Jane Im

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Research Interests

Human-Computer Interaction, Social Computing, Social media, Socio-technical systems, Feminist HCI

Education

University of Michigan, Ann Arbor, MI — Sept. 2018 - Present
Ph.D. in Information Science
Advised by Eric Gilbert

Korea University, Seoul, Republic of Korea — Mar. 2013 - Aug. 2018
B.B.A. in Business Administration
B.S. in Computer Science and Engineering

Massachusetts Institute of Technology, Cambridge, MA — Sept. 2016 - May 2017
Undergraduate special student program (non-degree, full-time enrollment)

Employment

Sassafras Tech Collective, Ann Arbor, MI (remote) — May 2020 - Aug. 2020
Software Development & Research Intern with Dr. Jill Dimond

Airbnb, San Francisco, CA
Research Intern Recipient 2020, ***Internship deferred due to COVID-19***

University of Michigan, Ann Arbor, MI — Sept. 2018 - Present
Research Assistant, Teaching Assistant

Publications

Proceedings and Journals

[c1] Jane Im, Eshwar Chandrasekharan, Jackson Sargent, Paige Lighthammer, Taylor Denby, Ankit Bhargava, Libby Hemphill, David Jurgens, Eric Gilbert. Still Out There: Modeling and Identifying Russian Troll Accounts on Twitter. *ACM Conference on Web Science (WebSci 2020)*. Southampton, UK. *27% Acceptance Rate*
[Best Paper Runner Up Award]

[c2] Jane Im, Sonali Tandon, Eshwar Chandrasekharan, Taylor Denby, Eric Gilbert. Synthesized Social Signals: Computationally-Derived Social Signals from Account Histories. *ACM Conference on Human Factors in Computing Systems (CHI 2020)*. Honolulu, HI. April 2020. *24.3% Acceptance Rate*

[c3] Jane Im, Amy X. Zhang, Christopher J. Schlling, David Karger. Deliberation and Resolution on Wikipedia: A Case Study of Request for Comments. *ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW 2018)*. New York, NY. November 2018. *25% Acceptance Rate*

[c4] Jane Im, Paul Medlock-Walton, Mike Tissenbaum. App Inventor VR Editor for Computational Thinking. *Computational Thinking in Education Conference (CTE 2017)*. Hong Kong. June 2017.

Papers under submission for peer-review

[c5] Jane Im, Jill Dimond, Melody Berton, Una Lee, Katherine Mustelier, Mark Ackerman, Eric Gilbert. Yes: Affirmative Consent as a Theoretical Framework for Understanding and Imagining Social Platforms. *under submission at CHI 2021*

Working Papers

The papers here will soon be submitted in 2020.

[p1] Paul Resnick, Aljoharah Alfayez, **Jane Im**, Eric Gilbert. Crowds can Outperform Expert Judgments of Misinformation.

Posters, Demos, and Workshop Papers

[w1] Jane Im, Jeeyoon Hyun, Jill Dimond, Melody Berton, Eric Gilbert. Building Social Platforms around Affirmative Consent. *Moving Forward Together: Effective Activism For Change Workshop at ACM Conference on Human Factors in Computing Systems (CHI 2020)*. Honolulu, HI. April 2020. Workshop Paper.

[w2] Jane Im. Non-consensual Images & Videos and Consent in Social Media. *Sensitive Research, Practice, and Design in HCI Workshop at ACM Conference on Human Factors in Computing Systems (CHI 2019)*. Glasgow, UK. May 2019. Workshop Paper.

Awards & Scholarships

Best Paper Runner Up Award 2020
ACM Conference on Web Science (WebSci 2020) [c1]

2017 Annual Soft Robotics Competitions 1st prize in Design 2017
Harvard University, Cambridge, MA

Big Data Analytics Competition 3rd Prize 2015
SK Telecom, Seoul, Republic of Korea

Korea University Honor Scholarships 2014 spring & fall, 2015 fall
Honors Scholarships, 33% of tuition covered for 2014 spring, 50% of tuition covered for 2015 fall
Best Honors Scholarships, tuition fully covered for 2014 fall

Grants

Rackham Conference Travel Grant 2020
University of Michigan, Ann Arbor, MI

School of Information Conference Travel Grant 2018 - 2020
University of Michigan, Ann Arbor, MI

Research Experience

comp.social, University of Michigan Sept. 2018 - Present
Research Assistant

- Currently building novel social computing systems that are *consentful*—systems that protect people's interpersonal consent in interactions
- Theorized how socio-technical systems can be built to ensure online interactions are consensual based on affirmative consent [c5]

- Built *Sig*, a Chrome extension that computes and renders synthesized social signals (S3s) on social platforms. S3s are social signals computationally derived from an account's history, and then rendered on the profile. [c2]
- Built ML models to identify potential Russian trolls on Twitter, using an unbalanced dataset of 2.2K Russian troll accounts released by Twitter and 170K control accounts. [c1]

Haystack Group, MIT Apr. 2017 - June 2017
Undergraduate Research (Remotely collaborated until April, 2018)

- Investigated how various factors affect the outcome of Request for Comments (RfC), a deliberative discussion on Wikipedia, by building machine learning models. [c3]

MIT App Inventor, MIT Oct. 2016 - May 2017
Undergraduate Research

- Enabled novice programmers to create modular code in the App Inventor, by developing customized blocks within the system that can execute any functions of an imported API.
- Implemented virtual reality (VR) blocks in the App Inventor to help novice users build VR apps. [c4]

Soft Active Materials Lab, MIT Sept. 2016 - Feb. 2017
Undergraduate Research

- Developed 3D printing based soft robotic hands with stand-alone actuation and control system.
- Implemented the software interface for precise 3D printing for advanced soft materials.

Teaching Experience

SI 539: Web Design, Development, and Accessibility, University of Michigan Winter 2020
Graduate Student Instructor

- A graduate course providing hands-on approach to learning responsive, accessible front-end programming for Web Design. Topics covered include HTML5, CSS3 (including Bootstrap framework), JavaScript, and the POUR design principles of accessible design.
- Led 2 discussion sections per week.

SI 339: Web Design, Development, and Accessibility, University of Michigan Fall 2019
Graduate Student Instructor

- An undergraduate version of the course above.

Selected Press

Predictive Model Identifies Wikipedia Arguments that Will Never Get Resolved.
Campus Technology. Dian Schaffhauser. Nov 27, 2018.

A Third of Wikipedia Discussions Are Stuck in Forever Beefs.
Vice Motherboard. Samantha Cole. Nov 7, 2018.

Invited Talks

CS 598 Antisocial Computing Guest Lecture, University of Illinois at Urbana-Champaign Oct. 2020
Synthesized Social Signals: Computationally-Derived Social Signals from Account Histories.

EECS 598 Human-Computer Interaction Guest Presentation, University of Michigan Apr. 2020
Synthesized Social Signals: Computationally-Derived Social Signals from Account Histories.

PhD Recruitment Flash Talk, University of Michigan School of Information Feb. 2019
Still Out There: Modeling and Identifying Russian Troll Accounts on Twitter

Wikimedia Showcase, Wikimedia Foundation Sept. 2018
Deliberation and Resolution on Wikipedia: A Case Study of Requests for Comments

IAR Seminar, University of Michigan School of Information Sept. 2018
Deliberation and Resolution on Wikipedia: A Case Study of Requests for Comments

Academic Mentoring

Paige Lighthammer, University of Michigan (Undergraduate) [c1] Sept. 2018 - Apr. 2019

Jackson Sargent, University of Michigan (Undergraduate) [c1] Sept. 2018 - Apr. 2019

Ankit Bhargava, University of Michigan (Undergraduate) [c1] Sept. 2018 - Apr. 2019

Taylor Denby, University of Michigan (Undergraduate) [c1] Sept. 2018 - Aug. 2019

Sonali Tandon, University of Michigan (Masters) [c2] Sept. 2018 - Apr. 2019

Katherine Mustelier, University of Michigan (Undergraduate) [c5] Mar. 2020 - May. 2020

Service

Review

ACM CSCW full paper 2019 - 2020

ACM CSCW poster 2020

ACM CHI Late-Breaking Work 2020

IEE ICDM full paper 2019

Leadership

Michigan Interactive and Social Computing (MISC), Student Organizer Fall 2020 - Winter 2021

Doctoral Executive Committee (DEC) Fall 2019 - Winter 2020

- DEC is a group of PhD students that represent the voice of PhD students at University of Michigan's School of Information.
- Organized social events and actively participated in addressing departmental issues that impact PhD students.

