

ABSTRACT

Title of Thesis:

***EXPLORING TRANSGENDER
INDIVIDUALS' EXPERIENCES OF
SAFETY WITH TECHNOLOGY.***

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Transgender individuals face numerous interpersonal safety concerns. These concerns, including a lack of emotional wellbeing, harassment, physical harm, sexual assault, and murder, are being increasingly documented in physical spaces. However, there has been little exploration of the role of technology or online spaces in safety for this population within Human-Computer Interaction (HCI). This work investigates the experiences and concerns of transgender individuals in two contexts. First, with an investigation of transgender individuals' experiences with safety and digital technologies. Then, with a study exploring the perceptions of a specific emerging technology, *Automatic Gender Recognition (AGR)*. Findings reveal both ubiquitous experiences of abuse when using common digital technologies and pervasive safety concerns transgender individuals have regarding emerging technology. I conclude with insights towards mitigating harm, caused by and with technology, for transgender and marginalized users.

Exploring Transgender Individuals' Experiences of Safety with Technology

By

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Table of Contents

<i>Acknowledgements</i>	<i>ii</i>
<i>Table of Contents</i>	<i>iii</i>
<i>List of Tables</i>	<i>vii</i>
<i>List of Figures</i>	<i>viii</i>
1 Introduction: Transgender Identity and Technology	1
Chapter Overview	1
Document Organization	3
Motivations	5
Research Questions	13
Research Question 1: How Do Transgender Users Experience Safety Online?	13
Research Question 2: What Do Transgender Individuals and Technologists Think about Automatic Gender Recognition (AGR)?	15
Approach	16
Contribution	17
2 Related Work: The Role of Gender in Safety	18

Chapter Overview	18
Gender and Identity	19
Gender in Society	19
Transgender Identity	22
The Trans Community and Technology	22
Intersectionality and Power	24
Physical and Emotional Safety	25
The Role of Safe Spaces in the Trans Community	25
Safety and Harm in HCI	27
The Role of Algorithms	29
Automatic Gender Recognition (AGR) Technology	29
Algorithmic Bias in Technological Systems	32
<i>3 Methods: Uncovering Intersectional Experiences with Safety</i>	<i>36</i>
Chapter Overview	36
Defining Safety, Harm, and Abuse in This Study	37
Interview Design	40
Finalized Interview Protocol	42
Participant Recruitment	46

Data Analysis	51
<i>4 Findings: Technological Harm in Online and Offline Contexts</i>	<i>53</i>
Chapter Overview	53
Research Question 1: How Do Transgender Users Experience Safety Online?.....	55
The Unsafe Reality for Transgender People: “I Feel Unsafe All the Time, Really”	55
Digital Safe Spaces: “How Could You Be Trans Before the Internet?”	57
Digital Threats to Safety: “There’s Always a Loophole for People Who Want to Harm Trans People”	62
Research Question 2: What Do Transgender Individuals and Technologists Think About Automatic Gender Recognition (AGR)?	74
Previous Experiences of Misgendering: “The Base Alienation that Comes with Transphobia” ..	74
Can AGR Really Work?: “I Would Show Up as a Blip or an Error”	76
Impact of Being Misgendered by AGR	78
Questioning AGR’s Necessity: “What Benefit Would this Provide to Society?”	82
AGR as a Tool for Abuse: “It’s Just Going to Exacerbate what’s Already There”	84
AGR’s Impact Beyond the Transgender Community	91
<i>5 Discussion: Technology May Propagate and Perpetrate Harm to Transgender Users</i>	<i>95</i>
Chapter Overview	95

Experiences of Abuse are Salient and Diverse for Transgender Technology Users.....	96
The Harm of an “External Gaze”	100
Intersectionality and Histories of Oppression Impact Safety	102
Intentionality does not Negate Impact.....	104
Considerations for Technology Designers.....	105
6 Conclusion: Mitigating Harm to Trans Individuals.....	112
Chapter Overview	112
Limitations.....	112
Future Work	113
Conclusion	114
Appendices.....	119
Appendix A: Demographic Survey.....	119
Appendix B: Finalized Interview Protocol.....	119
Works Cited	123

List of Tables

TABLE 1. A TABLE SUMMARIZING THE DEMOGRAPHICS OF PARTICIPANTS.	49
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List of Figures

FIGURE 1. 6 FORMS OF HARM IDENTIFIED IN THIS STUDY.	64
FIGURE 2. AN ANONYMOUS POST IN 4CHAN'S /POL/.	73
FIGURE 3. A PHOTO OF THE BILLBOARD P2 REFERENCED.	87

1 Introduction: Transgender Identity and Technology

Chapter Overview

This chapter summarizes the motivations of this study by providing background information on transgender identity and the experiences of transgender individuals with personal safety, in terms of both violence and emotional wellbeing. Transgender individuals' flagrant risk of experiencing violence has been documented by transgender and LGBTQ (Lesbian, Gay, Bisexual, Transgender, Queer) organizations and social studies (e.g. [62,79,132]). The high risk that a transgender person will become the victim of abuse, harassment, and discrimination motivates the need to better understand the role technology plays—or could play—in the safety and wellbeing of members of this community.

The objective of this study was to illuminate the experiences transgender individuals had regarding safety, including interactions individuals had with others both online and offline. This included examining participants' perceptions of an explicitly gendered technology, referred to in this study as *Automatic Gender Recognition (AGR)*. AGR, also known as *gender classification*) is a set of computational algorithmic methods, often using automatic facial recognition [76,91] and body

recognition [22,122] algorithms to extract the visual features from images, video, or audio of human targets to determine gender. These experiences and perceptions illuminate both the limitations and potentials of technological mediation in safety for individuals with marginalized gender identities.

This work contributes to a growing body of literature within Human-Computer Interaction (HCI) on transgender individuals and their experiences. It offers novel findings about transgender individuals' experiences with safety and the technologically-aided abuse participants faced both online and offline. I examine the links between negative experiences of abuse and participants' negative perceptions of AGR, a technology which is primarily encoded with binary gender categories.

Parts of this research have recently been published as a full peer-reviewed paper in the *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* [52]. This study expands on this published work, which primarily focuses on concerns surrounding AGR. This thesis synthesizes those concerns with findings on transgender experiences with safety relevant to everyday, pervasive technologies like the Internet.

Document Organization

This thesis is organized into six chapters. This chapter, Chapter 1, presents an introduction to this study, starting with the motivations underlying its conception. I also present and explain the two research questions fashioned to guide this study and the approach taken to answer these questions. Finally, I describe the contribution this work makes to the field of HCI and technology designers seeking to create inclusive systems that are safe for marginalized populations.

In Chapter 2, I present the related work fundamental to examinations of transgender experiences with technology. This includes an examination of gender as it exists within broader society, and both past and current work surrounding transgender identity within gender studies, queer studies, and HCI. I also present literature describing the concept of *safe spaces*, conceptual spaces that exist in both physical and digital space meant to provide emotional and physical safety from harmful anti-transgender behaviors, actions, or words. I present recent work within HCI discussing the concept of safety online for marginalized groups, and technologies that tackle issues around safety, including harassment and violence. In the last section of Chapter 2, I present work on AGR technologies, highlighting recent developments using

transgender datasets. I also present literature discussing algorithmic bias against marginalized populations, including women and people of color, found in historical and contemporary computer systems.

In Chapter 3, I describe the methods used to conduct this study. I begin with an explanation of the terms “safety,” “harm,” and “abuse” in the context of this study and the findings. I detail the semi-structured interview design, methods for participant recruitment, and the reasoning behind chosen participant sampling. I also describe the process of qualitative data analysis used to determine the findings.

In Chapter 4, I present the findings of this thesis. The findings are divided into two sections, Research Question 1 and Research Question 2. The themes which contributed to answering the two research questions are presented within these sections. The findings within Research Question 1 show the lack of safety participants experience offline, and the ways online media have improved personal and emotional wellbeing for participants. In contrast, findings show that participants also experienced diverse understandings of harm in relation to pervasive technology. Findings under Research Question 2 show participants’ common experiences with misgendering in both offline and online spaces and the emotional harm those

experiences cause. Subsequently, I present findings about transgender individuals' perceptions about misgendering by AGR and the gendered conceptions currently embedded in AGR.

In Chapter 5, I present a discussion on the ways conceptions of harm manifested through technology for transgender participants. I discuss the complexity of different harms identified in this study, further obfuscated by the lens of intersectionality mapped to participants' interlocking identities. I also deliberate the concerns transgender participants' had about AGR. I confer the trends which map these concerns to experiences of harm participants had experienced when using pervasive digital technologies. I conclude the discussion with considerations for technology designers, including addressing the intentionality and complexity of harm, the role of abusive users, and the potential to provide support for transgender users.

Motivations

As of 2016, an estimated 1.4 million United States citizens identify as transgender [16]. *Transgender* refers to an individual whose gender identity is different from the one they were assigned at birth [89]. This differs from *cisgender*, a person whose gender identity aligns with the one they were assigned at birth (e.g. a person who

identifies as a woman and was born with a vagina) [89]. In this thesis, I also refer to non-binary individuals (individuals who do not identify as either male or female, identify as both, or identify as somewhere in between) as “transgender,” or “trans.” The scholarship and discourse relevant to non-binary and genderqueer identities have fallen largely under *Transgender Studies*, the academic study of transgender identity, and is encompassed into the larger “trans” umbrella [103]. Leslie Feinberg’s 1992 pamphlet, “Transgender Liberation: A Movement Whose Time has Come,” [77] popularized transgender as a unifying term for all gender identities which do not conform to *cisnormative*¹ conceptions of gender. Non-binary identity does not align with sex assigned at birth like cisgender identities do, and thus is considered *trans*, or “across from” their gender assigned at birth [89].

While the experiences of this population are now being increasingly studied in other fields [72], there has been little research involving transgender individuals in human-

¹ (also referred to as cissexism) the assumption and normalization of cisgender identity that contributes to the “othering” or stigma of transgender identity [89]

computer interaction literature. A 2016 literature review of CHI papers found there were only 3 papers specifically about the transgender community [109]. I also conducted a non-exhaustive, non-intensive search of the ACM Digital Library to survey the state of trans-related research in HCI two years following this 2016 review. As of February 8, 2018, using the settings “any field matches any,” the search term “transgender” returned 14 results. However, only 7 papers explicitly involved the transgender community, in terms of involving transgender participants or including more than a mention of transgender identity. In the 7 other cases, the term transgender was mentioned in the document or was incorporated into LGBT, but did not explicitly examine transgender identity or experience. Beyond the lack of high-level research about transgender individuals in the field, there has yet to be an exploration within Human-Computer Interaction on the role of safety for the transgender community. The significance of HCI exploring safety for the trans community is incited by the vulnerability of this population to discrimination, abuse, and violence inflicted by others.

There has been growing attention to the lives of transgender identifying individuals—in everything from popular media (e.g. [29]) to government policies [123]. However, despite a rising level of acceptance of trans identity compared to past decades [52],

trans individuals are still at a higher risk of being victims of discrimination than cisgender individuals (e.g. [66]), particularly due to the lack of legal protections which disproportionately impact transgender individuals (e.g. [28,34,43]). The transgender community has historically experienced, and is still experiencing, high volumes of harassment and abuse [49]. The largest survey conducted on transgender individuals in the United States found that, in 2015, 46% of respondents experienced verbal harassment, 47% were sexually assaulted, and 54% experienced intimate partner violence [42]. Nuttbrock et al. found that 53% of transgender women in their 2014 study suffered psychological abuse [54]. The National Coalition of Anti-Violence Programs (NCAVP) reported that half of LGBTQ (Lesbian, Gay, Bisexual, Transgender, Queer) people killed in hate crimes in the United States in 2009 were transgender women [72]. Experiences of violence are more exacerbated for transgender people of color and homeless transgender people [45,135], and black and Latina trans women are at a higher risk of murder than other gender groups [33]. Researchers have suggested the need for increased research on the experiences of harassment, cyberbullying, and other abusive behavior among LGBTQ technology users [110], yet there is a gap within the HCI literature about transgender individuals' experiences with safety when using and interacting with technology and online media.

There have also been numerous studies exploring the impact of *misgendering*² on transgender individuals (e.g. [5,64]). While misgendering is not always deliberately malicious, misgendering has been found to cause emotional stress to transgender individuals [88]. It is possible perceived intent plays a role in this stress, along with other variables, such as frequency of experience of being misgendered and the relationship to the individual doing the misgendering. Furthermore, the National Transgender Discrimination survey reported 41% of trans individuals attempt suicide, and 56% of those regularly misgendered in their workplace attempted suicide [45].

In response to the pervasiveness of abuse both offline and online for this population, *safe spaces*, places where individuals can be safe from physical, verbal and emotional harm, have emerged to accommodate LGBTQ community and their allies. Safe spaces also operate as avenues for the political organization of LGBTQ communities [67]. While safe spaces often refer to physical spaces, such as spaces on university campuses, community centers, health clinics, or social clubs, they have also extended

² misidentifying another person's gender, either intentionally or unintentionally

beyond the physical world and into the virtual realm of social networks, forums, and mailing lists [80].

Due to the vulnerability of the trans community, even in comparison to sexual minorities (LGB; lesbian, gay, bisexual) [69], this study sought to understand transgender individuals' experiences of safety and the way that technology may facilitate or mediate abuse. The disparate levels of violence experienced by transgender people of color, particularly transgender women of color, also motivated the inclusion of principles of *intersectionality*, the complex and multidimensional relationship between various identity elements [23]. Research confirming safety risks for the transgender community motivated the exploration of technology-mediated safety in the context of embedded conceptions of gender identity within culture and technology.

Furthermore, the interplay of risks of violence and the negative impact of misgendering on transgender individuals mental health, established in psychology and feminist studies [64,70,88], motivated the need to more deeply understand the ways trans individuals view technology that assigns gender categories to human beings. Haimson et al. have discussed the ways embedding gender in social media platforms

construct cultural conceptions of gender and impact the way users experience their own gender identities [12].

Automatic Gender Recognition (AGR), a uniquely explicit gendered technological method due to its foundational notion of embedding gender classifiers, presented a distinctive avenue for researching trans perceptions of gendered conceptions in technology. In this study, I desired to uncover the potential implications of AGR on the safety and wellbeing of transgender individuals, especially as computer vision and facial recognition technologies are being looked at for improving safety for other populations, like blind individuals who may desire more descriptive information about others to feel safer [18]. While other specific technologies also present an avenue for exploring harm to transgender individuals—and may potentially present more safety concerns than AGR to certain segments of the transgender community—AGR was chosen due to its uniquely focused categorization of gender, a core aspect of transgender individuals’ identities and experiences.

Researchers have proposed the need for ethical consideration for employing binary gender classifiers in the application domain of natural-language processing (NLP) which tries to predict gender based on text [75]. Yet, currently, little research has

been conducted by AGR developers exploring the potentially negative outcomes of gendering human faces and bodies, even when methods like measuring chest shape have been acknowledged as potentially invasive [102]. This direction was further motivated by the lack of consideration of transgender individuals and their perspectives in this rapidly developing application domain [91], even in cases where AGR developers sought to identify transgender individuals' faces across gender transition [71,83].

