The Computer as a Queer Object

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Abstract

There have been many different definitions of queerness: *indeterminacy, the other, the becoming yet not quite reaching a conclusion.* In some senses, queerness is an animated, yet static and suspended state of metamorphosis in which an unimagined creature never crawls out to be fixed. What would happen if we take this animation and image toward computers? What feats could we accomplish? Computers have been studied in its breadth of militaristic, hierarchical, and binary logics; elements which repel the indeterminate. Nevertheless, in the finer details of computer science exists these queer artefacts; within its communities, its proliferation of software and its ideologies. We examine recent scholarship that has undertaken what it means to *queer* computer science. From the performativity of Linux, to the algorithms of Facebook's advertisements, to the logics of MySQL we might see and understand computers are might a bit queerer than we conceive.

Keywords: queer, science and technology studies, queer theory, computing, feminism, human computer interaction.

1. Introduction

The boundary of what pertains to computing and computer science is much contested and continues to evolve (Tedre and Sutinen 2008). Whether or not computing is placed as a descendent of mathematics, science, or engineering, it is clear that the developments in computing has reached an intersection of many wide and various fields of study, notwithstanding or exclusive to STEM. Computing participates and influences fields such as crip studies, feminist studies, critical race theory (CRT), new media, design, fine arts, anthropology, behavioural psychology, sociology, linguistics, literature studies, and so on and so forth (Ames et al. 2011; Bidwell and Winschiers-Theophilus 2015; Fisher et al. 2015; Nakamura and Chow-White 2013; Pow 2018; King 2015). In our essay we will examine areas where computing intersects with queer studies, either through direct correlation or through a lens of one of the fields listed above.

Through the work and tradition established by Donna Haraway and Judy Wajcman, we will view computing as technoscience — a term used to emphasize that technology and science are now inextricable, throwing away the argument of whether computing is applied mathematics, or theory-driven invention (Tedre and Sutinen 2008). We see in the histories of the computer, like WW2-era in Bletchley Park, where women were named as Computers for doing high-level computations (Hicks 2017), that there has never been a delineation between machine and human since the beginning. This is further asserted by Turing's formative paper, *Computing Machinery and Intelligence* (Turing 2009), which develops a test for a machine's intelligence based on the imitation game. The imitation game is a guessing game where one must guess the gender of a concealed person based on how they answer questions (Turing 2009; Fancher 2018). Furthermore, Fancher argues that Turing's technical writing of the machine feminizes intelligence and that by comparing what a machine cannot do, like "*falling in love* and eating strawberries and cream, Turing places bodily experiences central to machine intelligence" (emphasis ours) (Fancher 2018, 98). From these few examples of the history of computing, we start to understand that computing, like other traditional sciences, has always been more than passive object, or as Haraway puts it:

> Feminists, and others who have been most active as critics of the sciences and their claims or associated ideologies, have shied away from doctrines of scientific objectivity in part because of the suspicion that an "object" knowledge is a passive and inert thing....Situated knowledges require that the object of knowledge be pictured as an actor and agent, not a screen or a ground or a resource, never finally as slave to the master that closes off the dialectic in his unique agency and authorship of 'objective' knowledge. (Haraway 1988, 591-592)

We will use the framework of science and technology studies (STS) and its contributors to move forward with our analysis. One example is through critical literature scholar Tara MacPherson (2013), who takes an axiomatic set of principles within the computing and programming community called *The UNIX Philosophy* and analyzes it through its culture milieu of which it was written (McPherson 2013). By using works like MacPherson's, this paper is will give a brief analytical summary of queer STS by pulling relevant texts to reveal connections between contemporary works of queer reading of STS.

Many scholars that were included in this literature review focus on one of the various, yet pertinent aspects of queer theory and how it applies to their subject matter. Indeed, since

the writing of *The Second Sex The Second Sex* (Beauvoir 1952), and *Gender Trouble* (Butler 2011)—formative texts to queer theory—STEM fields have been able to apply queer theory as a tool to uncover, recover, complicate, or in other words, *queer* the subject (Haber 2016; Molldrem and Thakor 2017; Barad 2011).

In this paper, we will examine attempts to reach a queer epistemology towards computing, how technology is gendered, queer technology, how organizations such as open-source can be gendered, and finally how these can be employed as strategies within the intersection of design, behavioural psychology and computers (also known as human-centered interaction, or HCI) (Carroll 1997). This paper will look at the binaries that computers have offered us for decades from a queer perspective: by thinking about the boundaries that exist we can also examine the effects that the world and society and its citizens have inadvertently inherited.

2. Background Information

2.1. Queer Theory

While its definition remains in constant flux, varying from author to author, in general, queer theory is often used as a critical lens for scholars to scrutinize common subjects to reveal a structural power. So, how did queerness arrive to where it is today? In Anna Marie Jagose's text, *Queer theory: An introduction*, she finds that since queerness was first conceptualized as an answer to the term *homosexual*, at its core queer theory will always be rooted in the context of sexuality (Jagose 1996). However, due in part to the long and ongoing history of homosexuality's marginalization as a target of systemic and other violences, queer theory emerged in academia as a means to examine history, art, literature, and culture from within the view of the constantly fluctuating margins. Outside the center, a queer perspective allows for thinking beyond the hegemony—but the caveat of queer theory is that it never remains fixed. Queer theory is meant to de-normalize what is often normal—to discover, or reveal, what was hidden but obfuscated. The *what* may vary from subject to subject, from ethos to ethos.