Coursework

Microarchitecture, Computer & Network Security, Human-AI Interaction, Data Mining, Doctoral Foundations Seminar, Human-Computer Interaction, Qualitative Research Methods, Interpretivist Theories in Computer-Supported Cooperative Work/Social Computing, Research Methods

Last updated: September 19, 2020

Attaching my paper “Yes: Affirmative Consent as a Theoretical Framework for Understanding and Imagining Social Platforms” which is under submission at *CHI 2021*, as it is deeply related to my proposal.

Yes: Affirmative Consent as a Theoretical Framework for Understanding and Imagining Social Platforms

ANONYMIZED FOR REVIEW

Affirmative consent is the idea that someone must ask for, and earn, enthusiastic approval before interacting with someone else. For decades, feminist activists and scholars have used affirmative consent to theorize and prevent sexual assault. In this paper, we ask: Can affirmative consent help to theorize online interaction? Drawing from feminist, legal, and HCI literature, we introduce the feminist theory of affirmative consent and use it to analyze social computing systems. We present affirmative consent's five core concepts: it is voluntary, informed, revertible, specific, and unburdensome. Using these principles, this paper argues that affirmative consent is both an explanatory and generative theoretical framework. First, affirmative consent is a theoretical abstraction for explaining various problematic phenomena in social platforms—including mass online harassment, revenge porn, and problems with content feeds. Finally, we argue that affirmative consent is a generative theoretical foundation from which to imagine new design ideas for consentful socio-technical systems.

Additional Key Words and Phrases: affirmative consent; interpersonal consent; social platform; socio-technical gap

ACM Reference Format:
Anonymized for review. 2020. Yes: Affirmative Consent as a Theoretical Framework for Understanding and Imagining Social Platforms. In *CHI 2021*. ACM, New York, NY, USA, 25 pages. https://doi.org/10.1145/1122445.1122456

1 INTRODUCTION

Affirmative consent is the idea that someone must ask for—and earn—enthusiastic approval before interacting with another person [62, 93]. Sometimes referred to by the shorthand "yes means yes," affirmative consent is, at its core, a precursor to interpersonal interaction designed to ensure agency and positive outcomes. For decades, feminist activists and scholars have used it to theorize and prevent sexual assault [62, 80, 93]. Here, we ask: *Can affirmative consent similarly help theorize online interaction and, perhaps, prevent its harms?*

This paper introduces the feminist theory of affirmative consent and applies it to social computing systems. We present affirmative consent as five core concepts, drawn from feminist, legal, and HCI literature: affirmative consent is *voluntary*, *informed*, *revertible*, *specific*, and *unburdensome*. Using these five principles, we argue that affirmative consent explains many existing problems on social platforms. In her influential feminist HCI paper, Bardzell contended that feminist theories are not only critical strategies, but also action-based design agendas [6]. Similarly, we propose that affirmative consent provides a theoretical foundation from which to imagine new futures for interacting online.

First, we explore how affirmative consent can explain problematic phenomena on social platforms. After exploring "zoombombing" [91, 116], people in abusive situations disconnecting from their abusers [45, 122], and encountering triggering content [48], we present three detailed case studies through the lens of affirmative consent: *mass online harassment*, *revenge porn*, and *problems with content feed algorithms*. For instance, prior work has documented problems

Manuscript submitted to ACM

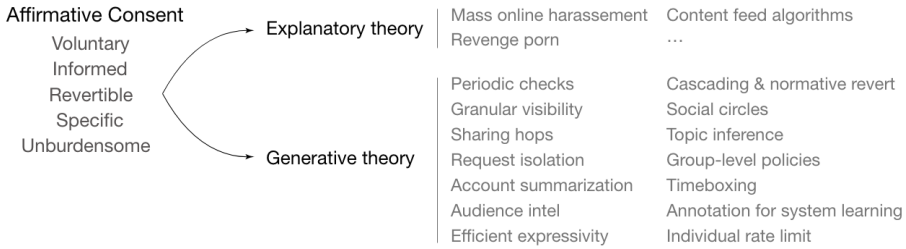


Fig. 1. Structural diagram of this paper's theoretical argument.

with content feeds—often related to their opacity [25, 41, 42, 51, 52]. We re-frame these feed issues as violating affirmative consent's *voluntary* principle: simply put, users cannot tell systems what they want in their feeds. Revenge porn, on the other hand, most problematically violates the *specific* principle: consensually sharing intimate photos with partners does not entail consent to re-sharing with others [32]. We argue that affirmative consent is a theoretical abstraction for understanding various problematic phenomena on social platforms, and can be part of the Bardzell arc to "integrate feminism in a more intellectually rigorous way ... that encompasses both theory and design practice" [6].

Second, this paper argues that affirmative consent is generative. A micro-social rather than macro-social theory [69], affirmative consent naturally complements social computing interaction design at an elemental level. We use the five core concepts of affirmative consent to generate 35 design proposals for future, socio-technical systems that encode affirmative consent (see Table 1). Examples include:

> *Voluntary Content Feeds:* Content feeds that ask what you want to see today, this week, etc. (See Figure 2.)
>
> *Revertible Profile Pages:* Revert posts, comments, and tags on profile pages using features resembling the Git revert command [29]. (See Figure 3.)
>
> *Unburdensome Messaging:* Leverage network data to control who can chat with you. For example, people can only message you if a friend previously initiated conversations with them. (See Figure 4.)

In this design work, we reflect on the socio-technical gap [2] induced by reifying affirmative consent in software. For example, enforcing complicated, multi-step consent protocols everywhere would likely come with extraordinary costs for users. While software's rigidity may have certain upsides in this context (e.g., ensuring consent actually happens [111]), careful, strategic computation is necessary to ameliorate the gap.

Figure 1 presents a structural diagram of this paper's theoretical argument. In the following sections, we provide an overview of affirmative consent movements and scholarship; position affirmative consent as a socio-technical gap; introduce the core concepts of affirmative consent; illustrate how the affirmative consent framework is both explanatory and generative; and, conclude by discussing the framework's implications and future directions.

1.1 Position Statement

We briefly pause to introduce an author position statement. Following feminist standpoint theory, it is important to disclose and acknowledge our standpoints (e.g., [17, 133]). The authors of this paper include a mix of women and men and comprise Asian, Asian-Canadian, and White people. Some of the authors are also members of or have closely interacted with queer, transgender, and disability communities, and those experiences have impacted our perspective on consent. We acknowledge that all anti-oppression lenses contribute to highlighting non-consensual interactions on the

Internet. Technology perpetuates and magnifies the existing social structures—which oppress marginalized populations, including people of color, disabled people, lesbian, gay, bisexual, transgender (LGBTQ) people [34, 132]. Thus, while we focus on feminism in this work, we also consider race [133], disabilities [34], and queer identities [112]. We believe by considering various power imbalances, we can aim to redistribute benefits and harms more equitably—rather than having our insights maintain, or even exacerbate, existing power relationships in the offline world.

2 RELATED WORK

We first review affirmative consent work from scholars and social movements. Next, we situate consent in social computing systems as a socio-technical gap; in particular, we argue that systems may actually clarify consent processes (through software's rigidity [111]), and strategic computation may ease the burden of communicating consent boundaries.

2.1 Affirmative Consent Movements and Scholarship

Feminist literature and movements anchor our definitions of consent because this praxis centers those who face nonconsensual interactions the most, while considering structural power dynamics such as patriarchy and heterosexism [1, 47, 115, 149]. We first review feminist activism and sex education programs, which are devoted to improving how people communicate sexual consent [12]—in order to understand how definitions of consent have advanced. We focus on these movements because they *led the knowledge production around how we define and communicate consent.*

An influential movement in reconstructing consent was the "No Means No" campaign, started by the Canadian Federation of Students (CFS) in the 1990s. CFS started the campaign to increase awareness and to prevent sexual assaults and rape on and off campuses [28]. However, the "No Means No" movement was criticized because it leaves the responsibility to women to say no—when in reality *saying no* is hard due to structural factors such as gender norms [27]. Furthermore, sexual violence is often complex; for instance, many people that are assaulted know their sexual violence perpetrators [37, 154]. Telling women to "just say no" ignores complexities in interactions and violence [27]. "No Means No" positions women as mere "gatekeepers" to their bodies. [71, 125]. As Carmody writes: "Constructing violence prevention based on refusal denies negotiation, positions women as responsible for managing another's sexuality and reinforces gendered expectations about who initiates sex" [26].