To summarize, this study was motivated by three distinct themes identified across multiple disciplines. 1) The rising discussion of transgender rights and identity in the United States, both in scholarship and the public eye, motivates further contributions to a growing—but limited—corpus of literature within HCI. 2) Statistics and literature describing the vulnerability of the transgender population to violence and discrimination that negatively impact their physical and mental wellbeing motivates the decision to examine safety in the context of technology use and technological systems. 3) The impact of misgendering on transgender individuals' mental wellbeing motivates further exploration of the impact of computer systems that attempt to gender human beings. The discussion of computer vision technology that uses facial

and body recognition technology for promoting safety [19] motivated the decision to study transgender perceptions of the specific gendered technology, AGR.

Research Questions

The core research question motivating this thesis study is: *“How can transgender individuals’ experiences of safety with technology inform the way we consider designing technology?”* This broader question was divided into two, more targeted questions which this study was designed to answer. The first question aimed at exploring transgender individuals’ current experiences of safety online, as it relates to their experiences of safety offline. The second question delved more deeply into the specific technological method of AGR using computer vision in order to understand transgender individuals’ perceptions of this emerging technology.

Research Question 1: How Do Transgender Users Experience Safety Online?

While there has been an increasing exploration of transgender individuals’ use of social platforms in HCI [47–49], there has been little discussion about the role technology plays in the safety for this population. Considering the high risk of

violence this population faces in the physical world, this question motivates the exploration of safety and abuse in online communities, as well as the impact technology may have on safety offline.

The first research question this study sought to answer was: “*How do transgender users experience safety online?*” This question was aimed at gathering data on the different experiences transgender users have with safety online versus offline, such as the role of other user behaviors on feelings of safety or lack thereof.

Smaller sub-questions were designed to aid in answering this larger research question and to provoke the selection of appropriate methods. How do transgender individuals experience safety offline and do those experiences overlap with their online experiences? What features of an online platform promote safe or unsafe experiences for transgender users? What role does intersectional identity play in experiences of safety in both online and offline spaces?

Research Question 2: What Do Transgender Individuals and Technologists Think about Automatic Gender Recognition (AGR)?

The discussion of the role of restrictive binary gender categories on social media platforms and its implications for reifying cultural notions of gender has recently emerged within HCI literature [12], but the role of assigning gender classifiers in computer vision algorithms is new to the field. The second question this study sought to answer was: “*What do transgender individuals, including transgender technologists, think about Automatic Gender Recognition (AGR)?*” Considering the evidence that misidentifying a transgender individuals’ gender causes stress when perpetrated by a human being [64,88], I sought to probe transgender individuals about their perceptions of a computerized system gendering them based on appearance.

The sub-questions this research question provoked included: What happens when AGR misgenders a transgender individual? Is there a difference between AGR and a person misgendering someone? Do transgender technologists have different perceptions about AGR? Does safety play a role in the perceptions transgender individuals have about AGR?

Approach

To address both research questions above, I chose to conduct in-depth semi-structured qualitative interviews with a small sample size of transgender individuals and technologists. These methods were chosen due to their proficiency in gathering detailed, contextual data from participants about their experiences and perceptions [1]. Semi-structured interviews allow the researcher to prepare a targeted protocol aimed at answering the research question, but present a level of flexibility that allows the researcher to glean the most relevant information *in situ* [1]. While larger scale surveys could provide a larger corpus of quantifiable data to analyze within a shorter period of time, semi-structured interviews with a smaller sample size is known to provide rich and diverse data [105]. This approach also allowed me to carefully balance demographics towards ensuring a heterogeneous sample size fitting of applying an intersectional lens. As described in Chapter 3, Methods, responses to the broader demographic recruitment survey necessitated careful selection of participants, so as not to privilege the voices of white and masculine-identified individuals.

As part of the intention at focusing on identity and the importance of examining identity in HCI research, I have made the stylistic choice to refer to use first person pronouns to describe the author and research, as demonstrated in the first section of this chapter. In doing so, I practice *reflexivity* in positioning myself not as an omniscient and objective presence, but as an actor within the context of this study. Reflexivity, often practiced by feminist researchers, is an acknowledgment on behalf of the researcher of their own identity and role in shaping the research process [57]. Michelle Fine referred to the concept of research speaking for participant as “the ventriloquism of researchers who seek asylum behind anonymous texts or texts in which they deny their authorial subjectivities” [40]. In this thesis, I present abundant quotes from participants alongside my interpretation and synthesis of these quotes.

Contribution

This study contributes to a growing body of research involving transgender individuals in HCI. The findings communicate the importance of exploring experiences of safety for the transgender community, which experiences high levels of violence and discrimination. This study found that transgender participants also experience pervasive harm caused by emotional stressors and physical threats when

using digital technologies and the Internet. I also found that transgender participants attributed a lack of safety to technologies that misgender, in the context of AGR. These findings contribute to an exploration of new methods for understanding safety for transgender individuals and other marginalized populations.

2 Related Work: The Role of Gender in Safety

Chapter Overview

The literature review encompasses numerous themes, connecting conceptions of gender identity to experiences of safety among marginalized populations and the role of algorithmic bias in representing marginalized identities. The first discusses the concept of gender, as well as current work on transgender identity, both within HCI and in other fields. The next describes safety, including work being done in the field of HCI. The final section reviews historical and contemporary work on AGR, including research on algorithmic bias and embedded bias in computer systems. These topics are situated alongside literature discussing power dynamics and the role of intersectionality in conceptions of power.

Gender and Identity

Gender in Society

Gender is an identifier rooted in cultures and societies across the globe. It can be found on legal identifiers, such as identification documents; in institutions, like legal marriages or gender-segregated schools; and in our technology, from Facebook profiles to the way the public perceives virtual agents, like Siri. Discussions of gender—including transgender identity [38]—can be traced back to early civilizations, found in the texts of ancient Greek philosophers or the religious texts of every organized religion [111]. The amount of research on gender and its role spans decades of research in many overlapping fields, such as the role of gender in applying a new lens to historical analysis (e.g. [111]). Psychiatrists have even analyzed individuals with trans identities to determine the root of masculine and feminine identities in cisgender individuals [118].

Gender has become ingrained in the way many social interactions operate, and thus likely feels natural to include in many of the social technologies we now use. Generally, the most common manifestation of gender in Western civilizations is cisgender and binary, dividing gender, sex, and gender expression into two distinct

and separate checkboxes: male and female [111]. Understanding the way gender operates in our society grounds both the stigmatization of non-traditional gender identities in online spaces and the exploration of AGR, including the motivation researchers may have for developing it.

There has also been much discussion around the terms “gender” and “sex,” with some researchers and scholars positioning them as two separate concepts, and others arguing that they are one in the same. Some feminists, gender theorists, and transgender scholars have positioned sex as the biological characteristics of the body, while gender represents an internal identity that often reflects social and cultural ideologies [100]. Though this has a complex history beyond trans identity, some transgender activists prefer the conception of separate sex and gender definitions in contrast to cisnormative gender definitions which assume gender and sex are both the same and biologically defined (meaning, there is only male and female and these identities are defined by genitalia). This is seemingly the conception of gender which is embedded into AGR categorizations which assign gender from sex characteristics of the human body.

However, other theorists and scholars position the distinction between gender and sex as a misconception that can be used to discredit transgender identity (such as positioning a transgender woman as still biologically male, and thus, not a woman). Julia Serano, transgender activist and author of *Whipping Girl: A Transsexual Woman on Sexism and the Scapegoating of Femininity*, discusses the “biological sex myth” in her book [113] and on her blog [112]. Anne Fausto-Sterling also discussed the way this distinction fails to encompass intersex bodies, which do not fall into distinct “male” or “female” sexes [37]. Furthermore, the gender/sex distinction is seen as medicalizing or problematizing the relationships transgender and non-binary individuals have with their bodies. However, not all trans people hate their bodies or distance themselves from their bodies (e.g. [36,90,121]). Differentiating sex and gender can similarly reinforce cisnormative notions that define certain genitalia as belonging only to certain genders, insinuating, for example, that a trans woman has a male body regardless of whether she identifies her own body as female.

In this paper, I use language relevant to literature and perspective outlined in the second point, that gender identity is not separate from sex. This is why I do not refer to the concept of sex throughout this thesis. This also mirrors work within AGR, though it frames gender with a cisnormative lens.

Transgender Identity

Although many terms (e.g. “transvestite,” “transsexual,” “transgender”) that Western culture is familiar with originated from the early 1900s and after, the concept of “crossing” gender or existing outside of the gender binary is an ancient one that spans across many cultures [119].

In literature, transgender identity is perhaps most discussed in feminist studies and queer theory. Perhaps one of the most key works in queer and transgender studies is Judith Butler’s 1988 essay titled, “Performative Acts and Gender Constitution: An Essay in Phenomenology and Feminist Theory” [20]. Butler moves feminist notions of sex and gender away from the physiological, arguing that gender is socially constructed through socially constructed actions that “sustain discrete and binary categories of man and woman” [20].

The Trans Community and Technology

While there has been a growing corpus of research for the past few decades on transgender identity in social studies (e.g. [55]), communication studies (e.g. [32]), and queer studies (e.g. [72]), there is still a dearth of research in HCI or computing on

transgender identity. This has been changing, as more papers are being published on this population. Numerous works in the ACM library have mentioned the transgender community or included transgender participants (generally under the umbrella LGBT/Q) but have not included distinctive research on transgender experiences (e.g. [14]). Within the CHI community specifically, for example, research on transgender issues has been increasing since the first publication appeared in 2015 [48].

Some HCI research has explored technological solutions for well-known transgender rights issues, such as bathroom access [9] or medical transitioning [44]. Much of the literature discusses transgender individuals' experiences using online communities, like Facebook [49] and Pinterest [48]. Haimson et al. have conducted research on transgender users of online communities, uncovering unique experiences transgender users face when using social media platforms, such as stress in dealing with identity disclosure [47] and managing digital identity when transitioning genders [50].

Furthermore, Haimson et al. explored how social networks embed gender in platform design for targeted user data collection and marketing, thus enforcing specific notions of gender and potentially shaping the culture around gender [11].

Intersectionality and Power

The HCI community continues to explore feminist [7] and social justice orientations for approaching research and design [35]. Researchers have pointed out the role of power in interface interactions, including the impact that power has on transgender users [65]. In addition to HCI's recent attention to uplifting voices of marginalized and vulnerable populations, there have been recent calls to start attending to intersections of identity. Schlesinger et al. provided a framework for approaching intersectionality in HCI research, which they point out has not been present in much literature in the field thus far [109]. A concept crafted by black feminist scholars, intersectionality pertains to the relationship interlocking identities have to overlapping systems of oppression [30]. In this paper, I explore trans identity in relation to other intersecting identities (such as race, class, location, or age) which also contributes to experiences of safety.

Physical and Emotional Safety

The Role of Safe Spaces in the Trans Community

As described in Chapter 1 of this document, the transgender community is at an alarmingly high risk for violence for a minority group [139], and this risk is even more prevalent for trans women of color and homeless transgender people [62,74,135,139]. This reality of abuse has led to the construction of *safe spaces* within and for LGBTQ communities [67]. These safe spaces serve as physical or emotional barriers to transphobia³-motivated harm.

Safe spaces can be traced back to the women's liberation movement in the 1960's United States [67]. While the concept emerged as a conceptual space of resistance to violence and freedom to organize, the term has become commonly used to denote safety from any emotional harm or *othering* (being treated as abnormal or alien). The

³ prejudice towards transgender individuals

definition of safe space is as fluid and contextual as the subjective concept of safe space itself; the meaning varies dependent upon intersectional identity, historical context, and geographical location.

Safe spaces are not necessarily safe from outsiders. From harmful language to terroristic violence [31], safe spaces can be coopted, invaded, and destroyed. Two groups that utilize technology to attack the trans community emerged during this study: right-wing reactionaries (the alt-right, white supremacists) and TERFs (Trans Exclusionary Radical Feminists, radical feminists characterized by transphobia and transmisogyny). TERFs use technology to launch harassment campaigns, doxx⁴ trans people (search for identifiable information of people online and publish it), and call their family members and employers in an attempt to harm them [4,127]. Right-wing reactionary groups coopt safe spaces by organizing online [81,107], appropriating safety symbols and trans language [84,108], and harassing trans activists [101].

⁴ publish personally identifying information, such as physical home address, for malicious ends

Technology and the proliferation of the Internet has opened new opportunities for transgender individuals and communities to create and join safe spaces [80]. The activities users engage in relevant to their identities transform digital spaces into meaningful places to organize and connect with others [54]. Platforms, forums, and other web-based apps have been adopted by trans users, even if they were not intentionally designed to support their gender identities [50]. However, research into the abuse transgender users experience on online safe spaces has yet to be explored. This study aimed to better understand digital safe spaces for trans people and their experiences with online abuse.

Safety and Harm in HCI

There is an ongoing investigation about the role of safety, harm, and fear [16,19,104,110] across the online/offline divide for many user populations. Researchers have explored the impact that harassment online has had on women [128] and people of color [27]. To address these concerns, technical solutions have centered around community awareness [73], providing peer support for harassment [13], diminishing local crime concerns [78], and empowering victims of targeted and highly gendered violence, like sex trafficking [120]. However, safety online for the

LGBTQ community has not been studied as extensively. As trans individuals have largely different and specific experiences with identity exploration [129], disclosure [29,31], and safety [62,116] in comparison to other populations, I focus on experiences of harm and safety within the trans community in HCI.

Conversations around transgender safety as it relates to technology usage in HCI thus far have encapsulated how individuals' identities are negotiated on social media websites. Haimson et al. have done extensive work in exposing both the negative and positive aspects of online communities for transgender users [48–50]. They discuss the emotional impacts of digital footprints on Facebook in transitioning gender [50], as well as the stress and fear associated with disclosure [49]. On the other hand, they have also uncovered the benefits of online communities in that they provide support and inspiration specific to this user groups' needs [48,49]. This study builds on this work by explicitly analyzing the experiences of physical and emotional safety for transgender users of online communities and pervasive technologies. I discuss the potential ways harm attributes to negative perceptions of emerging technologies for historically marginalized groups, like transgender individuals.

The Role of Algorithms

Automatic Gender Recognition (AGR) Technology

As defined in Chapter 1, *Automatic Gender Recognition* (AGR) (also known as *gender classification*) refers to algorithmic methods, including automatic facial recognition [76,91] and body recognition [22,122] technologies, that extract features from images, video, or audio of one or more individuals in order to identify their gender. AGR often leverages *computer vision* algorithms and/or voice recognition modules. Computer vision extracts data from images and videos for various applications, such as indexing and decision making, and dates back to the 1960s where it was first explored at MIT [58]. A common method is to extract features (e.g., facial hair) from an individual's visual and/or audio data (e.g., a video showing their face) and compare them with ground-truth samples (e.g., videos of faces for which the gender is known) in an existing database. If the input features are found to be similar to those in the database, a match is declared. While Automatic Gender Recognition (AGR) software can also use speech recognition to identify gender [125], and is also often used on websites that track user behavior for marketing purposes.