One can begin to think of queerness as indeterminacy or as José Esteban Muñoz' first articulates as a horizon of possibility (Muñoz 2009). Queerness is constantly changing and self-reflexively critiquing itself to endure new realities; it is a lens to analyze the ways identity shapes reality and how the reality it is situated in shapes identity; it problematizes the subject. In our contemporary definitions, queerness strives to de-normalize objects, artefacts, relationships, and anything in the world that is constituted under hegemonic terms, governance, and politics insomuch that "Judith Butler (1994:21) likewise cautions that 'normalizing the queer would be, after all, its sad finish'" (Jagose 1996).

2.2. What is Human-Computer Interaction?

Human-computer interaction (HCI) researches "how people can best interact with computers, and then to design and build technologies and tools that facilitate that interaction" (Wulff and Mahling 1990). As opposed to a designer assuming what a user wants, HCI insists a designer use on theory-driven design and/or designing iteratively alongside the user which will produce a more useful and inclusive technology.

Since HCI is a field that relies on collaborators from varying fields, it continues to shift, self-critique, and evolve as more voices are folded into HCI research. More recently, LGBTQIA+ issues have become a part of the conversation.

3. Situated Selves

Haraway writes against a commonly deployed tactic in knowledge production called "The God Trick" (Haraway 1988), which assumes all bodies of knowledge. In recognition of this observation and critique, we and many scholars include a situated self section in order to inform our reader about our positionality, our intention with the research, and what might influence more sustained focus to areas in the subject matter. So in that tradition, we say hello world!

3.1. Elizabeth (Second Author)

I (Elizabeth) am from a rural part of Canada where there was no queer community. Where I always felt different for being queer. The internet was my lifeblood as a teenager. I "grew up" part of an online community that, luckily for me, had a large contingent of openly-queer members for me to befriend and look up to as role models. The internet gave me a space to experiment with my identity and to realize I could be accepted by others.

When I went to university I found acceptance and comfort within the queer sub-community of the mathematical/computational sciences. It seemed like everybody I knew in math and CS was queer. Why though? I still don't know, but three universities later I still haven't shaken the notion that computing draws a more-queer-than-average group of people. When Jess (First Author) came to me with their interest in queer theory and computing, not only was I receptive, I was curious — is there something more queer about computing that's been drawing us all in?

3.2. Jess (First Author)

Identity is malleable, and yet, we treat it as fixed. What artefacts in the world have come to contribute to our way of thinking like this? I (Jess) grew up playing video games that allowed me to choose whatever gender I wanted. There is always an implication you ought to be the corporeal, fleshy version of you, but I always chose what drew to me; you can change your clothes. In online games, people always addressed me as a man. They would not know the difference, and as a young person, I was always afraid of being caught (for fear of lying, for fear of being exposed). I draw on this experience because my passion towards games drew me towards computer science. But when I began attending classes and getting to know my peers, the reality and consequence of not being able to hide or change my gender became very clear to me. The working field was very much different from what I imagined.

Ultimately, I ended up here, in the Social Studies of Computing Lab working with my supervisor (Elizabeth) to begin investigating what "queerness" meant in the context of computer science. Neither of us knew what would be found/discovered (personally or scholastically). What began as a scholarship ends as an intra/introspective reflection of what flows through me, of what discursively changes, what is always provisional.

I have heard enough technology aficionados write off magic by saying, "any sufficiently advanced technology is indistinguishable from magic". But I have heard enough trans people in my life also say and believe gender is magic. It is magic in the way we compel the way people look at us, to see us as feminine or masculine or neither. The ways we change and transmorph. We literally change our bodies; our mannerisms; our way of speech; we transform. We direct the gaze. And we change the way you look at us: spiritually, mentally, physically. If that's not casting spells and magic, then what is?

I thought that coalescing my identity through scholarship would make me understand myself better. Discursively living and looking at one's life. But if anything, queer studies taught me a lot more about how to be comfortable with indeterminacy. The main tenet of what queerness means. The what and which exists outside of our traditional ways of explanation. A different way of knowing by not knowing.

4. Technology Performs Gender

> [Feminists] characterized the conceptual dichotomizing central to scientific thought and to Western philosophy in general, as distinctly masculine. Culture vs. nature, mind vs. body, reason vs. emotion, objectivity vs. subjectivity, the public realm vs. the private realm—in each dichotomy the former must dominate the latter and the latter in each case seems to be systematically associated with the feminine.
> — *Feminism confronts technology* (Wajcman 1991, 5)

Judy Wacjman's paper *Feminist Theories of Technology* builds on her existent STS work and proposes a technofeminist theory which "conceives of technology as both a source and consequence of gender relations" (Wajcman 2010, 149). By examining previous works which corroborate STS with feminist studies, Wacjman demonstrates how we have come to gender and then diminish categorically "feminine" technology.