Affirmative consent emerged in legal scholarship in the 1980s, but it was first codified in 1991 [93]. Antioch College—a private university in the United States—passed a code in the university's Sexual Offense Policy stating that only "Yes" can mean consent, a way of viewing consent as a clear and voluntary agreement [93, 152]. In other words, silence or no resistance does not indicate consent [114]. Compared to "No Means No," affirmative consent emphasizes that one must ask and earn an enthusiastic approval before performing an action to another person [62]. It views women as desiring and active beings, not the passive gatekeepers implied by "No Means No". Because affirmative consent is based on the experiences of people whose agency is often inhibited by structural power dynamics, it prioritizes individual agency.

While critics of this movement note that it may be unrealistic to get a verbal agreement for every layer of interaction [36, 128], affirmative consent became a popular movement in the 2000s. In 2008, feminist writers Friedman and Valenti published the book "Yes means yes!" which made the phrase popular [62]. The Obama administration launched the "It's on Us" campaign to combat sexual violence on campus, which further made affirmative consent popular [155]. As a national movement, many colleges and universities organized campaigns to promote affirmative consent, and adopted affirmative consent in sexual assault policies [80, 86]. Furthermore, the state of California passed legislation in 2014 stating that only an affirmative yes can mean consent [62, 103], followed by New York [106]. New Jersey, New Hampshire and Connecticut have also introduced similar consent bills [106].

In the present work, we build upon feminist movements and argue that: 1) the affirmative consent framework can explain a number of existing problems in socio-technical systems; and, 2) affirmative consent can generate novel design insights for social platforms. HCI/CSCW researchers have more actively integrated feminism within their work after Bardzell's influential 2010 piece (e.g., [17, 44, 45, 50, 56, 57, 107, 145, 158, 160, 163]). Most recently, Nguyen and Ruberg introduced the concept of consent mechanics based on queer theory, feminist scholarship, disability studies, and HCI [130]. Our work grows from this tradition, alongside work by practitioners such as Una Lee [109]. In this work, we aim to build a theoretical argument around affirmative consent's potential for explaining and re-imagining social platforms.

2.2 Affirmative Consent as a Socio-technical Gap

Translating interpersonal consent processes into software is an example of a *socio-technical gap*, a term that Ackerman coined 20 years ago [2]. Ackerman argued there is an inherent socio-technical gap between the social world and software systems: "the divide between what we know we must support socially and what we can support technically." While people have flexible, nuanced, and contextualized ways of interacting and communicating offline, software often fails to support this. Ackerman argued that systems tend to have simple models and assume all people have shared understanding of information—which is not the case in offline interactions [2].

Communicating consent is no exception—the way people communicate consent is nuanced. Prior research has shown that young adults rely on nonverbal signals when communicating consent for sexual encounters [13, 85, 92, 94]. Specifically in the case of refusals, research has shown they are complex and often implicit [23, 35, 63]. Behavior around privacy and trust is similarly nuanced. Group conversations around security and privacy practices are more implicit than explicit and specific [165]. Prior work has also shown that interpersonal trust is open-ended, whereas systems codify explicit interpersonal trust [64]. Furthermore, the communicative nuances regarding consent are deeply related to *power dynamics*, which are challenging to support flexibly in systems [53]. People say yes or no after considering "complex networks of power," indicating that not all verbal "yes-es" signal enthusiastic agreement [7, 53].

Lastly, the socio-technical gap is also deeply related to the scale of interactions on social platforms. Because tens of thousands of people (or more) can interact via social platforms, consent violations can emerge from the sheer volume of interactions. In the case of online harassment, Jhaver et al.'s study revealed that many tactics of harassers abuse the fact that attacks can be easily escalated at scale in online spaces (e.g., brigading, dogpiling, and swarming) [101]. However, the problem of scale is not limited to online harassment. Consider a public Twitter profile with 100 followers. One retweet by a popular account can violate the original *imagined audience* [113], and therefore the *imagined consent*.

In the present work, we argue that careful design with affirmative consent can ameliorate (but not close) the socio-technical gap. There are, as is often the case, tradeoffs when handling issues through software [2]. However, when appropriately used, the rigidity of software may in fact have an upside in affirmative consent contexts: consent can become a mandatory and specific precursor to interpersonal interaction online. Enforcing it everywhere, however, would likely come with extraordinary costs to users. To address this, we also argue that when appropriately used, computation can be powerful in ameliorating the gap between nuanced communication around consent and rigid systems. We explore these concepts in the setting of large-scale online interactions in Section 5.

3 CORE CONCEPTS OF AFFIRMATIVE CONSENT

Next, we introduce the core concepts of affirmative consent. We derive the core concepts from feminist activism, legal theory, and HCI/CSCW work in the context of social platforms. Specifically, affirmative consent has five core properties: affirmative consent is **voluntary**, **informed**, **revertible**, **specific**, and **unburdensome**.

3.1 Voluntary

First, affirmative consent is *voluntary*: consent is an agreement that is 1) freely given and 2) enthusiastic. Feminist activists and scholars have argued that consent cannot exist when someone is coerced: it must be "freely given" [11, 62, 92]. For instance, Beres (2007) wrote: "As a feminist I am attracted to a version of consent defined as being 'freely given"' [11]. Hickman and Muehlenhard (1999) defined consent as "free verbal or nonverbal communication of a feeling of willingness" [92]. Building upon these definitions, we argue that an act that is forced (even if it results in pleasure and satisfaction despite the coercion) is non-consensual.

Next, consent that is voluntary must also be *enthusiastic*. This means consent is not just the absence of coercion, but a *strong desire to engage in the interaction*. In short, the essence of affirmative consent is: instead of viewing "yes" as a default state, "no" becomes the default. "Yes," delivered with enthusiasm, becomes the mark of consent. As Lee and Toliver[1] wrote in their important work on consentful technology, "if someone isn't excited, or really into it, that's not consent" [109]. Enthusiasm is crucial according to feminist standpoint theory; it is important to acknowledge people's desires and willingness, especially for people that have been oppressed by structural forces [11]. For instance, while some scholars only think about explicit forces in a dyadic interaction that lead to unwanted sex (e.g., physical threat, intoxication), many times women engage in unwanted sex because of "larger issues of social forces" [11, 67, 166]. In short, women tend to give up their *desire* to "participate in the desire of men" [24, 145].

An illustrative example of a social platform violating the *freely-given* principle is having a complete stranger tag you in a post. At the time of this writing, Twitter permits this. Once you set your account to public, the platform allows any other user to mention you in a thread. Another recent example of violating the freely-given principle is "zoombombing"—perpetrators hijacking video call meetings (who were not invited), saying or showing obscene, racist, or misogynistic content [116]. Marginalized communities experience zoombombing more frequently [91]—illustrating that non-consensual interactions impact marginalized populations more severely in online spaces as well [34, 130]. Similarly, current technologies are not well-equipped for protecting non-binary and queer people's "voluntariness" in interactions, sometimes leading to severe violence in both online and physical spaces [84, 151, 164]. A prototypical *unenthusiastic* interaction is when a person receives a message from an acquaintance because the user's status is set to "active." The status does not convey with whom they would like to interact, nor how much.

3.2 Informed

Second, affirmative consent requires people to be *informed*: people can only consent to an interaction after being given correct information about it—in an accessible way. *Informed* is the most widely discussed principle of consent in many contexts. For example, in terms of research, U.S. federal regulations state that prospective research participants must be informed about the nature of the research and "any reasonably foreseeable risks or discomforts" [140]. Similarly, the National Intimate Partner and Sexual Violence Survey (NISVS)[2] includes using false promises to obtain sex in its definition of sexual coercion [16]. In HCI, the concept of being informed has been discussed more frequently in the context of *user-to-system* interactions than *user-to-user* (i.e, interpersonal) interactions [60, 61, 131]. For instance, researchers have observed problems regarding how companies establish informed consent via privacy policies [55, 123, 136].

