

The (Im)possibility of Autonomous Feminist Infrastructures

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Abstract

Scaling-up, speeding-up, and powering-up of technology are all coterminous to the hegemonic cycle of infrastructural development. These capitalist impulses shrink the possibilities of building technology from critical perspectives. As such, this paper explores the (im)possibility—the possibility and impossibility—of autonomous feminist infrastructures. We focus specifically on feminist servers as a case study of these infrastructures, critically reflecting on our experimentation to build a prototype server. We contextualise this experiment with our work on Full Stack Feminism in Digital Humanities (DH), drawing a line from feminist histories in computing to development of feminist servers. Orienting our movement towards our own prototype server, we outline our theoretical framework of queer phenomenology. We expand on queer and feminist theorisation of infrastructure, outlining the relational role of infrastructure, in bridging and walling out communities. From our historical context and theoretical framing, we draw insights from experimentations. We outline the possibilities and negotiations with existing infrastructures in building autonomous feminist servers. Through our experimentation and reflections, we emphasise the need for a plurality of infrastructures and an exploration of the socio-technical entanglements in which such infrastructures exist.

The (Im)possibility of Autonomous Feminist Infrastructures

The dominant capitalist models of technology separate the labour from the product — the frontend from the backend — in a manner that the producers of a given software may never own the infrastructure on which they have built their application. Such investments in infrastructure dictate the possibilities for development of technology. In this paper, we ask what is the (im)possibility — meaning both the possibilities and impossibilities — of feminist infrastructures that challenge hegemonic systems of technology? What negotiations with existing infrastructures do feminist technological autonomy require? What gains emerge in creating these autonomous infrastructures? In responding to these questions, we draw upon intersectional feminist praxis and queer phenomenology to conceptualise and prototype an autonomous server. As part of our critical practice, we prioritise process over product to unpack the politics and power of digital technologies and their underlying infrastructures.

As such, this paper draws insights from our research prototyping autonomous feminist servers. ^[1] It builds on prior and ongoing foundational work, from projects such as TransHackFeminist, Syster Server, Anarchaserver, and MariaLab. The work described here, therefore, represents a single component of a larger ecosystem of activism and critical practice. With current innovation in AI demonstrating a logic of capitalist accumulation, optimisation, and ongoing social stratification, these counter ecosystems point to alternative possibilities of infrastructural development. As deeper entanglements into legacy systems and accumulated bias from historic data defines the orientation of future-facing technologies, critical approaches to technology become invaluable. Autonomy in, and ownership of, infrastructures

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become a mode to challenge current possibilities and imagine alternative futures. As [Posner 2016] notes, ‘when we choose not to invest in our own infrastructure, we choose not to articulate a different possible version of the world’.

In addition to contributing to feminist infrastructure building and worldmaking, this research contributes to digital humanities (DH) knowledge and methods. The processes we expand on in later sections are part of a collaborative project and intervention in DH titled ‘Full Stack Feminism in Digital Humanities’ (FSF). ^[2] FSF draws from a history of intersectional feminist theory and ongoing developments in DH which reflect how the field is coming to terms with its histories and embracing the need to engage with queer, feminist, and de-colonial praxis. These interventions are threaded in the work of several DH scholars, including [McPherson 2017], [Losh and Wernimont 2018], [Basset, Kember, and O’Riordan 2019], [Bordalejo and Risam 2019], [Kim and Koh 2021], among others. Their publications, and the various queer, feminist and de-colonial theories they draw from and develop, reflect a significant shift in the socio-cultural politics of DH — that is who is doing it, for what purposes, and who stands to benefit. Full Stack Feminism contributes to this development within DH through intersectional digital methods that amplify the need to critique all layers of our social, cultural and technological infrastructures. It demands criticisms of all the stacks of development in design and innovation. In doing so, it contributes to the ever-expanding field of intersectional feminist, and queer digital humanities, and provides the context for our prototype — an autonomous feminist server. The aim of this prototype was to host FSF’s project archive on our own, purpose-built server. In essence, we wanted to own our infrastructure, maintain our heritage, and embed the aforementioned feminist and queer interventions in building new possibilities. To frame our guiding concept and process, in the next sections we situate and outline our theoretical orientations and historical context, and methods. We then move to discuss our prototype, highlighting insights we have drawn from our experiments.

Feminist Histories to Feminist Servers

Histories which have erased women’s contributions to the development of computational technologies were a significant motivating factor for FSF and for the development of our prototype. The sheer abundance of literature on this subject underscores the enormity of the issue and the daunting task required to address it. Literature on this topic includes [Wajcman 2004], [O’Neill 2016], [Hicks 2017], [Bucher 2018], [Noble 2018], [Benjamin 2019], [Eberhardt 2019], [Fry 2019], [Chun 2021], among others. Much of this work is influenced by, and stems from, intersectional feminist thinking and praxis, critical race and decolonial theory, as well as social justice and equity work. It recognises how current computational systems are entangled with our socio-cultural and socio-political pasts.

Through forms of digitisation, whether digitisation of canonical Western texts for machine learning, or the digitisation of our thoughts in software code and software logics, we have transferred and embedded the ingrained biases of society into bias in our digital spaces. These processes often replicate traditional power structures, instead of radically overhauling them ([O’Neill 2016];[Chun 2021]) and result in relatively benign and unassuming software systems which discriminate as a result of statistical anomalies and assumptions. Such anomalies, however, cause significant harm to certain communities. Specifically, we can look to surveillance technologies (Eberhardt, 2019), insurance and banking systems ([O’Neill 2016]), as well as judicial decision-making algorithms ([Benjamin 2019]) which cause significant harm to, for example, African American communities. Racist stereotyping because of algorithmic sorting and ranking, or racist profiling because of bias, skewed, and decontextualised data, is but one part of the technological kaleidoscope of biased stereotyping, and profiling. As Benjamin notes, in *Race After Technology* (2019), discriminatory practices precede software and hardware design and are rooted in historical legal and social codes. Algorithms are not neutral — ‘even just deciding what problem [an algorithm solves] requires a host of judgments; and yet we are expected to pay no attention to the man behind the screen’[Benjamin 2019, 6].

