der digitalen Plattformen*. Wiesbaden: Springer Fachmedien Wiesbaden.

Jandik, Mirjana. 2019. 'Sie Haben Einen Namen. Informationen Zu Ermordeten Frauen in Mexiko Auf Internetkarten'. *Ila* 426 (37). https://www.ila-web.de/ausgaben/426/sie-haben-einen-namen.

Jasanoff, Sheila. 2015. 'Future Imperfect: Science, Technology, and the Imaginations of Modernity'. In *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, edited by Sang-Hyun Kim and Sheila Jasanoff, 1–33. Chicago: University of Chicago Press.

Jasanoff, Sheila, and Sang-Hyun Kim. 2015. *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Chicago: University of Chicago Press.

Kember, Sarah. 2003. *Cyberfeminism and Artificial Life*. London: Routledge.

Kerr, Ian J. 1995. 'Colonialism and Technological Choice: The Case of the Railways of India'. *Itinerario* 19 (2): 91–111.

Kiernan, Denise. 2014. *The Girls of Atomic City: The Untold Story of the Women Who Helped Win World War II*. New York: Atria.

King, Michelle T. 2012. 'Working With/In the Archives'. In *Research Methods for History*, edited by Simon Gunn and Lucy Faire. Edinburgh: Edinburgh University Press.

Koepp, Rob. 2002. *Clusters of Creativity: Enduring Lessons on Innovation and Entrepreneurship from Silicon Valley and Europe's Silicon Fen*. Chichester; Hoboken: Wiley.

Kwet, Michael. 2022. 'The Digital Tech Deal: A Socialist Framework for the Twenty-First Century'. *Race & Class* 63 (3): 63–84.

Laak, Dirk van. 2020. 'Infrastrukturen'. *Centre for Contemporary History: Docupedia*, 1–53.

Le Reset. 2016a. 'La Charte'. *Voici Quelques Principes* (blog). https://lereset.org/charte.html.

———. 2016b. 'Femmes & Queers Dans Les Sciences'. *Compte-Rendus D'ateliers* (blog). 9 October. https://lereset.org/comptesrendus.html.

———. 2018. 'Projet de Biolab Pour Le Reset'. *Le Wiki Du Reset* (blog). 20 May. https://wiki.lereset.org/ateliers:resetlab.

———. 2019a. 'La RepRap Du Reset'. Le Wiki Du Reset. 10 June. https://wiki.lereset.org/ateliers:reprap:start.

———. 2019b. ‘Atelier d’écriture Spéculative de Technologies Féministes’. Le Wiki Du Reset. 27 October. https://wiki.lereset.org/ateliers:ecriturespeculative.

———. 2020. ‘Le Wiki Du Reset’. 12 October. https://wiki.lereset.org/start.

Lenz, Sarah. 2021. ‘Is Digitalization a Problem Solver or a Fire Accelerator? Situating Digital Technologies in Sustainability Discourses’. *Social Science Information* 60 (2): 188–208.

Light, Jennifer S. 1999. ‘When Computers Were Women’. *Technology and Culture* 40 (3): 455–83.

London School of Economics and Political Science, dir. 2021. *Data Feminism: What Does Feminist Data Science Look Like?* YouTube. https://www.youtube.com/watch?v=guIxU_hK4aY.

Lorde, Audre. 1984. *Sister Outsider: Essays and Speeches*. The Crossing Press Feminist Series. Trumansburg: Crossing Press.

Maggic, Mary, dir. 2019. *Molecular Queering Agency*. Vimeo. https://vimeo.com/372133054.

Magis-Weinberg, Lucía. 2021. ‘Digital Citizenship under Lockdown: Promoting the Healthy Use of Technology for Adolescents Growing-up in Perú during COVID-19’. *Journal of Children and Media* 15 (1): 77–80.

Make the Breast Pump Not Suck Collective. 2022. ‘Our 2014 Event’. ‘Make the Breast Pump Not Suck!’ Hackathon. 2022. https://makethebreastpumpnotsuck2018.com/our-2014-event.

Mapping Back Collective. 2022. ‘About Us’. *Our Story* (blog). http://mappingback.org/about-us/.

Marialab. 2017. ‘Cartilhas de infraestruturas feministas’. Infraestructuras Feministas. https://www.marialab.org/infraestruturas-feministas/.