In society's imagination, technology is often "thought of in terms of industrial machinery and military weapons, the tools of work and war" (Wajcman 2010, 144). In this profile of technology, utility and context embodies, extends, and depends upon hegemonically Western masculinity (Wajcman 2010, 145). Feminists scholars have demonstrated how masculinity is privileged over femininity (Harding 1986; Wajcman 2010), therefore it stands to reason domesticated tools—tools which demonstrate feminine qualities such as emotion, softness, or naturality, such as dishwashers, birth control, cooking and childcare tools—fail to be recognized as *technology* (Wajcman 2010, 145).

Wacjman traces the effects of technology's segregation. By focusing on interpretations of men whom are technologically inclined, and women who are technically incompetent, her findings suggest that "[e]ntering technical domains therefore requires women to sacrifice major aspects of their feminine identity" (Wajcman 2010, 145). Science and technology are a patriarchal knowledge (Wajcman 1991, 5) and by recognizing the larger systemic power at work, Wacjman confronts second-wave feminism which demands equity within science (Wajcman 2010, 146). She changes the conversation from "how can we get more women involved in science" to "how a science apparently so deeply involved in distinctively masculine projects can possibly be used for emancipatory ends" (Wajcman 2010, 146).

Following the examination of how technology production has become gendered, Wacjman's research asserts "gender is embedded into technology" (Wajcman 2010, 149). In order to interrogate how technology perpetuates and behaves as an oppressive force, work must be redirected into locating where the gendering happens:

> After all, if 'technology is society made durable' (Latour, 1991, p. 103), then gender power relations will influence the process of technological change, which in turn configures gender relations. (Wajcman 2010, 149)

The gendering of technologies is created in the design process and is "shaped or reconfigured at the multiple points of consumption and use" (Wajcman 2010, 149). There is no singular point of gender construction. It is as malleable and fluid as a conversation. Wacjman invokes Judith Butler's theory of performativity (Butler 2011) on how gender is made through similar moving relations: "both technology and gender are products of a moving relational process, emerging from collective and individual acts of interpretation" (Wajcman 2010, 150). Although the location of gender construction in technological tools is neither fixed nor singular, Wacjman's takeaway is women must have a substantial role during the black box design process, because if the designers of technology remain to be mostly cishet white men, design and innovation will continue to exclude specific and marginalized users (Wajcman 2010, 150).

4.1. Computer Text Analysis

Outside of direct analysis of organization and development of computers, there is a wealth of scholarship which examines text within computer science practices. For example, computer operating systems have used a language where a process which controls subprocesses is named "master" and its subprocess, "slave". After years of critique, large corporations and maintainers of large coding communities have begun to shift this language (Landau 2020). Similarly, Tara MacPherson examines how the rules of The UNIX Philosophy reflect the logics of power relations in society.

MacPherson focuses on two principles of The UNIX Philosophy: modularity and separation of concerns (McPherson 2013, 26). She argues that these principles reflect the same ideologies that helped aid in the separation of black civil right's activists and union labour rights, causing the dissolution of class solidarity (McPherson 2013, 29-30). She emphasizes that we cannot solely locate the blame to the machine, but by analyzing its components which carry ideology and meaning, we can garner a clearer vision of how the world works.

UNIX is still used as a base-model for most computing systems, coined as UNIX-like, and within software communities these principles remain to be devoutly followed. The case can be made that The UNIX Philosophy has become embedded into most coding frameworks and therefore software systems. Simply put, the reach of UNIX is tremendous.

4.2. Computers as Colonial Knowledge

As more critical thought turns towards computers and their promise of convenience and emancipation, either from domestic labour, discrimination or subjectivity—we see that promise is empty. Ruha Benjamin writes in her book *Race After Technology: Abolitionist Tools For The New Jim Code* Benjamin (2019), "[c]omputer systems are a part of the larger matrix of

systemic racism" (Benjamin 2019, 62), citing a glitch exposed on Google Maps where Malcolm X Boulevard is read aloud as Malcolm *Ten* Boulevard (Benjamin 2019, 61). Though this incident does not result in direct violence, it invokes larger systemic logics which dismiss the important historical contributions of Malcolm X and the black civil rights movement. This is what Benjamin declares as "default discrimination", where systems "reflect and reproduce racialized commands that instruct people where they belong in the larger social order" (Benjamin 2019, 62).

The exclusion and the reinforcement of status quo for women, trans, non-binary, intersex, black indigenous and people of colour, disabled people are being revealed by one "revolutionary" tool after another (Benjamin 2019; Hamraie and Fritsch 2019; Bivens 2017; Nathan et al. 2017; Prates et al. 2019). Rena Bivens exposes how Facebook and other social media sites may just provide non-binary options for your profile's gender field, however, your interactive data becomes reified back into the binary male or female when it gets sold to advertisement companies (Bivens and Haimson 2016). In 2020, an application was launched to provide a social network for only women, using AI to screen the user's gender; but was unable to recognize transwomen for their tool (Schiffer 2020). Facial recognition is notorious for declaring black people as apes and failing to distinguish between two distinct asian people (Prates et al. 2019). It is clear that in spite of the attempts to use technology to emancipate minority groups, the inherent structure and design process continues to enact systemic violence.