Here, we extend this thinking to interpersonal interactions. For example, as Donath argued, social platforms are currently designed so that social signals—"features provided by platform designers that allow users to express

[1] Lee and Toliver's work was in turn inspired by Planned Parenthood's FRIED campaign: https://plannedparenthood.tumblr.com/post/148506806862/understanding-consent-is-as-easy-as-fries-consent

[2] https://www.cdc.gov/violenceprevention/datasources/nisvs/index.html

themselves"—are easy to fake [46]. This makes it possible, even easy, for accounts to hide problematic behavior (e.g. toxicity, misinformation) [46, 96]. In other words, most users have difficulty in making informed decisions about even quotidian online interactions.

Finally, it is crucial that informed consent be *accessible*. Here we use accessibility as a broad term, including physical, intellectual, cognitive, and learning abilities, over time—both visible and invisible [54]. All necessary information should be accessible for everyone, including people who hold marginalized identities [148]. A field unto itself, HCI/CSCW researchers have worked on accessibility in various technologies. In the present context, for example, Gleason et al.'s work making Twitter images accessible is impactful and relevant [72–74].

3.3 Revertible

Third, affirmative consent is *revertible*: consent can be revoked at any time. Affirmative consent is revertible because consent is an "ongoing negotiation," as prior scholars have argued [10, 11, 14, 95, 130]. Prior research has shown how important it is for consent to be revertible, because people feel uncertain when deciding what to do, especially in sexual interactions [14, 95, 127, 135]. Such ambivalence and uncertainty arise because people need more information before making a decision, or because decisions are contingent on multiple, complex factors. Thus, it is crucial to periodically check whether a person shows signs of interest and willingness. Beres argued that people need to check for signs of "active participation," which are behaviors that signal ongoing interest and willingness [10, 11].

This kind of ongoing negotiation should be translated into online interaction as well. Even if a user decides to interact with another user through the platforms' features like *follow, like, tag,* and *retweet*, they should always have the options to easily undo the action at any time. Despite current platforms providing some revertible features—such as unfollowing, unfriending, and removing tags—those features are still limited, *especially at scale*. For instance, it is difficult if not impossible for a person to remove an entire past tag history initiated by an ex-partner they decided not to interact with anymore. The user would have to delete each and every tag; a more thoughtfully designed revertible feature might allow the user to specify a query to retrieve all those tags and act on them. Another example is users having no control over people's replies to their deleted posts: on Twitter, replies to tweets remain even when the original tweet is deleted. This can be problematic as prior research has shown that remaining replies can be used to infer the deleted content [126]. For transgender people, it is difficult to revert one's digital footprints to start a new identity on current social platforms [82]. In cases of domestic violence, it is hard for people who are being abused to disconnect from their abusive partners in current social technologies [45, 122].

3.4 Specific

Fourth, affirmative consent is *specific*: people should be able to consent to a particular action (or a particular person), and not a series of actions or people. That is, giving consent to one action does not imply that the person has consented to other actions. For example, in terms of sexual interaction, there are numerous behaviors that some people see as indicative of sexual consent, such as going home with someone late at night. However, even if a person consented to such an action, it does not mean that they consent to every other subsequent interaction [127].

Being specific is also crucial in online spaces. Although norms may differ in various platforms, consenting to one online interaction does not mean that a user consents to others. For instance, a person uploading a post does not (normally) explicitly consent to being harassed on a massive scale via comments [101, 146]. Furthermore, despite our social ties being heterogeneous (acquaintances vs. friends vs. close friends), social platforms are constructed so that

most social ties are treated equally by default [70]. Current platforms do not typically allow users to consent to different actions by different groups quickly and efficiently.

Content feeds[3] also exhibit a lack of specificity—people do not have specific control over what to see in their feeds, nor whom they want their posts to be shown to. For instance, people often come across posts that contain triggering content [48]. Even if a person has consented to being a friend with the sharer, the user has not directly consented to seeing such triggering content on their feed. Furthermore, a person can be tagged by a friend in a post that exposes them to people they are uncomfortable with [15]. Prior research has also shown that users find it difficult to control who can see their posts [102]: there is difficulty aligning the imagined audience [119] with the actual audience. Due to problems like this, people will create new accounts in order to carve out more intimate and private spaces [161, 167].

3.5 Unburdensome

Fifth, affirmative consent should be *unburdensome*: the costs associated with giving consent should not be so high that a person gives in and says "yes" when they would rather say "no." Affirmative consent has been criticized, and even mocked, for being unrealistic and burdensome [62, 80]. And this is a reasonable concern: scholars have pointed out that affirmative consent can ask too much in terms of mental load or costs (especially to the initiator of the interaction) [86, 93]. Importantly, prior attempts to advance consent, including affirmative consent movements, have failed to consider power dynamics, societal norms, and burdens typically borne by marginalized communities [68, 76, 138, 166]. For instance, Americans technically can object to police searches; however, this simplified version of consent ignores the police oppression experienced by people, especially people of color, in the United States [89, 156, 157]. Many feminists of color (e.g., INCITE![4]), have pointed out that our legal structure is based on the idea of "innocent until proven guilty". The survivors have to carry the burden of proof, most severely impacting marginalized people [132].

It is crucial to make consent unburdensome in online spaces as well. However, software is rigid [2]—compared to face-to-face interactions, it is hard to build systems that perfectly embed nuance. For instance, blocking one's annoying boss on a social platform is hard. It is difficult to build a social platform that completely shields the end-user from the power relationship with the boss. However, while we acknowledge that software cannot solve all power imbalance problems, we argue that current social platforms are far from making consent unburdensome.

One major example of current platforms violating the unburdensome principle is transgender people's experiences disclosing their new gender on social platforms. It is crucial for transgender people to be selective in choosing to whom they disclose their transition [81, 83, 151]. However, it is currently difficult to separate out the networks to whom transgender people feel comfortable disclosing [83]. For instance, in current non-anonymous social platforms like Twitter and Facebook, it is hard to control the visibility of a post (that discloses one's gender) so that only a certain part of the network can see it. In the case of online harassment, previous work has shown that filing reports against perpetrators of online harassment is burdensome, especially when there are many harassers [17, 117, 120]. Lastly, prior work has also shown that blocking other users on social platforms is very challenging, especially at scale [101, 117].

3.6 Affirmative Consent and Agency

To conclude, we note that affirmative consent naturally prioritizes individual agency. Affirmative consent centers marginalized populations whose agency has been historically limited, due to structural power dynamics (e.g., patriarchy)

[3]Content feeds are "aggregated flows of content seen on the home pages" on social platforms [8]. An example is Facebook's News Feed. https://www.facebook.com/facebookmedia/solutions/news-feed

[4]INCITE! is a network of feminists of color organizing to end interpersonal and state violence. https://incite-national.org/

[90, 164]. This agentic perspective implies that a person always has the ability to control what happens to them in an interaction, even if the other side of the dyad disagrees. In short, affirmative consent *need not be symmetric*. Further, an affirmative consent framework implies that other people may not even know what choices an actor made. In other words, people should be able to consent to interactional transparency. For example, some people may be comfortable disclosing they blocked another person; others are not, and should be able to control that disclosure.

At the same time, sometimes affirmative consent's natural asymmetry may lead to unintended side effects: for example when an individual's consent boundaries clash with societal values. Echo chambers are an interesting example [66, 142]: easily marking boundaries of consent may make it easier for people to remain in siloed, homogeneous groups. We believe that only in cases when societal values outweigh individual ones, there should be carefully designed mechanisms to limit individual agency. In 5.3.2, we explore how those limits may be designed.

4 AFFIRMATIVE CONSENT AS AN EXPLANATORY THEORY

Next, we explore in greater detail how affirmative consent can explain problematic phenomena on social platforms. In the previous section, we briefly highlighted various social platform issues through the lens of affirmative consent: zoombombing [91, 116]; accounts hiding problematic behavior [46, 96]; the difficulty trans people have when starting new online identities [82, 83]; people in abusive situations failing to disconnect from the people causing them harm [45, 122]; unexpectedly encountering triggering content [48]; and, the burden of reporting online harassment [17, 117].

