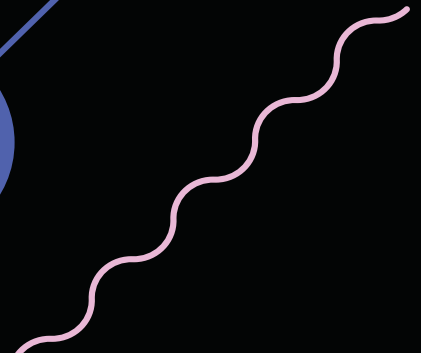
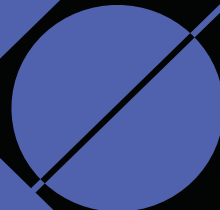


Undoing Data Practices

From Immersive Experiences to the Metaverse:
How Can We Engage More Users?

Data Practices and Data Stewardship

Seeing Like a Dataset: Notes on AI Photography



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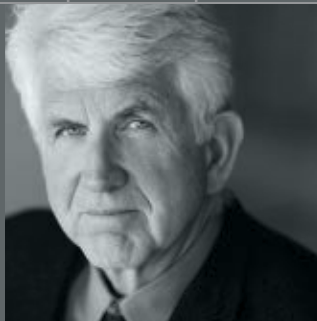
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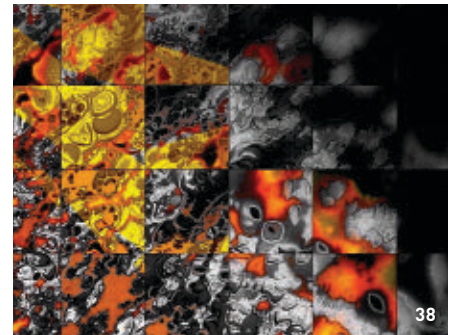
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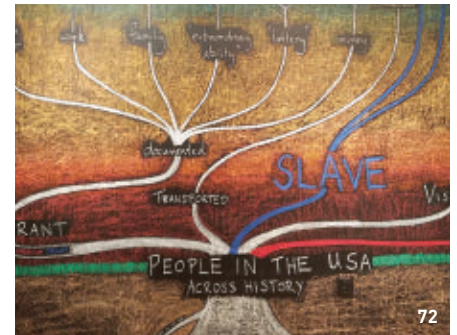
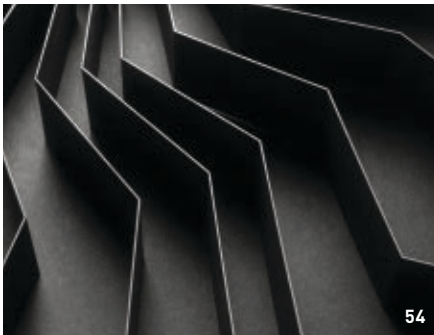
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Image by Normform / Shutterstock.com



The mushroom disrupts the patterns of the soil; it is an outlier in need of removal.

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Undoing Data Worlds

Many readers will have been exposed to, if not directly involved in, the now pervasive worlds of data. As practitioners and researchers designing and understanding the proliferation of technology, it's become impossible to ignore the unerring charge toward *data worlds*—these worlds enumerate bodies and experiences and extract data of all kinds, and, in a perversely reflexive way, dictate how we come to know, govern, and indeed experience life.

As consumers of technology, we feel data's pervasive presence through interactions on social media platforms, through our wider spheres of commercial and democratic transaction, and in the growing number of decisions made about our finances, health, well-being, and so much more. Lurking behind this immediate and visceral experience of data worlds are technoscientific, commercial, and governmental agglomerates that build and sustain a machinery of value and exchange. Such data worlds are not benign, but rather determine what counts as valuable, where data flows, and who wields control and power.

In this issue, contributors explore these data worlds through a sort of reverse engineering. But this is not a centering on (or valorizing of) technoscience with a narrow focus on technical means. Instead, it is to see data worlds as an entangled web of actors, agencies, and forces. And it is to see such webs at risk of intensifying

and amplifying the very structures of power and control we have become so acutely aware of. Works in this issue seek then to undo data worlds in the hope that new webs are strewn and the promise of many more and radically different relations are made possible.

In Angelika Strohmayer and Michael Muller's dialogue, for example, the two authors' conversational back-and-forth explores the constitutive role of data practices, calling attention to the limits imposed through data science's established methods and inviting different modes of knowing and doing. Evelina Liliequist, Andrea Aler Tubella, Karin Danielsson, and Coppélie Cocq look closely at the binaries of sexuality and sexual identity to invite critical questions of the data and data practices that underlie the rise of AI. Here, data is seen as a source of bias and discrimination but also as a means to reimagine the possibilities. Eryk Salvaggio shows us a way forward through his creative endeavors in AI photography. As an allegory of sorts, Salvaggio's piece and his work show how AI and its sources of data can provide a medium with which to think differently about what is framed and bring new relations to the fore.

Beyond our Dialogues section, provocative and creative proposals for undoing data practices and reimagining the possibilities are dotted throughout the magazine. In our front matter, Subhashish Panigrahi (Blog@IX), Anuradha Reddy (Exhibit X), and Marijela Melo (Making/Breaking) each explore new routes for developing

systems that use data and expressing meanings through data. In her forum piece, Janis Wong extends the thinking to reflect on new forms of collective stewardship and data governance.

Altogether these undoings of data worlds are an invitation to us to embark on or continue our projects that unsettle data's proliferation. There is an acknowledgment of data's potential but also a question posed to each of us about the direction we wish to travel.

In closing, two of us, Alex and Daniela, are bringing our tenure as co-editors-in-chief to a close with this issue. We are immensely grateful to the ACM team for their support during our tenure, which by any measure has been full of peaks and troughs. To John Stanik, Diane Crawford, Margaret Gray, and Andriy Borys, we are indebted. Sincerest thanks must also go to our stalwart contributors and readers who have energized us in our project to open up the magazine, seek an inclusive platform, and, dare we say, be a little disruptive in doing so. Our enthusiasm would have quickly waned without the support from so many.

Finally, we owe our deepest thanks to Mikael Wiberg, Amanda Windle, and Nadine Tanio, our partners during our tenure who have made everything better and without whom we could not have coped. We are so happy to see them, along with Elizabeth Churchill, will be steering the ship from here.

*Alex Taylor, Daniela Rosner,
Mikael Wiberg, and Elizabeth Churchill*
eic@interactions.acm.org

The *Interactions* website (interactions.acm.org) hosts a stable of bloggers who share insights and observations on HCI, often challenging current practices. Each issue we'll publish selected posts from some of the leading and emerging voices in the field.

OpenSpeaks Before AI

Frameworks for Creating the AI/ML Building Blocks for Low-Resource Languages

Subhashish Panigrahi

There has been a tremendous push on many levels to make artificial intelligence—and machine learning—based applications ubiquitous. Soon, the life decisions of almost every digital technology user will be affected by some form of algorithmic decision making. However, the development of large language models (LLMs) that drive this research and development often lacks participation from people with diverse backgrounds, ignoring historically oppressed communities such as Black and other ethnolinguistic or socioeconomic minority groups, women, transgender individuals, people with disabilities, and elderly individuals globally, and the Dalit-Bahujan-Adivasi communities in South Asia and the diaspora. Data about and by these people is therefore systematically suppressed. Even more problematic is that this data is mostly suppressed in creating the LLMs driving AI/ML research and development.