5. HCI Limitations

HCI theory is an essential part of inclusive design, but critics have pointed out how research methodologies reinforce stereotypes or perpetuate delimiting beliefs to its participants (Lazar et al. 2017; Ymous et al. 2020; Bennett and Rosner 2019). There is little meaning to HCI's promise of "transform[ing] the world from its current state to a preferred state" (Zimmerman et al. 2007) when the preferred state remains systemically oppressive, rather than changing the system, which privileges hegemonic bodies (Wendell 1996). Doing "good" through technological interventions tends to be dangerous for those who already suffer from systemic injustice, since technology and algorithms reproduce and reinforce these discriminations (Bhattarai 2017; Green 2019). When research fails to involve voices from their targeted user groups or it lacks self-criticism, it will approach problem spaces with a deficit-model which only amplifies the participant's sense of unbelonging (Ymous et al. 2020).

Sam Breslin (2018) takes a different approach through her research which looks at computer science students in Singapore. In her research, she notices in CS education, students are bestowed with a self-efficacy to solve real-world problems through code (Breslin 2018). This is what she names *rendering technical*, "the work of translating reality into code, algorithms and other computational knowledges and practices" (Halmaghi 2019). In further analysis of Breslin's work, Halmaghi gleans that "as computational and computable worlds are separated from the historical, social, cultural and political contexts that make them possible, technical renderings become natural" (Halmaghi 2019), drawing from his own personal foray into a tech industry which generates innumerable solutions for complex social problems. Breslin invokes what Barad calls *intra-cuts* in her own critique of physic's limited experimental spaces— wherein division of the problem space is not clear and sometimes arises at the very moment in which the phenomena occurs, including social forces, historical forces, and future forces, ones that within a problem space/experimental space, are never accounted for (Barad 2007).

Take, for example: a signup form. Most websites which contain personal profiles offer a gender selection field. These fields often only provide male or female as a choice, which enforces the idea that only two genders can exist. Any attempts by large websites to provide more options, such as Facebook which provides 58 options, have been demonstrated by Bivens to reify a perceived gender back into the binary for advertisement companies (Bivens and Haimson 2016). Therefore, it becomes a matter of why a website is asking for your gender—do they really need to know? Or do they merely want to sell your data (the answer is yes)? We see that while Facebook is solving one problem, providing a complex spectrum of gender options, it is doing a hidden violence by selling data through its reification of gender.

5.1. Intersex Invisibility

An important question to ask in surveying queer analyses of computing is: which queer identities are being considered? Gay and lesbian standpoints have long dominated queer spaces and theories, to the point that trans scholars have started referring to "trans theory/studies" as separate from queer theory/studies.

In doing our survey, we happily found that trans* standpoints are now included in how computing and computers are analysed—for example many scholars have looked at the inclusivity of technology for trans* users, whereas Haimson (2018) examines how social media provides a site of liminality which facilitates gender construction (Haimson 2018; Spiel et al. 2019; Jaroszewski et al. 2018; Ahmed 2018; Beirl et al. 2017; Haimson et al. 2020). But as we wrote this paper and examined this literature, it became apparent to me (second author) that intersex issues and standpoints have been notably absent in the analyses of queerness and computing.

Let's now go back to the example of AI facial recognition. For example, in Keyes' analysis of automated gender recognition software, intersex is only briefly noted in the introduction—and then entirely absent from the rest of the paper (Keyes 2018). Yet automated gender recognition software has just as many repercussions for intersex people as it does trans* people.

But more common in the queer HCI and STS literatures is to not even acknowledge the existence of intersex people. For example, in "Hacking the Cis-Tem", Hicks provides a valuable queer lens on the history of computerizing government records in Britain. Hicks documents how trans individuals hacked the system in various ways (technologically, socially) to change their officially-recorded sex. Hicks positions these records as an early case of algorithmic bias, and discusses computerized government in this light (Hicks 2019).

But notably absent from this history is the consideration of intersex individuals. Like trans people, intersex people have a vested interest in being able to change their official sex and medical records (Costello 2016). And this was a point in British history when intersex variations were first being systemically medicalized and officially recorded (Griffiths 2018).

In all this discussion of a "queer" object being one that is ambiguous between categories, grounding has always been in trans/nonbinary-ness as the ambiguity between sexes/genders — not considering other ambiguities such as intersex variations. Intersex scholars have long been arguing queerness is even more complex and nuanced than conventional queer theory has posited (e.g. (Malatino 2010; Holmes 2016; Hird 2000)).