———. 2022. ‘Biblioteca MariaLab’. 2022. https://www.marialab.org/biblioteca/.

Marung, Steffi, and Matthias Middell, eds. 2019a. *Spatial Formats Under the Global Condition*. Dialectics of the Global, Volume 1. Berlin; Boston: De Gruyter Oldenbourg.

———. 2019b. ‘The Respatialization of the World as One of the Driving Dialectics under the Global Condition’. In *Spatial Formats Under the Global Condition*, edited by Steffi Marung and Matthias Middell, 1–12. Dialectics of the Global, Volume 1. Berlin; Boston: De Gruyter Oldenbourg.

Marx, Leo. 2010. ‘Technology: The Emergence of a Hazardous Concept’. *Technology and Culture* 51 (3): 561–77.

Mavhunga, Clapperton Chakanetsa. 2014. *Transient Workspaces: Technologies of Everyday Innovation in Zimbabwe*. Mobility Studies. Cambridge: MIT Press.

———. 2017. ‘Introduction: What Do Science, Technology, and Innovation Mean from Africa?’ In *What Do Science, Technology, and Innovation Mean from Africa?*, edited by Clapperton Chakanetsa Mavhunga, 1–27. Cambridge; London: MIT Press.

McLean, Nyx, and Tiffany Kagure Mugo. 2015. ‘The Digital Age: A Feminist Future for the Queer African Woman’. *IDS Bulletin* 46 (4): 97–100.

media.ccc.de, dir. 2018. *35C3. Feminist Perspectives*. YouTube. https://www.youtube.com/watch?v=NDcwl3n47ak.

Medina, Eden. 2008. 'Big Blue in the Bottomless Pit: The Early Years of IBM Chile'. *IEEE Annals of the History of Computing* 30 (4): 26–41.

Medina, Eden, Ivan Costa Marques, and Christina Holmes. 2014a. 'Introduction: Beyond Imported Magic'. In *Beyond Imported Magic: Essays on Science, Technology, and Society in Latin America*, 1–23. Essays on Science, Technology, and Society in Latin America. London; Cambridge: MIT Press.

Medina, Eden, Ivan da Costa Marques, and Christina Holmes, eds. 2014b. *Beyond Imported Magic: Essays on Science, Technology, and Society in Latin America*. London; Cambridge: MIT Press.

Meta. 2022. 'Ideas'. Tech at Meta. https://tech.fb.com/ideas/.

Middell, Matthias. 2019. 'Category of Spatial Formats: To What End?' In *Spatial Formats under the Global Condition*, edited by Matthias Middell and Steffi Marung, 15–47. Dialectics of the Global, Volume 1. Berlin, Boston: De Gruyter.

Minard, Jae, dir. 2015. *Deep Lab*. Vimeo. https://vimeo.com/116314844.

Miss Jane. 2018a. 'Cartografía Textil del Feminicidio'. *Facebook-Event* (blog). 8 June. https://www.facebook.com/events/instituto-municipal-de-las-mujeres/cartograf%C3%ADa-textil-del-feminicidio/167960737381831/.

———. 2018b. 'Cartografía Textil Del Feminicidio'. Facebook Flyer. 1 September. https://www.facebook.com/mustangjane.art/photos/1818188964960949.

MIT Office of Sustainability. 2020. 'The Data + Feminism Lab Hosts Joana Varon'. *Event* (blog). 13 February. https://sustainability.mit.edu/event/data-feminism-lab-hosts-joana-varon.

Mitova, Veli. 2020. 'Decolonising Knowledge Here and Now'. *Philosophical Papers* 49 (2): 191–212.

Mohamed, Shakir, Marie-Therese Png, and William Isaac. 2020. 'Decolonial AI: Decolonial Theory as Sociotechnical Foresight in Artificial Intelligence'. *Philosophy & Technology* 33 (4): 659–84.

Morley, David. 2013. 'On Living in a Techno-Globalised World: Questions of History and Geography'. *Telematics and Informatics* 30 (2): 61–65.

Muchie, Mammo, and Swapan Kumar Patra. 2020. 'China–Africa Science and Technology Collaboration: Evidence from Collaborative Research Papers and Patents'. *Journal of Chinese Economic and Business Studies* 18 (1): 1–27.