Furthermore, seemingly public information might not always be collected ethically with informed consent from the people affected. Even mature regulatory frameworks such as the General Data Protection Regulation (GDPR) in the European Union do not provide enough guidance on how private data is collected, stored, and shared. Naturally, those behind LLM creation do not have a clue about the biases in their data or how it is collected. Take the case of DALL-E 2 models, which use publicly available images owned and copyrighted by different people, or ChatGPT, which uses massive datasets from multiple sources. In both instances, not only does the LLM

creation lack the representation of marginalized groups and contain only biased data about them, but also the outcomes that derive from the training data make these groups even more vulnerable.

LOW-RESOURCE LANGUAGES

The creation of LLMs like GPT-3, when used in applications such as chatbots, directly affects the dominant-language users. Underpaid tech support workers subcontracted to support users in developed countries might even see these chatbots as a potential threat. But when it comes to low- and medium-resourced languages, the issues stemming from biases and low representation can aggravate things further. The issues of many Indigenous, endangered, and low- and medium-resourced-language native speakers are poorly documented or missing in HCI research and development, particularly in AI-based tech innovations. For instance, issues with script input or other technological problems are generally documented and fixed for the most well-established and dominant writing systems and languages. Speakers of many languages spoken and written in nondominant settings often do not have the know-how or the means to report these issues publicly, or discuss them privately.

OPENSPEAKS BEFORE AI

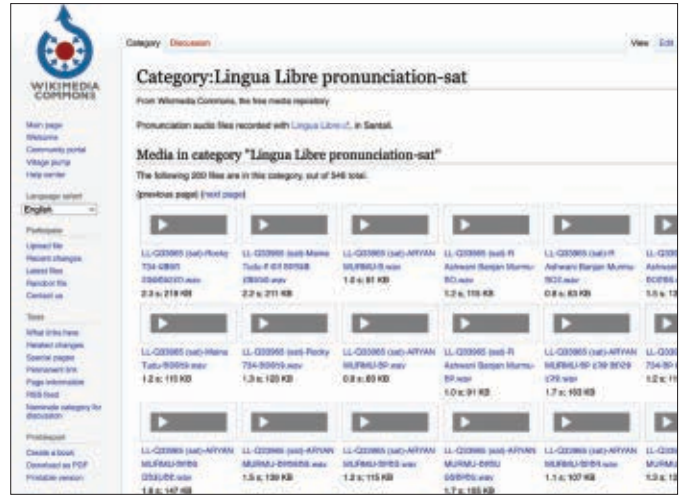
Mozilla defines trustworthy AI as “AI

The development of large language models often lacks participation from people with diverse backgrounds.

demonstrably worthy of trust, tech that considers accountability, agency, and individual and collective well-being” [1]. As a part of this, Mozilla started the MozFest Trustworthy AI Working Groups; as members of the 2021 working group cohort, we at the O Foundation piloted an experimental framework called OpenSpeaks Before AI [2].

Instead of treating AI as a stand-alone area, we looked at a few open-source platforms that allow users to generate multilingual big data (useful for AI/ML) and audit them openly. We tried to see whether this pilot could help us derive best practices that were inclusive in nature and relevant for low- and medium-resourced languages. Broader feminist viewpoints [3] and two existing studies primarily inspired the process: a seminal paper titled “Datasheets for Datasets” [4], which focuses on identifying gaps and biases in datasets, and our own research on Web content monetization in two Indigenous languages from India: Ho and Santali [5]. We conducted two open audits in two languages, Odia and Santali, and of two recording platforms, Lingua Libre and Mozilla’s Common Voice, both of which help in creating multilingual speech data. Odia is a macrolanguage from India with nearly 45 million speakers; Santali is an Indigenous Indian language spoken by 9.6 million people.

Lingua Libre and Common Voice are open-source platforms that allow users to record words and phrases (Lingua Libre) and sentences (Common Voice). The Lingua Libre study and its outcomes were explained in detail in the Wiki Workshop 2022, focusing on Odia and its Baleswari dialect [6]. The audit of Common Voice for Santali was presented during Mozilla Festival (MozFest) 2022 [6]. The OpenSpeaks Before AI



Santali-language Wikipedia editors being celebrated in Bhubaneswar, Odisha, India. Despite its official recognition and being spoken by 7.6 million Santal people, Santali is yet see widespread use, leading to poor online representation of Santals and their community knowledge.

Screenshot of audio files of pronunciation of words and phrases in Santali, recorded by volunteers using Lingua Libre.

framework covers six main areas:

- *Purpose and affordability*: reasons a user uses a platform or a contributor contributes to developing it and how affordable it is for them to use/contribute
- *Hardware and platforms*: devices and other platforms they use
- *Accessibility*: accessibility issues and needs for those using a platform
- *Project launching*: the preparation that leads to the first significant use/launch
- *Privacy*: privacy- and ethics-related advantages and concerns
- *Diversity*: diversities of different kinds (e.g., gender, caste, affordability/access, race, ethnicity).

The framework itself is neither conclusive nor a restrictive guide. Rather, it collects some critical details about platforms that help people build LLMs and speech synthesis applications, and about their users and/or contributors. Audits can be conducted by both users and nonusers of a platform—and, importantly, by researchers or developers tied to a platform. The audit can be imagined in the same way as ethnographic user research, revealing what is working or not working and indicating what needs to be removed or improved. The open frameworks created based on the initial audits are also open to modification—and the products of a pilot, they have a lot of room for improvement.

The foundational layers of OpenSpeaks (<https://theofdn.org/openspeaks>) as a set of open educational resources lie in multimedia language documentation and emphasize Indigenous, endangered, and low- and medium-resource languages. It was initially intended to help citizen documenters and archivists with standalone audio and video projects, including documentary films, but now encompasses building multimedia language data. Since our tested languages have writing systems of their own, it was straightforward to publish the audit reports as text. Auditing platforms that use oral-only languages and dialects, however, can also be done through audio and video interviews. These could be useful to strengthen the foundational areas in languages that lack resources before moving on to building massive speech data or LLMs. Foundational layers such as word or speech corpora often help in the research and development of many vital tools such as typefaces, input tools, and text-to-speech and speech-to-text tools. Broadly speaking, open auditing can also help in identifying gaps and advocating for resources for priority areas. Like any other correcting mechanism, open auditing is not foolproof. It can only help us see gaps and add a layer of accountability by incorporating practical tools such as “datasheets for datasets” [4].

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12 WHAT ARE YOU READING?

14 MAKING/BREAKING

16 SPACE



ENTER

EXHIBIT
X

Islamic Geometry-Based Moon-Period Calendar and Interaction Design

Anuradha Reddy

Shocked by the recent overturning of *Roe v. Wade* by the U.S. Supreme Court, people who menstruate worldwide were advised to back up, delete, and hide their period data from mobile apps, doctors, and partners—data that could incriminate people for exercising privacy around fetal viability and their right to abortion. And just like that, decades of struggle and hard-earned progress is replaced by profound fears of patriarchal state control over female bodies.