Feminist computer historians point a light towards the people behind the screen. Historians such as [Hicks 2017] have documented how computing became a male dominated profession. Their research, alongside that of [Evans 2018] and others, trace the historical factors behind the ongoing gender gap in computer science and software engineering fields [Webb 2023b]. Amongst these factors are: the feminisation (or devaluation) and masculinisation of certain labour because of past bureaucratic and fiscal decisions [Hicks 2017]; the erasure of women in computing histories ([Evans 2018];[Kleiman 2022]); and the marketisation of computers to boys and men during the 1970s and 80s. These, as well

as other aggravating factors, mean that as of 2023, only 19% of computing degree applicants in UK higher education were female [Women into Science and Engineering 2023]. This demographic unevenness (in the UK, Europe and US at least), is of course part of a longer historical narrative which perpetuates and relies on the myth that women are not technologists or software developers ([Jane and Fischer 2003]; [Aspray 2016]; [Abbate 2017]), despite their significant contributions to the development of early computing [Edwards and Harris 2016]; [Hicks 2017]; [Kleiman 2022]. It also reflects the lack of diversity in the field of computing and who imagines, designs, and builds technology.

While an extensive history of women's erasure from computing is out of scope for this paper, it is a significant motivating factor of this research. Noting this history, both from the perspective of women's contributions and their subsequent exclusion from computing histories, is crucial to understanding current technological problems, and informing their socio-technical solutions. From the above cited scholarship, it is evident that our current digital ecosystems are a result of historic processes. These processes not only define our present but also predict our future [Chun and Cotte 2020]. The above histories show that technologies are not always reflective, representative of, or work for those traditionally, or continually, marginalised in our societies. But, as Joy Buolamwini, founder of the Algorithmic Justice League posits, ([Tucker 2017]), 'we don't have to bring the structural inequalities of the past into the future we create, but that's only going to happen if we are intentional'. In this regard, recognising that the socio-technical stacks of bias, oppression, and discrimination are historic, allows us reorient technology and its infrastructure with a feminist lens..

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Orientations

"Technology is wedded to ideology. When people create something, they are imposing their orientation on the world through their invention" [Alkalimat 2021, 7].

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Specific world orientations are reflected in common biases in technology. User profiling systems rely on a default user, resulting in software that works for some and often excludes minoritised others. An example is illustrated in the design of the Strava fitness application privacy settings. Back in 2017, its enhanced privacy setting shared location and personal details [Spinks 2017]. This meant that by default, users who had not turned on the "hide from leaderboards" toggle could be tracked by strangers. Inadvertently, the default options endangered women's safety. The feature makes assumptions on gender and safety provisions, thereby reflecting male, cisgender, straight, white, and ableist experiences. It begs the question, what would a feminist orientation in software design have done for safeguarding? These notions of defaults and universal settings are not only tied to software design and the field of computing. The philosophical approach of phenomenology has long explored lived experiences. Traditional phenomenology perceives lived experiences of the world as universal, neutral, and objective. Ahmed's (2006) conceptualisation of queer phenomenology, however, underscores the absurdity of asserting that our individual and collective experiences are anything but subjective, and calls for us to account for our different orientations. Although Ahmed does not address tensions with technology, we see queer phenomenology as key to a feminist design and technical practice.

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We frame our research within a queer phenomenological approach. If traditional phenomenology requires one universal experience, queer phenomenology 'involves disorientation: it makes things oblique' [Ahmed 2006, 178]. Queer phenomenology is a 'disorientation device [...] open[ing]-up another angle on the world' ([Ahmed 2006, 172]) — opening up alternatives that might seem impossible in the current system. It is in this context, when we say '(im)possibility' that we are referring to disorientation and negotiation with universal systems. To queer phenomenology, then, is to 'dwell', belong, inhabit worlds, however transient or impossible they may be. Employing queer phenomenology prompts us to refocus our 'orientation' as a means to cultivate plural consciousnesses, experiences, and modes of 'dwelling'. Our orientation also includes feminist scholars, activists, and technologists who have been alongside us or have come before us in the context of our political positioning and 'situated dwellings' [Ahmed 2006, 5]. To 'dwell' or inhabit, is 'to linger, or even to delay or postpone' [Ahmed 2006, 20]. In imagining feminist infrastructures, we dwell in feminist worlds and their many possibilities.

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In our work, we imagine alternative "slants" — different possibilities that counter existing socio-technical infrastructures — guided by a feminist orientation that resists technological optimisation and reduction. This reorientation calls for openness, for transparent boxes instead of opaque ones, for access to the codes which define operations and

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functions, so that we may reveal and thereby counter what has been hidden and normalised as default. A queer phenomenological approach does not only render visible the invisible, it also makes technology transparent by 'bringing what is 'behind' to the front' [Ahmed 2006, 4]. It turns us 'toward certain objects, those that help us to find our way' [Ahmed 2006, 2]. In light of moving towards objects, we therefore turn towards feminist servers as a form of autonomous feminist infrastructure. To expand on autonomous feminist servers, we first frame our understanding of infrastructures and autonomy.

Autonomous Feminist Infrastructures

A prevalent model in the current technological environment is Infrastructure as a Service (IaaS). IaaS is a rising model in webhosting wherein service providers use cloud-computing to deliver hardware such as servers and software such as virtual machines [Bhardwaj, Jain, and Jain 2010]. Under this model, programmers do not have to buy and configure server computers where they would store images and videos for their websites or apps. They would not need to deal with the endless process of installing operating systems on these servers and setting-up their virtual environment with relevant prerequisites. They would instead pay for the services of a reliable provider who may host their content so they can focus on design and technical functionality of their apps or websites. A capitalist model par excellence, IaaS separates the labour from the product — the frontend from the backend; the wait staff from the chefs and porters at the back of the restaurant; and so on — in a manner that the producers of a given app may never own the infrastructure on which they have built their software. In essence, under IaaS, practitioners gain convenience, scalability, and optimisation at the cost of their autonomy alongside any intimate knowledge of the technology.

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It should come as no surprise that the same large companies that dominate the technology sector are also the main IaaS providers [Statista 2024]. The usual names—Amazon, Google, and Microsoft—hold the majority of the market. In 2021, Amazon demonstrated the political power of infrastructure when it withdrew the right-wing application Parler from Amazon Web Service (AWS) for allowing violent content that went against Amazon's terms of service [Novet 2021]. This decision occurred in response to the January 6th, 2021, US Capitol attack. Amazon stated that Parler had not controlled the posts that encouraged the violent insurrection. Even as Amazon eventually stopped Parler from accessing its cloud servers, it is important to note that the application had been on AWS since 2018. Essentially, AWS infrastructure enabled the gestation of hate for three years on Parler that contributed to the January 6th attacks. Before the patriotic disdain that led to the failure of Parler's/Amazon's infrastructure was a capitalistic ambivalence. It is due to this power, that feminist technologists emphasise a need for autonomous feminist infrastructure.