Müller, Simone M., and Heidi J. S. Tworek. 2015. '"The Telegraph and the Bank": On the Interdependence of Global Communications and Capitalism'. *Journal of Global History* 10 (2015): 259–83.

Mundy, Liza. 2017. *Code Girls: The Untold Story of the American Women Code Breakers of World War II*. New York: Hachette Books.

Mworia, Wilfred Mutua. 2016. 'Mobile Technology Innovation Ecosystem in Kenya'. In *Innovation Africa: Emerging Hubs of Excellence*, edited by Olugbenga Adesida, Geci Karuri-Sebina, and João Resende-Santos. Bingley: Emerald.

Mz* Baltazar's Lab, dir. 2021a. *MBL Space*. Vimeo. https://vimeo.com/user132862623.

———. 2021b. 'Salon for Open Secrets (SOS) 4'. Paula Pin in Interview with Mz* Baltazar's Laboratory. https://www.mzbaltazarslaboratory.org/sos4-paula-pin/.

———. 2022a. 'Background'. *About* (blog). https://www.mzbaltazarslaboratory.org/background/.

———. 2022b. 'SOS – Salon for Open Secrets'. *Projects* (blog). https://www.mzbaltazarslaboratory.org/sos-salon-of-open-secrets/.

———. 2022c. 'Über Uns / About'. https://www.mzbaltazarslaboratory.org/about/.

———. 2022d. 'Workshop Bioxeno by Gaia Leandra and Ce Quimera'. *Events* (blog). https://www.mzbaltazarslaboratory.org/event/workshop-bioxeno-by-gaia-leandra-and-ce-quimera/.

Mz*Baltazar's Lab, dir. 2021. *Paula Pin at Mz Baltazar's Lab*. Vienna: Vimeo. https://vimeo.com/646861029.

Nafus, Dawn. 2014. 'This One Does Not Go Up to 11: The Quantified Self Movement as an Alternative Big Data Practice'. *International Journal of Communication* 8 (2014): 1784–94.

Nguyen, Lilly U. 2016. 'Infrastructural Action in Vietnam: Inverting the Techno-Politics of Hacking in the Global South'. *New Media & Society* 18 (4): 637–52.

Nilsson, David. 2016. 'The Unseeing State: How Ideals of Modernity Have Undermined Innovation in Africa's Urban Water Systems'. *NTM Zeitschrift Für Geschichte Der Wissenschaften, Technik Und Medizin* 24 (4): 481–510.

Noble, Safiya Umoja. 2018. *Algorithms of Oppression: How Search Engines Reinforce Racism*. New York: New York University Press.

Ntapanta, Samwel Moses. 2021. '"Lifescaping" Toxicants: Locating and Living with e-Waste in Tanzania'. *Anthropology Today* 37 (4): 7–10.

Nwaka, Solomon. 2021. *Social and Technological Innovation in Africa: Sustaining a Post COVID-19 Research for Development*. Singapore: Springer.

Obasi, C. J. Fiery, dir. 2018. *Hello, Rain*. Short Movie. https://www.imdb.com/title/tt7505882/.

Odumosu, Toluwalogo. 2017. 'Making Mobiles African'. In *What Do Science, Technology, and Innovation Mean from Africa*, edited by Clapperton Chakanetsa Mavhunga, 137–50. Cambridge; London: MIT Press.

Okonjo, Anwulika Ngozi. 2022. 'Through the Eyes of African Women'. *Social Movements Lab, Duke University* (blog). https://sites.fhi.duke.edu/socialmovementslab/portfolio/through-the-eyes-of-african-women/.

Okorafor, Nnedi. 2011. 'Hello, Moto'. Short Story. https://www.tor.com/2011/11/02/hello-moto/.

Oranye, Nnamdi. 2016. *Disrupting Africa. The Rise and Rise of African Innovation*. Edited by Ryan Peter. Africa Is Open for Business. Leipzig: Amazon Distribution.

Oxford English Dictionary. 2022. 'Digitalization, n.2'. In *OED Online*. Oxford University

Press. https://www.oed.com/view/Entry/242061.