6. Queering HCI

Over and over again, we are given evidence of the explicit and non-explicit discursive power technology is afforded. To cite from my (Jess) own experience, at a software development conference I attended years ago, a former YouTube employee shared with me an anecdote about something that happened while they were working at that site. They told me incidents their early days at YouTube their team pushed a feature that, as a side-effect, changed videos that were set to private to public. This was detrimental to people in the LGBTQIA+ community who were not out to their communities and had been using their YouTube channels as private diaries to talk about their sexuality. This resulted in YouTube notifying their followers and friends and accidentally "outting" these people.

This is just one of, I'm sure, dozens of incidents that never made it to the press because of a developer's power to propagate changes without a user's consent. Because of this power dynamic, the designer-user relationship becomes even more destabilizing and precarious, and this personal anecdote is just one example of how when you fail to recognize the needs of your users, one seemingly innocuous decision can have destructive effects.

Queer rhetorics are "identification to disrupt and reroute the flows of power, particularly discursive power" (Fancher 2018). Scholarship which reveals the "coded discriminations" (Benjamin 2019; Phan 2019) is only the first step in disrupting the power. Benjamin points at that the failure of inclusion, such as a camera's exposure failing to capture black skin tones, can be exploited to evade/allude surveillance tools used for over-policing surveillance (Benjamin 2019, 75). HCI ought to be enacted in order to consider the complicated social forces that endanger/misrepresent vulnerable groups of people, but since most technology users face is centralized by impermeable corporations, there must be alternative ways to conduct analysis to reveal how technology can be exploited and used against itself in order to disrupt flows of power.

6.1. Heterodoxy as HCI

Ann Light highlights the detriments of Facebook in it is natural design that inadvertently harms people in the LGBTQIA+ community. However, she encapsulates these design flaws that queer users have leveraged in order to strategically avoid and/or minimize the harm done by Facebook. The 4 tactics she extrapolated from her research are: *forgetting, obscuring, cheating,* and *eluding.*

Forgetting

Social networks have impermeable memory. Even if something gets erased or taken down on the web, it is likely that the internet archive has preserved the content. In the age of data collection and monetization, the act of forgetting is an incredibly necessary act of resistance in the face of raw data trade. Algorithms persist and aggregate your data to reify behavioural patterns through advertisements, or even for their community. For queer users, this includes identity when exploring different forms of gender expressions. The paper proposes that "without erosion, the data portraits are likely to be qualitatively different from representations of the past in that they would not be easily superseded but only built on incrementally" and "forgetting resists the opportunity for systems to infer increasingly accurate behavioural patterns and hold us to them"(Light 2011, 434).

Obscuring

Technology today is designed with a proclivity towards revealing information. In a sense, they leak your information out towards the public. Whether its Spotify broadcasting what you're listening to, or Facebook sharing your page likes and which events you plan to attend, these social applications reveal user data by default. It is possible to opt-out, but Light suggests that design should be opt-in by default, not opt-out. There are instances where you can view a user's friends, following lists, and by the nature of it, out the user.

Cheating

Design should allow for cheating within the system: "cheating is a means of overthrowing the constraints of 'normal' play for the player while functioning as an initiation into the constraints of the both the game world and the system that runs it"(Light 2011). To be able to cheat allows subversion and most importantly, reveals the rules of "the world" that you are in.

Eluding

Eluding refers to the ways we can step outside of the ontology built by technological systems. One example is the word "woman" and how it exists in relation to "mother to", "wife of", "sister to", and other family oriented roles. We understand then the word "woman" to denote a familial system. Instead of having more actionable words such as "owns" or "runs" which would reveal a more agentic profile. (Light 2011, 435) "The risk is 'congealing knowledge into a cold and quickly obsolete imitation of living scholarship[']"(Light 2011, 436).

The heterodoxical rules supplied here have been enacted intentionally or unintentionally by artists and designers in order to "subvert the system". Zach Blas' Fag Face Mask is a project that aims to create a collective mask that unionizes and hides the identities of members within protest groups. As opposed to the all-black balaclava, it is an abstraction of a face, which is unrecognizable to machines but is seen by humans. This project came out of Blas noticing the face as the new landscape for governmentality: the US and Canada have enforced legislation so that the face is always visible to be scanned and stored.

The Fag Face mask was also born from the studies that have been published which "prove" a person (and therefore an AI) can distinguish gay faces from heterosexual faces (by showing many faces in close succession), which people have begun to facetiously call "fag face". This validation is not unlike the phrenology done in the nineteenth century, which examined and quantified skulls to prove that black men were inferior or more likely to become criminals (Gould 1996) by their shape and volume. Despite many surveillance scholars that cite post-9/11 to be the emergence of the surveillance state, and in resistance, the impetus of anonymity, Blas prefers to think of anonymity as opacity, returning back to a nineteenth century poet and philosopher, Eduard Glissant, who writes that opacity is the "foundational quality of the world" (Blas and Gaboury 2016, 161).