I am angry and I cannot let the stifling narratives about periods and the predictive data practices around them define how I visualize and perceive my body's rhythms. Menstrual rhythms, which are as

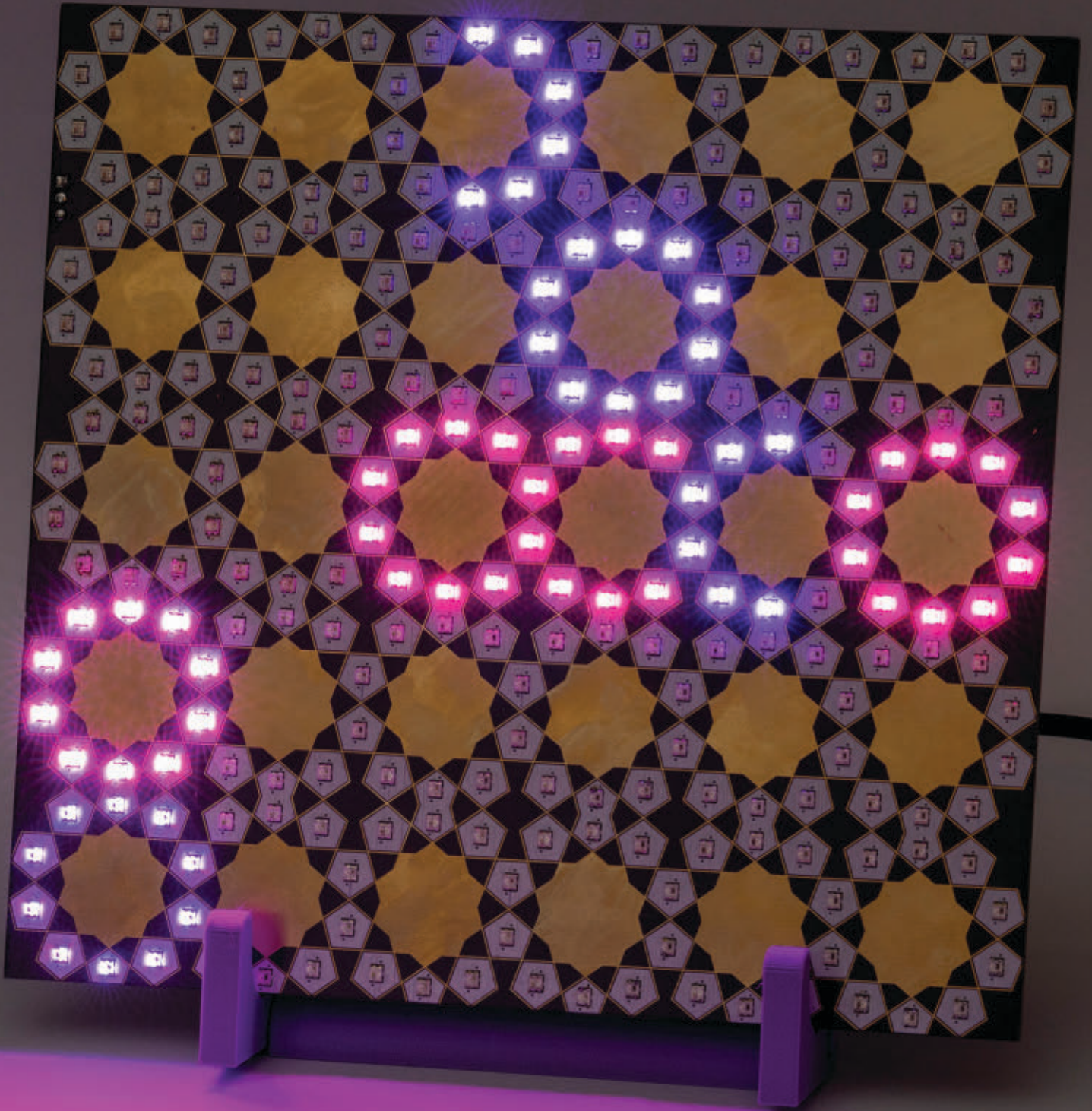
Menstrual rhythms have once again become a thing to be suppressed.

mundane as the moon as it cycles through its phases, have once again become a thing to be suppressed, go unmarked, and not exist unless they serve a reproductive purpose.

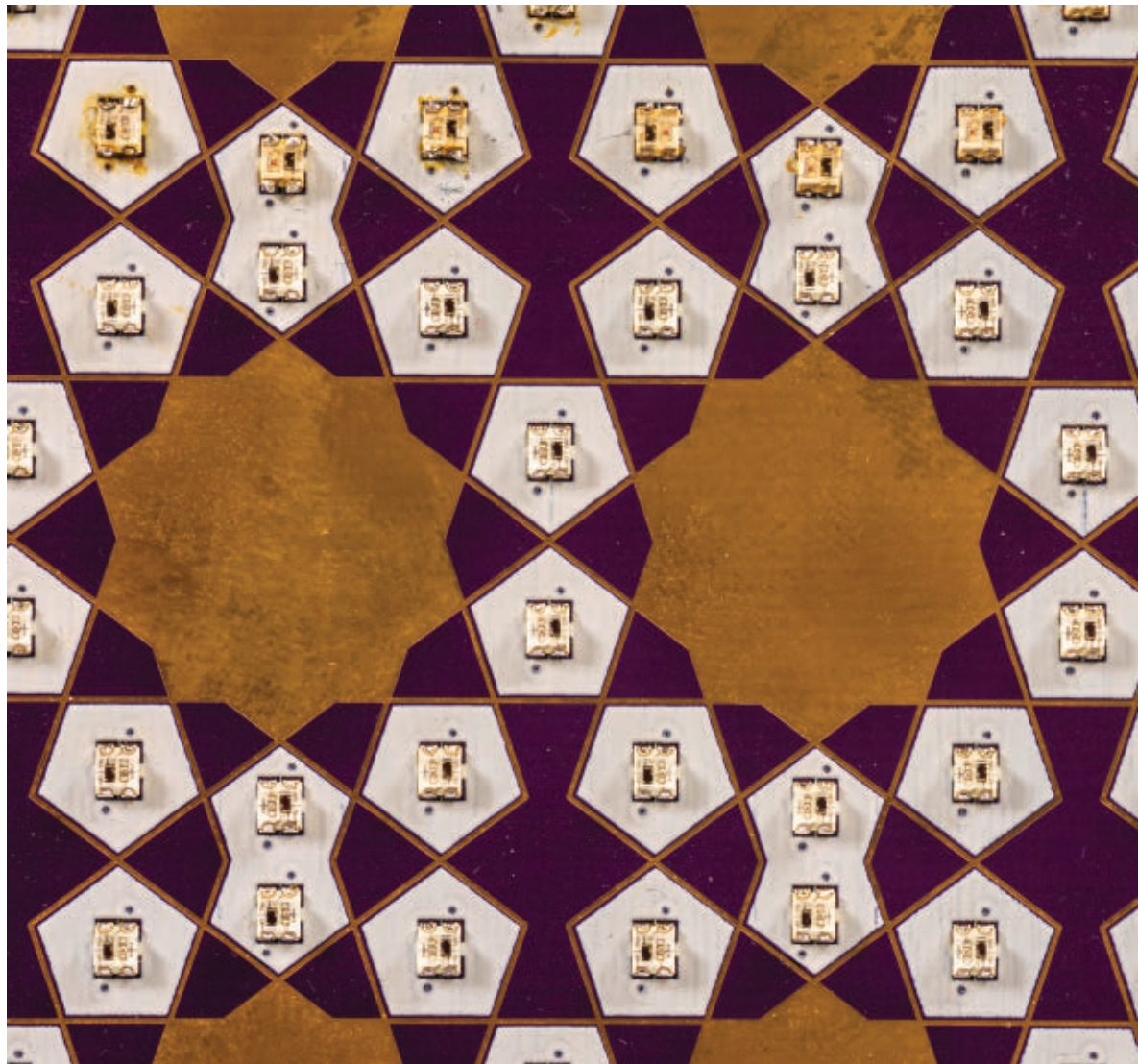
Raised in South India, I am not unfamiliar with hushed period-tracking etiquettes. They are passed down from grandmothers to mothers to daughters and between girlfriends and cousins, each offering advice about the myriad ways of tracking menstrual cycles. My cousins, for instance, are accustomed

↑ Seeing my period days overlap with the moon phases on a visual matrix gives me a sense of when my next cycle will arrive. In this image, my period coincides with the third quarter of the moon, so I predict my future cycle happening a row above it, approximating near the next full moon. This way, I use my self-knowledge to reprogram the calendar and prepare for the following months' cycles. Accuracy is not crucial, as I'm the only person programming and using the device, in the privacy of my home.