Paasonen, Susanna. 2011. ‘Revisiting Cyberfeminism’. *Communications* 36 (3): 335–52. https://doi.org/10.1515/comm.2011.017.

Patra, Sudhakar, Berhampur University, Ganjam, Odisha, India, Kabita Kumari Sahu, and North Orissa University, Baripada, Odisha, India. 2020. ‘Digitalisation, Online Learning and Virtual World’. *Journal of Humanities and Social Sciences Research* 2 (S): 45–52.

Pechblenda Lab. 2014a. ‘Ámbitos de Experimentación: Servidores Feministas y Gynepunk’. *THF!* (blog). https://network23.org/pechblendalab/728-2/transhackfeminist/.

———. 2014b. ‘Transhackfeminismo. Manifesto’. https://pechblenda.hotglue.me/?transhackfeminismo/.

———. 2017a. ‘Laboratorio Experimentación Bio-Electro-Química’. *Hardlab Transhackfeminista* (blog). 17 February. https://wiki.calafou.org/index.php/Pechblenda.

———. 2017b. ‘Re-Activation Open Lab’. *Hangar* (blog). 6 September. https://network23.org/pechblendalab/.

Pechblenda Lab and Hackteria Lab. 2014. ‘DIY Fluids Narratives and Polluted Industrial Dialectics on Our Environment. Biohack Embodiments and Poluted River DIY Rescue Technics’. https://we.riseup.net/assets/177310/pechblenda+dialectica+fluidos+hackterialab2014.pdf.

Pfaffenberger, Bryan. 1992. ‘Social Anthropology of Technology’. *Annual Review of Anthropology* 21 (1992): 491–516.

Pfeiffer, Sabine. 2021. ‘The Greater Transformation: Digitalization and the Transformative Power of Distributive Forces in Digital Capitalism’. *International Critical Thought* 11 (4): 535–52.

Pickren, Graham. 2014. ‘Political Ecologies of Electronic Waste: Uncertainty and Legitimacy in the Governance of E-Waste Geographies’. *Environment and Planning A: Economy and Space* 46 (1): 26–45.

Plant, Sadie. 1997. ‘Techno/Cyber/ Xeno-Feminism. the Intimate and Possibly Subversive Relationship Between Women and Machines’. In *Zeros and Ones: Digital Women and the New Technoculture*, edited by Alice Strete, 4th ed., 83–108. London: Piet Zwart Institute.

Pollicy. 2018. ‘3rd Edition of #DataLadies’. Twitter. https://twitter.com/PollicyOrg/status/986087037668397057.

———, dir. 2021a. *Afrofeminist Data Futures Community Webinar*. YouTube. https://www.youtube.com/watch?v=T-__Mwi-mTA.

———, dir. 2021b. *Engendering AI: A Gender and Ethics Perspective on Artificial Intelligence in Africa Series Launch*. YouTube. https://www.youtube.com/watch?v=F4vVU5UbUt8.

———. 2022a. ‘Data Fest Africa’. *Data Futures* (blog). https://datafest.africa/.

———. 2022b. ‘Data Ladies’. *Events* (blog). https://pollicy.org/events/call-for-civic-tech-

organisations-initiatives/.

———. 2022c. ‘Pollicy - Redesigning Government for Citizens’. https://pollicy.org/.

———. 2022d. ‘Africana Futurism: Speculative Fiction from Africa’. *Call for Stories* (blog). 1 April. https://pollicy.org/events/call-for-stories-tell-me-a-story-about-your-personal-experience-with-technology/.

Pollock, Anne, and Banu Subramaniam. 2016. ‘Resisting Power, Retooling Justice: Promises of Feminist Postcolonial Technosciences’. *Science, Technology, & Human Values* 41 (6): 951–66.

Qiu, Jack Linchuan, and Julie Yujie Chen. 2019. ‘Margins at the Center: Alternative Digital Economies in Shenzhen, China’. In *Digital Economies at Global Margins*, edited by Mark Graham, 319–39. Cambridge; London: MIT Press.

Quimera, Ce, and Gaia Leandra. 2020. ‘Wetlab Fanzine’. 01. Wetlab de Hangar: wetlab.hangar.org.

quimerarosa.net. 2022. ‘Quimera Rosa’. https://quimerarosa.net/.