> Anonymity (or opacity) is something that does not exist at the level of the state; it is a foundation for human existence; it is an anti-identity politics. It's an embrace of what is always transforming, what is always unknown within us. (Blas and Gaboury 2016, 162)

In conversation with Jacob Gaboury (2016), Blas attempts to articulate the notion of a *queer technics* which blurs the identity categories that are so native to binary logics of technical systems (Blas and Gaboury 2016, 155).

7. Queer Technics

Following our exploration of Wacjman's assertion that technology is gendered and begets gender, we will look at Catharina Landström's work, which folds queer theory into existent STS feminist theory. Landström's analysis finds previous scholarship assumes that "gender is stable and technology is malleable" (Landström 2007). In her paper *Queering Feminist Technology Studies*, she looks at STS Deleuzian assemblages and Butler's performativity *in relation* to technology. This differs from Wacjman who assumes a fixed gender binary and finds technology to be either feminine or masculine. When we layer Landström's analysis onto that of Wacjman's feminist technoscience, we can further complicate the process of technological design and what attributes they carry in their manifestation.

This marks a new era in STS, and has been met with scholarship that reveals exactly how technology could be queered or is already queer (Molldrem and Thakor 2017). To position this paper in the lineage of technology studies that have focused on seeing software through gender studies, we use Gaboury's paper *Becoming NULL: Queer Relations in The Excluded Middle*, which goes on materialize queer theory and critical race theory (CRT) in order to unsee computers as fixed and binary.

7.1. (Non)-binary logics

When we discuss computer systems, we are faced with the questions: are computers inherently queer? Can we make them queer? If so, how do we make computers queer? At the heart of software lies a binary logic, therefore can software even be queer? To answer this line of questioning, Gaboury looks specifically at the popular database MySQL. We must note both Benjamin and Breslin's critical analysis of databases (Benjamin 2019; Breslin 2018) to help further contextualize Gaboury's work.

In layman terms, a database is an advanced spreadsheet which has strict rules about how each column and table are related to one another. Often before beginning a project, the database is drafted in order to figure out in advance which tools and features will need to be built. A database scaffolds a software application. Benjamin talks about how we model the world in databases (Benjamin 2019). In Breslin's dissertation, she remarks how one of the first problems computer science students are faced with is making three database tables: one which is male, one which is female, and one which is a relationship table. The purpose of the relationship table is to hold the relationship between the male and female tables. The type of relationship held in the table is called "marriage" and it can either be true or false (Breslin 2018). Breslin points out how this reinforces heteronormative ideologies about the world.

However, in Gaboury's paper he examines the way computers are commonly seen as machines that run on binary logic. He focuses on a third value available to MySQL databases: a *NULL* space. NULL in the language of computer science is somewhat synonymous with empty or undefined. Gaboury makes a case that the unspecificity and the undetermined-ness of NULL makes space in computing for programs and technical logic to be queer.

> To this end I begin by asking: what would a queer technics look like – one that is explicitly situated within the logic of information systems but refuses this gesture of capture and extraction? In answering this question, I negotiation of identity through a politics of refusal, one that explicitly connects contemporary information systems with an expansive literature in queer and critical race theory reaching back over three decades. (Gaboury 2018, 2)

The NULL space alludes binary logic by presenting another option. This option represents a refusal. Within refusal is a resistance that has been explicated both by queer theorists and critical black theorists. To refuse is to reject notions of sufficiency (Gaboury 2018, 2). It alludes power structures that have historically and presently harm(ed) racialized and queer bodies.

He looks at NULL spaces through black critical theory, as well as queer theory, attempting to coalesce the space between both theories (enacting intersectionality) to argue for resistance against sufficiency (an alluding of power structures that harm racialized and queer bodies) that is an invokable quality in MySQL.

Systems in this case do not remain solely within the computational system, but also within societal levels (with Deleuzian's notion of soft control as being enforced through the powers of access and legibility to technical systems (Gaboury 2018, 145)), identity systems, and our engagement with them.

Gaboury applies queer theory successfully to the existent logic of a prevalent software logic. He ostensibly *"queers"* MySQL by re-reading it through the lens of queer logic and black critical theory to reveal the systems involved. While Gaboury does not make the claim that MySQL is inherently queer, he nevertheless extends these theories to make the claim that the NULL space is a technical system which leaves room for indeterminacy and can be exploited toward alluding control within technologies of identification. The queer quality is its ability to avert having identity visible, fixed, and named. In the next section, we revisit Wacjman's pressing question, "how a science apparently so deeply involved in distinctively masculine projects can possibly be used for emancipatory ends" (Wajcman 2010, 146) by examining how open-source communities fix masculinity as an ideal trait through masculinity contest cultures (MCCs).

8. Masculinity Contest Cultures

Masculinity contest culture (MCC) is a way to sociologically describe cultures which prioritize masculinity and masculine traits as a way of being. Berdahl explores this phenomenon in her paper *Work as a Masculinity Contest* (Berdahl et al. 2018) in the context of working environments to identify what hierarchical norms become established in the workplace and understand what we are faced with when talking about power relations and inequality across the gender axis.