ALL PHOTOS BY BART URO182



→ The Islamic pattern on the circuit board is based on a 10-pointed star grid (one LED for each star) made with a purple solder mask, white silk screen, and gold-plating for decorative illumination. The 10-pointed star pattern is borrowed from a book I found in my late grandfather's dusty old library when I last visited my parents in India (*Islamic Designs for Artists and Craftspeople* by Eva Wilson, Dover Publications).



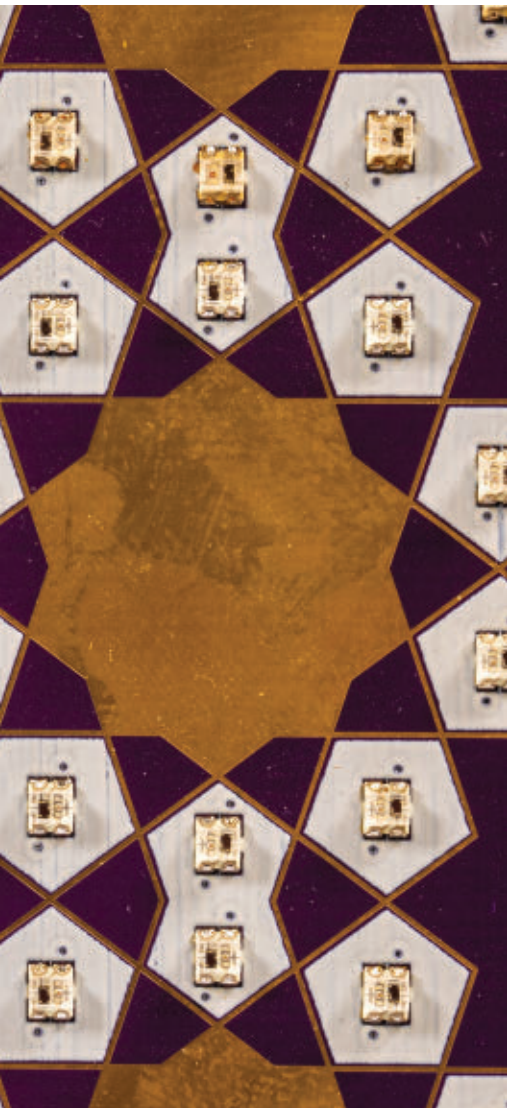
```
show_firstquarter(2, 0x190033)
show_fullmoon(9, 0x190033)
period(14, 0x330019)
show_thirdquarter(15, 0x190033)
period(16, 0x330019)
period(17, 0x330019)
period(18, 0x330019)
show_newmoon(24, 0x0F000F)
```

↑ A code snippet for a single month's tracking

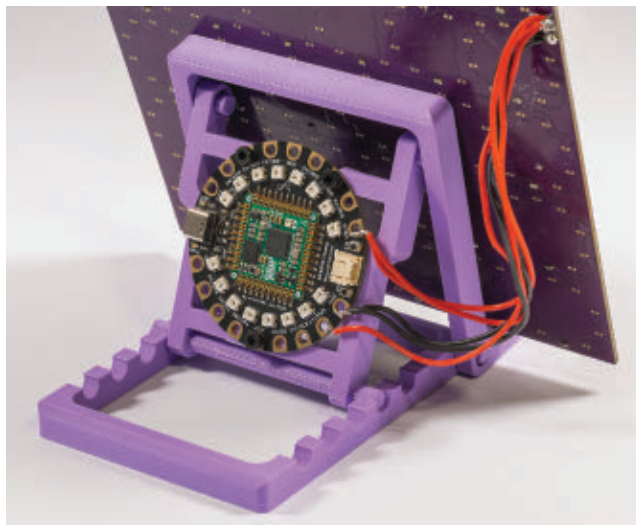
to following religious lunar calendars. If a religious day (e.g., a no moon day) coincides with their menstrual cycles, they refrain from worshipping on those days, which helps them keep track. At the same time, for the closest family members, it is noticeable when, on occasion, mothers and daughters don't join a routine temple visit or set foot in the kitchen (considered sacred). Even if one were excused from doing household chores with the intention to give

rest to the menstruating body, my younger self found this familial custom conservative and biased. I did everything to hide my period and avoid being in my family's gaze. *Thank you, period-tracking mobile apps*, I thought.

Fast-forward to the present. How did we end up in a situation where having (or not having) a period puts menstruating bodies at the risk of legal prosecution, driven by the same technologies that benefit some of us with privacy from



↑ The printed circuit board is made by the Swedish company Solder Party. Each circular unit of 10 LEDs is programmed as a single unit. There are 30 units in total (6" x 5" grid) for 30 days in a month (lunar months always alternate between 29 and 30 days).



↑ The calendar uses the RP2040 Stamp Round Carrier board with CircuitPython to program the LEDs in delectable twilight colors (#330019, period; #190033, moon).

surveillant household traditions? Certainly I am not suggesting a return to how it was, but I believe there are more-than-human values in the lunar calendar example waiting to be explored in the entanglements between different data, bodies, and naturally occurring cycles. Even still, I would like my period data to be local, private, and undisclosed to those who can cause harm by making decisions about what I'm

(not) allowed to access and do with my body and its data.

I decided to experiment with a data visualization project of a moon phase and period-tracking calendar based on Islamic geometry patterns. Playing with Islamic geometry's cyclical and geometric elements has made it a joy to speculate on my body's rhythms and the moon's cycles each month through making and coding, the process for which I describe here.

I also point out that I'm not pursuing any pseudo-theory that syncs moon phases with menstrual cycles. But it's interesting to put the two cycles next to each other and marvel at them, individually and together!

📄 Stamp Round Carrier: <https://lectronz.com/products/rp2040-stamp-round-carrier>
 CircuitPython: <https://circuitpython.org/>
Islamic Designs for Artists and Craftspeople: <https://www.amazon.com/Islamic-Designs->

Artists-Craftspeople-Pictorial/
 dp/048625819X

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Srravya Chandhramowuli

Undoing is an ambitious project, perhaps one that is always evolving, with myriad possibilities and no definitive end. In this piece, I try to find little entry points into this project by turning to a few books, both old and new, that have stayed with me recently and through which I find inspiration or nuance for the agenda of undoing.