Radhuber, Isabella M. 2015. ‘Extractive Processes, Global Production Networks and Inequalities’. Working Paper 89. Global Extractive Chains and Social Inequalities: Lithium Mining in Argentina and Chile. Berlin: Desigualdades.net, Research Network on Interdependent Inequalities in Latin America.

Ramirez, Ivonne. 2019. ‘Algunas Víctimas Relacionadas Entre Sí’. Ellas Tienen Nombre. https://www.ellastienennombre.org/2019.html.

Ramírez, Ivonne. 2019. ‘Ellas Tienen Nombre 2019’. Cartografía Digital de Feminicidios. https://www.ellastienennombre.org/mapa.html.

Reigeluth, Tyler Butler. 2014. ‘Why Data Is Not Enough: Digital Traces as Control of Self and Self-Control’. *Surveillance & Society* 12 (2): 243–54.

Reyes, Inmaculada Perdomo. 2016. ‘Gênero e tecnologias. Ciberfeminismos e construção da tecnocultura atual’. *Revista Iberoamericana de Ciencia, Tecnología y Sociedad* 11 (31): 171–93.

Rhee, Margaret. 2015. ‘Hacking Feminism’. *Bitch Media*, Media and Tech, 17 March. https://www.bitchmedia.org/post/fembot-collective-profile-tech-and-feminism.

Ricaurte Quijano, Paola. 2019. ‘Data Epistemologies, The Coloniality of Power, and Resistance’. *Television & New Media* 20 (4): 350–65.

———. 2020a. ‘Descolonizar’. In *Tecnoafecciones. Por una política de la co-responsabilidad*, edited by Nadja Cortés Lagunas, 15–17. México: Instituto de Liderazgo Simone de Beauvoir.

———. 2020b. ‘Soy Una IA Feminista’. Nos Permitimos Imaginar”, Escrituras Hackfeministas Para Otras Tecnologías. México: Instituto de Liderazgo Simone de Beauvoir.

Ricaurte Quijano, Paola and la_jes. 2020. ‘Mapear’. In *Tecnoafecciones. Por una política de la co-responsabilidad*, edited by Nadja Cortés Lagunas, 18–23. México: Instituto de Liderazgo Simone de Beauvoir.

Richterich, Annika. 2018. *The Big Data Agenda. Data Ethics and Critical Data Studies*.

London: University of Westminster Press.

Sadowski, Helga. 2016. ‘From #aufschrei to Hatr.Org: Digital–Material Entanglements in the Context of German Digital Feminist Activisms’. *Feminist Media Studies* 16 (1): 55–69.

Salguero, María. 2021. ‘Feminicidios durante el confinamiento’. *Pluralidad y Consenso* 11 (47): 2–7.

Savic, Selena, and Stefanie Wuschitz. 2018. ‘Feminist Hackerspace as a Place of Infrastructure Production’. *Ada: A Journal of Gender, New Media, and Technology* 13 (May).

Servus.at. 2014. ‘Camp: A TransHackFeminist (THF!)’. *Projekt: Cultopia* (blog). https://core.servus.at/de/projekt/cultopia/camp-transhackfeminist-thf.

Shah, Syed Ghulam Sarwar, David Nogueras, Hugo Cornelis Van Woerden, and Vasiliki Kiparoglou. 2020. ‘The COVID-19 Pandemic: A Pandemic of Lockdown Loneliness and the Role of Digital Technology’. *Journal of Medical Internet Research* 22 (11): 1–7.

She Code Africa. 2022a. ‘About Us’. https://shecodeafrica.org/about.

———. 2022b. ‘Current Partners & Sponsor Organisations’. Donation & Partnership. https://shecodeafrica.org/donate-partner.

———. 2022c. ‘Our Team’. https://shecodeafrica.org/team.

———. 2022d. ‘Laptop Scholarship Fund’. *Applications* (blog). June. https://shecodeafrica.org/events.

Shetterly, Margot Lee. 2016. *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race*. New York: Harper Collins.

Sick-Leitner, Magdalena. 2015. ‘SOYA C(O)U(L)TURE – aus Abfällen entsteht Nützliches’. *Ars Electronica* (blog). 30 September. https://ars.electronica.art/aeblog/de/2015/09/30/soya-coulture/.