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Autonomous feminist infrastructure, as with the feminist histories of computing, is a field of inquiry with literature drawing from infrastructure studies, communication studies, feminist science and technology studies (STS), and creative computing. 'Infrastructure' itself is not only a word that connects an interdisciplinary field of research, it also has meaning in quotidian contexts that is often a subject of satire in popular media. At the launch event of the Full Stack Feminism in Digital Humanities project, we adapted an XKCD comic frequently shared on computer programmer forums (see Figure 1). The original comic pointed to 'A project some random person in Nebraska has been thanklessly maintaining since 2003' as the precariously thin block that held up the Jenga-like stack that made up modern digital infrastructure. Our adaptation, on the other hand, pointed to patriarchy, capitalism, colonial racism, and systemic injustice as the foundations of this stack. This image served as an entry point and visual epistemology of the socio-technical stack of digital infrastructure.

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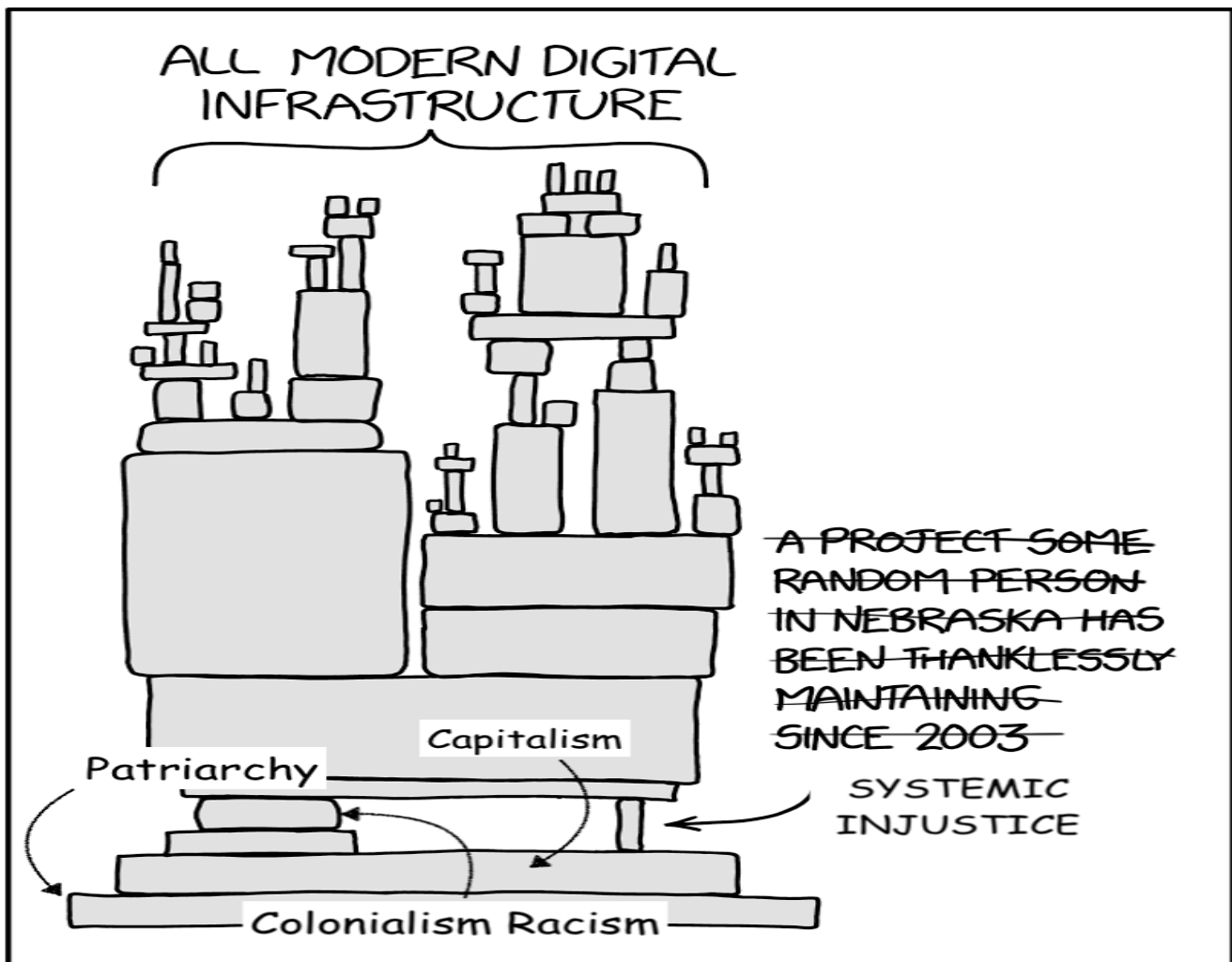


Figure 1. Sociotechnical Dependencies' Adapted from 'Dependency' by xkcd comic. (Creative Commons Licence: CC BY-NC 2.5)

Within critical framing, infrastructure is not easily defined. Instead of fixing a solid meaning to infrastructure, feminist scholar Star (1999) famously encourages a reading of infrastructure that searches for characteristics. Such characteristics include the embeddedness of infrastructure into other social structures and their wide scope beyond single events or sites. In this sense, feminist framing of infrastructure does not simply study calcified roads, pipes, and cables, but also examines their role as part of everyday life. Researchers have explored pre-internet infrastructures such as the Bulletin Board Systems (BBS) which supported much feminist, and queer, community development and knowledge sharing [McKinney 2020]; [Dame-Griff 2023]. BBS required specific knowledge to host and sustain communities. While regarded as precarious infrastructures, bulletin board systems relied upon a network of individuals who had an inherent, value based, interest in both upholding the network, and of being connected to the individuals or the community it created and sustained. BBS users and domain owners were orientated to the technology for reasons other than commercial gain, as they sought out like-minded members/individuals with shared values and interests. BBS, a precursor to our current social media platforms, were decentered from large tech companies, and instead relied on individuals having the technical knowledge to run the network. Beyond social infrastructure, researchers also interrogate code as infrastructure. For instance, if comments are part of an infrastructure of technical documentation, the analysis of code in Easter's (2018) article examines how misogyny can be embedded into a programming language and its wider community of programmers. On the other hand, projects such as *Queering Bash* ([Soon and Karagianni 2023]) which subvert the Bourne Again Shell (Bash) language used in the highly technical field of Systems Administration, demonstrate how communities of queer creative coders can use command line languages to express desire through code poetry. Such analysis and interventions of digital infrastructure illustrate that through relational readings, infrastructure becomes uncalcified from a 'system of substrates' to an active 'part of human organisation' [Star

1999, 380]. An inflexible definition of infrastructure is therefore an oxymoron to its mutable characteristics.