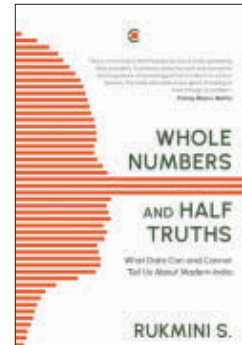
The preoccupation with data's "power" to transform contemporary ways of knowing and being in many ways mirrors



the hyped discourse of "information is power" from the early 2000s [1]. Janaki Srinivasan's *The Political Lives of Information: Information and the Production of Development in India* (2022) provides an opportunity to reflect on and learn from that moment to challenge and undo notions of data as inherently transformative. Srinivasan focuses on the central role accorded to information in effecting

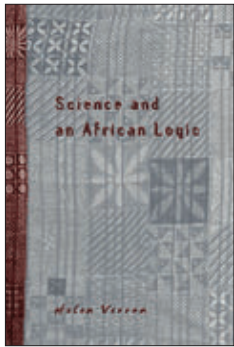
socioeconomic transformation, asking how issues of development came to be framed as informational problems and what work such a framing does. She argues that the ambiguity of the term *information* and its "blandness" allowed its adoption across the political spectrum as a tool for development, and in the process, for depoliticizing development itself. Tracing projects that championed access to information with varied levels of success, Srinivasan shows the role of specific social structures, ideologies, individual agency, collective action, and material forms in defining what counts as information, and what doesn't, as well as their role in producing, accessing, and leveraging information.

Fascinatingly enough, just as much as there is hype surrounding data's transformative potential, it is also caught in a culture of distrust fueled by misinformation and political polarization. Data journalist Rukmini S. addresses this in her book *Whole Numbers and Half Truths: What Data Can and Cannot Tell Us About Modern India* (2021). Her experiences from more than a decade of wading through data to tell stories about everyday events



in India offer rich insights into spirited debates on the methods of calculation, the invisible labors of enumerators, and contested survey instruments. She shows that India's statistical architecture is more robust than it is belied by fears of fudging and fraud. She argues that sweeping dismissals and discrediting of data only further its decay, distracting from demands for accountability and dissuading efforts to strengthen data credibility. Rooted in a practitioner's commitment to her craft,

Srinivasan shows the role of specific social structures, ideologies, individual agency, collective action, and material forms in defining what counts as information.



the book helps me anchor the project of undoing in critical scrutiny.

Another book that I have read in the past year and returned to quite a few times since is Helen Verran’s *Science and an African Logic* (2001). Verran takes us through her struggles in reconciling the disconcertment she felt about the ways in which Yoruba-speaking children in Nigeria learned to do numbers (and science). She resists producing a relativist account of logic that recognizes the Yoruba speakers’ ways of engaging with numbers as both valid and different but still casts it within the frames and structures of Eurocentric ways of doing numbers. Instead, Verran aims to illustrate numbers (and ways of knowing) as not only multiple but also connected and ongoing. Here the undoing is ontological; this thinking has informed discussions in HCI on postcolonial computing [2] and tensions

in difference-making [3]. In my research examining data labeling for AI, I draw on Verran’s engagement with the ontological implications, or politics, of certainty to consider the logics of counting that order-labeling work and ask what is lost in ordering these logics and what alternatives there might be. More importantly, the book inspires me to stay with the disconcertments I encounter in my own work and confront my role in the stories that I tell about the worlds I study.

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Designing Data Physicalization Artifacts

Marijtel Melo, University of North Carolina at Chapel Hill

As opposed to 2D-rendered data representations that are solely visual, data physicalizations are 3D representations of datasets that can be touched, heard, and even smelled. The ethos of 2D data visualizations is touted in the simplicity of their portrayal: clean lines, minimal images, muted colors, and an aura of what Donna Haraway calls the God-trick—the idea that the visualization offers an unbiased, objective representation from an “all-knowing” author [1]. A common assumption is that data visualizations are objective; however, notions around objectivity and the “hygiene” of visualizations

The design of 3D datasets allows for critical reflection on the performative nature of data visualizations and how they contribute to larger conversations about power.

are called into question from a critical standpoint.

While data physicalizations have existed since time immemorial, the design of 3D datasets allows for critical reflection on the performative nature of data visualizations and how they contribute to larger conversations about power. For example, data and the researcher are often invisibilized in a chart or graph. What would it mean to have the researcher extend their positionality into the data representation? To recognize the limits of objectivity and instead strive for transparency regarding how the visualization was created [2]? To showcase the limits of the dataset?

I teach a course on critical making and assign a data physicalization project. I ask students to reenvision their relationship to a 2D dataset by creating a 3D artifact based on that dataset. Specifically, students were asked to consider the ethics and politics of data visualization through critical lenses (e.g., race, gender, sexuality, class). The students chose their dataset topics; the

subjects were diverse: the harms of masking in the LGBTQ+ community, the impact of banned books on user communities, and land loss on Turtle Island and Indigenous resistance. Students designed rhetorically persuasive data physicalizations with an accompanying strategic rationale to outline their making processes.

Presented here are two examples of students’ artifacts and their making processes.

1. Holes in the Data: A Representation of LGBTQ Data

For the physicalization of this data I have knitted a mesh tank top, using different stitch patterns and colors to represent different elements of the data. I chose a mesh tank top as a queer item of clothing that plays with aspects of concealing and revealing, which reflect different approaches to collecting queer data. Each band of color represents a different point of data. The holes in the pattern symbolize the fact that there are gaps in LGBTQ data

collection (what is unknown about LGBTQ lives captured by data) even as they reveal the body underneath.

—James McKinnell

2. Unbearable Ugliness

The purpose of this project is to capture the reactions of many devout Catholics to the data presented by Report 1 of the 40th Pennsylvania Statewide Investigating Grand Jury, 2018. Through this, I hope to bring greater awareness to the sexual abuse crisis in the Catholic Church and to remind viewers to be critical of all organizations.

—Maria Palmtag

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TABLE 1
More than half of LGBTQ Americans hid a personal relationship to avoid discrimination
 Measures taken by LGBTQ Americans to avoid discrimination, by demographic group

Measures to avoid discrimination	Total across Survey	Transgender*	People of color**	Respondents who reported discrimination in the previous year
Had a personal relationship	54%	52%	51%	73%
Made decisions about where to work	35%	58%	37%	55%
Changed the way they dressed/mannerisms	35%	66%	34%	53%
Avoided houses of worship	35%	47%	30%	54%
Avoided public places (e.g., restaurants)	33%	55%	36%	56%
Moved away from family	32%	47%	33%	45%
Avoided law enforcement	30%	50%	34%	48%
Moved from a rural area	22%	37%	21%	32%
Made decisions about where to attend school	21%	35%	25%	33%
Avoided doctors' offices	20%	47%	21%	36%
Avoided getting services for self/family	19%	39%	21%	31%
Avoided travel	18%	31%	21%	28%
Postponed adding children to the family	11%	20%	16%	17%

* The statistics for transgender individuals include nonbinary, gender-nonconforming, genderqueer, and agender respondents.
 ** For the purposes of this survey, people of color include Black, Hispanic, Asian, and multiracial individuals, as well as those identifying as "other race/ethnicity."
 Source: Center for American Progress and NORC at the University of Chicago online survey, June 2020, on file with the authors.