Now, we look at three case studies in detail. We recast *mass online harassment*, *revenge porn*, and issues with *content feed algorithms* as violations of affirmative consent. The framework lets us pinpoint which property is being violated in design (e.g., *specific*)—providing a systematic way for researchers and designers to dissect a wide range of social computing problems. We then reflect on the *interpersonal scope* of affirmative consent as an explanatory theory: while, we argue, applicable to many interpersonal contexts, the framework does not neatly explain non-interpersonal ones.

4.1 Mass online harassment as an affirmative consent problem

Online harassment plagues online platforms, disproportionately impacting marginalized communities such as people of color, LGBT people, and disabled people [3, 19, 22, 58, 77, 78, 110], and has been the focus of considerable HCI and CSCW research (e.g., [17, 18, 101, 117]). Earlier work has catalogued various "behavior patterns and tactics" that people perceive as online harassment; however, it can be difficult to universally agree on what online harassment is [101]. As Jhaver et al. put it, there's "a more nuanced narrative:"

> "Some participants argued that often, the perception is that online harassment is transparently malicious, involves violent threats, etc. but online harassment can manifest more subtly too." [101]

We argue that the affirmative consent framework helps in systematically defining what is online harassment: an online action that violates any of the five principles of affirmative consent is online harassment. As examples, here we recast dogpiling and sealioning as affirmative consent problems.

4.1.1 Applying an affirmative consent lens to dogpiling. One manifestation is dogpiling: the act of "many users posting messages to a single individual" [101]. The intent of the message senders might not have been harassment—some may have just purely wanted to send a message to the receiver [101]. At scale, however, the effect is overwhelming.

We can recast dogpiling as a violation of affirmative consent. First, the recipient never agreed enthusiastically to receive potentially thousands of messages (**voluntary**). On Twitter for example, the platform never informed the original poster about the potential outcome: it is hard to imagine your post will cause hundreds or thousands of people to reply

back threateningly [146], especially when one has a small number of followers/friends (**informed**) [146]. A participant's quote from Blackwell et al.'s study on online harassment illustrates this well: before her first experience the participant had no idea "*how scary it is to see hundreds and hundreds of people wishing death upon you*" [17]. Furthermore, users are not able to leave specific threads if they scale up beyond their tolerance threshold at any time (**specific** + **revertible**) [101]. When they try, the manual effort required is overwhelming (**unburdensome**). Even when a person sets their account to private in order to stop receiving messages [117]—a common, and blunt, counter-tactic—perpetrators find other ways to send them. The situation sometimes evolves into cross-platform harassment [121]. Often it is people who are marginalized by racism, heterosexism, etc. who are forced to find more private spaces or abandon platforms [40, 77].

4.1.2 Applying an affirmative consent lens to sealioning. Another manifestation is sealioning: an act of "politely but persistently trying to engage the target in a conversation" [100, 101, 118]. Often subtle, the perpetrators may ask the targets for evidence behind their statements [101]. Some people can and do argue that sealioning is not online harassment—after all, the person asked *"politely."*

However, it is clearly a violation of affirmative consent. First, it is hard to know in advance which polite initiation of a conversation is sealioning and which is the genuine start of a respectful, enjoyable, serendipitous conversation (**informed**). For example, people manage their self-image as civil to hide that they might be a sealion. The dearth of signals—"perceivable features and actions that indicate the presence of those hidden qualities"—on social platforms makes it even harder to predict what the conversation will be like in advance [46]. Second, a person should be able to leave the conversation any time (**revertible**) or at any kind/level of interaction—such as allowing words of encouragement but not skepticism (**specific**). But in cases of sealioning, the repliers aim to prevent the original poster from leaving [101]. Lastly, sealioning has the same burdens associated with it as dogpiling above (**unburdensome**).

4.2 Revenge porn as an affirmative consent problem

Revenge porn "involves the distribution of sexually graphic images of individuals without their consent" and is also referred to as "cyber rape" or "involuntary porn" [32]. At the same time, the Cyber Civil Rights Initiative[5]—an organization dedicated to combating online abuse—notes that "revenge" porn is not an accurate name as "many perpetrators are not motivated by revenge or by any personal feelings toward the victim" [97]. A difficult property is that *revenge porn often involves an artifact that the subjects consented to at the time it was taken.* As Blackwell et al. wrote: revenge porn is "a form of doxing in which sexually explicit images or videos are distributed without their subject's consent, often by a former romantic partner" [17]. Citron and Franks note that some people argue that consensually taking nude photos also implies consenting to publicly sharing them online [32].

Perhaps unsurprisingly, revenge porn can be recast as a violation of affirmative consent. First, while a person may have even enthusiastically consented to the original capture of the photo, they almost certainly did not know in that the perpetrator would share the photos publicly (**informed**). Perhaps the most concerning part of revenge porn involves the inability of people in photos/videos to recall the bits once published on the internet (**revertible**). Once circulating, complete strangers view the photo (**specific**). Typically, the only recourse available includes filing a lawsuit and a DMCA takedown[6], which are time-consuming, expensive, and challenging processes (**unburdensome**).

[5] https://www.cybercivilrights.org
[6] https://www.dmca.com/faq/What-is-a-DMCA-Takedown

4.3 Content feed algorithm problems as affirmative consent problems

Content feeds—"aggregated flows of content seen on the home pages" on social platforms [8]—have become deeply embedded in our lives. Research has documented many issues with their current design, often revolving around their opacity to end-users [25, 41, 42, 51, 52]. For instance, Eslmai et al. found that more than half of users are not aware of feed algorithms at all [52]; moreover, people come up with folk theories about how automated curation works [51]. Here, we re-frame some known issues with content feeds as affirmative consent violations.

First, users simply cannot signal their enthusiastic agreement to posts and accounts showing up in their feeds (**voluntary**). Many platforms, such as Twitter, Facebook, and Instagram, populate feeds with accounts that users do not explicitly follow. On Twitter, the feed renders popular tweets from accounts not directly followed by users; they are recommended via network popularity data.[7] Second, many accounts and posts show up on content feeds unexpectedly. Platform users do not know how the content feed algorithms work [51]—so people do not have concrete ideas about which content and accounts will appear (**informed**), which can sometimes lead to traumatizing experiences. For instance, the dissemination of videos featuring the killings of Black men can be traumatizing, especially to Black people [79, 88]. Third, users cannot specifically agree to which types of content appear on their feeds. For example, many users may want to eliminate certain content categories, such as eating disorders [137] or memories of deceased family or friends [21, 49, 124] (**specific**). Lastly, people have nuanced needs around content types that vary across time [139] (**revertible**). For instance, a couple that has experienced pregnancy loss might not want to see posts related to babies temporarily, even when they are posted by close friends [4, 5].

4.4 Explanatory power and limitations of the affirmative consent framework

We believe affirmative consent permits conceptualizing many disparate problems with a theoretical abstraction. At the same time, it is worth noting that the preceding examples are all interpersonal in nature: the problems presented revolve around people interacting with others online. Affirmative consent as an organizing, theoretical framework will find the most power in interpersonal contexts. However, there are online problems which it fails to clearly explain. One example is misinformation [39]. The fundamental problem with misinformation is that people who interact with the misinformation might subsequently believe it. The problematic relation is *person-to-object* rather than *person-to-person*.

5 AFFIRMATIVE CONSENT AS A GENERATIVE THEORY

Bardzell argued that feminism contributes to interaction design both as a critique and as a generative framework [6]. Bardzell further contended that while feminism has made significant critique-based contributions, HCI and CSCW have room to develop feminism's potential for generative contributions [6]. In addition to being capable of explanation and critique (Section 4), affirmative consent also generates novel design ideas. In other words, affirmative consent is an "action-based design agenda:" *a generative design framework* [6]. In this section, we introduce the generative nature of the framework, presenting design proposals for social platform features grown from affirmative consent. We also consider the socio-technical gap induced by requiring consent for interactions [2], presenting models of computation[8] which we argue, can be powerful in ameliorating the gap.

[7] From https://help.twitter.com/en/using-twitter/twitter-timeline: "You will sometimes see Tweets from accounts you don't follow. We select each Tweet using a variety of signals, including how popular it is and how people in your network are interacting with it."