While infrastructure as facilities (such as roads, bridges, or broadband) might seem universal, a queer phenomenological lens emphasises the orientations of these objects. A queer phenomenological approach places affect as an orientation device for building and maintaining infrastructure. As [Wilson 2016, 262] notes infrastructures have orientations, they are 'repurposed toward intimacies we cherish and toward those we don't'. Public washrooms, in Wilson's (2016) case study, perfectly illustrate how communities might orient infrastructures for closeness (as in gay men's cruising) or for division (as in racially segregated toilets in apartheid South Africa). Indeed, these infrastructures become an ideological battleground, as exemplified by anti-trans lobbyist obsession with gender policing in public toilets. While both uses of public toilets could not be any further from each other, they highlight that 'there is power in the sewers' [Wilson 2016, 248]. Mundane infrastructures such as public washrooms might be taken for granted but they express power when specific bodies are excluded or when they become zones of radical intimacy, reclamation, and activism. Collective affect is mobilised for the care, repair, and maintenance of some projects. It is also mobilised in ambivalence, disdain (as with the previous Amazon/Parler example) or the failure of other infrastructures. Failure of infrastructure is therefore a mode to understand the affective orientation of a given facility and the intimacies they prioritise.

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Feminist and queer scholars have unpacked the role of affect and failure as an essential characteristic of infrastructure (e.g. [Halberstam 2011]). [Star 1999] outlines that infrastructure is a hidden substrate that becomes visible on breakdown. This understanding posits that infrastructures such as public trains fade into the background of everyday transportation until there is a problem on the line. However, recent scholarship has outlined that some broken systems have failure embedded in their structure. The prison abolition activist [Kaba 2021] emphasises this in relation to the anti-Blackness in the US judicial infrastructure. Kaba notes that the rhetoric of brokenness places reform as the sensible choice in place of more transformative alternatives. In the same vein, [Noble 2018] and [Benjamin 2019] have expanded on glitches that harm Black women as a feature (and not a bug) of discriminatory technology in the larger structure of systemic racism. Berlant places their analysis of infrastructure in 'troubling troubled times' ([Berlant 2016, 395]) where global social movements against racism, xenophobia, austerity, and capitalist exploitation point to an 'infrastructural breakdown of modernist practices of resource distribution, social relation, and affective continuity' [Berlant 2016, 394]. Berlant theorises that broken infrastructures reveal the opportunities for repair or abandonment for alternate options. In this sense, infrastructure does not simply sit still. For Berlant, infrastructure is also always moving and transforming. The process of 'infrastructure-making' is a social and political action of 'assemblage and use' that transforms and organises the world [Berlant 2016, 403].

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Moving away from the public washroom and facilities to feminist infrastructure-making, autonomy is a necessity in organising feminist worlds. As [Toupin and Hache 2015, 24] note, 'one of the main constitutive elements of feminist autonomous infrastructures lies in the concept of self-organisation'. Examples such as the aforementioned Amazon-Parler server deplatforming, demonstrates that big tech often promises convenience and scalability. These promises disguised as democratisation of technology and agency, take the semblance of autonomy but are in fact a neo-liberal and individualistic Faustian bargain. Ownership is an illusion, and access is subject to capitalist impulses. Feminist autonomy is in opposition to these neoliberal promises of big tech. As a method or proposition it confronts neo-liberal individualism through collective, relational understandings that privileges embodied knowledge and intimate understandings over technological abstraction and efficiency. As Toupin and Hache (2015) highlight, feminist autonomy cannot be fully achieved, as feminists do not exist in silos outside of technology. In this sense, feminist autonomy is always in negotiation with existing systems, recognising boundaries which are negotiable and un-negotiable, possible and impossible. Within the capitalist systems we must also negotiate the human and environmental cost.

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Feminist autonomous servers are therefore a prime example of these negotiations with current technological infrastructure. One manifesto declares a feminist server as 'a situated technology. [... that is] run for and by a community that cares enough for her in order to make her exist' [Snelting 2013]. One of the earliest documented feminist servers, Syster Server, ^[3] notes that the maintenance of a server is an act of care [Wessalowski and Karagianni 2023]. They state that the traditional field of system administration (sysadmin) often distinguishes the process of setting up and maintaining a server infrastructure from care, even as the practice requires thought and consideration. As with

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the broader field of computing, sysadmin is masculinised and the affective power of the servers they maintain is devalued. Alternatively, feminist servers ‘set out to explore non-scalable ways of forming networks of solidarity and care among themselves and beyond. [...] They make space for ways of relating differently to each other and (with) technology’ [Wessalowski and Karagianni 2023, 203–204]. Syster Server also describes their server as ‘an affective space for sharing and streaming videos away from centralised platforms’ [Karagianni 2023]. In reclaiming the affective power, servers, as a form of feminist infrastructure, opens up opportunities of intimacy and care within a network of computers and people.

Syster Server is one of many ‘networks of solidarity and care’ that form feminist servers and infrastructure. It is beyond the scope of this article to recount a comprehensive history of feminist servers. In the mode of feminist citation, however, we would like to chant out some servers as noted in earlier scholarship:

Kéfir, Vedetas, Codigo Sur, Maddix, Cl4ndestina, Systerserver, Matriar.cat, Anarchaserver, Rhizomatica, Palabra radio, Pi-node, Tetaneutral, Framasoft, any many others... [Toupin 2020, 53].

The following section focuses on our intervention and contribution to the above ecosystem of feminist servers and their practice of infrastructure-making.

Full Stack Feminism Server Prototype

...What would be the purposes and principles of a feminist server? Can feminist servers support women, feminists and GLBTQI in their fight for having their rights such as freedom of expression and opinion respected? Can we create trust among us to develop cooperative approaches to the management of those spaces of resistance and transformation? [Toupin and Hache 2015, 24].