1 Working draft of the mesh top.

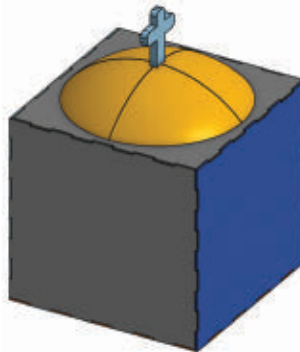
1 A stitch chart to represent a data point on LGBTQ dress and mannerisms.



1 The finished data physicalization artifact.

1 Dataset from the Center for American Progress and NORC at the University of Chicago, 2020.

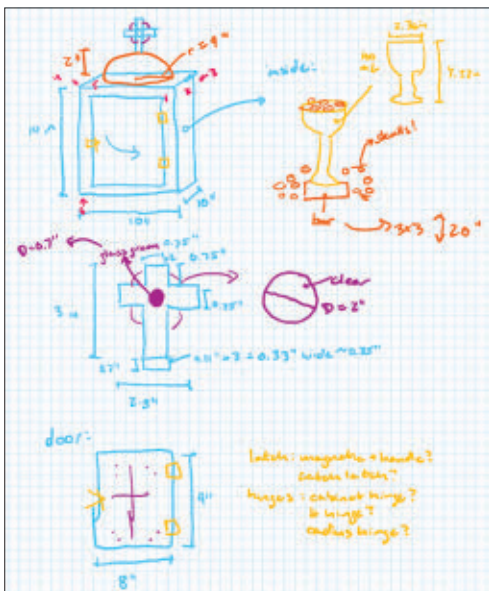
DIOCESE	NUMBER OF ACCUSED	PERCENTAGE OF TOTAL ACCUSED
ALLENTOWN	37	10.6%
ERIE	41	11.8%
GREENSBURG	20	5.7%
HARRISBURG	45	12.9%
PITTSBURGH	99	28.4%
SCRANTON	59	16.9%
PHILADELPHIA	63	18.1%
ALTOONA-JOHNSTOWN	51	14.6%



2 3D model prototype rendered via Onshape.

2 Table from Report 1 of the 40th Pennsylvania Statewide Investigating Grand Jury, 2018.

2 Sketch of the artifact's dimensions and components.



2 The finished data physicalization artifact.



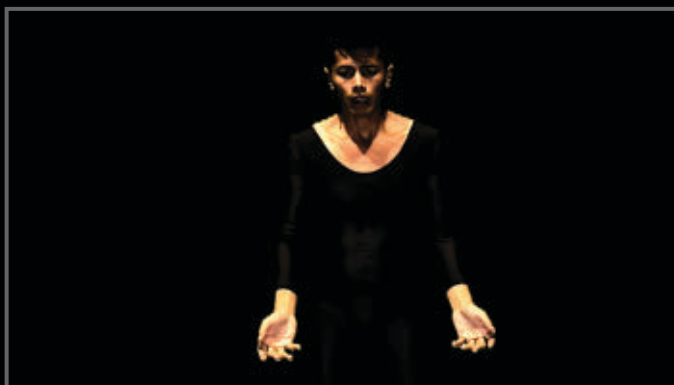
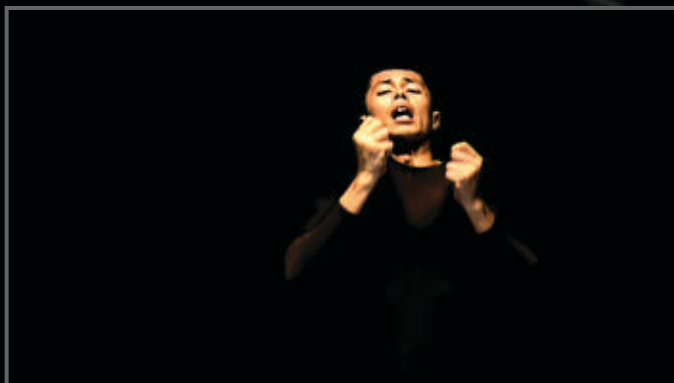
Acknowledgments

We would like to thank On the Boards and the panelists for Black Box Weatherxan for allowing us to realize this work.

CREDIT: TK

Stratum: Selfhood in the Digital World

Chari Glogovac-Smith, University of Washington



Stratum is an intermedia movement-based performance work that explores selfhood and the human condition in a post-human digital society. Using video projections, immersive sound, 3D animation, and green screen technology, Stratum invokes the dynamics between presence and being present, between here and somewhere, and between self and selfhood.

The first iteration, a 10-minute piece featuring a solo dance performance by Gary Champi (shown here), debuted at On the Boards in Seattle in 2022. The projections were composed by filming Champi in advance in front of a green screen and then integrating the footage into a world created with 3D animation. Champi's movements were synced with the projections to create a duplicitous effect. In addition to the new media areas of exploration, we were also interested in investigating traditional performer-audience dynamics and experimented with breaking the fourth wall by extending the "stage" into the audience.

The project originated as a part of a performance residency at On the Boards called Blackbox Weathermxn. The premise was to reinterpret and envision the technology, structure, and compositions most often used in weather forecasting as a creative framework for the realization of the performance work. Our approach created a conversation between abstract suggestions of self-realization and the dynamics of unsettled and changing weather, metaphorically and creatively.

This was the first time Glogovac-Smith and Champi worked with green screens and cameras in a live performance setting. During the residency, they grew into an efficient and focused team with a clear vision.

Chari Glogovac-Smith is an Emmy-nominated composer, performer, and intermedia artist. Using an evolving mixture of traditional and experimental techniques, they dynamically explore and illustrate various counterpoints between the human experience and society. Their recent works have posed questions about empathy, conflict, landscapes and cultural connections, the archive, social justice, healing, listening, and time.

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Gopinaath Kannabiran

But I'm Not Paranoid!

There was no place for him to go. No place he could hide. No place where his enemy didn't exist. No escape from unconscious wakefulness. There was no rest. And so he just lay there with the nauseous pain of exhaustion.... Yet it was this constant and all-pervading pain that seemed to allow him to survive for without it the overwhelming anguish and terror of his mind would have destroyed him.

— Hubert Selby Jr. (*The Room*, 1971)

The above excerpt describes a peculiar aspect of paranoia: a constant and all-pervading fear that seems to allow one to survive when perceiving overwhelming anguish and terror. Paranoia is typically characterized as a pathology of an individual's psyche. In this column, I formulate paranoia as a matrix of sociotechnical interactions that arise in reaction to a collapse in the ecology of meaning and expected order. Thus, paranoia is a form of knowing that arises when what is known can become undone. Queer theorist Eve Kosofsky Sedgwick notes that "paranoia refuses to be only either a way of knowing or a thing known" [1]. Queering the subject/object binary, my approach to paranoia straddles between an objective diagnostic analysis (what is known) and a subjective prognostic rationale (what ought to be done) with respect to technologically mediated social interactions. In recent years, there has been an increased push in HCI toward engaging with social-justice-related issues across problem domains. Social-justice-informed design epistemophilia—an invested drive for knowledge—has a proclivity to position researchers and designers as valiant protectors of the vulnerable against pervasive oppressive structures.

While social responsibility and ethical considerations are indispensable for design practice, it is vital to acknowledge the limits and limitations of "doing good through design" narratives. In this context, I will explore paranoia as a sociotechnical matrix of interactions with concomitant desires that bear implications for the design of technology.

PARANOIA AS A SOCIOTECHNICAL EPISTEME

அரண்டவன் கண்ணுக்கு இருண்டதெல்லாம் பேய்!