[8] In this paper, we use "computation" to refer to a wide spectrum of modern computing tools and architectures including algorithms, networked technologies, visualization techniques, and interactive technologies.

5.1 Challenges of translating affirmative consent into socio-technical systems

We first discuss the difficulties of translating each concept of affirmative consent into social platforms. Then, we briefly sketch socio-technical "building blocks" that can be combined to mitigate such difficulties. In Section 5.2, we introduce new platform features that are derived from these building blocks. Some are novel to the best of our knowledge; others have appeared on existing social platforms at some point in time. Each building block has a corresponding glyph (e.g., ★, †, ∨) that appears in Table 1 to link the two sections.

5.1.1 Voluntary. We defined "voluntary" as an agreement that is 1) freely given and 2) enthusiastic. The challenge of translating "freely given" into social platforms is understanding whether the user's decision is truly not coerced. While ensuring "freely given" is also difficult offline due to factors like power dynamics [1, 47, 115, 149], the scarcity of cues may make this more difficult online [46]. Offline, a person can use nuance to communicate non-consent (instead of explicit communication): e.g., using non-verbal cues [10]. Most online social platforms do not permit analogous nuance.

Ensuring "enthusiasm" in social platforms is perhaps even more complex. Research in CSCW has shown technology is partially constitutive in people's practices of expressing desire, such as sexual desires [87, 105, 159]. However, technology often *assumes and is designed for a particular kind of desire* [6, 87]. When desires do not align with what the technology creators had in mind, people's experiences clash with the technology's anticipated construction [87].

With these pitfalls in mind, the rigidity of software has an upside in the context of affirmative consent: as Lessig wrote, "*software does exactly what it is told to do*" [111]. And can do so at scale. Inspired by these ideas, we propose the following high-level, socio-technical building blocks:

- ★ **Periodic checks.** System periodically *asks the end-user (and does not assume)* whether they want the interaction to take place. For instance, a system asks a person if they want to enter the group chat room they are invited to, instead of automatically adding them.
- ★ **Granular visibility.** System allows granular levels of visibility of personal information for different friends. While some social platforms provide this, many are limited to differentiating "friends" and "non-friends." For example, users could have agency over their visibility based on strength of ties [70].
- ✳ **Sharing hops.** Systems permit limits on how far a post can be shared. For instance, a person can allow people to only directly share their post (hops=1)[9], helping the author control the degree of visibility and interaction.
- ✲ **Request isolation.** Systems allow users to accept a friend request but isolate it, sending the request sender to a separate queue. Users can apply customized social rules to the accounts in the queue. This is in contrast to the current platforms' rigid options regarding relationships (e.g., accept vs. decline), supporting deeper social rules.

5.1.2 Informed. The main challenge of translating informed into socio-technical systems is *synthesizing important social information in a concise and legible way*. Compared to offline contexts, where most of our interactions are dyadic or in small groups, the scale of online interactions is considerably larger [146]. Socio-technical building blocks that may help bridge this gap include:

- † **Account summarization.** Using algorithms, systems synthesize account-level behavioral data (e.g., [96]). Of course, every user needs to be aware this could be happening (otherwise it violates the *informed* principle). For example, a system could show whether an account has consistently used toxic language in the past.
- ‡ **Audience intel.** Systems give feedback when the real audience diverges from the imagined one. For example, a system notifies a user if their post is shared within a new network using community detection algorithms [129].

[9]This takes inspiration from "hops" in computer networks—referring to a packet passing from one network segment to another [33].

5.1.3 Revertible. The challenge of building *revertible* social computing systems is undoing actions or reverting data that is scattered all over the internet—the totality of which has been called our "data bodies" [20].[10] Making this even more challenging, it is functionally impossible to prevent people from replicating data on the web. People can always take photos or videos of existing data on the Internet.

While ensuring totally revertible social systems is impossible, software defaults can be very powerful in setting norms. Moreover, software is *powerful at reverting once it is configured to do so*, such as the Git revert command [29]. At the same time, there is an important difference between software and human interactions. While Git (and many other software) undoes the changes made to the software, it still keeps the record of the version before the revert. However, for human interactions, keeping a public record of changes could increase exposure to harm rather than eliminate it. Considering these tradeoffs and complexities, we argue for the following as socio-technical ways forward:

- ⊛ **Efficient expressivity in deleting/hiding own data.** System efficiently allows users to completely delete all types of information—tags, posts, comments, friendships, etc. For example, when someone unfriends another person, the platform might ask "Would you like to remove past tags of this person *as well as related posts*?"
- ⊕ **Cascading and normative revert.** System completely deletes past shares/copies if the original data (e.g. post) is deleted. For example, on a centralized sytem like Twitter, retweets disappear if the post is deleted by the poster; on a decentralized system like Mastodon, a protocol could enforce revertibility, with punishments for defections.

5.1.4 Specific. The challenge of building *specific* socio-technical systems is in *choosing how many and what kind of options to present to users*. Clearly, having options for literally every kind of interaction would be overwhelming (and, crucially, undermine the *unburdensome* goal). This becomes even more challenging on platforms that allow interactions at scale—for instance, the average number of friends on Facebook is over 300 [108]. Offering overwhelmingly diverse options is ineffective [153]. Prior research in privacy has underscored the importance of not overwhelming users with choices [150]. In the context of social platforms, research has shown people have difficulty simply remembering and managing accounts one has blocked or muted [101]. Considering such challenges, we propose the following:

- ⩛ **Social circles.** Using computation on interaction data, systems can scaffold classifying relationships into groups, or "social circles." This might be accomplished with community detection algorithms [129], for example.
- ⧖ **Topic inference.** Using computation over textual and image data, systems can scaffold classifying content into high-level categories.
- ∧ **Group-level policies.** Once these circles and topics are created with computational scaffolding, systems can let users articulate more specific group-level policies for messaging, content feeds, etc. For example, a user might choose to only allow comments on a post from people who have commented (and not been blocked) before.

5.1.5 Unburdensome. The challenge of building *unburdensome* socio-technical systems is building systems that do all of the above *without completely overwhelming the user.* This is challenging because boundaries of consent and risk tolerance are diverse and contextual [130]. We suggest the following composable solutions:

- ⧁ **Timeboxing.** Systems can put customized time limits to interactions. While ephemeral content [162] is an example, we argue timeboxing can be applied to interactions other than posting (e.g., stop sharing after a week).
- ⧁ **Annotation for system learning.** Using computation, systems learn about consent boundaries. Users can annotate posts/comments to articulate their preferences [168] (e.g., annotate posts on content feed as triggering).

[10] Our Data Bodies (ODB) is a collaborative research and organizing effort investigating the ways "communities' digital information is collected, stored, and shared by governments and corporations." See: https://www.odbproject.org

⟐ **Individual rate limit.** Systems limit volumes of comments, mentions, etc. based on end-users' preferences. For example, a user may decide to only allow up to five comments to a post that is on a sensitive subject.

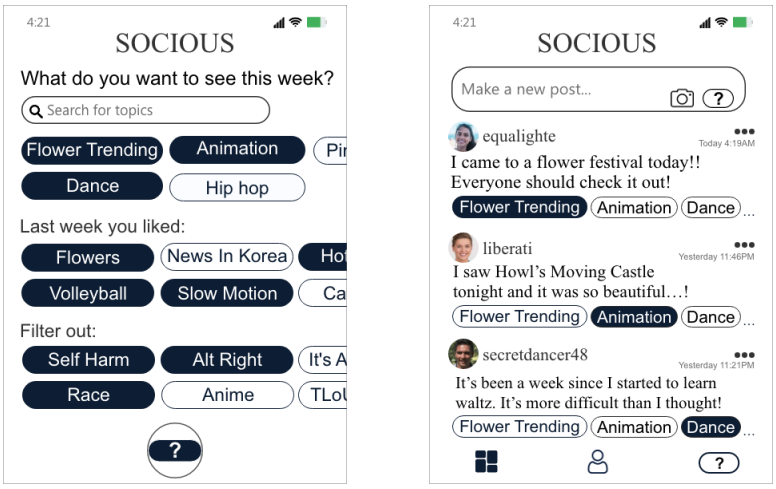
Many building blocks we have suggested above can be seen as *strategic computation*, the tactical use of computation to ease consent burdens. This is an umbrella term for the network, interaction, and topical algorithms introduced above.