It wasn't until 1990 that the earliest form of gender recognition software was developed. Golomb et al. employed a *neural network* called SexNet, which used sample images of human faces in order to classify gender. Neural networks are a type of algorithm which allows a system to progressively learn as it collects new data, a concept that dates back to the 1940s [87]. Since SexNet, automatic gender recognition development has become increasingly prevalent, with many engineers exploring different implementation techniques for improved accuracy (e.g. [22,46]).

AGR has advanced since its inception in 1990, and is now being used in commercial applications (e.g. [92,136]). Gender recognition is being explored for marketing, biometrics, surveillance [91], and future human-robot interaction applications [102]. The motivation for these developments is improved targeted marketing, safety, and demographic collection [91] and more personalized user interactions [102]. The primary contribution of current research in this space is improving accuracy using different techniques and information analysis, such as algorithms that analyze gait [134] or hair style [76] to categorize gender.

Some research has mentioned user concerns with AGR methods. Ramey and Salichs' work on AGR derives gender information from the shape of the target's breast in

order to categorize the target [102]. They point out the privacy concerns of users briefly with this method, but do not delve into the gendered expectations of the targets' bodies.

Recently, AGR researchers have also started exploring gender recognition for transgender faces. Mahalingam and Ricanek have published a transgender facial dataset for AGR by scraping transgender YouTubers' images [82]. This dataset have been used by Mahalingam and Ricanek [83] and by Kumar et al. [71] in works attempting to address accuracy issues in facial recognition for an individual across gender transition. These works discuss the challenges gender transition presents to accurate AGR classification, and have recently been heavily criticized on social media and in queer media due to concerns of consent and privacy [63]. Similarly, a study on facial classification of sexuality using facial recognition technology resulted in media debate [130].

Criticism of facial and gender recognition technologies lead to a need in HCI to better understand how these technologies potentially affect users and targets. Though some AGR developers argue for the potentials of improved user experience, it is possible AGR could negatively impact the user experience for trans individuals and other user

groups. There are also potential safety implications to thoughtfully consider beyond the user experience when designing technologies that incorporate identity.

Algorithmic Bias in Technological Systems

The existence of bias in computer systems is not a new discovery. Batya Friedman has published numerous works discussing the existence of embedded bias in systems. Friedman and Nissenbaum published a journal article in 1996 categorizing three types of bias: preexisting (social biases), technical (constraints), and emergent (context-of-use) [42]. They offer a framework for minimizing bias in computer systems. Friedman also established a perspective in HCI for creating Value-Sensitive Design in a 1996 article [41], a framework which is referred to and built upon by researchers into contemporary literature (e.g. [17,115]).

The concept of *computer ethics* is even older, dating back to 1950 when MIT professor Norbert Wiener published a book titled *The Human Use of Human Beings*, though the term “computer ethics” was not explicitly used until Walter Maner in 1976 [124]. Computer ethics as a field of research bloomed in 1985 with the creation of the first textbook [124] and continues to be discussed to this day.

Studies of algorithmic bias are increasingly growing, both in HCI and in other fields. In 2017, Safiya Umoja Noble published a book discussing the ways Google’s search algorithm, harms people of color, specifically women of color [94]. ProPublica, a nonprofit journalist organization, also published a report discussing the racist biases in algorithmic policing software and how it disproportionately impacts black Americans [3]. Caliskan et al. explore cultural stereotypes embedded in semantic-based machine learning [21] and O’Neil published a book on the injustice of algorithms [96]. Zach Blas’ “Facial Weaponization Suite” project was created in direct protest of facial recognition and biometric technology, even using the images of queer identifying men’s faces to object biometric attempts at categorizing sexuality [15].

In automatic recognition systems, issues regarding bias are compounded by concerns for human autonomy. *Human autonomy* can be defined as the ability “to be one's own person, to be directed by considerations, desires, conditions, and characteristics that are not simply imposed externally upon one, but are part of what can somehow be considered one's authentic self” [26]. Previous research in HCI has long identified the need to support human autonomy as a central ethical value [8,41]. While some of the researchers developing AGR systems have briefly discussed concerns of privacy for their users (e.g., [102]), most of the previous research in this area has focused on

addressing technical issues of the algorithms themselves and how to improve their accuracy. Additionally, recent news stories have reported the use of AGR-capable facial recognition systems for advertising in public spaces without user knowledge or consent; systems whose use became only apparent to passersby after a billboard screen malfunction [93]. In the face of these stories and concerns about the possibility for algorithmic bias and threats to user autonomy posed by automatic recognition systems, it is important to study and better understand the ethical and social implications of these systems.

Numerous HCI researchers have proposed orientations both for conducting research and for design that tackles bias and promotes diversity. Shaowen Bardzell's *"Feminist HCI,"* published in 2010, has become a key piece in critical HCI methodologies [7]. Its agenda of presenting design orientations for researchers and practitioners to incorporate has been extended on in Dombrowski et al.'s *"Social Justice-Oriented Interaction Design"* [35], in Schlesinger et al.'s *"Intersectional HCI"* [109], and in Hui and Farnham's *"Designing for Inclusion"* [59].

These growing concerns of machine and algorithmic bias, as well as the continuous development and adoption of feminist and social justice design agendas, demonstrate

the relevance of inclusive and critical analyses of machine learning technologies, like facial and gender recognition. While neither historical or contemporary research of transgender individuals' technology use or perceptions have encompassed facial recognition or gender recognition technology, the growing body of research in HCI alongside conversations about trans identity in the United States set a precedent for the need for more representation in HCI of this population.

3 Methods: Uncovering Intersectional Experiences with Safety

Chapter Overview

In this chapter, I detail the methods used during this study. I preface this description by defining the terms used to describe the findings of this study (safety, harm, and abuse) to justify the choice of qualitative methods. This chapter is divided into three sections: Interview Design (and a sub-section, Finalized Interview Protocol), Participant Recruitment, and Data Analysis. In each section I discuss the logic behind the methods chosen for this study. I detail the aims of the interview protocol in addressing the Research Questions and the inclusion of major themes to guide insightful information gathering. I describe the motivations of the demographic survey deployed for participant recruitment, as well as the breakdown of survey respondent demographics and the subsequent selection of participants. I describe the decision to use *grounded theory coding techniques* on the interview data. I also acknowledge my role as researcher in shaping the outcome of the data analysis. In

practicing reflexivity, I recognize this role also shaped the data extracted during interviews and participant selection, as well.

Defining Safety, Harm, and Abuse in This Study

In setting out to explore questions about safety for transgender individuals' experiences with technology, it was necessary to define what "safety" meant in order to choose the best methods and questions to ask. Safety is a highly situated, subjective concept that differs across contexts. I am not looking to explore safety in terms of accidental bodily harm (as in a workplace or vehicle collision), for example. In this study, safety largely refers to freedom from emotional, physical, and social *harm*. This is grounded in definitions of safety utilized in current research of safety on online communities, like those of children and youth (e.g. [104,110,126]) and women (e.g. [56,128]), which are concerned about the ways *abusive* behaviors, like harassment, trolling, bullying, and cruelty, cause emotional distress, jeopardize physical safety, and harbor negative social impacts that span both online and offline spaces. Similarly, this definition is also founded in queer *safe space* literature, which aim to provide LGBTQ communities with spaces free of homophobia, transphobia,

queerphobia, and other identity-based discrimination and violence in which to speak and organize freely [67].

I also define the term “abuse” as a threat to safety. Pater et al. pointed out that some technology platforms categorize abuse, bullying, harassment, and hate under the same umbrella within policy documents [98]. Poland discusses case studies of the abuse of women online and its bearings on women’s offline lives [6]. Another lens in which abuse is framed is in the abuse of systems for nefarious means (e.g. [131]). In the case of this study, this definition applies if the outcome of the abuse of a system is personal harm to another human being, as demonstrated by an online event on Reddit referred to as “The Fappening,” where users illegal hacked the iCloud accounts of celebrity women and spread their nude images online [85]. In this study, the term “abuse” classifies behaviors that jeopardize safety, emotional, physical, or social, for transgender individuals and communities. I refer to those who display abusive behavior that causes harm to others as an “abuser” or an “abusive user.”

Lastly, I define harm as the negative effect of abuse and safety issues. While harm is not always specifically and rigidly defined, it is often discussed in work on online abuse. For example, Matthews et al. discuss types of harm experienced by survivors

of intimate partner abuse [86]; O’Leary et al. explore the way triggering content can encourage self-harm for those experience poor mental health [97]; and Rubya and Yarash found that the social lives of individuals recovering from substance use disorders may be harmed by self-disclosure of their recoveries [106]. Noble discusses in depth the wide-reaching harms caused by racist stereotypes reinforced by Google’s search and ranking algorithms, defining harm as something that is not simply inflicted by an individual human being, but also by technology and developers [94]. I define harm as something that is fluid and dynamic, but leaves a negative impact on an individual, a community, or society. This can be emotional in nature, resulting in distress, negative feelings, and triggers in mental illness; physical in nature, including battery, sexual assault, or death by murder or suicide; or social in nature, resulting in loss of social support from family or friends or loss of employment.

I concluded that investigating such highly situated, thorny issues such as safety, abuse, and harm required qualitative methods that allowed me to gather in-depth data about participant experiences and perspectives. For this reason, I chose to conduct semi-structured qualitative interviews and use grounded theory coding techniques for this study.

Interview Design

The interview protocol was aimed at exploring the experiences transgender individuals have regarding safety in both the physical world and online. The choice to do qualitative interviews rather than surveys was to gather detailed and contextual information from our participants. While previous work related to transgender participants in HCI has utilized surveys [2,49,50], the choice to do qualitative interviews was inspired by the in-depth analyses of the trans community (and intersectionality within the trans community) in the field of social science [114,116]. While surveys may more easily allow a larger participant pool and more targeted quantitative analysis of data, semi-structured interviews offer richer insight into the complexities of identity and safety among the participants and also elevate the participants' voices in defining their own experiences [39]. This methodology is widely used in HCI, but not often in the context of the trans community.

As the concept of intersectionality is discussed frequently within queer and feminist studies [18,29], and is known to be an important concept within transgender communities, I intentionally incorporated questions that investigate participants'

experiences of intersectional identities. The interview protocol included questions probing the role of intersectionality in participant experiences with safety.

One semi-structured interview protocol was designed to target both research questions, as introduced in the Introduction section above. A preliminary version of the interview protocol was tested on two pilot participants. Pilot 1 was a 26 year old white transgender woman who used she/her pronouns. Analysis of data from this protocol informed a second iteration of the protocol, which was then used with Pilot 2. Due to Pilot 2's insightful and unique responses, he was asked to become a study participant and became P7. The protocol used with Pilot 2 became the finalized protocol used for all participants.

Due to the semi-structured nature of the interview, the interviews were flexibly tailored to responses given by participants and occasionally involved additional questioning or probing. Technologist participants were asked more focused questions about their expertise in technology. For example, T3, the final participant recruited for this study, was only asked questions relating to Research Question 2 (*“What Do Transgender Individuals and Technologists Think about Automatic Gender Recognition (AGR)?”*) and was not asked questions relevant to Research Question 1

(“*How do transgender users experience safety online?*”). T3 was recruited later because of the need for more data from trans technologists in support of Research Question 2. I felt that Research Question 1 had been sufficiently addressed by the 12 other participants. For this reason, T3 was omitted from the Findings relevant to Research Question 1.

Finalized Interview Protocol

The finalized interview protocol was divided into six sections. The first section of the interview was the “Introduction.” This section of the interview was intended as an introduction to myself and the purpose of the study. I also used this section to confirm consent for participation. Prior to interviewing, each participant was emailed an interview consent form. Most participants filled this out and emailed it back. A few participants asked me to read through the consent form at the start of the interview and then gave their verbal consent.

I conducted each interview, including the pilot participants, using my smartphone. Phone interviews were chosen for numerous reasons. Firstly, the participants selected for interviews were dispersed, with some residing in different areas of the city and others residing in suburban and rural areas. Transportation was potentially an issue

for participants. Secondly, as demonstrated by the literature above, safety was of a large concern to this participant population. In considering both participant safety (who might view researchers as potentially anti-trans) and researcher safety (who may attract anti-trans individuals with recruitment materials), phone interviews were considered a better method than in-person interviews. Furthermore, participants who have regular experiences of misgendering may fear being misgendered in person by researchers. Thirdly, the questions being asked in the interviews probes deeply emotional and potentially troubling content. It was hypothesized that it would be easier for participants to open up on the phone, rather than in person, especially if they do not trust the researchers.

Each interview was recorded using a phone recording app with permission from the participants. Recordings were uploaded to the encrypted content management system, Box. I also kept a file of notes associated with each interview, including references participants made during interviews or sent to me post-interview.

The second section of the interview protocol was titled “Starter” and was made up of warm up questions about participants’ self-identified demographics. This section offered insight into participants’ experiences with overlapping aspects of their

identity, whether their identity had changed over time, and whether they were open about their gender identity to others.

The third section of the protocol, titled “Technology,” queried participants about their personal technology use, including technology or platforms used to express their identities. This section also included questions about technology participants disliked or avoided using, or technologies they stopped using in connection with their gender identity. I asked participants if there was a connection between their technology use and their identity. I also asked them if they knew of any technologies or platforms adopted by the broader trans community. Participants also were prompted to imagine what their lives would look like if the technologies they used regularly did not exist.

The fourth section was dedicated primarily to Research Question 2 and was titled “Facial Recognition.” Participants were asked if they were familiar with facial recognition technology. They were then introduced to the application of gender recognition in facial and body recognition technologies. After explaining gender recognition using camera vision, participants were asked what their initial thoughts on this technology was, as well as if they believed this technology would be useful to them. They were also asked how they would feel if AGR-enabled facial or body

recognition misgendered them. This section was presented before the fifth section, “Safety,” so as not to influence associations with safety related to AGR.

The “Safety” section asked questions relevant to participants’ experiences of safety due to their gender identity and other intersecting identities. It also included questions about safety when using technology. Participants were asked if there were any technologies participants avoided specifically due to safety, as well as whether there were any technologies they used to promote safety. They were also asked about their conceptions of “safe spaces.”

The sixth and final closing section was a short portion of the protocol labelled “Design Futures.” This section asked participants three closing questions relevant to prospective futures they envisioned. The three questions were: “What is the scariest technology to you as a transgender person?”; “What is the most empowering technology to you as a transgender person?”; and “If you could build any technology for trans community, what would you want to build?”

Participant Recruitment

In this study, I focused on understanding the perspective of individuals who identify as *transgender* (e.g., a different gender identity than the one assigned at birth) [138]. In addition to binary-identifying transgender individuals, people with non-binary and gender non-conforming trans identities have also been included.

Participants were recruited using an online demographic survey created with Qualtrics. The opening text of the survey explained the intentions of the study and informed survey takers that I would be contacting respondents later for phone interviews. This survey asked open-ended questions about gender identity, pronouns, race, age, and location. Open-ended questions were chosen over close-ended questions so participants had agency over providing accurate, personalized language to describe their own identities. Participants were also asked how they heard about the study and were asked to provide an email address to contact them with if they were selected. The survey was distributed online using snowball sampling; I posted the link to my personal Facebook profile and Tumblr account and contacts then shared the link with others. I also posted the link within Facebook groups. Fliers with the survey link were also posted in trans-positive brick-and-mortar locations within the local

area. In one case, a participant (P8) was recruited based on the suggestion another participant gave during their interview.