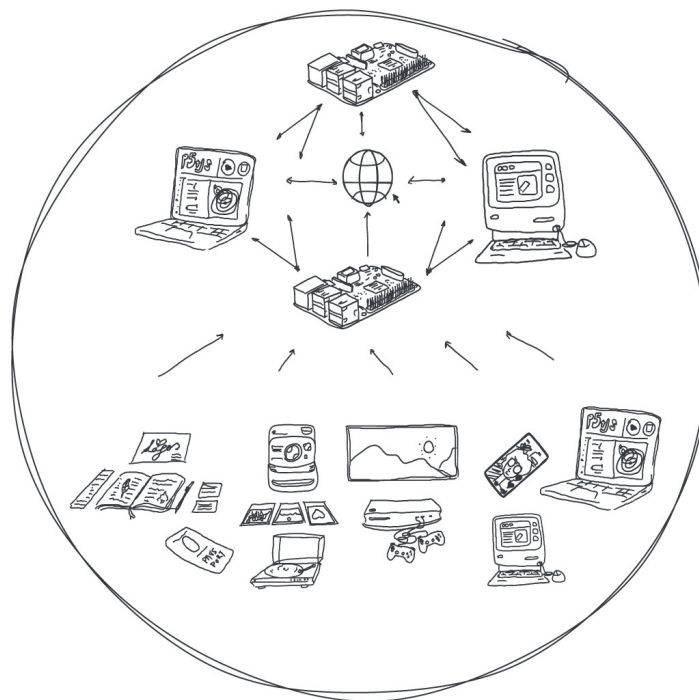


Figure 2. Speculative FSF server diagram imagining items and network connections.

The speculative FSF server diagram (Figure 2) encapsulates our vision for our prototype. Servers, for us, are not just software applications and hardware components, they are material artefacts which have meaning — they are ancestral totems, and heirlooms that connect the intimate and sacred to everyday life. In their form as software, servers are also virtual spaces akin to traditional archival institutions that hold, share, and recreate ideas of heritage and history. In this sense, we understand servers as both physical and virtual holding places for collective memories, histories, and

materials. This understanding echoes with TransHackFeminist (2015) statement that feminist servers ‘ensure that memory of feminist groups are accessible, preserved, and managed’. Anarchaserver also reiterates that feminist servers play a role in ‘regaining control and gaining autonomy in the access and management of our data and collective memories’ [spideralex 2023].

As we are concerned with both the concrete and virtual holding of archives, we aimed to design everyday objects — such as vases, sculptures, boxes — that will house our server. In this sense, we also draw from the understanding that ‘things,’ to paraphrase [Grosz 2009, 126], ‘make our world’. [Hall 1997, 45] also notes how worldmaking emanates from our ‘fantasies, desires and imagining’ as nations, communities, and families. Subsequently, our prototyping included diagrams (as in Figure 2) or imaginations of our autonomous feminist servers. Through our visualisation and mapping, we engage in speculative worldbuilding. We explore how we might hold intimate objects — passports, journals, records, video games — with care.

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Given the centralisation of knowledge and power in big technology firms, our intimate objects have been held away from us in layers of abstraction that keep us reliant on capricious systems. Therefore, underlying our orientations towards servers was a goal to retain autonomy and intimate knowledge of the infrastructures we so heavily rely upon. To achieve this goal, we needed to understand the code, the machine, the processes, the points of failure. In doing this we would also identify the possibilities and impossibilities of autonomy. Furthermore, as feminist autonomy is ‘a desire for freedom, self-valorisation and mutual aid’ ([Toupin and Hache 2015, 23]), we were also concerned with accessible forms of server making that could be shared across our communities. For this reason, we aimed to build together as a collective. We prioritised process, understanding, and documentation over an efficient and optimised final product. We aimed for a prototype over a marketable, universal solution with measurable impact.

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Our collective experiment took place over the course of 9-months (2022-23) with FSF team members in Maynooth University, Ireland, and University of Sussex, UK. It included the authors, Ranju Upadhyay (FSF Programmer at Maynooth) and Alex Peverett (FSF Technician at Sussex). We investigated various options, including using old PCs from our universities’, but decided to build on Raspberry Pis. The Raspberry Pi is a credit card-sized microcomputer used in various contexts from DIY to industry, heritage exhibitions to wildlife observations. It is relatively affordable, compared to most computer devices. It is open and encourages tinkering, with extensive online documentation and community forums. With its size, the Raspberry Pi is modular and portable. It has expansions such as small-screens and microphones that can be housed in everyday objects. This means that projects built with the Raspberry Pi are open to repair and scalable. ^[4] For our project, we aimed to explore the possibility of hosting a website with media artefacts (text, images, sounds, or projects such as chatbots) from our coding workshops. We wanted the server to be portable so that it could be used in exhibitions and workshops — becoming an object that archives and connects our feminist research community. However, a single Raspberry Pi would easily bottleneck, so we decided a Raspberry Pi cluster would be a better option.

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After researching parts we needed, we bought matching items (including a Raspberry Pi cluster kit, ethernet splitters and cables) in Sussex and Maynooth to ensure we had a similar hardware setup. Using online tutorials and documentations, we built our cluster hardware together and began the software development by setting up the operating systems and programming environments for our server. As we aimed to share this knowledge in future workshops, we kept notes on the process. In these notes we outlined accessible and inaccessible tutorials — those that brushed over major details, and those that were outdated. In this sense we documented our problem-solving and reflected on pre-existing assumptions about technical knowledge. At every step we questioned the pursuit of autonomy given various infrastructural and technical limitations, embracing that ‘the notion of autonomy is vital to feminist attempts to understand oppression, subjection, and agency’ [Mackenzie and Stoljar 2000, 3]. For example, through prototyping we were able to question whether we can be truly autonomous when we are reliant on university access to the internet, a global supply chain of hardware, and computers with microchips that might be made from extractive labour. These issues are not trivial, they highlight the infrastructural entanglements in which we exist, and which limit our options and ability to be fully autonomous. It is on this note that we discuss negotiating with existing infrastructures and their constraints when prototyping our autonomous feminist server. We outline our insights from our collective experimentation and development.

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Negotiations and Gains:

I'm very much interested in owning the domains, owning the understanding [of] how to upkeep the information that we're building and making, and how to have the community hold those memories themselves rather than...outsource...[Brathwaite-Shirley 2023].