The above Tamil adage roughly translates to "Every shadow is a ghost to the eyes that hold fear!" To dismiss someone's fear as paranoia is a contention for power about what can be admitted as "reasonable" while persuading others. Therefore, an ethical consideration of paranoia behooves us to ask who benefits from dismissing others' fears and how such reasoning is enmeshed within design discourses. Expanding beyond a pathologizing conceptualization, I explore paranoia as a sociotechnical episteme—a way of knowing and making sense—that can offer a multitude of competing explanations and speculative expressions that arise out of suspicion. John Farrell offers

What happens when we acknowledge that we do not merely perceive design problems as they are but perceive them as we are?

a genealogy of suspicion in modern Western thought and characterizes paranoia as "a psychological tendency in which the intellectual powers of the sufferer are neither entirely undermined nor completely cut off from reality, but rather deployed with a particular distortion" [2]. Paranoid thinking deserves careful consideration because it cannot be readily dismissed as persecutory delusions of an individual. Farrell argues that "modern people identify with the paranoid character [because they] feel the need to account for their individual and collective failures, to set their own lives meaningfully in the context of their moral relations with others" [2]. Paranoia then can be characterized as an Other-oriented episteme that is inherently relational.

Made manifest and mediated through a sociotechnical matrix of interactions, paranoid thinking becomes a form of "group thinking" that involves an orienting belief about "possessing a special insight into the epistemologies of enmity" [1]. Ieva Jusionyte and Daniel M. Goldstein illustrate "the multiple and shifting intersections of in/visibility and in/security in today's security-minded world" [3]. They assert that "paranoid concealment and creative camouflage are the modi operandi of contemporary security regimes, and the ability to manipulate visibility and to penetrate the opaque are key techno-discursive components of ongoing state projects of security" [3]. Wendy Hui Kyong Chun provocatively states, "To be paranoid is to think like a machine" [4]. Thus, to leave no stone unturned is a machine-logic response to perceived threat. We use digital vaccine passports that determine how human bodies can move across human-made borders and

involve legal, state, medical, policy, and policing experts. In my opinion, what seems to be lacking is a caring sensitivity toward those for whom paranoia is experienced as a necessity for survival, specifically groups of people who carry multigenerational trauma in their bodies and experience it repeatedly playing out in the group's psyche. Groups that have been and are systematically exploited continue to survive despite the dangerous and alienating interactions because of their paranoid thinking. Whether it be state-level public health measures or teaching small children not to accept food from strangers without asking an adult in the family, paranoid thinking is an adaptive response to perceived threat to survival.

DESIGN THINKING AND PARANOID THINKING

Anyone not paranoid in this world must be crazy...Speaking of paranoia, it's true that I do not know exactly who my enemies are. But that of course is exactly why I'm paranoid.

— Edward Abbey (*Postcards from Ed: Dispatches and Salvos from an American Iconoclast*, 2007)

When designing technologies that mediate our relationships with others across contexts, how might we design to balance the impulse to detect threats from others while also learning to cultivate trust with others? Design thinking is often entrusted with the task of innovating our way out of complex issues such as climate change at the global level, social inequities at the communal level, and intimacy at an interpersonal level. Are we to expect designers to repent about their role in and atone for making a mess to begin with while also acrobatically kowtowing to the demands of the market to make a living? Design theorist Donald Schön approaches designing as reflective conversation with the materials of a design situation. He points out that designing involves: 1) tacit knowing that cannot always be fully articulated; 2) establishing patterns, relationships, relevance, and meaning; 3) values, norms, and beliefs that inform appreciation criteria and decision making processes; and 4) understanding that the problem and solution space are not given but



constructed and coevolve over time [5]. How might Schön's characterization of design as reflective practice intersect and interact with the politics of "doing good through design" narratives in HCI? And what does paranoid thinking have to do with design thinking?

Paranoid reasoning is constructed and offered as an alternative rationale to the status quo but tends to deny or at least distrust alternatives to itself. Timothy Melley insists that paranoid reasoning "is a reductive, but still useful, form of political representation [that] develops from the refusal to accept someone else's definition of a universal social good or an officially sanctioned truth" [6]. Thus, critical impulses within HCI and design discourses that are developed from the refusal to accept someone else's definitions and values are necessary to meaningfully engage with complex issues that have sociopolitical implications. Sedgwick observes that "paranoia is drawn toward and tends to construct symmetrical relations, in particular, symmetrical epistemologies" thereby propagating "a mode of selective scanning and amplification" [1]. For example, while moderating content in online group discussion forums, the act of censoring might be necessary sometimes but it can also trigger the belief that the act of censorship itself is a confirmation of our worst-held fears.

Sticking to everything with which it comes in contact, paranoia tends to be hermetically sealed by "blotting out any sense of the possibility of alternative ways of understanding or things to understand" [1]. Thus, censoring is a necessary but not sufficient mechanism of harm reduction. Censoring alone is not enough as a harm-reduction practice while designing interactive technologies, such as online discussion forums, that have the potential for the expression of toxic opinions and problematic group behaviors. Reaffirming the opinion that retributive, justice-oriented technologies alone are not enough, designers and HCI researchers must engage with the design of technological interactions through the ethics of reparative justice.

Moving away from a pathologizing perspective of paranoid thinking, we might begin by asking what could possibly be the value of paranoia? From an evolutionary perspective, Nichola Raihani and Vaughan Bell "argue that the presence of coalitions and coordination between groups in competitive situations could favour psychological mechanisms that detect, anticipate and avoid social threats" [7]. Therefore, they "suggest that paranoia should not solely be viewed as a pathological symptom of a mental disorder but also as a part of a normally

functioning human psychology” [7]. If we are to agree that paranoid reasoning warrants critical engagement despite its problems, what is its relevance for designing technology? American novelist Nathaniel Hawthorne wrote concisely of the dilemma that paranoia brings: “Trusting no man as his friend, he could not recognize his enemy when the latter actually appeared.” The messy entanglements between paranoid thinking and design thinking intensifies when we realize that design: 1) is often entrusted with recognizing and protecting us from potential threats (through concerns such as privacy, security, risks, etc.); but also 2) helps us explore and cultivate healthy relationships with others across contexts (through concerns such as care, intimacy, trust, etc.).

SAVING THE WORLD THROUGH DESIGN AND OTHER STORIES

*Oh, de kodak fiend, he's sly an' mean,
An' you can't go out near his machine,
Or he'll take you down wid yo'
kinked-up hair,
An' yo' dirty clothes, and yo' feet all bare.*
— Joel Benton
 (“The Kodak Fiend,” 1894)

The above poem warns readers about an amateur photographer using his Kodak camera to take unflattering pictures of strangers. Fear of what might become possible with new technological changes continues to engender paranoid responses in numerous ways. In relation to paranoia, what happens when we acknowledge that we do not merely perceive design problems as they are but rather perceive them as we are? Regarding the pain of others, queer activist Susan Sontag wrote that to photograph is to frame, and to frame is to exclude. Design involves framing in the form of establishing patterns, relationships, relevance, and meaning that are operationalized through appreciation criteria and decision-making processes informed by the values, norms, and beliefs of a group of people. Does framing always necessarily mean excluding? If yes, then how might we work toward meaningful inclusive design practices? Casting others as victims without accounting

for their strengths and resilience provides discursive cushioning for authoring designer-as-savior narratives. If designing means “doing something” about perceived problems, we might be stumped when faced with a situation that requires us to do nothing, or where nothing can be done. In relation to a culture of conspiracies, Melley uses the term *agency panic* to describe the “intense anxiety about an apparent loss of autonomy or self-control” [6]. When confronted with our worst fears, how might designers and HCI researchers compassionately navigate our agency panic?