The questions included in the survey were aimed at allowing me to recruit a diverse pool of participants. As outlined by Schlesinger et al [109], the goal of participant recruitment was to follow an intracategorical approach, where “transgender” was the controlled identifier. The other dimensions we included were race, gender, age, location, and class. Some participants also described sexual orientation during interviews. This approach demonstrates the reality of heterogeneity within a group and allows participants to discuss the role of intersectionality within their lived experiences.

I also desired to recruit transgender technologists, or professionals working in a field related to digital technology, such as software engineering. This was motivated by the possibility that individuals with technical expertise may have different attitudes towards technological innovation. To identify trans technologists, myself and my advisers asked personal contacts to distribute the online survey in their professional circles.

The survey was live from June to August 2017 and received a total of 44 responses. Interviews took place on a rolling basis, from late June to late August 2017. In total, 13 trans-identifying participants were recruited for phone interviews. Three of these participants were technologists. Each participant was compensated with a \$20 Amazon gift card. The interviews lasted from 36 to 91 minutes, an average of approximately 85 minutes. I denote technologist participants by using a T as their Participant ID (e.g., T1) and denote non-technologist participants by adding a P to their ID (e.g., P1). Though survey respondents were not asked about their socioeconomic status, I asked interview participants to describe their socioeconomic status. This status is not “cleanly” divided or clear due to self-reporting and personalized perspectives participants had about their own statuses. See Table 1 for participant demographic information.

Participants						
Participant IDs	Participant Demographics					
	<i>G</i>	<i>P</i>	<i>R</i>	<i>A</i>	<i>L</i>	<i>S</i>
	<i>P1</i>	Non-Binary Trans Masculine	He/Him	Black	21	Suburban Upper Middle Class
	<i>P2</i>	Non-Binary Trans Woman	She/Her & They/Them	White	19	Suburban Middle Class
	<i>P3</i>	Non-Binary Male	He/Him or They/Them	Black	19	Suburban “Poor”
	<i>P4</i>	Trans Feminine	She/Her & They/Them	Black / Mix	19	Urban Middle Class
	<i>P5</i>	Genderqueer	They/Them	Black Jamaican	22	Suburban Upper Middle Class
	<i>P6</i>	(Trans) Woman	She/Her	White	62	Suburban Upper Middle Class
	<i>P7</i>	Trans Male	He/Him	White	20	Rural Middle Class
	<i>P8</i>	Non-Binary	They/Them	White/Latine	28	Urban 20,000 / Lower Middle Class
	<i>P9</i>	(Trans) Female	She/Her	White	66	Suburban Middle Class
	<i>P10</i>	Bigender	They/Them or He/Him or Ey/Em	Half Japanese & Half White	23	Urban “Poor”
	<i>T1</i>	Trans or Gender Non-Conforming	They/Them or She/Her	White	33	Urban Middle or Upper Class
	<i>T2</i>	Trans Woman	She/Her	Middle Eastern/South Asian	28	Urban Working Class
	<i>T3</i>	Non-binary	They/Them	White	27	Urban “Complicated”

Table 1. A table summarizing the demographics of participants. Participant IDs beginning with 'T' represent a technology developer or researcher. All demographics` were self-reported by participants. The six demographical categories are: G (gender), R (race), P (pronouns), L (location), S (socioeconomic status), and A (age). Participants self-reported all identities. All participants also had a college education or were currently in college.

Participants were consciously selected to ensure diversity from survey respondents. Of the 44 survey respondents, 75% identified as white or Caucasian (not including people who identified themselves as partially white or Caucasian, which would raise the amount to 81%). About 18% identified as trans women/trans female, women/female, trans feminine, or MTF (male-to-female); about 30% identified as trans male/trans men, men/male, trans masculine, or FTM (female-to-male); and 61% identified on the non-binary spectrum, including genderqueer, queer, bigender, agender, and more. In some cases, these overlapped (e.g. nonbinary trans male), so the statistics do not add up to 100%.

Of the participants selected, 31% identified as black, with 54% identifying as people of color (POC). 46% identified as white, with 62% identifying as partially white. In terms of gender, 23% identified as male or trans masculine (.07% identified as solely male, meaning not non-binary as well); 38% identified as female or trans feminine (31% identified as solely female, meaning not non-binary as well); and 62% identified as non-binary, including genderqueer and bigender (38% identified as solely non-binary, including genderqueer and bigender, meaning not as trans male, trans female, trans masculine, or trans feminine). Ages ranged from 19 years old to 66 years old, an average of 29.7 years and a median of 23 years.

Data Analysis

In the practice of reflexivity, it is important to acknowledge that the process of data analysis introduces the perspective of the researcher and collaborators in drawing similarities and conclusions about data gathered from participants. Collaborative data analysis with Stacy Branham and Foad Hamidi introduced different perspectives to further shape the narrative of this data. However, my primary objective was to elevate the voices of participants in my approach to data analysis.

The primary procedure for analysis of the interview data was *grounded theory coding techniques* [24]. Grounded theory coding involves an iterative process of assigning meaning to data and allows researchers to sort and synthesize data to draw analytic comparisons from the data. This method of data analysis benefits qualitative data by breaking down preconceived notions about the data and uncovering new patterns and relationships between segments of the data.

Following the completion of the interviews, I transcribed each interview using the program Inqscribe. After completing the transcriptions and reviewing the data, I conducted a round of *initial coding* of the concepts that emerged in the data. These concepts were continuously developed through numerous rounds of independent

segmented coding. I grouped these codes through the process of focused coding as relationships between open codes emerged. Focused codes represented the larger themes of the data, while open codes were used to denote instances of these themes.

The data was then separated and organized by research question. I separated all codes that answered Research Question 1 from all codes that answered Research Question 2. Following their separation, the codes were iteratively and collaboratively refined for each research question through regular discussions with Stacy Branham and Foad Hamidi. We conducted clustering activities using both white boards and sticky notes to draw out similarities between the codes. The finalized codes were clumped into descriptive categories which encompassed numerous instances found in the data. For Research Question 1, we identified 3 main categories and 10 sub-categories. For Research Question 2, we identified 6 main categories and 10 sub-categories. This resulted in a total of 9 main categories and 20 sub-categories. These categories and sub-categories are represented in Chapter 4, Findings, as headings.

To draw conclusions for discussion from the findings, I later re-analyzed these categories and sub-categories as a single group. I once more employed a clustering

activity using sticky notes as a means of synthesizing data from the findings. I discuss the trends I identified in the data in Chapter 5.

4 Findings: Technological Harm in Online and Offline Contexts

Chapter Overview

Semi-structured interviews conducted with a total of 13 transgender identifying participants revealed that safety was a major theme in participants' lives and impacted their perception of technology. This chapter is divided into two major parts: findings relevant to answering Research Question 1, and findings relevant to answering Research Question 2. This organizational structure is reflective of how the data was analyzed and showcases to the reader how the data gleaned from the interviews answered each research question.

In presenting the findings, I directly quote participants extensively in order to platform their words, experiences, and perspectives verbatim. Participant quotes are italicized to explicitly and seamlessly denote that they are participants' words. In

some cases, quotes are shortened and concepts synthesized; when words have been omitted by a quote, I use ellipses. Each theme in the findings was derived directly from participant quotes and each quote presents an example of those themes. I accompany these quotes with explanations of their context to larger connotations compiled during data analysis. As a researcher, my role is to synthesize and draw meaning from participant experiences and then present that meaning in a structured manner. In this sense, my role is as an actor in the construction of these findings, and not solely an objective scribe. This acknowledgment does not undermine the significance of my findings, but complicates the richness of the data interpretation of myself and my advisers, Stacy Branham and Foad Hamidi, who each bring their own identities as researchers—as all researchers do—to the table.

Research Question 1: How Do Transgender Users

Experience Safety Online?

The Unsafe Reality for Transgender People: “I Feel Unsafe All the Time, Really”

Participants (8 of 12) expressed feeling unsafe on a regular basis in real world situations and shared the sentiment voiced by T2 in the heading of this section: almost all spaces are unsafe. Feeling unsafe was attributed to past experiences of physical violence, sexual harassment, and sexual violence perpetrated against them.

Participants had been yelled at, spat on, and accosted by strangers. Moving through public spaces in a city where gender-based violence is frequent was a reminder that emotional and physical vulnerability were real (P2, P4, P3, P10, T2). P4 explained that she “*get[s] coffee a block down from a place where a trans woman was killed two years ago.*” She described this awareness as a reminder of her own susceptibility to violence as a trans feminine person.

Various identity markers signified people who might be dangerous: neo-Nazis (P2, P4), “*anti-social justice warriors*” (anti-SJWs; P2, P7), conservatives (P2, P7, P8),

“confederate flag bearers” (P7), the alt-right (P1, P7), TERFs (P9), *“country people”* (P8), Christians (P9), and *“trans chasers”* / *“fetishists”* (P1, P2, P3). Many participants describing being wary of cisgender men as a broader group (P1, P2, P3, P4, P7, P8, P9, T2).

Intersectionality also impacted safety (P1, P2, P4, P5, P6, P7, T2, P9, P10). P2, P6, and T2 spoke about the risk of violence that comes with being a trans woman of color, a trans sex worker, or both. P2, P4, and T2 explained that heterosexual trans women were at a higher risk of violence compared to lesbian trans women or trans women who refuse to date men. T2 identified *“toxic masculinity”* and *“fragile masculinity”* as the source of male violence towards trans women, which she stated are upheld by American legal institutions through *“trans panic”*⁵ defense arguments.

⁵ a legal defense employed by a defendant of a violent crime claiming that temporary insanity caused their violent behavior towards a transgender person

Even identities which our participants did not hold could complicate the way trans people assess unsafe situations. P4 described the identities strangers project onto her when being harassed or threatened on the streets of her city:

“Does this person think that I’m a gay man and he’s calling me a faggot from across the street? ... Does this person know that I’m trans and think that I’m trying to deceive him personally? Or is this person a white person who is yelling at me for being black and taking up space? ... I’m always thinking about that as I’m navigating spaces. Like, what could this person hate me for?” –P4

Digital Safe Spaces: “How Could You Be Trans Before the Internet?”

Participants articulated the revolutionary role of the Internet in building safe spaces for the transgender community. Both P6 and P9 came out as transgender before the Internet was widely used, and faced challenges that are more easily overcome in the digital era. Overall, the most common platforms participants viewed positively were Facebook (P3, P4, P5, P7, P10) and Tumblr (P3, P7, T2, P10).

Not only was the Internet considered a provider of safe spaces, but it was also a source of personal and social liberation: *“Undoing years of repression that every single trans person has”* (P2). The Internet was considered so essential to transgender

identity that younger adults often asked P6, now in her 60s, “*How could you be trans before the Internet?*”

Technology has supported trans users in finding a language for understanding their own identities, connecting with strangers online, providing platforms for activism, and maintain safety and wellbeing. Below, we share some of the ways participants found that digital spaces enabled identity exploration and access to peer support, which were often not accessible offline.

Finding a Language, Finding a Voice

The Internet has helped many participants come to *see themselves* by helping them collaboratively develop a vocabulary (P2, P4, P5, P6, P7, P9). For example, P6 recalled a time when she did not have access to supportive resources and community as she tried to make sense of her identity:

“When the only info about ... you comes out of abnormal psychology books, or little ads in the back of porno magazines, it’s hard to figure out that this is something natural, normal, part of life ... [Before the Internet] we were lonely, alone, scared.” –P6

Connecting to other trans people online provided affirmation, proof that participants were not alone, and sounding boards for grappling with identity questions:

“Having Facebook as a global community that I can bounce things, ideas, off of—‘Am I the only person who’s ... this way?’—and then finding out that I’m not.” –P4

In addition to helping trans people *see themselves*, online spaces also empowered trans people to *make themselves seen* by engaging in activism (P4), sharing resources (P10), and posting art related to trans experiences (P7’s poetry; T1’s comics).

Strangers Consoling Each Other

The Internet was overwhelmingly a place where participants could find and curate safe spaces by surrounding themselves with other trans individuals. Specifically, its ability to create connections that transcend physical space is significant for building community and personal support structures for trans users. Participants used various platforms to form connections with other trans users. P1 used Twitter to keep in touch with other trans friends; P2 first met another trans person on a video game called Space Station 13; and P8 described social media as a “*connector for trans people in [my city]*.” P7 explained the benefits of being able to separate offline social ties from supportive online social ties:

“When I wasn’t out yet [offline], I didn’t have to worry about confiding in people that are already very integrated into [offline] communities where I don’t feel safe. It was nice to have strangers consoling each other [online].” –P7

The affordances of the web were particularly useful to trans participants with intersecting marginalized identities. For example, P5, a black genderqueer person, used Google to search for other black non-binary people because they could not find these connections offline.

Using Technology for Activism and Outreach

Participants used the Internet as a means to organize and engage in social justice activism. P8 describes how important Facebook is for organizing in their city by local trans rights groups. P4 also used social media to participate in social action beyond state lines. She noted that thousands of people can sign a petition online and described how she could show solidarity of a protest of a cake shop in North Carolina that denied a wedding cake to a gay couple.

P6 discussed how social media allows activists to “*expand [a] live event into a virtual event.*” She hosted a local showing of National Geographic’s *Gender Revolution* on Facebook Live to promote understanding and a sense of safety for genderqueer youth in her local community:

“The young people who were genderqueer ... in the audience, to hear a positive response from people in their community to this documentary, it must

have felt good. It must have felt like, 'I can be okay, I feel safe in this community.'" –P6

Using Technology to Promote Physical Safety and Wellbeing

Participants (P4, P5, P7, T1, T2) used information online to avoid or minimize exposure to unsafe spaces in the offline world. P4 would check public transit online to minimize the risk of street harassment. P4 also explained that trans people use online crowdfunding platforms, like Kickstarter, to fundraise for gender affirming surgery or to find safe housing. P5 researched *"the general demographics of the area"* before going someplace to avoid unsafe spaces. P7, T1, and T2 all mentioned an app that helps transgender people find safe, gender neutral bathrooms nearby. P1 used mobile technology to connect him with family and friends who could help navigate threats in the offline world:

"I use Find My Friends, which allows [my family] to see my location, and if I'm out, my friends might say, 'Oh, message me when you get home safely.'" –P1

Other participants used technology to disconnect from abusive strangers. P4 relied on mobile technology to filter out street harassment offline:

"Headphones are the greatest weapon against harassment and misgendering for an urban transgender ... I put in headphones and I can't hear people yell shit at me." –P4

Yet, P4 thought technology could only help so much. She believed seeking advice from local elders in the community, either offline or online—who could tell younger trans people things like: “*don’t go to this place, they’ll fuck you up*” or “*don’t speak with this person, they’ll sexually assault you*” (P4)—was the most effective way of staying safe.