Skare, Marinko, and Domingo Riberio Soriano. 2021. ‘How Globalization Is Changing Digital Technology Adoption: An International Perspective’. *Journal of Innovation & Knowledge* 6 (4): 222–33.

soniamadrigal.com. 2022. ‘Distribución Geográfica De La Violencia Feminicida’. El mapa colaborativo. http://soniamadrigal.com/mapa/elmapa/.

Sovacool, Benjamin K. 2019. ‘Toxic Transitions in the Lifecycle Externalities of a Digital Society: The Complex Afterlives of Electronic Waste in Ghana’. *Resources Policy* 64 (December): 101459.

Spideralex. 2021. ‘How to Open a Conversation with Your Community about Technological Sovereignty and Strategies to Influence and Achieve Changes in Relation to Technologies’. *Futurotopixs Feministxs* (blog). 11 June. https://zoiahorn.anarchaserver.org/specfic/2021/06/11/335/.

Sreberny, Annabelle. 2015. ‘Women’s Digital Activism in a Changing Middle East’. *International Journal of Middle East Studies* 47 (2): 357–61.

Steele, Catherine Knight. 2021. *Digital Black Feminism*. Critical Cultural Communication. New York: New York University Press.

Stubby the Rocket. 2018. 'How Hello, Rain Builds on the Magic of Nnedi Okorafor's "Hello, Moto"'. *Tor.Com*, 16 January. https://www.tor.com/2018/01/16/hello-rain-adaptation-nnedi-okorafor-cj-obasi/.

Sursiendo. 2019. 'Encuentro hackfeminista en Chiapas: estar en analógico para construir entornos digitales más dignos para nosotras'. *Sursiendo* (blog). 16 July. https://sursiendo.org/2019/07/encuentro-hackfeminista-en-chiapas-estar-en-analogico-para-construir-entornos-digitales-mas-dignos-para-nosotras/.

———. 2022. 'Somos'. Comunicación Cultura Digital. https://sursiendo.org/quienes-somos/.

Taffel, Sy. 2016. 'Invisible Bodies and Forgotten Spaces: Materiality, Toxicity, and Labour in Digital Ecologies'. In *Security, Race, Biopower: Essays on Technology and Corporeality*, edited by Holly Randell-Moon and Ryan Tippet, 121–41. London: Palgrave Macmillan.

———. 2022. 'AirPods and the Earth: Digital Technologies, Planned Obsolescence and the Capitalocene'. *Environment and Planning E: Nature and Space*. 0 (January): 1–22.

Tatarchenko, Ksenia. 2019. '"The Man with a Micro-Calculator": Digital Modernity and Late Soviet Computing Practices'. In *Exploring the Early Digital*, edited by Thomas Haigh, 179–200. Cham: Springer International Publishing.

Taylor, Linnet, and Dennis Broeders. 2015. 'In the Name of Development: Power, Profit and the Datafication of the Global South'. *Geoforum* 64 (August): 229–37.

Thatcher, Jim, David O'Sullivan, and Dillon Mahmoudi. 2016. 'Data Colonialism through Accumulation by Dispossession: New Metaphors for Daily Data'. *Environment and Planning D: Society and Space* 34 (6): 990–1006.

The WhoreDykeBlackTransFeminist Network. 2010. 'Manifesto for the Trans-Feminist Insurrection'. *Anarcha Library* (blog). 20 October. http://anarchalibrary.blogspot.com/2010/10/manifesto-for-trans-feminist.html.

Toupin, Sophie. 2020. 'Feminist Hacking. Resistance through Spaciality'. In *The Beautiful Warriors: Technofeminist Praxis in the Twenty-First Century*, edited by Cornelia Sollfrank, 19–34. New York: Minor Compositions.

Toupin, Sophie and Spideralex. 2018. 'Introduction: Radical Feminist Storytelling and Speculative Fiction: Creating New Worlds by Re-Imagining Hacking'. *Ada: A Journal of Gender, New Media, and Technology* 13 (May).

Transfeministech. 2017. 'Transfeminist Algorithms: A Speculative Exercise for a Less Fcked up Future'. *That's When It All Started* (blog). 17 November. https://www.transfeministech.codingrights.org/transfeminist-algorithms.