MCCs can be identified by the traits that are expressed in environments, which are contoured and sharpened by normative ideas of what "masculinity" ought to look like, also known as hegemonic masculinity. Berdahl notes that masculinity varies across cultures and regions, and focuses on discussing western ideas of what masculinity is: strong, independent, and dominant (dominance is obtained through social, cultural, and physical capital).

> This conflation of top performance with masculine gender performance means
> that masculinity and workplace success are often treated as synonymous. Success
> comes to focus not on meeting performance goals, but on proving you are more
> of man than the next guy. Thus, being a top performer is tantamount to being a
> man—or for the winners, "the man." (Berdahl et al. 2018)

These traits can spread in any organization due to hierarchical structures, top-down leadership, and the by-stander effect. Not only do men have to participate, but so do women. Berdahl also finds that MCCs disproportionately affect men of colour, which is to say the masculinity contest at play is a White masculinity contest. Overall, in order to rise to the higher ranks of an organization that is seeped in MCC, it immensely helps to distance yourself from "feminine" traits and from people of colour and to act more White.

Through this framework, we can identify Linus Torvalds as a leader in perpetuating masculinity as something to be gained by debugging complex sections or by spending many unpaid, late hours on the Linux project. Adrian Mackenzie identifies Linux as a performative object that makes pliable forces such as capitalism and commodification, while clinging onto other stratas of power, such as gender (Mackenzie 2005).

One of the first calls for contributors from Torvalds wrote, *"Do you pine for the nice days of minix-1.1, when men were men and wrote their own device drivers?"* (Mackenzie 2005). Mackenzie speculates that this is tied to the larger, "gendered corporeal set of practices in programming work" (Mackenzie 2005). We can re-see this work through the lens of the MCC framework, which is not absent from open-source communities. In this section, we will apply a more critical framework that allows us to examine how organizations can be gendered, within the context the open-source community, using Dawn Nafus' paper, *Patches don't have gender* (Nafus 2012), where she identifies their traits in the broader Free or Libre Open Source Software (F/LOSS) communities.

8.1. MCCs in Open Source Communities

In *'Patches don't have gender': What is not open in open source software* (Nafus 2012), a case study of open source communities is presented in order to understand why gender disparity persists in these communities. In 2011, Nafus found that a mere 1.5 percent of free/libre/open source software (F/LOSS) participants were women (Nafus 2012, 670).

Some of the reasons discussed in Nafus' research include instances of hostile work environments. For example, rape jokes were made in the community's IRC channel and when a woman spoke up about this issue, she was told to "get over it" (Nafus 2012). As opposed to helping newcomers, questions were responded to with the abbreviation "RTFM", meaning "read the fucking manual". Nafus explained that "softer" work such as writing documentation, rather than writing code was often deferred to women. She also notes that mentorship for women was often seen as a dating opportunity or women were used for emotional labour.

The community ignores or refuses to admit there's a problem. Nafus determines this as gender blindness, resulting from the moral liberal ideology of the F/LOSS heritage, which sees minimizing gender differences as the path to achieving gender equality. Since liberal morality is based around hacker morality, the intellectual tradition advocates for the power of the self, meritocracy, self-cultivation of knowledge but creates a double-bind by denying individuals the social responsibilities that tie them to others, asserting one is to blame for their

own marginality. For example, when confronted by the researchers of the paper, a community leader admitted that their project had a gender problem, but when given prescriptions that might help or aid the problem, rejected their suggestions. In F/LOSS, the persisting ideology is that technology is a neutral item, something that has transcended capitalism or reliance on others, insomuch patches are believed to be more real than gender. By this logic, if woman were to be deliberately included, the deferral of agency to technology would be broken. The researchers argue here, there is a "social loop" which exists in the creation of knowledge/code through the cultural frames of its developers and subsequently community, and admitting that would threaten the idea of "open" in open source.

9. Queer Epistemologies Toward Computing

Within the critical analyses of computing, a way of studying this has been dedicated to conceptualizations of "the digital," "software," "computation," "manufacturing," "information," and "code," (Keeling 2014, 152). Less scholarly attention has been paid to coalescing these views and artefacts through the lens of queer embodiments, materializations, and settler-colonialism critiques. Kara Keeling addresses this problem in her piece, *Queer OS* (Keeling 2014), by conceptualizing an epistemology for studying how new media and technology can be studied through queer theory and sexuality. QueerOS can be taken as a framework which accounts for:

> [H]istorical, sociocultural, conceptual phenomena that currently shape our realities in deep and profound ways, such as race, gender, class, citizenship, and ability [...] to be mutually constitutive with sexuality and with media and information technologies, thereby making it impossible to think any of them in isolation. (Keeling 2014, 153)

Keeling's conceptualization has been used and iterated upon by Ben Haber who redescribes QueerOS through what he coins as "queer circuits" (Haber and Sander 2018), used to highlight "queerness as an underutilized epistemology for encountering computation" (Haber 2016). Queer circuits employs Deleuze's assemblages (Deleuze and Guattari 1988) via non-sentient, inhuman connections and nodes in order to complicate the social in which we are constantly orienting ourselves. One example of how Haber applies queer circuits to our understanding of technology is through Wendy Hui Kyong Chun's description of the *leaky* nature of "friendships" formulated within social media networks. It is a connection that blurs boundaries between profit, public and private, work and leisure, trust and security (Chun 2015, 103-127).