Digital Threats to Safety: “There’s Always a Loophole for People Who Want to Harm Trans People”

Participants saw the Internet as a tool for safety through connecting with trans-positive people and insulating themselves from trans-negative people. However, technology was also a source of harm caused by negative interactions with others. Furthermore, online spaces can be appropriated by “*abusers*” (P2), abusive users who caused harm to participants. The same affordances that make the Internet a place for trans organization also enabled abuse by anti-trans people:

“There’s always a loophole or a backdoor for people ... who would want to access information with the intent of harming trans people. The thing on the Internet that I’m most afraid of is ... places that give people who want to hurt us or harm us a place to organize.” –P7

Although considered the most positive platform among our participants, P1, P4, and T2 noted negative aspects of Facebook for the trans community as well. P1 said

“certain portions of really big social media sites, like Facebook, Twitter, Instagram ... are vehemently transphobic.” P1 felt that social media was often a place for like-minded, anti-transgender users to congregate.

Abusers made up all or parts of digital platforms—Reddit (P4, P7, P10, T1, T2), YouTube (P10, T1), Twitter (P1, T1), Facebook (P1), Instagram (P1), 4chan (P1), 8chan (P2), and various dating apps (P1, P2, P3, P4, P6, P7, T1)—unsafe for trans people. Participants describe the different, multi-faceted, and often overlapping forms of harm experienced online.

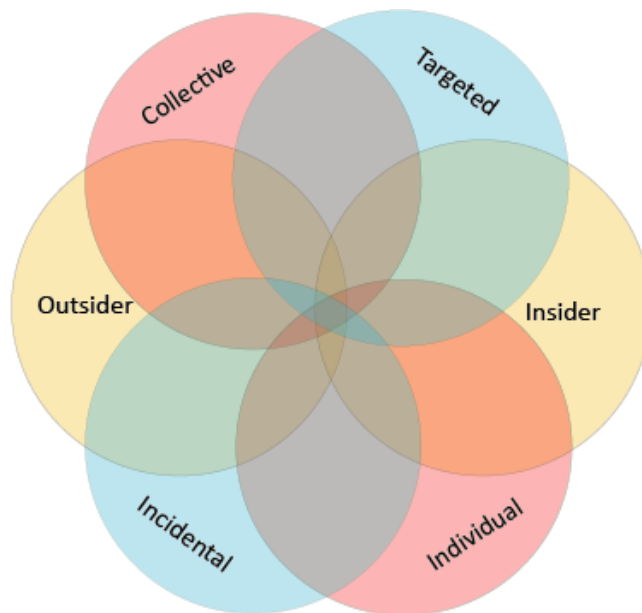


Figure 1. The above graph shows the 6 Forms of Harm identified in this study. There were 3 dichotomies of harm. 1) Outsider/ Insider harm; 2) Targeted/Incidental harm; and 3) Collective/Individual harm. While these dichotomies may be experienced alone, they can also overlap with each other (e.g. one can experience Individual harm that is also Incidental, Targeted, Insider, Outsider and/or Collective harm.).

Outsider Harm

Outsider harm can be defined by anti-trans harm perpetrated by individuals outside of participants' social circles or the larger transgender community. P9 describes the way the Internet gives abusive users access to transgender “*enemies*” they can harass:

“[The Internet] has ... given [reactionaries] the power to identify ‘the enemy’. If somebody’s a right-wing religionist who feels that trans individuals are an abomination, technology has given them the ability to identify who those abominable people are.” –P9

Affordances of web-based technology and online platforms have allowed outsider to be appropriate technology and attack transgender users. While anonymity was used as a tool for safety by some participants, it also enables harassment and harm online. Participants identified websites that they considered unsafe due to anonymity or polynimity, such as 4chan (P1), 8chan (P2), Tumblr (P10), Reddit (P10), and YouTube (P10).

T2 explained that on Tumblr, trans people use hashtags like #mtf (male to female) and #trans to find each other, but there are people who troll these hashtags by using

them to annotate trans-negative posts. Other participants came across anti-trans content on forums that disturbed them:

“The website 8chan—I stumbled across board called ‘transfags’, which is basically bunch of cis men talking about how they want to brutally murder or hate crime trans women and encouraging them to kill themselves.” –P2

Lack of safety was attributed to homogenous online “bubbles” (T1) of “destructive” (T1) anti-trans communities. Destructive anti-trans communities were viewed as negative outsider communities by participants.

Insider Harm

Insider harm was committed against participants by individuals who were within participant social circles, the larger LGBTQ community, or spaces considered otherwise trans-positive or safe. Some participants (P1, P4, T1, T2) described incidents of harm in spaces they regularly sought comfort and validation. People within LGBTQ groups and communities can also display anti-trans or anti-non-binary

attitudes, which P4 refers to as “*lateral violence*”⁶.” P1 said he had interactions with other trans people in comments sections where he was told “*non-binary is not real*” and it “[makes] ‘real’ trans people look bad.” P2 described an online community of trans women called “*Baeddels*” who used abusive tactics to harm others in the trans community.

Awareness that people within your own community or from “inside” your social circle could be harmful led participants to alter their online behavior in order to protect themselves. For example, P4 chose not to post some things on social media, and spent time deleting others:

“[I deleted my] old name, and just shit that could be dragged up to disparage me ... People will lurk on my page just to get material to fuel their hate-filled whatever against me.” –P4

⁶ Sometimes referred to as horizontal violence, lateral violence is hostility, discrimination, or abuse directed at one’s peers or other oppressed populations [133]

Targeted Harm

Targeted abuse was categorized as abuse, harassment, or cruelty aimed directly at participants. For example, P10 received hateful anonymous messages on eir trans Tumblr blog, and anti-trans users invaded eir trans Discord chat servers that ey advertised on eir blog.

Participants (P1, P2, P4) also described being subject to direct objectification online by users with *“toxic fetishizing attitudes”* (P2), called *“trans chasers”* (P2, P3).

These users targeted trans individuals with invasive questioning about their bodies that *“invalidate[d]”* (P1) their trans experience. For example, P1 said that people *“message [him] on dating apps and ask ‘What’s in your pants, or what really are you?’”* P4 said this was a common experience for trans women on dating apps, and she has also received *“jarring”* messages that were *“unwelcome and unwanted overly aggressive sexual things.”*

Bridging offline connections with those trans users meet online can also be risky, even if the other did not necessarily appear abusive. For the trans community, transphobia on localized meet-up apps, like dating apps, can have dangerous implications for those who meet others offline. P2 described a friend who

appropriated dating apps in order to do sex work who “*was held at knifepoint*” (P2) after going to meet their client.

Incidental Harm

Incidental harm described harmful content witnessed by participants, but which was not directed at them specifically. This included observation of comments, conversations, posts, pictures, ads, and news articles. Incidental harm was more commonly experienced by our participants than targeted harm; still, participants attributed negative emotional and mental outcomes from observing this content. Witnessing anti-trans and LGBTQ content resulted in emotional distress.

In one instance, P8 witnessed an incident on Facebook after the 2016 U.S. presidential election that made them feel “*anxious*” on the platform. As a result, they restricted their Facebook use to direct messaging friends and finding events:

“[My queer friend’s] family members piled on him ... saying things like ... ‘Why would you want gay marriage if you’re just gonna get AIDS and we’ll have to pay for your healthcare?’ ... His family has not ... no one is speaking to him.” –P8

Some participants felt the way digital technology and social media is designed allowed for negative experiences. Participants expressed that portrayals of trans

people online are often “*starkly cis people’s perspectives, whether it’s well intentioned or not*” (P8) and tend to propagate “*misinformation*” (T2) about trans people. P4 and T1 attributed the way some platforms bred unsafe spaces to the lack of consideration or understanding of trans peoples’ needs:

“They’re not made with the concerns I would have in mind. Like, the way that Twitter has really allowed a lot of awful trolling, for example. That’s just a clear demonstration that their values are different than my values.” –T1

“There’s massive problems in the way that dating apps are structured that make them unwelcome for trans people ... There’s no dating app for me that I can be like ‘You know what, I don’t wanna see any cis people.’” –P4

P3 described a specific example of incidental harm caused by platform design: the way targeted ads on Facebook can “*inadvertently out*” people by revealing their gender identity to others who might see their screen. In another instance, Facebook’s auto-play video feature resulted in P4 unexpectedly witnessing triggering (emotionally distressing) content:

“A video of a Brazilian transgender woman being beaten to death, and it was an autoplay video on Facebook ... Seeing the death of black people recurring over and over again [on social media] got to be incredibly frustrating and hurtful.” –P4

Participants seeking out positive resources sometimes came across negative ones by accident. T1 recalls looking for trans resources on Reddit and stumbling across a TERF subreddit (a user-created forum hosted on the website Reddit) they originally

thought was trans affirmative, while T2 describes the impact this content had on her own self-image. T2 also stated that this experience resulted in her no longer seeking out information on trans identity on Reddit.

“When I first found [this group], I was like ‘oh cool, a trans group, this’ll be fun, there’s a community for me here’ ... I didn’t understand all the acronyms at first ... then I realized this was just a group that was really upset about trans people taking away what it means to be like female.” –T1

“[On Reddit, there were] subreddits for people who believed it was a sexual fetish. ... That made me feel more pathologized, more fucking deviant or abnormal because I was reading this fucked up shit people were writing.” –T2

Individual Harm

Individual harm described harm that impacted a specific individual, rather than a collection of individuals. This harm could be committed by outsiders or insiders and could be targeted or incidental.

One impact of harmful behavior online that was a major concern for participants (P2, P3, P8, T2, P10) was “outing” (having one’s trans identity disclosed without consent). Participants’ fears of repercussions from being outed included: being kicked out of one’s home (P10), having trouble getting hired (T2), being harassed by coworkers (P10, T1), oneself or one’s relatives being fired from their job (P8, P10), having one’s

home vandalized (P8), and being physically or sexually assaulted (P10). P10 also described the fear of anti-trans abusers finding em offline:

"There are people [online] who ... want to rape, or beat up, or kill people who are queer, and so if they knew where I lived or they found me on the street at night, then they might try that." –P10

Stalking was a concern for participants (P2, T2, P10). *Cyberstalking* describes the use of technology to monitor, threaten, and harass participants; for our participants, this was motivated by their gender identity. This practice was also often perpetrated by strangers on the web, but also by those close to participants. P9 explained various ways she has been the target of stalking by TERFs and how it affected her offline life:

"I had one TERF call family members of mine and tell them I was crazy and needed to be institutionalized and that I have, because I've medically transitioned ... self-mutilated my body." –P9

One participant (P2) was outed due to stalking from an insider, a family member who found trans content on her Tumblr blog. Despite being careful to make two social media accounts to conceal her gender from family, she was unexpectedly confronted by her mother about being trans:

"I specifically limited my online presence because I knew that my mom sort of stalked my internet presence to try to figure out stuff about me ... I would keep my Tumblr blog in like a hidden mode ... Previously she'd actually physically taken my computer and gone through my browser or my chat history." –P2

Cyberstalking can also be accompanied by a practice called *doxxing*, where online abusers publish personal, identifying information of a person online with the intent of harming them. T2 found her name on an online list and was afraid of the implications it could have offline, including job security:

“There was someone who had a list of trans people. You would go on this thing online—basically, if you were public in anyway, you could find yourself. I could find myself ... I don’t know how they did it, maybe they scraped Google searches ... Honestly it looks like something just used for doxxing ... It was pretty fucking scary ... That person never asked me if I could be on that thing.” –T2

Collective Harm

Collective harm had implications beyond the individual and could affect larger trans communities. For example, some participants (P4, P7) talked about local trans safe spaces being targeted by anti-trans communities online. P4 explained that neo-Nazis identified brick-and-mortar DIY (do it yourself) spaces—which often serve as affordable housing and places of free expression for trans community members—and then mobilized on Reddit and 4chan to shut them down. Both P4 and P7 stated that their city’s own DIY space was targeted, leaving many trans people homeless. P7 provided researchers with screenshots of this online organizing. The researchers then found the forum on 4chan’s board, /pol/, to discover that the abusers P4 referenced

called themselves the “Safety Squad” and replicated digital iconography of Pepe the Frog⁷ and the Nazi party’s stylized “SS”⁸ to brand their effort. They used the web to find and catalog DIY spaces in urban cities around the county. Then, they used social media to coordinate distributed efforts to alert local officials about these locations and have them closed, under the guise of preventing another fire like that in Oakland, California’s Ghost Ship DIY space [137].

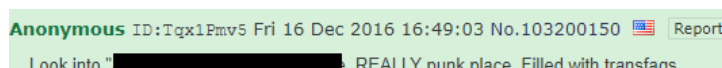


Figure 2. An anonymous post in 4chan's /pol/ ("politically incorrect" forum) discussing the shutdown of the trans-inclusive DIY space P7 named.

These anecdotes provided by participants offer insight into the larger scale offline harms malicious organizing online can have on transgender individuals and their communities.

⁷ a meme appropriated by the alt-right to become a racist hate symbol

⁸ short for “Schutzstaffel,” the Nazi party’s governmental body, literally meaning “Protection Squadron”

**Research Question 2: What Do Transgender Individuals
and Technologists Think About Automatic Gender
Recognition (AGR)?**

***Previous Experiences of Misgendering: “The Base Alienation
that Comes with Transphobia”***

Misgendering in Physical Spaces

Participants discussed the negative impact of misgendering on their mental and emotional wellbeing. Some (P1, P2, P3, P4, P7, T2) reported being more often misgendered offline. Participants who identified as non-binary (P5, P8, P10) reported never being gendered correctly by strangers. Others (P2, P6) who said they usually “pass” (e.g., are correctly gendered by others) in person, reported instances where they were misgendered on the phone or through voice chat where people cannot see them.

Participants (P1, P2, P7) described feelings of frustration and emotional exhaustion that come with trying to avoid being misgendered by others:

“It can be exhausting to have to go out and be misgendered. [It makes] me dysphoric. What about my face is like this gender that I don't identify with? ... [It] makes me try to hide that trait from other people ... If I feel like my chest is sticking out too much, I might ... wear longer clothes or try to ... lean forward.” –P1

The frustration stems not only from being misgendered, but also from an awareness that others simply do not know their gender identity exists: *“It’s annoying that [people] don’t think that, ‘Oh! Non-binary is a thing”* (P5).

Misgendering in Virtual Spaces

Participants (P1, P2, P3, P4, P7) said that technology and especially online spaces presented them with more control over how others see their identities and interact with them. P3 said he can control his avatar or image online, but he *“can’t control everything in real life.”* P7 said he would actively manage his gender presentation online with *“things like the angle of [his] jaw when [he] would take a picture”* to *“masculinize”* his facial features. These mechanisms were particularly valued by people who did not pass as their preferred gender in face-to-face situations. Further, ease of gender presentation online supported more fluid, day-to-day expression along a gender spectrum (P4).

However, participants (P7, P10) also noted that online systems could reinforce problematic gender expectations they usually faced offline. P10 said online surveys that forced them to pick male or female are “*terrible*” and that the lack of pronoun options on some sites is “*frustrating*.”

“When I see the language of male and female ... as the only two options, ... that’s an indicator that they haven’t done one of the most basic things to accommodate trans people, so I don’t know if I can trust the rest of the experience.” –P7

While online profiles support more control over gender presentation and thus reduce misgendering by other users, the system itself can misgender users by embedding inflexible binary gender categories.