5.2 Affirmative consent as generative: sociotechnical interaction features

Using the building blocks above, we next present proposals for new designs based on affirmative consent. We take the core principles of affirmative consent—*voluntary*, *informed*, *revertible*, *specific*, and *unburdensome*—and use them as

	Voluntary	**Informed**	**Revertible**	**Specific**	**Unburdensome**
DM + group chat	Users are asked if they want to join when invited to group chat. ★	Platform visualizes topics discussed in group chat before a person decides to enter. ⧖	Users can revert *message read* status to *unread.*	Different online status by group: *would love to chat* for friends; *online, but busy* for others. ✱∧	Classify DMs from strangers using sender's content [30] and behavior [96]. † (Figure 4)
Profile	Users can control profile visibility by audience: *only show selfies to friends & friends' friends.* ✱∧	Platform shows how many people that viewed the profile are strangers. ‡	Users can query and delete, en masse, tags and comments from their profile related to account (e.g., ex-partner). ⊛ (Figure 3)	Some profile fields are only shown to accounts that have been friends for $> t$ time. ∧	Platform periodically reminds user how their profile looks to other people: "*This is how your profile looks to Jake.*" ★
Friend + follow	Users can accept a friend request but can isolate it, sending it to a separate queue. (e.g., if acceptance is coerced). ⁂	Platform alerts if friend request comes from account with history of posting toxic content [96]. †	Requests from people previously unfriended are sent to a queue. —ensuring revert. ⁂	Assign people to "circles" [104] at follow time with rules: *no tags from this circle.* ∨∧	Periodic reviews of followers/friends with new risk scores (e.g. toxicity level). †★
Post+ comment	*most platforms already support voluntary posting and commenting	Users receive reports of how many post viewers are strangers. ‡	Users can query and delete posts/comments at large scale. ⊛	Users can apply audience rules to hashtags: e.g, creator can restrict who can use it [143]. ∧	Users can rate limit comments per post. ⟐
Feed	Feed asks what users want to see today (or this week). ★ (Figure 2)	Content feed makes algorithms visible and salient [43].	Users can bookmark feed settings to easily revert to prior settings.	Users can set different types of content feeds per social circle. ∧ *similar to mastodon's local timelines [170]	Users can annotate posts in feed [168], from which the system can learn what posts the person wants to see (or not see). ◈
Tag	By default, platform always asks user if they consent to being tagged when another user initiates tagging. ★	Platform provides high-level summary of audience, outside friends, that sees tagged post. ‡	If user unfriends, the system asks if they also want to delete tags of the person. ⊛	Users set tagging rules by content type: *disallow tags in photos of people.* ⧖	Users can timebox tag frequency: *Jake can only tag once a month.* ◈
Share + retweet	Users can limit how many hops shares are allowed to travel. ✳	Users are notified if post is shared to a new network "neighborhood." ‡	When user deactivates post's sharing, or deletes the post, existing shares disappear. ⊕ *twitter partially implements this	Leveraging data of past interactions, users can decide who can share each post: *Only people who I have messaged 5 times can share.* ∨	Platform alerts user if their post starts being shared rapidly by strangers [146]. ‡

Table 1. Proposals for new sociotechnical interaction features generated from affirmative consent. Common platform features listed vertically; affirmative consent concepts listed horizontally.



(a) When Lucy opens Socious, they are greeted with the content feed asking what they want to see this week.

(b) Once Lucy selects the topics they want (or not want) to see, the changes are immediately reflected in the feed.

Fig. 2. Mockup of Socious's voluntary content feed.

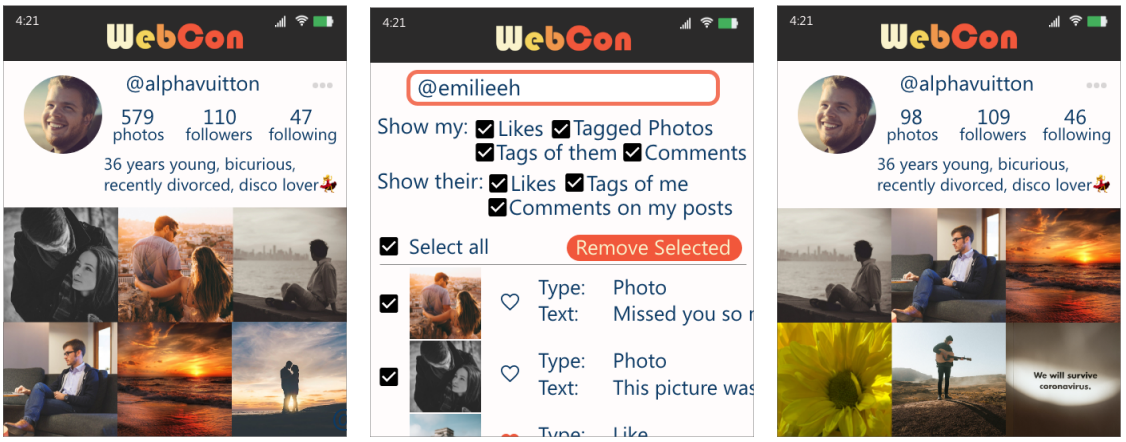
design axes to generate sociotechnical interaction features. In some senses they are "primitives"—core interaction ideas that could be repurposed on a variety of social platforms in flexible ways. Each cell of Table 1 presents an interaction primitive. We also sketch three cells from Table 1 in more detail in the subsections that follow. For each of the three sketches, we illustrate the consentful interaction design idea by presenting mockups of fictional platforms.

5.2.1 Voluntary Content Feeds: feeds that ask what you want to see today/this week/this month. Current content feeds do not ask what a user wants to see; they typically assume what a user wants based on inference over platform data [52]. As a result, many encounter unwanted posts in their feeds, sometimes even after the user has invested great effort to avoid such posts [139]. A content feed constructed around the voluntary principle of affirmative consent would *periodically ask what the user wants to see.*

Imagine that Lucy logs onto a new platform called Socious, and the platform greets them by asking "What do you want to see this week?" (Figure 2). Lucy sees Socious recommended keywords like "Flower Tending", "Animation", and "Dance" based on topic modeling. Lucy decides they would like to see more of flowers, dance, and animation. Lucy also notices they can specify topics they *do not want to see.* Lucy can also select among tags that include well-known triggering topics. Lucy selects "Self Harm", "Alt Right," and "Race" for exclusion from their feed. As Lucy scrolls down the feed, they see the new preferences immediately reflected. After a week, Socious asks Lucy again for topic preferences—though Lucy can change the frequency of requests any time.

5.2.2 Revertible Profile Pages: Revert posts, comments, and tags efficiently. Our social networks constantly change offline—we sometimes distance ourselves from people who were once close friends, go through break-ups, or our loved ones pass away. However, the rigidity of current platforms makes it hard to reflect these changes [139]. For instance, Facebook's feature called "On This Day"[11] shows content that you shared in the past—in some cases showing memories that a person may not want to recall, such as photos of one's recently deceased family or friends [49, 124].

[11] https://about.fb.com/news/2015/03/introducing-on-this-day-a-new-way-to-look-back-at-photos-and-memories-on-facebook



(a) Jon's profile page on WebCon.

(b) Jon queries for posts containing tagged photos of Emily or ones that Emily left comments on or liked. Jon decides to delete all of them.

(c) Jon goes back to his profile page and sees the queried posts removed from his profile.

Fig. 3. Mockup of WebCon's revertible profile page.

Imagine Jon logged into WebCon, a new social platform (Figure 3). Jon recently went through a break-up, and wants to remove all data related to his ex-partner, Emily. Jon goes to the dashboard and queries for his posts that Emily liked, is tagged in, or left comments on, as well as Emily's posts that he liked, is tagged in, or left comments on. He decides to delete all of his posts that are related to Emily. He also chooses to remove his likes, comments, and tags in/on Emily's posts. Jon goes back to his profile page and sees these posts removed from his profile.

5.2.3 Unburdensome messaging: Leverage network data to control chats. On most current platforms, when a person sets their account to public, strangers or spam accounts can DM them with unsolicited content. For instance, about half of

(a) Sannvi sees many unwanted messages when she opens CoMedia.