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Breaking it Down to The Code: Accessing Technology

Our first critical infrastructural block and the resulting negotiation was related to global supply infrastructures and the material demands of acquiring hardware for our cluster. The compromise we made was to reconsider the scope of the project. Given the post-2021 global supply chain shortage in computer chips — inflated by a combination of events such as the COVID-19 disruptions, high demands for computing power for machine learning and AI model training, and the surge in electric vehicle production amongst others ([Sweney 2021];[Waferworld 2025]) — we were unable to acquire the 16 Raspberry Pi's needed for a sizeable cluster. To proceed with the project, and to build matching clusters during our collective coding sessions, we had to limit our cluster to two Raspberry Pis, thus reducing both the capacity and capability of our feminist server. Even with this change, we still experienced disruptions in delivery which further impacted and reduced the timeframe of our project. Academics such as Crawford (2021) write about AI and its ravenous demand for computing power as a planetary cost. Conversely, the initial blocks we faced highlight the opportunity cost of these ever-increasing computing demands — that smaller scale projects lose out to capitalist technology, thereby closing off possibilities to build alternatives.

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After the arrival of our components, we used a hybrid set-up to work synchronously across geographical boundaries with team members in Maynooth and Sussex. For our real-time collaboration, we had dual cameras for face-to-face video conferencing and a desk view to live-share our building process (see Figure 3). Our collaborative remote workshops highlighted different institutional infrastructural limitations and constraints. For example, to access institutional Wi-Fi to connect our cluster, we had to develop two different configurations. In addition, mundane situations in computing such as cross-compatibility across different operating systems, download speed or writing operating systems onto storage cards, take time. This meant a number of our collective workshops were dedicated to downloading, installing, and configuring the Raspbian operating system. To reiterate, these mundane processes are not trivial. Access to high-speed internet and uninterrupted energy is an infrastructural privilege. They highlight the unevenness of infrastructural capacities and the implications of broader global digital divides. In this sense, our location within institutions with unlimited access to Wi-Fi afforded us privileges that might not exist in other contexts.

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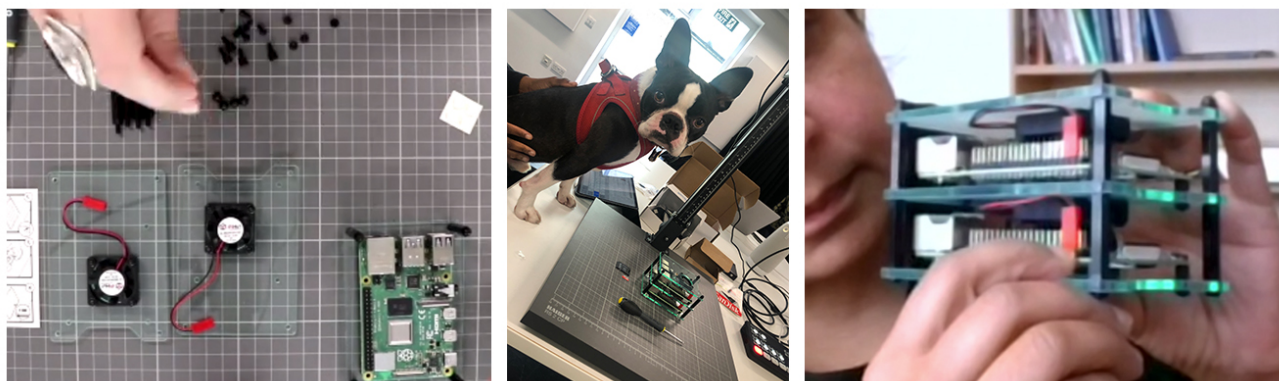


Figure 3. A three-panel image showing the setup Raspberry Pi cluster hardware. Panels 1 and 2 show the hardware setup and finalisation in Sussex. Panel 3 shows the final setup in Maynooth via videoconferencing.

We negotiated with another double-sided layer of access — technical knowledge. Raspbian, the Linux-based operating system commonly used on Raspberry Pis, is a free and open-source software. As with most open-source software, Raspbian has a community that shares tutorials in addition to the official guidance from the Raspberry Pi Foundation. These tutorials could be outdated or contradictory. Reading and following instructions outlined in a given tutorial

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requires some technical skill. Tutorials we followed assumed prior knowledge that frequently sent us into tangential routes in search of fixes. They often used language charged with racial and gendered implications such as ‘master/slave’, which is controversial even in more mainstream coding platforms [Landau 2020]. This difficulty accessing technical knowledge via documentation is not unique. It is actually embedded in the infrastructural culture of open-source software and programming, characterised by the phrase “Read the F*cking Manual”. RTFM is a retort used in open-source forums to respond to enquiries suggesting a user should consult the manual before seeking help. This retort discourages new participants and contributes to exclusivity and lack of access to technical knowledge. Interventions such as Read the Feminist Manual appropriate this term, drawing attention to exclusive practices in documentation in open-source manuals [Karagianni 2023]. As [Soon and Karagianni 2022], who collectively work on feminist approaches to sysadmin and coding, highlight, free and open-source software has a problem:

...the diversity of people contributing to free and open source...is a problem because...of the disparity of gender imbalance and disparity in terms of ethnicity, class...we tend to have these benevolent dictators to put it gently. They’re usually the maintainers of the software library, and they tend to dictate on decision making processes... [In this context] how can we talk about free and open-source software as...something that’s beneficial in a society when it’s monoculture based.

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FSF Cluster - Finish Assembly and Write OS to SD

We had issues writing the OS to the SD drive with the Raspberry Pi Imager on the Lab Laptop.

As an experiment, the team asked that I tried the manual configuration on my Laptop. I am not using the SD adapter – instead the SD card is slotted directly into my Anker 8-in-1 PowerExpand adapter.

From past experience writing the Raspberry Pi image to an SD, I know that the default format does not work on MacOS. I checked out [this youtube](#) tutorial from 7 years ago to refresh my memory!

Preparation

1. To get my Mac to recognise the SD card, I used Mac’s native application Disk Utility to format the card as MS-DOS (FAT32) with the Master Boot Record.
2. I then downloaded 32-bit Raspberry Pi Lite OS image from the [official site](#).
3. In the Downloads file on MacOS Finder, I extracted the file 32-bit Raspberry Pi Lite OS image by right clicking on 2023-02-21-raspbios-bullseye-armhf-lite.img.xz then click Open With > Archive Utility to extract the img file

Figure 4. A screenshot of a team member’s log documenting their process of manually installing Raspbian.