Can AGR Really Work?: “I Would Show Up as a Blip or an Error”

When asked about their impression of AGR, all 13 participants had serious concerns about the assumptions these systems make about gender and how they might reflect on the trans community.

Some participants (P2, P8, T2, P10, T3) disagreed with the assumption AGR systems make about the nature of gender as something that can be classified using external

features; they stated that gender is an internal identity not necessarily tied to physical features:

“The very premise is flawed. It’s not even a matter of adding more categories [of gender] ... You [cannot] map a sort of appearance or map a presentation onto a gender with anything approaching accuracy.” –T3

Other concerns about accuracy were related to fluctuating gender presentations (P7, P9, T3) achieved with makeup, hormone replacement therapy (HRT), and/or gender affirmation surgery. On the flip side, lack of access to these options as well as realistic limitations of changing one’s physical body to match their identity also raised concerns:

“Whose gonna change their wrists? Or whose gonna change ... their bone structure to the point where they’re either going to look male or look female? Are you going to change your rib cage, are you going to change your hips?” – P9

Here, P9 explains how AGR algorithms based on physical form might make it difficult to accurately identify one’s gender while simultaneously placing unrealistic expectations on transgender bodies to conform. This quote captures the stress that can result when socially-constructed standards are materialized and imposed on users through technology implementation.

Finally, P7 noted that trans people are often mistakenly accused of “*catfishing*,” or luring others into relationships using false and constructed online personas. He was therefore worried that AGR systems might flag transgender individuals, lumping them in with ill-intentioned people trying to commit fraud or deception.

Impact of Being Misgendered by AGR

All participants acknowledged the potential harm of being misgendered by AGR. They differed on their reading of the severity of misgendering perpetrated by an algorithm as compared to a human being.

Worse than a Human: “It’s the Worst Social Exclusion”

Most of the participants (P1, P7, P8, P9, P10, T1, T3) considered misgendering by AGR *worse* than being misgendered by another human being. This stemmed in part from the fact that AGR simply introduced another potential source of invalidation. P7, P10, T1 and T3 were concerned that it would add to the regular exhaustion and impact of being misgendered that they already experience.

“I get misgendered enough by ... human beings, why on Earth would I want a robot to help in that? ... Programmatic misgendering, it sort of just adds to the ocean we all swim in of constant small comments ... [Misgendering] is death by a thousand paper cuts.” –T3

Participants also foresaw that increased misgendering would lead to an increase in its negative effects:

“That would just increase trans people’s dysphoria [e.g., the distress or discomfort some transgender people experience when their physical body does not match their gender identity], as well as increase the amount that they’re getting misgendered, which is terrible.” –P10

For others, the distinction between human and computer mistakes was significant.

One set of concerns was rooted in the belief that AGR systems might not allow users to perceive and therefore correct gender classification errors. P9 and T3 expressed being more tolerant of human mistakes, because *“people you can correct”* (T3). In the long-term, it would be *“really demoralizing”* (T1) to consistently be seen as *“something that you’re not”* (T1).

Other participants (P1, P4, P7, P8) expressed that being misgendered by a computer was worse due to the perceived objectivity of computer systems:

“Computers are said to be a lot smarter than people ... I would feel a little bit worse if there was a software that looked at everything about me [and misgendered me].” –P1

“Not only is human error getting my identity false, it’s computers and AIs and technology also messing up too. It’s not a person’s uncertain perception, it’s a more precise mathematical analysis of me that led to this conclusion, which kinda would rub it in my face even more.” –P7

In contrast, P8 was aware that computers carry the biases of their human developers. But, as a result, he interpreted being misgendered by a computer as a more severe act committed by many people as opposed to just one:

“It would probably feel shittier if this million-dollar piece of software developed by however many people decides that I’m this thing that I’m not.” – P8

Finally, both P1 and P7 thought being misgendered by AGR technology would reinforce gendered standards that transgender individuals would then internalize and hold themselves to. The perception of computers as somehow being more “*objective*” or as a synthesis of general human standards led participants to a sort of insult-to-injury mindset because they interpreted the gender label assigned by the computer as more definitive and exacting.

The Same as a Human: “A Misunderstanding of Gender”

Other participants (P3, P5, P6) said the impact of being misgendered by AGR would be the *same* as being misgendered by a human being because, like humans, machines are “subjective.” P3 also attributed AGR misgendering them to its designers having a “*misunderstanding of gender as a whole.*” However, they thought the impact of

misgendering was *“basically the same, because a person would be responsible ultimately for making and designing [AGR]”* (P3).

Better than a Human: “Oh, this Machine is Stupid”

P2, P4, and T2 thought being misgendered by AGR would be *better* than being misgendered by a human being. P2 and T2 both said they would view the mistake as a flaw in the technology, for which they would judge the designers:

“I’d be like, ‘Oh, this machine is stupid,’ you know? It would tell me something about the assumptions of gender that were being put into the design.” –T2

P4, however, was more focused on the sophistication of human versus machine classifiers. She suggested that being misgendered by AGR would be less concerning because there would be less perceptivity and intentionality behind the mistake:

“A human being misgendering a person can be a lot more nuanced and it can mean a lot more or less depending on the person it’s coming from ... Robots misgendering me is kind of like a fake objective ‘you look like a man,’ but there is no objective look of masculinity.” –P4

Regardless of where participants stood on the spectrum of AGR being worse, better, or the same as human beings misgendering them, none of them expressed that AGR getting their gender wrong would be viewed positively.

Questioning AGR's Necessity: "What Benefit Would this Provide to Society?"

Participants were skeptical of useful or necessary applications of AGR and they all questioned whether implementing it would offer any benefit to end users. Most of the participants were familiar with other automatic recognition technologies: nine out of 13 participants had used automatic facial recognition technology before. However, of the 10 trans non-technologists and 3 trans technologists, none of them could imagine any benefit that AGR would offer its users. Put bluntly by P9:

"It has no social redeeming value ... I either would totally ignore the [AGR] robot, [or] if it were possible, kick the robot in the balls and knock it over and get out of my way." –P9

P2, P3, P4, P7, and P10 were against the development of AGR due to its potential negative impact.

"I don't know if [AGR] would intersect well with transness ... It sounds like it could be bio-essentialist [e.g., reducing gender information to biological characteristics]." –P3

Several participants related their concerns about the similarity of AGR to facial recognition software. P10 described how she was "wary" of facial recognition software because of how it could be used for "gendered marketing." P10 described

the face tagging functionality of Facebook as “*creepy*.” P4, P5, P9, and T1 all stated that automatically gendering others on sight was undesirable.

“Why in the first 30 seconds that you meet someone, whether it’s a robot or human, [would you need to know their gender]? The only reason we have to establish gender really is so we can use the right pronouns.” –T1

P6, P7, and P8 questioned what the benefit would be, both in the context of society and to developers.

“Particularly with the range of expression of gender now, I just wonder ... if that’s actually valuable information.” –P6

P9 was the most optimistic of the participants. Although she was concerned that the potential “*negatives outweigh the positives*,” she also expressed hope that if designers could adjust for the negatives AGR could have potential. Nonetheless, both P9 and P10 did not feel it would work out in the current cultural and political context.

“Right now, I don’t see programmers having the ability to screen out or prevent the negative use, the hostile use.... I don’t think we’re progressive enough as humanity to successfully navigate the use of that kind of a program for only good.” –P9

All three technologists (T1, T2, T3) also disliked the concept of AGR. T1 and T2 had used facial recognition software in lab contexts before and were familiar with technology (e.g., Microsoft’s Face API) that has features to detect age, gender,

emotion, pose, smile, and facial hair on images. T3 had experience researching facial recognition, and stated that they had encountered it in airports before.

T2 said that technology that could serve cisgender people may be unable to serve transgender people, because in technology design the “*treatment of identity [is] poor.*”

“[These] algorithms ... they’re looking for certain things. They’re looking for masculine landmarks or ... feminine contours, or whatever ... it’s not clear how that stuff is made. Who’s making those decisions? That’s binarist as fuck.” –T2

Technologist participants expressed a sense of resignation about their lack of agency in designing AGR:

“The work that they’re doing has no provable meaningful benefit. It does have provable meaningful harm ... I think (trans people) should absolutely be concerned ... Yeah, this is bad technology, and yeah this doesn’t work, but ... there will always be someone willing to deploy it.” –T3

AGR as a Tool for Abuse: “It’s Just Going to Exacerbate what’s Already There”

Participants expressed fear that AGR could be used, whether intentionally or not, as a tool for renewing oppressive structures that already affect the trans community.

Participants’ concerns about AGR being employed for abusive purposes echoed the

findings which answered Research Question 1. Specifically, they were concerned that AGR would reinforce gender binaries, override user autonomy, and impose surveillance that undermines privacy and safety. P4 articulated the experience of abuse and oppression that trans individuals already face and how AGR would intensify it: *“There's already so many eyes on every trans person navigating through the world and we all feel those eyes ... It's just going to exacerbate what's already there.”*

AGR Reinforces Gender Binarism

Participants (P1, P4, P8, T1, T2, T3) viewed current AGR implementations, which classify targets into male or female categories, as reinforcing a binary gender system. Adopting a binary male/female scheme excludes, invalidates, and assures the misgendering of non-binary identities. Further, as T2 pointed out, binary AGR systems would likely give preference to transgender people who *“pass”* as their gender identity by conforming to binary categories of gender expression.

Participants (P4, P8, T1) noted the incongruous pairing of futuristic AGR technology with old-fashioned conceptualizations of gender and its value to society:

“I don’t think [AGR is] good or necessary moving forward in a world where we’re caring less about gender.” –P4

“For legal IDs, we put sex ... but we don't have blood type on IDs, which doesn't make sense because when EMTs [e.g., Emergency Medical Technicians] open the wallet they don't always need to know what your genitals are but they do need to know what blood type you are ... It doesn't need to be gendered, that doesn't need to be the system of classification.” –P4

P4, P7, P10, T1, T2, and T3 expressed that technological futures should not simply replicate archaic gender systems, they should drive them forward:

“People are raised to be really, really cissexist ... whereas a robot or a screen or some kind of technology, they’re not raised in society, so they have no reason to misgender you except that someone specifically programmed them to do so.” –P10

From this perspective, AGR in its current implementations represents a “*missed opportunity*” for progress (T1). Consequently, AGR is a missed opportunity for including the trans community:

“We're excluded from the direction of the future ... that's sorta what it feels like.” –P7

AGR Undermines User Autonomy

Concerns about violations of user autonomy in relation to AGR and a lack of trust that emerged as an important topic in interviews. Specifically, several participants (P2, P4, P7, T3) described AGR as non-consensual:

“[AGR] is (1) completely unnecessary, and (2) undesired by many people who would be interacting with the software without their consent.” –P4

P2 described an incident in which an “*electronic billboard that crashed and revealed the program running beneath it*” was being used without user consent to identify the age and gender of people for targeted advertisements.

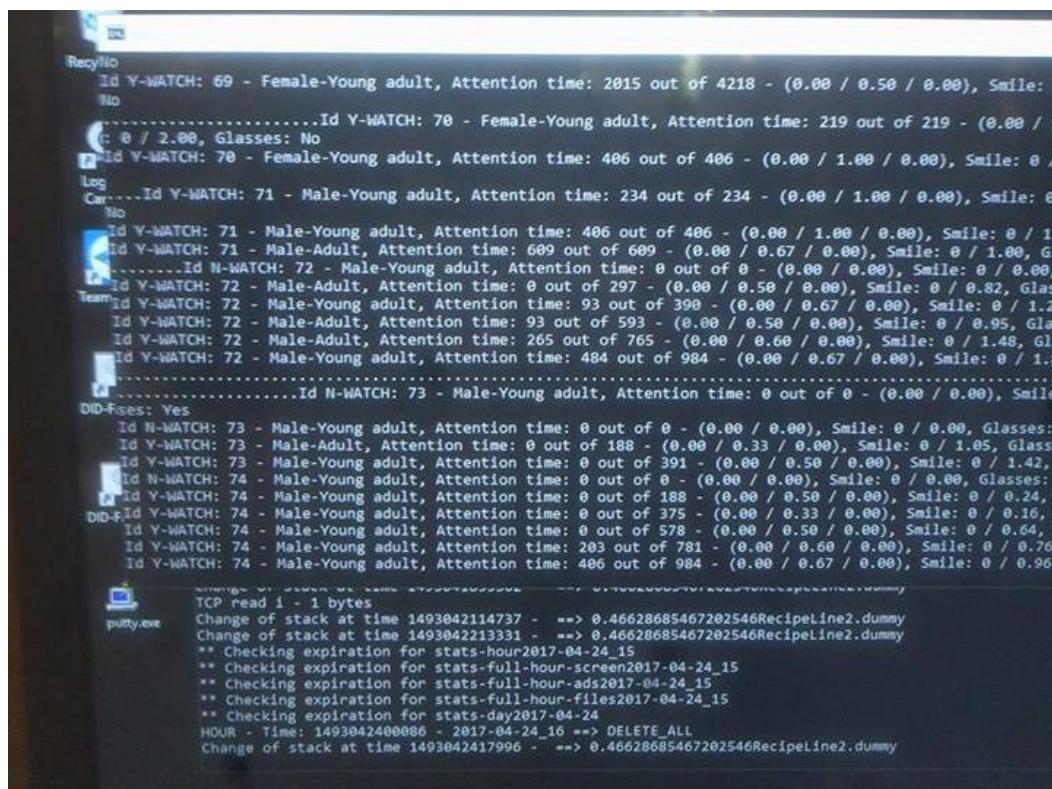


Figure 3. A photo of the billboard P2 referenced [61].

In addition to general disapproval of being gendered by a machine, P2 and T3 worried about whether their personal data would be stored and potentially sold to third parties.