In its most reduced explanation, QueerOS and its adjacent epistemology, queer circuits, offers us a way to examine the cultural productions of software from a diffracted lens. In the same vein Haber's queer circuits is QueerOS by forking and mutating from QueerOS the lens as offered. Haber collects articles by scholars who *queer* software, hardware, and the interface of computers, by looking at these technologies' relationships to whiteness, class, sexualities, capitalism, race, gender. In other words, we reframe how to consider technology and computation through the diffracting, crawling, and contracting intersectionalities and meetings of these invisible social forces, as well as the inhuman artefacts that behave as vectors and conduits. By the very same rubric, this paper is QueerOS.

10. Discussion

Over the past three decades, feminist writing has worked in STS to name how gender and technology are mutually shaped (Wajcman 2010, 148), and more recently, queer theory has entered the STS domain space (Molldrem and Thakor 2017; Haber 2016; Landström 2007). In this paper, we saw how technology can be gendered by design, how users can gender objects through their production and use, how organizations can be gendered, and how software can be queer. Since power relations are predominant in gender relations, it becomes important to examine how they become amplified and embedded into technology. But not only is gender embedded into technology, conceptualizations of hierarchies, commercialization, racism, are also shaped through and with technology. How do we fold in multiple perspectives? How do we respect and take into account the multiple intersections that arise through the construction of our social fabric?

The queer epistemology of QueerOS emphasizes the need to fold in historical, sociocultural, and conceptual forces to be mutually constitutive with sexuality, media, and information. While many papers here discern conceptions of queerness as defined in the background (the indeterminate, the unstable), *desire* goes unaccounted for often in our discussion of queerness in computing, despite the fact that desire in the core of queer theory. There have been moves to fold this into our discussion. In 'Queering code/space: the co-production of socio-sexual codes and digital technologies', authors discuss how code has infiltrated our domestic spaces through SMART devices and how we have personalized them. Scholars have also taken QueerOS as a concept, and materialized it as a pseudo-operative user's manual. The QueerOS manual describes tenets of queer theory, HCI, sexuality, and desire into the designing an imaginary operating system that alludes and resists power structures (Barnett et al. 2016).

One thing that is certainly missing within this framework is the emphasis on bodies and code. In particular, trans studies and disability studies. While queer theory destabilizes the gender binary, the discussion of transness is often placed on as an amendment or stops once the rejection of gender essentialism is reached. In queer STS, algorithms from social media have been proven to reify a person's gender based on their online activity (Bivens 2017). This information reveals the violence done to trans people by computers, advertisers, and designers. Nevertheless, there still lacks conversations on body augmentations done by code and technology in conjunction of transness. In the broader scope of gender studies, trans studies is beginning to fork off from queer theory, (in the same ways queer theory developed out of feminist theory) since the conversations that arise do not make room for the literal reconfigurations of one's body.

The discussion of bodies often gets sidelined when talking about queer theory. If queer epistemology towards computing really wants to steer towards a diffracting lens, which centers accountability, we need to be able to consider accessibilities that computers have or do not have and learn from disability studies in the same way Gaboury has used critical black studies to frame his discussions. Overall, more work needs to be done in this area to include discussions around code, bodies, and space.

11. Conclusion

In this paper we mapped a faint terrain of queer CS. Through these scholarships we see that a computer is an actor which reinforces and reifies the social strata of the gender binary.

This includes the design process (or lack thereof), misinformed datasets, or research methods that reinforce stereotypes. We also explored scholarship within CRT and queer theory that addresses exclusions as an opportunity to evade and/or transform the capture of our identities.

From this wealth of scholarship, we assert that we ought to pay attention to the limiting effects of binary logic and in return, the affect and space in which recognizing a 3-valued logic creates for us. We must recognize the various strategies, opacities, and ontologies of techno-relations which allude categorization and systemic violences that work on us. If we continue to believe that computers are simply binary math machines, we are also allowing the realities that binary logics discursively construct.

Binary logic *renders technical* (Breslin 2018). It is ahistorical in its refusal of accepting the past to be a contingent player in how the future unfolds. It refuses to accept how technology collects and manifests ideologies, and how we draw boundaries with the supposed objectivity of technology to exclude and marginalize people. Through its reduction of identity, it preserves an ideation of the world's division and nourishes an unrelenting and harsh hierarchy. To interrogate binaries is to actively work to against binaries, and that work will expand the capacities of solidarity and resistance.

If we can coax the evidence of queerness of computers into visibility and conversation, we can start to dismantle the ways computers are worked to uphold systems of violence. We accept that technology can oppress, reinforce, and emancipate simultaneously. This is a principle we rely on within queer, crip, and race studies by accepting multiple states of being. By evincing the multitude of processes through our own critical scholarship, we choose which forces to amplify.

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