As a community of technologists, with prior experience in creative coding we pooled together our knowledge and technical skills to solve problems. Our prior knowledge meant that we had easier, albeit still challenging access to open-source software. For instance, the official instructions to write the Raspbian operating system required that we used a graphical user interface (GUI) application that failed to work. However, with our past knowledge of command line interfaces (CLI), we were able to bypass the abstractions of the GUI and work directly with shell code to copy the Raspbian image to our SD card (see Figure 4). Our interventions were not limited to technical adjustments, we critically intervened on the reproduction of racial language in configuring our cluster by using main/clone in place of the terms “master/slave” used in tutorials. Through our collective troubleshooting and critical interventions, we successfully set up our software environment and connected our two-node raspberry Pi cluster to communicate with each other over the same network (see Figure 5). Following the setup, we ran some test scripts in Python to ensure that the cluster was functional. These test scripts served as a prototype for what would be the backend of the server that would also be written in Python. With the test scripts running, we had successfully configured the cluster to serve files and run code

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across each other, thereby preparing it to host data (images, sounds assets, software, etc..) for the project archive. We stopped the development at this point given time constraints and as we had achieved a significant step of configuring the prototype server infrastructure.

Restoring intimacy and collective joy

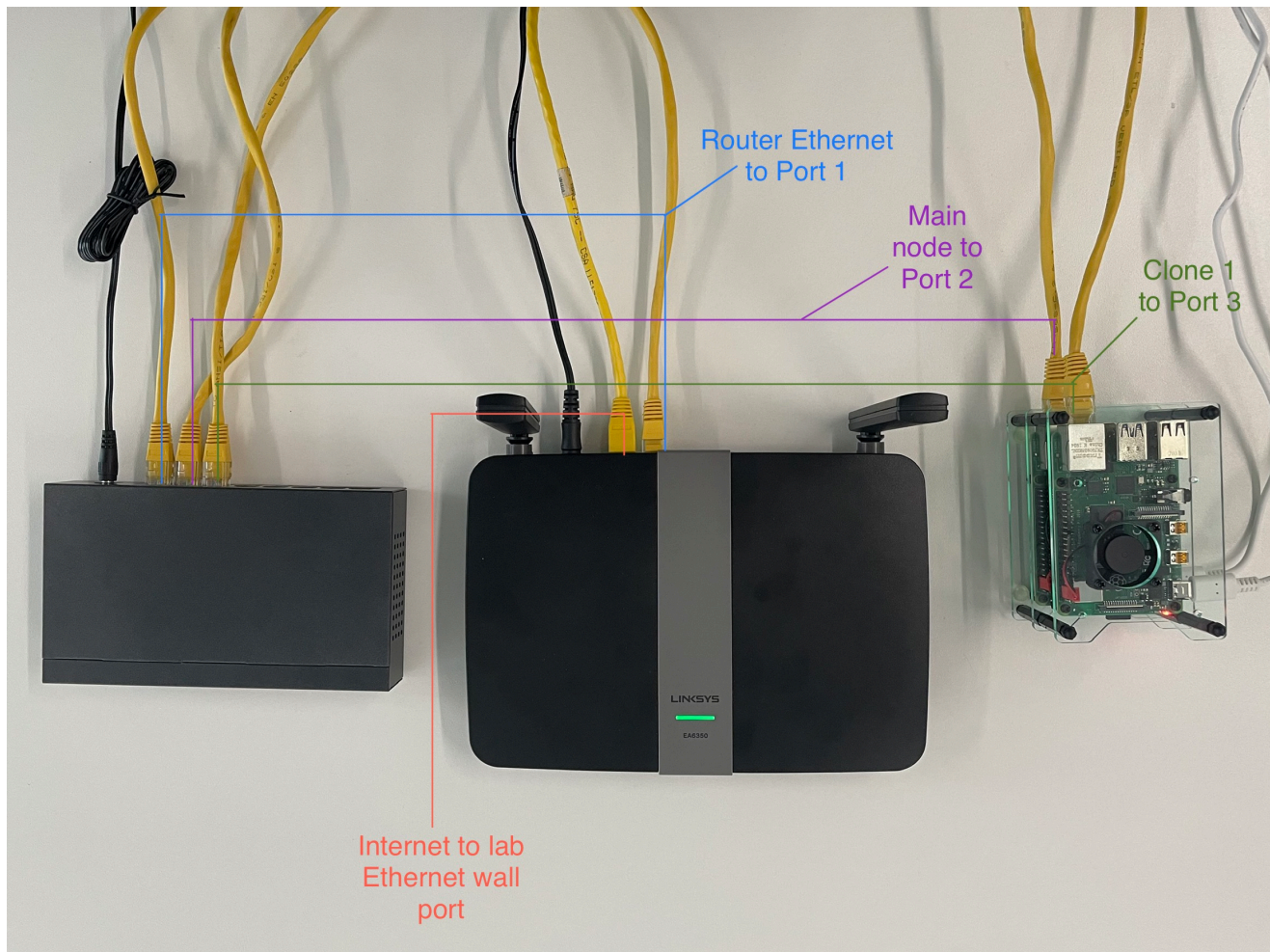


Figure 5. An image showing the Raspberry Pi cluster connected to a router via an Ethernet Network splitter. The router (middle) is connected to an ethernet wall port and connected to the splitter (on the left). Each individual Raspberry Pi is connected to a port on the splitter. The connection moves in the direction: Ethernet to Router to Splitter to Raspberry Pi.