AGR is a Tool for Surveillance

Participants (P2, P4, P7, P9, T3) were fearful that AGR could and would be used as a tool for surveillance. Lack of privacy was a common misgiving among participants, for whom AGR was perceived as uncomfortable and invasive:

“I would certainly be uncomfortable ... it’s a [high] level of invasiveness of photographing or recording your face.” –P2

But even more salient was the fear that surveillance infrastructures erected by AGR systems could be used to persecute the trans community. P2 was “*sketched out*” by AGR as well as facial recognition technology, believing they open new “*dystopian surveillance state potentials*.” The consequences cited ranged from being the target of yet another source of scrutiny, to being physically brutalized:

“We don’t need to feel another robot overlord set of eyes ... If security cameras were constantly on the hunt for my gender, I think that I’d be brutalized ... I think that I’d be exposed to a lot of violences that are unnecessary.” –P4

P1, P8, P9, and P10 also drew lines between AGR and other surveillance technologies that have been used by those in power to harm queer communities. P8 recalled a surveillance program run by their city without residents' knowledge, leading to skepticism about AGR technology:

“A lot has been illuminated in recent years about abuses of power and what can happen when people who have whatever bias are in control of certain surveillance technologies ... I’m also very aware of histories of surveillance being used against queer communities or communities of people of color.” – P8

AGR Threatens Safety

Participants identified several ways in which gender binarism, lack of autonomy, and surveillance imposed by AGR systems might present threats to emotional and physical wellbeing (P1, P9, T1) and civil liberties (all participants) of trans individuals. From the unrelenting emotional toll of daily microaggressions, to losing your job, or to being physically attacked, a future with AGR was interpreted as highly consequential:

“It’s easier for a cis person to be like, “Oh, that’s wrong.” But it’s more of a daily fight for a lot of trans folks, so I could see that being ... harmful. And also, it could be a safety issue ... Like the fear of being outed ... That could have job consequences or physical safety consequences.” –T1

All participants raised concerns about the possibility of AGR being misused to perpetrate discriminatory acts. P4 and P7 expressed fear that the system would be used in “malicious” (P7) ways to target trans people, especially those whose physical features do not conform to expectations of the AGR system:

“People who don’t fit promptly into the gender binary would be highly brutalized.” –P4

P2 imagined such a system preventing trans people from entering bathrooms that match their gender:

“You could see in some state, like if North Carolina’s still insistent on passing bathroom laws, detectors that try and gauge your gender based on your face every time you want to enter a restroom.” –P2

Similarly, P2, P4, T2, and P9 expressed concern that AGR could stand in the way of trans people gaining traction in the legislation that directly affects them, including healthcare and bathroom laws:

“[People think] ‘God forbid, trans folks win and consolidate power and have full authority over what gets made and what gets done’, I think that [for anti-trans people, AGR] would be the worst. Being able to out any trans person, being able to track trans people.” –T2

P9 expressed her fears about the current presidential administration in the United States using AGR in conjunction with tracking or a registry to exclude trans individuals from government employment:

“If you think about it politically now, if Hitler had had that ability, there would be a lot of dead people. If Trump has that ability, there’s a way to exclude trans individuals from government, from employment.” –P9

Finally, P9 explained that AGR technology is situated in a cultural and historical context that augment the probable uses and impacts of technology adoption. While AGR might someday be acceptable, in the current time it is a dangerous proposition for the trans community:

“Maybe in the future [possibilities for misuse become] less, but at this point in time [AGR is] dangerous, because I think it can be misused much more than it can be used appropriately.” –P9

Most participants (P1, P4, P7, P10, T1, T2, T3) were concerned that AGR will perpetuate and potentially amplify systems of oppression for transgender people.

AGR’s Impact Beyond the Transgender Community

While participants’ concerns were primarily about how AGR could negatively impact the trans community, they also expressed concerns about impacts to society at large:

“[AGR is not just a trans issue, it is] a misogyny and patriarchy issue because we’ve created these narrow boxes around policing male and policing female.” –T1

P1, P4, and T1 brought up the possible harm that misgendering cis people might cause.

“Guessing people's gender wrong [is] very bad ... People would react badly to that ... You could equally misread my wife for her gender using that facial technology.” –P6

Some participants (P2, P4, T2) also described how in their opinion biases in software design are not limited to gender and extend to other issues, such as race. P4 mentioned disliking Snapchat because its filters are “racist” and the filters “always give you blue eyes” and “change your face shape to be more European.”

“[AGR] may have trouble with the way that ... different races have different facial patterns.” –P2

P4 and T2 both blamed this on limited representation in technology design. They attributed bias to limiting datasets to data about white people, insinuating this could impact how gender is predicted.

“Based on... the proportion of people [tech companies] hire being trans or not, being women or not, the fact that tech is still majority white and male ... What kinda people are the bases for these predictions of ‘what gender are you?’” –T2

Incorporating Gender into Technology

While participants did not have a positive view of AGR, they expressed positive views of other forms of technology in general. Several participants had suggestions on how designers could adopt more inclusive practices to incorporate gender into technology.

T1 and P9 suggested giving people autonomy over the way they are gendered by technology. T1 suggested that technology should “*just ask*” people for their pronouns, while P9 said to avoid pronouns all together and choose to use names given by users.

“If somebody’s developing a robot that’s going to walk up to me and start interacting with me, the robot should say, ‘Hello. How are you? I’m R2D2. What’s your name?’ and once they get the input of my name’s [P9], the robot should respond with, ‘[P9], would you like a cup of coffee?’” –P9

P5, P7, and T1 recommended allowing users to explicitly consent and confirm their own identities, supporting their choice and autonomy in the interaction.

“I would definitely recommend having an option ... for the person to be able to confirm their identity or have an option ... for people to address that before it affects them.” –P7

T1 conveyed hope that, if technology designers implemented AGR well, it could be “*empowering*.”

“If technology were more inclusive, it could normalize a lot of things for the trans community, and for other folks, especially because it’s so ubiquitous.” –T1

P7, P8, T1, T2, and T3 advocated for including diverse voices in technology design.

T1 suggested designers should stop “*making assumptions about wanting to help the majority*.” P8 thought it was important to have “*amateurs meddling*” in the creation of new technology.

“[When] making new technology ... there should be a team ... to proof it or check it for these different things that would be really beneficial to people of marginalized identities.” –P7

“It’s about where you source the pictures you’re using from, it’s about how they are identified, it’s about what the categorical labels you use are, it’s about how the result is exposed to the user, and it’s about saying no to applications of the software that ... are provably harmful.” –T3

Finally, P4 and T3 suggested the effort put into AGR be used to create something more positive instead.

“Instead of investing energy into inventing a technology that genders people ... You could use that software to understand how gender exists in world.” –P4

5 Discussion: Technology May Propagate and Perpetrate Harm to Transgender Users

Chapter Overview

After conducting nine semi-structured interviews with transgender individuals and three with transgender-identifying technologists, I found that transgender individuals held fears about their safety regarding both pervasive and emerging technologies. I discuss the ways diverse experiences of harm rooted in pervasive technology use influence perceptions about the budding development of gender recognition technology. I conclude this chapter with a set of considerations for technology researchers and designers for mitigating the high risk of harm transgender individuals face when interacting with technology. These considerations address the complexity of harm identified in this study, the tensions of intention versus impact when harm is done, the acknowledgment that abusive users are technology users, and a call to provide support services to marginalized users.

Experiences of Harm are Salient and Diverse for

Transgender Technology Users

Previous literature regarding transgender identity within HCI has discussed the role of digital representation [12,50,51], support for gender transition [44,49], and utilizing technology to diminish negative experiences, such as finding gender-inclusive bathroom facilities [9]. This study sought to add to the present corpus of HCI research on transgender experiences with technology by delving into previously unexplored experiences with safety. Much like work discussed in the social sciences [80], this study found that the Internet has played a positive role for members of the transgender community, allowing individuals to develop a cultural language around identity, construct community and connect with other trans individuals, and engage more readily in trans activism.

However, this study also uncovered the prevalence of narratives of *harm* transgender individuals face when using digital technologies, an area that has been little discussed in research and has been absent from HCI. Common daily experiences of harassment and violence transgender individuals' faced offline were augmented by pervasive digital technologies. These experiences of harm encountered with common, everyday

technologies, like the Internet and mobile apps, also seemed to map to concerns about emerging gender recognition methods.

Although participants had minimal, if any, interaction with AGR methods and the technologies they are embedded in, all participants feared the potential harm that could be done to the transgender community and themselves by its development. This was often attributed to the gendered nature of AGR attempting to categorize individuals, resulting in potential emotional and social harms. Examining gender beyond a binary and static structure fuels an examination of AGR, which may not simply ingrain the “wrong” conception of gender, but may be unnecessary in a future that could move away from gender as a whole, making it an irrelevant technological pursuit. Considering computer vision that identifies features of other people in the environment is currently in use for *alleviating* negative safety concerns for individuals who are blind [19], it is apt to explore the way this would impact individuals with other marginalized identities.

Furthermore, the prospect of abusive users exploiting AGR to harm transgender individuals and other marginalized populations was of concern to participants. Participants felt that, much like the Internet, the affordances of AGR technologies

would allow for abusive appropriation of the technology to harm trans and other marginalized communities.

Participants identified a wide range of abusive user groups—Neo-Nazis, TERFs, the alt right, and more—who intentionally *targeted individual* transgender users, or a *collective* community of trans individuals, through appropriation of the ordinary affordances common to modern, prevalent digital technologies and platforms.

Abusive users anonymously contacting P10 with hateful messages represents an overlapping *targeted* and *individual* form of harm. Meanwhile, the 4chan users P4 and P7 referenced *targeted a collective* of transgender tenants in DIY spaces. Likely due to trends of negative experiences with safety and being harmed by abusive users of technology, participants also imagined abusers using AGR in nefarious ways to harm transgender individuals in communities if it was available to them. One concern was that abusive users appropriating AGR technology or collecting that data to target and harm transgender individuals, similarly to the ways participants described doxxing and cyberstalking online. T2 expressed that anti-trans abusers using AGR to “[be] able to out any trans person, [be] able to track trans people” was dangerous. P2 and P9 imagined AGR being leveraged against marginalized communities by larger political institutions, like state or federal governments.

Participants also identified abuse from seemingly *insider* groups, including other members of the LGBTQ and transgender community. Furthermore, abuse was not necessarily targeted, but could be unintentional, or *incidental*, while still holding negative repercussions for participants' well-being and safety. The diverse array of harmful individuals (*outsider* and *insider*) and forms of harm (*targeted*, *incidental*, *individual*, and *collective*) as described in Figure 1. identified in this study reveals that the Internet opens doors to harmful and dangerous repercussions for transgender technology users.

Lateral violence (or horizontal violence), a form of *insider* abuse perpetrated by other members of the trans community, resulted in participants feeling “othered” by their own peers within the trans community. For example, transgender users online commenting that non-binary identity besmirched the transgender community delegitimizes both non-binary identities and the experiences of abuse non-binary individuals may also face. Lateral violence opens the doors to heightened abuse from both horizontal and vertical directions, particularly against the most marginalized of the transgender community.

Participants expressed concern about, or had experienced, the negative ways abusive behavior of online users affected their offline lives. Cyberstalking, doxxing, and organized attacks on brick-and-mortar spaces coordinated through forums and social media represented some of the ways abusive users enacted harm on participants. Job consequences, loss of housing, and disruption of social ties represented potential implications for abusive technological tactics. These findings extend prior work on the offline consequences for youth due to the harassment and abuse online [110], highlighting the physical, emotional, and social consequences abuse of digital technologies may have on transgender users. The findings of this study indicates the need for focused consideration on the role of abusive appropriation of modern pervasive digital technologies and online media.

The Harm of an “External Gaze”

In Butler’s essay, *Performative Acts and Gender Constitution*, she discusses the ways gender is projected through cultural and historical productions onto the exterior body [20]. Feminist scholars have long been concerned with the concept of the “gaze,” specifically the male gaze, and the ways it impacts women’s internal identities (e.g. [99]). In this study, I found that the complexity of identity *projected* onto participants,

but not necessarily accurate of participants' true identities, led to unpleasant encounters which participants were then forced to grapple with internally. The external gaze cast by others onto transgender individuals also determines the potential abuses they may face—and convolutes the ways participants process the harm they experience. For example, P4's description of the internal dialogue she undergoes after dealing with harassment or threatening behavior leads her to question the source of said behavior. Whether she is threatened for being black, a woman, transgender, perceived as a gay man, or some combination of these traits, regardless of their accuracy to her own internal identity. This is similar to the way P6 was targeted by TERFs through various communication technologies; they targeted her for the "mutilation of her body," perceptions about her identity that she herself did not subscribe to.

AGR would also act as an external lens which assigns identity categories to individuals. The negative reaction participants had to the idea of their gender being misrepresented by a machine reflected prior research in psychology attributing experiences of negative emotional stress in transgender individuals to misgendering [70,88]. The misgendering of a trans person by AGR represents an example of the harm of projection of an outside machine onto another's identity. Participants already

claimed methods for avoiding misgendering and identity-based harassment, such as wearing headphones to block out abusive behavior on the street. Another concern was that misgendering by AGR could potentially out participants to others in the vicinity, resulting in physical danger as well as emotional harm, much like ads on Facebook.

While participants had varying opinions about the severity of impact a machine misgendering them had compared to a human being, all participants were nonetheless concerned about the concept. Many participants demonstrated an acute understanding that misidentification by an AGR system would be the consequence of embedded notions of gender written into the code by human engineers.

Intersectionality and Histories of Oppression Impact Safety

Intersectionality played a role in how participants experienced unsafe and abusive environments both online and offline, as is reflected in reports of offline incidents of violence and sexual assault perpetrated against members of the transgender community [62,139]. As discussed in previous work exploring the complicated reality of *safe spaces* [140], this study found that safety is fluid and identity-driven.

Black transgender participants encountered different experiences of abuse than white transgender participants; binary transgender participants encountered different forms of discrimination than non-binary participants. In some cases, spaces that were safe for some members of the transgender community could still be unsafe for others. Participants discussed the threats black trans women faced, demonstrating that trans individuals who hold numerous marginalized identities face distinctive challenges than those with more privileged identities. For example, P4 explicitly mentioned that “*seeing the death of black people*” cyclically on social media was harmful to her as a black trans woman. It can be assumed that the harm watching the same content would be different for a white trans woman.

An awareness of the ways surveillance has been used against queer communities and people of color seemed to promote distrust of surveillance technologies that might utilize AGR, particularly in the context of past and current stigmatization of transgender individuals. They expressed that it would threaten the safety of transgender individuals, rather than promote safety and security. Numerous participants expressed fear that AGR which collects and logs data on transgender individuals would intensify present day safety concerns relevant to issues like North

Carolina’s “bathroom bill” [69] and United States President Donald Trump’s exclusionary stance on transgender individuals [68,117].

Intentionality does not Negate Impact

Intentionality further complicates the notion of safety beyond a fixed, binary conception of “safe” versus “unsafe” or “abuser” versus “abused.” A concrete example from our findings is the tension found in *incidental* harm. While P3 found Facebook’s potential to inadvertently out trans people harmful, it is difficult to categorize Facebook developers as “abusive” for not seeing this possibility when designing the interface. However, the intentionality did not negate the harm potentially caused by this feature of Facebook, making P3 and others wary of technology designers who did not foresee these outcomes.

Similarly, AGR developers may not have the intent to harm transgender users with their technologies. Nonetheless, participants were concerned about its conception reinforcing the gender binary, undermining their autonomy, and threatening their safety. AGR developers who have utilized transgender datasets thus far have presented gender transition as a concern of biometric obfuscation [83], or disguise. Although the developers may not view their standpoint as transphobic or antagonistic,

it is also built on archaic stereotypes that endanger trans people's, particularly trans women's, lives [10]. AGR that is capable of identifying transgender individuals across their gender transition journeys may confirm numerous participant safety concerns about privacy and surveillance. Abusive users who decide to appropriate AGR technologies would have easier access to identifying transgender individuals, for example.

In the case of both pervasive digital technologies and AGR, participants believed that technology designers did not consider transgender perspectives, ultimately causing, or allowing, the harm of transgender individuals in the process. As affirmed by P7, participants expressed that the exacerbation of harm by emerging technologies to transgender individuals insinuated like they are “*excluded from the direction of the future.*”

Considerations for Technology Designers

Participants demonstrated frustration with technology designers who do not consider their role in technology creation and the harms and biases which underscore it. Given the ubiquitous concern transgender participants' had about harms caused by and with technology, how can designers prevent participants' fears of AGR from coming to

fruition? Participants of this study already had unique perspectives on how to better incorporate considerations for diverse gender identities into technologies in a way that would benefit individuals beyond the transgender community. Considering the harms that current systems present to transgender individuals—and, as documented previously, other marginalized populations (e.g. [25,27])—it is necessary to consider the ways the design of existing and emerging technologies may (negatively) affect the lives of already at-risk communities. I present a series of considerations for technology researchers and designers seeking to provide safety to trans and other marginalized users of their systems.