———. 2018. 'Tecnox 3.0'. *Activities* (blog). April. https://www.transfeministech.codingrights.org/tecnox.

———. 2019. 'Feminist Tech Night Berlin'. *Activities* (blog). May. https://www.transfeministech.codingrights.org/feminist-tech-night.

Transhackfeminist, dir. 2014a. *THF - TransHackFeminist Event (English)*. Calafou, Barcelona: Vimeo. https://vimeo.com/91474712.

———. 2014b. ‘TransHackFeminist Manifesto!’ 29 July. https://transhackfeminist.noblogs.org/post/2014/07/29/transhackfeminist-manifesto/.

———. 2014c. ‘Anarcha Server & Tecnologias Gynepunk DIT’. *Grafica* (blog). 4 August. https://transhackfeminist.noblogs.org/post/2014/08/04/transhckfeminist-thf-camp/.

———. 2016. ‘THF! Third TransHackFeminist’. *Call for Participation and Projects* (blog). 17 July. https://transhackfeminist.noblogs.org/post/2016/07/17/thf-2016-third-transhackfeminist-meet-up/.

Transversal Texts. 2022. ‘None Spideralex’. https://transversal.at/bio/spideralex.

Tuzcu, Pinar. 2016. ‘“Allow Access to Location?”: Digital Feminist Geographies’. *Feminist Media Studies* 16 (1): 150–63.

United Nations. 2020. ‘Digital technologies critical in facing COVID-19 pandemic’. *Department of Economic and Social Affairs* (blog). United Nations. 14 April. https://www.un.org/fr/desa/digital-technologies-critical-facing-covid-19-pandemic.

University of Applied Arts Vienna. 2019. ‘Mz* Baltazar’s Laboratory open call’. *Open Call* (blog). 20 May. https://www.dieangewandte.at/aktuell/wettbewerbe/wettbewerbe_detail?wettbewerb_id=1554286800443.

Varon, Joana. 2022. ‘Homepage’. https://www.joanavaron.com.

vedetas.org. 2022. ‘Vedetas: Servidora Feminista. Autonomia e Segurança Para Mulheres e Grupos Feministas’. https://vedetas.org/#servicos.

Verstraete, Ginette. 2014. ‘Mapping the Rise of the IPhone: Between Phones and Mobile Media’. *NECSUS. European Journal of Media Studies* 3 (1): 21–41.

WagesforFacebook.com. 2022. ‘Wages For Facebook’. 2022. http://wagesforfacebook.com/.

Wajcman, Judy. 2007. ‘From Women and Technology to Gendered Technoscience’. *Information, Communication & Society* 10 (3): 287–98.

———. 2010. ‘Feminist Theories of Technology’. *Cambridge Journal of Economics* 34 (1): 143–52.

Westera, Wim. 2012. *The Digital Turn: How the Internet Transforms Our Existence*. Bloomington: AuthorHouse.

Wetlab. 2021. ‘Invitación de Las Jornadas’. *Fanzine Resultado de Las Jornadas TransHackFeministas* (blog). June. https://wetlab.hangar.org/.

World Economic Forum. 2011. ‘Personal Data: The Emergence of a New Asset Class’. Report. Geneva: World Economic Forum.

Wuschitz, Stefanie, dir. 2016. *Mz* Baltazar’s Laboratory*. Vimeo. https://vimeo.com/168732056.

Xu, Xiuli, Xiaoyun Li, Gubo Qi, Lixia Tang, and Langton Mukwereza. 2016. ‘Science, Technology, and the Politics of Knowledge: The Case of China’s Agricultural Technology Demonstration Centers in Africa’. *World Development*, China and Brazil in African Agriculture, 81 (May): 82–91.

XXLab. 2015a. ‘XXLab Present: #Openkitchen’. Facebook. 13 August. https://www.facebook.com/809178292505614/photos/a.821417917948318/885464521

543657/.

———. 2015b. ‘Main Page’. 31 August. http://xxlab.honf.org/index.php/Main_Page.

———. 2015c. ‘Soya Couture’. *About the Project* (blog). 31 August. http://xxlab.honf.org/index.php/Soya_Couture.

———. 2016. ‘Facebook Profile’. https://www.facebook.com/profile.php?id=100063618374699.