The account of the server setup illustrates the economical, technical, and cultural negotiations we made to build our own infrastructure. With the compromises, time, and labour allocated to this process, it is also important that we reflect on what we gained. As stated previously, our queer phenomenological methodological approach emphasises the need for plurality and the role of affect in orientations towards objects such as servers. One of our most significant gains was affective — a restored intimacy with our technology. Developing intimate knowledge of technology means that we remained in line with the Full Stack Feminism ethos of reclaiming technology down to the code. More importantly, we also restored intimacy via our contribution to ‘networks of solidarity and care’ as with other feminist servers [Wessalowski and Karagianni 2023, pp.203–204]. The restoration of intimacy is extended not only by knowledge of technology and contribution to feminist practice but also by our embodied experiences. Unlike a cloud server or IaaS, we were able to tinker with our Pi Cluster. We were able to touch and adjust all the screws on the nodes in the cluster (see Figure 3). We are able to see which server is down by monitoring the lights on the boards. This physicality emphasised the materiality of servers and digital infrastructures — knowledge often lost through reliance on third party services to the detriment of the global climate. Most importantly, we are able to build affect around the object — the thing in itself — through the ways we as a community (including our non-human companions) interact with the Pi

In this respect, restoring intimacy to infrastructure through technological and embodied knowing, is a form of reorientation. Our movement away from Infrastructure as a Service (IaaS) orients us towards the possibilities, and impossibilities, of alternative pathways, places and spaces from which autonomous feminist legacies can be imagined, inhabited and maintained. As we carefully placed screws onto the plates that held each machine on the cluster, we embodied an ethics of care that is involved both in the development of feminist infrastructure, its maintenance, and ultimately care for the content it will one day host. When we rethink our (re)orientations towards affective infrastructures, they become entwined with human, digital rights, and security. As [Foz 2022, 11] states, ‘digital care’ is intimate since ‘the online and offline are indissociable’, meaning ‘what affects our data also impacts our bodies’. Governance in these spaces, is therefore, governance of our bodies, thus, ‘in the digital care perspective, taking care of our data [and of the artefacts that hold data,] is also taking care of our body and this care should be done every day, as a habit, a culture, politics’ [Foz 2022, 11].

In addition to a restored intimacy with technology, we also gained insights on the role of slowness in building autonomous feminist servers. The act of intentional slowness is a feminist act of care. As a wider movement—slow archiving, slow scholarship, slow computing—it counters neo-liberal approaches which foreground productivity under strict timelines. Intentional slowness bounded the parameters of the experiment, prompting us to stop at the configuration of our server infrastructure. As members of Syster Server write,

[p]ractices of care and maintenance within feminist servers must be understood as negotiations of collective responsibility. [...Sysadmins on feminist servers] participate according to their availabilities and thereby extend the principle of care towards themselves by taking into account the different intersectional precarities that define their situation [Wessalowski and Karagianni 2023, 197].

This form of slow computing, as per [Kitchin2020], is a practical and political strategy to regain control and agency in a hyper-connected and hyper-optimised digital world. As they note, ‘if you are a free-market capitalist, why would you care about worker wellbeing as long as you can extract profitable value from them?’ [Kitchin2020, 136]. Intentional slowness is therefore intentional care. Conversely, as [Kitchin2020] further note, by adopting and enacting a

philosophy of slow computing... **We stand to experience the joys of computing**, while minimizing some of the more pernicious aspects of the emerging digital society and economy if we pursue individual and collective, practical and political, actions.

Through our experiment, we challenged the centrality of optimisation and efficiency, foregrounding a feminist ethic of repair, maintenance, and intimacy, oriented toward collective autonomy and care.

These acts also reorientated us towards collective joy—a return back to the energising force within the practices of working with, making, and understanding technology essential to capacity and solidarity building. Intentional care and slowness helped us peel back the layers of abstraction inherent in capitalist approaches to Infrastructure as a Service, and instead provided a space to reclaim the layers, stacks of the technologies we rely on. If, as [Winner 1980] asserts, artefacts have politics, then our final artefact embodies our intersectional feminist politics and praxis.

Conclusions: On Possibilities and Plurality

Throughout this paper, we have examined our research questions, exploring the possibilities and impossibilities of feminist infrastructures; negotiations we have made in maintaining feminist technological autonomy require; and the gains we experience in creating these autonomous infrastructures. We have also situated autonomous feminist infrastructures within the technological terrain. From the retelling or revealing troubled histories that have excluded women from computing, to expanding on the context of our wider research project, to applying feminist theory to understanding infrastructures and autonomy, to expanding on our own collective experiments, we have examined modes of the negotiations and gains of feminist infrastructure-making within (im)possible constraints. Our experiment

demonstrates a move towards (im)possible autonomy and reflects aims to resist the dominant socio-technical, intervening on the aforementioned historical bias. As we have noted, our work exists within a space — a dwelling — of theorists and practitioners that have shaped our feminist praxis.

We have demonstrated that building autonomous feminist infrastructures, such as autonomous feminist servers, is a way to foster agency from technological gatekeepers. It is a means to redistribute power and build shared sustainable heritage. Critically, it is also a way to queer and reorient technology, recognising the ongoing need for more equitable technological environments. Such equitable environments ensure that women, including trans-women and fem-identified individuals, have agency in current and future techno-societal contributions and possibilities. Subsequently, to maintain and care for autonomous feminist infrastructures/servers within corporate communication technology and academic institutions is to negotiate inhabitings and dwellings through displacements and intimate exposures, intentional or forced. It is to accept the precarious reality that technology is not fixed — institutions often push for a form of technological standardisation and homogenisation and the servers that hold our collective memories might have to inhabit the uninhabitable. That noted, the very presence of autonomous feminist infrastructures in institutions means that we might disorient these systems. This follows the feminist STS understanding that digital and computational technology can both subscribe to or disrupt normative paths. Orienting our servers towards autonomy ultimately connects back to our feminist affective practices that allows for the restoration of intimacy and collective joy. In the two-way transformations of our infrastructures and our socio-technical environment, care gets reoriented as an affective force and highlights the (im)possibility of autonomy.

Feminist autonomous infrastructures — although hopeful — are never an endpoint but an ongoing process of collective care from which recognition, shared ethos for change, for justice are always shifting and transforming. As such, our project of building autonomous feminist infrastructures is ongoing. For instance, our Raspberry Pi configuration has been repurposed as a media server in exhibitions and workshops developed by our research community — the server itself has become an artefact which prompts discussion and dialogue about its context of development and the politics it represents. Our feminist design is situated to our context; however, we do encourage further research on the negotiations and gains of autonomous feminist infrastructure that contribute to the broader ecosystem of feminist servers. As we move towards the future, these research projects will contribute to the alternative possibilities of technological development. They will question whose experiences and legacy becomes prioritised in design, offering plural opportunities of restoring intimacy with technology and collective joy.

Notes

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[3] Syster Server is run by feminists using Free and Open-Source Software. They run workshops that act as spaces where people might learn sysadmin skills. They currently maintain a feminist video platform server using PeerTube. See <https://syserverserver.net> for more

[4] <https://www.raspberrypi.com/tutorials/cluster-raspberry-pi-tutorial/>

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