Design to address the complexity and context of harm. Due to the fluid and complex nature of harm identified in this study, eliminating it becomes a thorny issue. As demonstrated by Figure 1, the many facets of harm identified in this study can overlap with one another. Furthermore, harm could potentially change over time and impact different individuals with different intersectional identities in varying ways. For example, *Insider Harm* showcases that abuse can be perpetrated against transgender individuals by other transgender individuals; binary transgender individuals have different experiences with transphobia than non-binary transgender individuals. Furthermore, participants' experiences of harm were tied to

contemporary culture (e.g. P9's reference to Donald Trump; P2's friend using dating apps for sex work and being held at knifepoint), the knowledge of wider historical injustices (e.g. P8's awareness of historical surveillance used against queer communities and people of color), and the way they experience their identities throughout their lives (e.g. P6 and P9's experiences before the age of the Internet). The complexity of historical and cultural experience has previously been discussed for designing for the Global South in the form of post-colonial design [60]. Designers can begin to tackle this issue by situating their understanding of technologically-mediated harm against transgender populations as it exists within cultural context, historical injustice, and changing recent events.

Intentionality does not matter when harm is done. While technology designers generally have good intentions and do not anticipate their systems to be used in harmful or nefarious ways, good intentions do not always ensure that harm is not committed by abusive users or system affordances. Researchers continue to uncover new instances of ingrained biases that cause harm to marginalized individuals (e.g. [3,53]). This study found that the intentionality behind the harm did not matter to participants: they focused on the impact that the harm had on themselves and other transgender individuals. A black transgender woman being harmed by accidentally

witnessing a video showing the murder of another transgender woman of color on her Facebook feed may not have been an intentional form of anti-trans abuse on behalf of the poster of the video or the affordances of the platform. Similarly, technology which categorizes gender may not intentionally be designed to cause stress or emotional pain to transgender individuals by potentially misgendering them. Nonetheless, the concept of unintentional harm by AGR still upset participants and made them fearful of such a technology. To address intentionality, researchers and designers should incorporate methods which capture realities of harm faced by marginalized populations. Leveraging a deliberately intersectional lens that includes gathering diverse perspectives from marginalized populations could further help designers uncover instances of *incidental harm*.

Understand that abusers are users. Working with minority populations to uncover issues of safety and abuse perpetrated through technology is a useful method within HCI (e.g. [13,104]). On the other hand, researchers and designers have not worked with or incorporated the perspective of abusive users into design activities. As found in this study, abusive users commonly appropriate technologies to harm transgender individuals. Furthermore, transgender participants imagine ways emerging technologies can be used to harm them in the future. Designers could preemptively

design to prevent nefarious uses of their technologies by adopting the mindset that *abusers are users*. For example, designers could conceive rich scenarios of abuse to better understand the misappropriation of a technology, or create abuser personas based on data about safety gathered from at-risk users. However, there are many ethical considerations to be taken into account when exploring harmful uses or impacts of technology, even to improve it. For this reason, centering the participation of marginalized communities—particularly those at the risk of the most harm—is still at the core of exploring abusive or harmful design scenarios.

Provide support for individuals harmed by or with technology. Although multifaceted experiences of abuse were found to be central to participants' experiences and perceptions of technology, this study also confirmed the importance of emotional support facilitated by technology found in prior research [48,49]. The external gaze that influences both the production of harm by other users, who project their own perceptions and biases about identity onto transgender individuals, and the way transgender individuals then process that harm points to the need for specialized support for transgender technology users. In the context of online spaces on social media, participants identified the significance of being able to confide in other trans-identifying strangers or utilize technology to create or join safe spaces. When

building new technologies, designers should consider the structures of support they can instill into their designs. In the context of gendered technologies, this may include concepts like embedding trans-sensitive customer service solutions for unforeseen and incidental mistakes on behalf of the algorithm.

At the core of each of these considerations is the need to carefully consider the ethical responsibilities researchers and technology designers have when creating technologies. While some participants could imagine potential benefits of AGR technologies, they also voiced that the negatives outweigh any positives. While I could imagine potentially viable ways gender recognition technologies can be developed for good, there do not seem to be many positive applications that justify the potential harms found in this study. Furthermore, the automatic and unsolicited nature of current AGR implementations, which positions technological autonomy before user autonomy, is not ethically sound. While gender identity is an important aspect of human identity, as demonstrated by this study, automating gender embeds developer values into systems and enacts identity onto human beings without consent. For this reason, designers must tread carefully when designing systems that incorporate identity characteristics and think through complex ethical questions about whether their technology is truly beneficial. This extends beyond specific

technologies, such as AGR, and includes all technology development users interact with.

While these considerations are drawn from the perspective of transgender participants, they present a starting point for designers and researchers to tackle issues of abuse and harm caused with and by technology to other user demographics.

Though transgender participants were voicing their personal perspectives about technological harm, these perspectives speak to a larger reality of technological harm for many user groups. Adopting inclusive design practices that mitigate risks to transgender users is beneficial to other marginalized user populations as well, such as cisgender individuals who may be similarly misidentified by AGR.

6 Conclusion: Mitigating Harm to Trans Individuals

Chapter Overview

In the final chapter, I outline the limitations of this study and the ways I would seek to address them in future studies. I also discuss future research with transgender individuals' experiences of safety and harm in the context of technology design. This includes continuing work relevant to AGR and gendered algorithms, and also focusing on abusive users who seek to harm transgender users through the use of technology. I conclude with a summary of the contributions of this study.

Limitations

Diversity among participants was sought in order to explore safety with an intersectional lens. Despite this effort, participants were all college-educated or currently attending college. Additionally, self-reporting of participant income was unreliable for determining accurate diversity among socioeconomic status, thus could not really be used to analyze participant data collected from interviews. The small sample size also limited the diversity of intersectional narratives collected during this

study. In the future, I would like to seek out a broader pool of diverse transgender participants with more clearly defined educational and socioeconomic backgrounds. Analyzing educational and socioeconomic background could bring new insights to research on transgender technology users.

Furthermore, participants in this study did not actually experience being categorized by AGR technology, but were asked to imagine what encountering AGR would be like. Also, this study did not involve AGR designers, leaving absent their motivations behind developing AGR and their perspectives on transgender individuals in the relation to AGR.

Future Work

Haimson et al.s' [49] discussion of the stress transgender individuals experience in dealing with persistent digital artifacts on Facebook motivates deeper questioning of how machine learning algorithms scrape, catalogue, and utilize data. Though participants had not mentioned it in the context of this study, it would also be pertinent to explore the impact of enduring digital data on transgender individuals that is collected by computer systems. In the future, I would like to explore the perceptions transgender users have of the digital data that would be potentially

collected by AGR across multiple phases of their gender transition journeys. I would also like to include both cisgender individuals and technologists to compare perceptions about AGR to findings from transgender individuals and technologists.

Furthermore, I would like to explore the potentials of conducting research with abusive users who perpetrate harm by wielding technology against transgender individuals and communities. This would provide insight into the motivations and thoughts behind the types of abusive users participants in this study cited as being harmful to them as transgender-identifying individuals. I would seek to build a framework for conducting research and user-centered design practices with “abusers” at the center, rather than ideal users, to provide new insights to researchers and designers about the way their systems are, or can be, used to enact harm and how those users are using technology to do so.

Conclusion

There is an increasing interest in the way transgender individuals interface with technology in HCI research. However, transgender individuals’ experiences with and perceptions of abuse through technological means is still new to the field. In this study, I set out to explore two research questions: 1) *“How do transgender users*

experience safety online?” and 2) *“What do transgender individuals, including transgender technologists, think about Automatic Gender Recognition (AGR)?”* In order to explore these experiences, I conducted a total of thirteen semi-structured interviews with transgender individuals. I selected participants across multiple interlocking identities to address the ways race, gender, and age may also impact transgender individuals experiences with technology.

While participants stated the Internet and digital technologies had a largely positive role in their lives, as previous studies have also found [80], findings uncovered that harm was a prevalent experience in online spaces, perpetrated through common, pervasive technologies, and often impacting participants in a variety of ways across their multiple overlapping identities in both online and offline contexts. Furthermore, I identified many facets of harm that often intersected; these facets included *outsider*, *insider*, *targeted*, *incidental*, *individual*, and *collective* harms. Findings similarly uncovered that transgender individuals and transgender technologists had an exceedingly undesirable opinion of Automatic Gender Recognition (AGR), technologies that categorize human gender using automated algorithms. These opinions were heavily intertwined with perceptions of the technology’s ability to

cause emotional harm and present potential safety risks for transgender and other marginalized populations.

While the concept of harm largely encompassed experiences and concerns of both pervasive digital technologies and AGR, I also identified trends that interconnected the findings of both research questions. I discuss the existence of an “external gaze,” in which other human beings or machines project identity markers onto participants that further complicate notions of safety. Participants were also aware of the ways histories of oppression harmed marginalized communities, thus seemingly affecting their impressions of digital systems. It was also surmised that intentionality to harm did not negate the impact of being harmed by other users, technology designers, or AGR.

It is also important to acknowledge that while AGR might not present the largest technological challenge to transgender individuals as compared to other technologies—and it would potentially impact different transgender individuals in different ways—the explicitly gendered nature of this technology presented a unique use case for studying the impact of embedded values about gender categorization in technology. As demonstrated by the findings of this thesis, AGR demonstrated a

novel avenue for discussing gender with a population that considers the way gender is enacted regularly. It would be both strategic and ethical to intentionally involve transgender individuals, and other gender minorities, in all computing research and design due to the thoughtfulness they have given to gender.

Nonetheless, findings regarding safety using other commonly pervasive digital technologies also insinuated that gender did not need to be embedded explicitly within technology for transgender users to experience harm. Marginalized populations of users, such as transgender individuals, could also be harmed by other users or the unforeseen consequences of the affordances of technology. This points to the overall importance of incorporating complex identity concerns into technology design.

A major takeaway from this study is to inform technology designers of the way harm might be enacted towards transgender users of their technologies. I conclude this thesis by presenting potential considerations for designers to prevent abusive appropriation of current and future technologies that could cause emotional and physical harm to transgender individuals, and other marginalized individuals. These considerations address concepts surrounding the complexity and intentionality of

harm and the role abusive users play in enacting harm to transgender individuals. I also propose that designers consider ways to incorporate sensitive support systems into their technology designs for when instances of harm occur.

Appendices

Appendix A: Demographic Survey

Thank you for your time! The purpose of our study is to help researchers understand the perspectives and needs of transgender, non-binary, and non-cisgender individuals with diverse background. All participants will be kept anonymous.

After completing this short one minute background survey, our research team at UMBC will reach out to qualifying participants about participating in a follow-up phone interview. Not every person who fills out the survey will be selected for an interview. All those selected to participate in the interview will receive a \$20 Amazon gift card for their participation.

What is your age?

What is your gender identity?

What is your racial identity?

What city and state do you live in?

How did you hear about the study?

What is an email address we can reach you at to schedule an interview?

Appendix B: Finalized Interview Protocol

Introduction

Hello, (NAME), thank you for participating in this project. We want to ask you a few questions about your experience with technology in relation to your gender identity.

- As researchers, we are concerned about technology design and its impact on communities, particularly communities which are marginalized by society.
- Had you had an opportunity to read the informed consent form?
- We will record the interview in order to transcribe and preserve interview data. Only other members of the research team (two other people) will have access to this data. It is okay with you to move forward with the interview?

Starter

- Have you ever participated in a research study before? (< 3 minutes)
 - How did you find this study?
- Why did you decide to participate?
- What pronouns do you use?
- What is your age?
- Where do you live?

We are really interested in identity...

- What is your gender identity?
 - Has that identity changed over time?
 - When?
 - politics
- What are other identities that are important to you? What are other aspects about yourself?
- What is your racial identity?
- Can you talk a bit about the intersections of those identities? How do you think the different aspects of your identity impact each other?
 - In relation to your gender identity?
- Are you open / out about your gender identity to others?
 - To who?
 - Is this both online and offline?
 - How do you choose when to be open about it and to who?

Technology

- What technology do you use on a daily basis? (social media, apps, games, etc)
 - What do you use that for?
 - Do you use them to express your gender identity?
 - Are there aspects of expressing your gender identity you find frustrating or difficult with these technologies?
 - How do you usually manage that frustration/difficulty?

- Have you ever experienced a situation in which your true gender identity was mistaken (i.e., you were misgendered)?
- Are there any technologies you avoid using or dislike using?
 - Did you ever leave a technology bc you could not express your identity
- Is there a relationship between your technology and your gender identity?
 - Other aspects of your identity?
- In the trans community, have you heard which apps / technology are trans-friendly?
- What will happen if all the technologies never existed? How would that change the way you could express your trans identity?
 - How would that change the trans community?

Facial Recognition

- Have you heard of facial recognition technology?
- Have you ever used facial recognition technology?
 - If yes, What did you use it for? What was your experience?
- Have you ever experienced someone else using facial recognition technology to identify you? If yes, please explain.
- Some researchers and corporations are building technologies that use cameras that try to read the gender of people based upon visual information. We call this “gender identification technology.” What do you think about this type of technology?
 - Can you think of a reason anyone would want to build it? Use it?
 - Can you imagine a future scenario where it could be useful to you?
 - How do you think this technology might affect you, if at all?
 - Trans comm
 - How would you feel if it misidentified you?
 - How does it compare to a real person?
 - Some current applications are: social media photo tagging, security video footage, people who are blind. Does this change your opinion of the technology?

Safety

- Do you ever experience issues with safety due to gender identity?
 - How about in relation to other identities (e.g., race) you may have?
 - When using technology apps?
- Do you avoid any technologies due to concerns for safety or privacy?
 - Where does that feeling stem from?
 - (Physical safety)

- Have you personally had any bad experiences with safety / privacy?
- Do you use any technologies to feel more safe?
- Have you ever experienced safety concerns with using dating apps?
- Have you ever experienced any safety concerns in bathrooms?
 - Do you think technology could help those concerns?
- A very hot topic in the news right now is how law enforcement engages with marginalized populations.
 - What is your thought on relationships police have the trans comm?
 - How would you describe your relationship with law enforcement?
 - Do you foresee technology playing a role in these relationships?
 - Be harmful?
- Have you ever heard of the term “safe space”?
 - (def: a place or environment in which a person or category of people can feel confident that they will not be exposed to discrimination, criticism, harassment, or any other emotional or physical harm.)
 - Is that a term you use yourself? Why/why not?
 - What does it mean to you?
 - Where do you find safe spaces?
 - What parts of your identity do safe spaces serve? Are they the same across all your identities?
 - What role does technology / could technology play in safe spaces?
 - Are there spaces that feel unsafe?

Design Futures

- What is the scariest technology to you as a trans person?
- What is the most empowering technology to you as a trans person?
- If you could build any technology for trans comm what would you want to build?

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