(b) Sannvi uses network rules to control who can message her.

(c) Sannvi has the majority of her new messages sent to a separate queue. She also sees new messages from friends' friends, Sharon and Preeti.

Fig. 4. Mockup of CoMedia's unburdensome messaging.

American women ages 18 to 29 have received explicit images they never asked for [47]. At internet scale, it becomes very difficult to exercise control over messages; some people abandon platforms altogether for this reason [101].

As depicted in Figure 4, imagine Sannvi has been receiving many unwanted messages on CoMedia. The messages often include compliments about her looks, which she finds uncomfortable. Sannvi decides she does not want to see such messages and goes to "Control Panel," applying network-centric rules such as: *Only allow people that my friends have messaged to message me.* Now, if a stranger messages Sannvi on CoMedia, the system first looks up whether the sender has ever interacted with Sannvi or any of her friends on the platform. If not, CoMedia sends the stranger's message to a separate queue which Sannvi can later review if she wants.

5.3 Potential limitations of affirmative consent as a generative theory

We have introduced ideas for consensual socio-technical features that use computation to ease the burden of expressing consent. In this section we discuss: 1) socio-technical gaps computation cannot easily close, and, 2) an unintended but potential side effect of the framework: the potential discord between consent boundaries and social values (e.g., echo chambers).

5.3.1 Difficult to close socio-technical gaps. While we argue the design ideas suggested above can ameliorate the socio-technical gap of consent in social computing systems [2], there are issues that likely cannot be resolved easily. We illustrate two examples. First, computational systems cannot classify content in as nuanced a way as human cognitive capabilities—which is why there are human moderators [99, 144].[12] For instance, people's definitions of "disturbing pictures" are likely to be different in varying degrees [31]. While we have suggested design ideas like annotations for system learning so that people can better mark their boundaries of consent (Table 1), people are better than systems at catching the slightly different definitions people assign to the same terms. Relying on teams of (potentially peer) moderators in hybrid human-computational systems may be a way forward [30].

Second, it is still very difficult for someone to completely retract a piece of sensitive information from online spaces (see Section 4.2). People that have already read and know the content can always reproduce it. In contrast, in offline contexts, people easily build normative understandings of how to treat persistence of information based on partially shared, rudimentarily classified situations [65]. Because there have not yet been any reliable technical or socio-technical solutions, this problem has been addressed through complementary regulation: e.g., the right to be forgotten [98, 147].

5.3.2 Clash between consent boundaries and societal values. We consider another unintended but possible side effect: conflict between an individual's consent boundaries and societal values. As noted in section 3.6, affirmative consent emphasizes agency. However, there are cases where an individual's boundaries clash with societal values. One notable example is echo chambers. The ease with which people can mark boundaries of consent may cause more insulated echo chambers. For instance, one design proposal in Table 1 is to let people create specific social circles. This also makes it easier to solely consume media from a homogeneous group. For example, misinformation can spread unchallenged in such circles on Whatsapp [38, 75, 141].

We argue that one's agency in consenting should be respected and prioritized: an individual's agency should only be limited when the corresponding societal values are significant, and outweigh individual agency. Enforcing limits should be carefully designed, respecting an individual's consent as much as possible. For instance, a potential way to resolve echo chambers is to build social platforms that seek opportunities to *consensually suggest verified and balanced*

[12] It would be crucial to design moderation tools in a way to protect human moderators from the trauma caused by viewing abusive content.

information. Prior work has shown that personalization itself does not exacerbate echo chambers, but poorly designed personalization does [66, 142]. Future work could explore ways to build systems that give users the agency to mark their consent, but at the same time provide challenging, verified information—perhaps using consensual personalization.

One line of future work in designing limits in consensual ways is to make it easier for people to deliberate about agency in online spaces. Many researchers have argued consent is a negotiation and communication process (*ongoing* principle) [14, 95, 130]. Such processes should be made easier online: mechanisms for participatory deliberation among online community members (and not only admins) [59] are crucial for designing limits in consensual ways. One example is PolicyKit, a software infrastructure that lets community members author governance procedures [169].

6 DISCUSSION

We introduced the framework of affirmative consent, and applied it as an explanatory and generative theory: the framework systematically explains disparate problems, and also generates novel designs for social platforms. To conclude, we discuss the framework's implications and future directions. We first discuss how computation can be powerful to build consentful features, as well as important considerations while applying computation. Next, we discuss "usable consent," as too many choices for consent can overload users and make systems burdensome to use. Lastly, we argue for the need to not only understand and study, but also to build and deploy consentful socio-technical systems.

6.1 Computation for consent

In this paper, we propose to use computation to build features for interpersonal consent on social platforms. At the same time, there are important considerations to take into account. First, it is essential to *inform users that the system uses computation for consent* (it would be ironic otherwise). Just as many social platforms have been criticized for using users' data in opaque ways [9], the same (or stricter) standards should be applied to using computation for consent. This is especially the case for features using algorithms to detect toxic behavior (e.g., account summarization [96]).

Furthermore, it bears repeating that computation itself will not completely resolve consent problems in socio-technical systems. As Nguyen and Ruberg wrote recently: consent is a design problem, not a "problem to be solved" [130]. And thus the authors caution against naively thinking consent issues can be completely resolved [130]. For example, designers must consider power dynamics when building consentful systems. Moreover, designers should consider people's different backgrounds, such as gender [6], race [133], and abilities [34]. Thus, we argue that with careful design we can reduce, if not completely close, the consent gaps that currently exist in social systems.

6.2 Usable consent: designing for risk

HCI and CSCW have long grappled with the issue of usability—systems need to be usable in order for people to use them in the real world. How do we build usable consentful systems? Section 5.1 enumerates a number of sociotechnical strategies; to conclude, we introduce another important design factor: *risk*. This is a well-established principle in computing already. When a system is about to undertake destructive or irreversible actions, systems routinely require an additional step which gives users a chance to reflect on the action: e.g., "Are you sure you want to delete 1,299 files?"

We believe applying this risk principle to interpersonal consent will create less burdensome consentful features. In short, the complexity of the consent process could be proportional to the interaction's potential risk. At the same time, it is important to note that everyone's risk assessment is different. Echoing Ngyuen and Ruberg, consent is contextual [130]. Thus we argue that platforms should ask users up front (and not assume) to establish baseline risk profiles. This

would help systems nudge users into better consent defaults. This contextual approach is especially important for marginalized populations—who are most severely impacted by non-consensual interactions [34, 130, 133].

6.3 Call for consentful socio-technical systems

Lastly, we invite HCI and CSCW researchers to work on systematically re-imagining and building consentful social platforms. To date, existing work has focused on either understanding or building interventions to address consent between *users and systems* [60, 61, 131]. For instance, Nouwens et al. found the majority of the top UK websites do not comply to the General Data Protection Regulation (GDPR)[13], the EU's data protection law, and offer design recommendations to ensure compliance based on empirical evidence [131].

We argue for taking this a step further: we need to deepen our understanding of consent in technologies, but also *actually build novel consentful systems*. We believe academics may have a central role in this, as traditional market-based mechanisms likely will not incentivize exploring these spaces. Building and carefully deploying systems will be crucial in investigating how affirmative consent principles can be translated into systems in myriad ways. For instance, platforms that are more open and public will probably need more self-governance features to resolve conflicts between consent boundaries. As Ackerman wrote 20 years ago, CSCW (and HCI) follow the study-design/construction-theory circle [2, 134]. Building and deploying such systems will not only create important artifacts, but also contribute back to theory.

7 CONCLUSION

In this paper, we ask: Can affirmative consent help theorize online interaction, and perhaps, prevent its harms? Drawing from feminist, legal, and CSCW literature, we introduced and applied the feminist theory of affirmative consent to social computing systems. We presented five concepts of affirmative consent: voluntary, informed, revertible, specific, and unburdensome, and argued these concepts are both explanatory and generative. First, we explored how the five principles can explain a wide range of problematic phenomena in social platforms, including mass online harassment, revenge porn, and problems with content feed algorithms. Next, using the same principles, we generated design proposals for future socio-technical systems that encode affirmative consent while considering socio-technical gaps. We concluded by discussing the affirmative consent framework's implications and future directions. Lastly, we invite researchers to imagine and build future consentful social platforms.

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