Generating HCI research is an act of deliberate causality (thanks to Jofish Kaye for introducing this framing to me). HCI researchers and design theorists attempt to push reality toward a specific vision of the future among competing prospects and create a space of possibility for technologically mediated social interactions. Ideally, designers are interested in changing the world for the better. Design theorists must convince others about what is worth pursuing among competing prospects for what our shared future ought to be. The ritualized production of design research knowledge involves objectively constructed information, subjective expertise based on specialized training, relational sensemaking of multiple disciplinary practices, and material processes. HCI and design researchers are required to build coalitions among different stakeholders and coordinate between groups with the goal of deliberately manifesting their vision among several competing alternatives for the collective, technologically mediated future. My intention here is not to imply that design research and paranoid reasoning are the same but rather to spark communal discussion about how these two bear implications for each other.

HCI is primarily an interventionist discipline, since our work is not to merely study and describe the problems around us but to intentionally change the world, hopefully toward the better. When HCI research is framed as fighting unjust systems and empowering those who are marginalized through

technology design, the discourse can tip toward “trace and expose” projects. Shedding the guise of the disinterested impartial observer describing reality, HCI researchers and design theorists must make impassioned arguments by appealing to other people’s sensibilities, ethics, and morals, along with a convincing rationale and material evidence to legitimize their agenda for pushing reality in a certain direction. Design theorizing and paranoid reasoning about technological changes uncomfortably share a common terrain: Both offer a multitude of competing explanations and speculative expressions that might arise out of suspicion and distrust. While training designers and HCI researchers, how might we account for and accommodate lived experiences of paranoid reasoning in an emotionally reparative and socially responsible manner?

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Elizabeth F. Churchill

Throwing Spaghetti Against the Wall

Why Technology Leaders Need to Invest More in HCI and UX

At the time of writing this column, the world of search and information seeking is in a furor about OpenAI’s ChatGPT, and Microsoft’s adoption of its capabilities to “disrupt” the paradigm of online search as we know it. Google’s response was to announce the release of Bard, which has similar capabilities.

Generative AI is the talk of the town, and these tools in particular are at the center of the conversation, as well as being the conversational agents du jour.

Secretly, I’m hoping that the business “disruption” conversations will all be behind us by the time this column is published. I am more interested in constructive conversations about how to ensure we create positive and meaningful experiences for people.

ChatGPT and Bard use large language models (LLMs) to generate answers to questions, purportedly outperforming our (human) ability to do traditional search tasks with our favorite search engines. In theory, they can produce prose answers to questions that rival any A-grade student essay. To some, this capability is a shocking disruption in the field of traditional online search. I have certainly been having fun. Here was ChatGPT’s answer to my question about the topic of this issue of *Interactions*, “undoing data practices”:

Question: *What are queer, decolonial, more-than/other-than-human readings of dominant epistemic forms in data science?*

Response: *Queer, decolonial, and more-than/other-than-human readings of dominant epistemic forms in data science are critical perspectives that challenge the dominant epistemologies and power structures in data science.*



Queer readings of data science examine the ways in which dominant epistemic forms in data science are shaped by and reinforce heteronormative and cisnormative assumptions. This includes questioning the gender and sexuality biases in data collection and analysis, as well as the ways in which data science reproduces and amplifies existing power structures that marginalize queer individuals and communities.

Decolonial readings of data science examine how dominant epistemic forms in data science are shaped by and reinforce colonial structures and ways of thinking. This includes questioning the ways in which data science is used to surveil, control, and exploit marginalized communities, as well as the ways in which data is collected and analyzed in ways that perpetuate colonial power dynamics.

Overall, these critical perspectives offer important insights into the ways in which dominant epistemic forms in data science are shaped by and reinforce various forms of marginalization and oppression, and can help to identify ways in which data science can be used to challenge and

transform these structures.

An interesting response; not bad at all. And yet, as I try more and more questions, I have noticed some things:

- Accuracy varies. Sometimes the answers are wrong, which leads me to question the veracity and consistency of all the responses to my queries.

- Concerningly, people take received summaries and answers to questions as “certain,” in part because of the overblown belief in AI as all-knowing, as actually having high “intelligence” in the human sense of the word. Sadly, it has been reported that these tools project 100 percent certainty when they are actually correct 80 to 85 percent of the time—on a good day.

- Responses never say anything novel or surprising; they are not thought provoking or innovative. They offer an excellent regurgitation of what I could have looked up (aka *searched for*) myself.

- Using these tools is pedagogically problematic. In the act of researching a topic, of looking something up and summarizing what I learned, I would have cognitively engaged with relevant

materials, reviewed the debates and the sides of any particular “argument,” and had to have come up with an opinion. That would have been an engaged learning experience. Using these tools forgoes that deep engagement with a topic.

Though certainly useful and a lot of fun, for me these tools currently have issues similar to:

- Spelling autocorrect, which I find to be a useful tool, although one that consistently changes everything from my British English spelling to American English spelling, *favourite* to *favorite* being one good example.
- Email suggestion, which when trained on an undeclared dataset suggested that my email should start with “Hello, Darling” when writing to a senior vice president at my company.
- “Smart” product recommendations, which invite me to buy myriad things for which I have no need just because I once bought someone a gift.

The discussion around these tools renders visible a confusion between information, knowledge, domain literacy, and conversational exchange and debate. Unsurprisingly, after a lot of hype and overblown excitement, the inevitable happened: The conversational agents started getting things wrong. Asked “What new discoveries from the James Webb Space Telescope can I tell my 9-year-old about?” Google’s demo of Bard offered three bullet points in return, including one that states that the telescope “took the very first pictures of a planet outside of our own solar system.” Astronomers were swift to point out that this is factually inaccurate—the first image was taken in 2004, 14 years before the James Webb Space Telescope was launched. The agents also started becoming rude and creepy. Microsoft’s Bing chatbot very quickly became “unhinged,” generating rude, angry statements, and generally behaving like our very human Internet trolls. In one Verge article, journalists reported a number of incidents where Bing was insulting, lied, called its human interlocutors names, and generated emotionally manipulative discourse.

What surprises me most is why we keep being surprised.

Microsoft’s Tay chatbot was trained on Twitter data. Only a few hours after it was launched, in 2016, it began posting inflammatory and offensive tweets through its Twitter account. Microsoft shut down the service, blaming trolls on Twitter for feeding it offensive content, which it learned and then regurgitated. Yes, another example of the training dataset problem. It appears that trolls and hackers are already training our new crop of LLM-backed conversational agents to spread socially incendiary messages and/or figure out how to hack into systems. In the hands of nefarious actors, these tools have already been identified to be potential security threats [1].

What can we do as HCI and UX practitioners and scholars to have more influence, to be more involved? I hear from friends that HCI and UX skill sets are routinely missing from the exuberant techno-centric teams who produce these tools. It is clear that there is not enough testing in what has been dubbed the “AI arms race,” and that companies are, as usual, more involved in getting their shiny new toys launched than in thinking deeply how to serve people.

You may have noticed that the ChatGPT answer I posted earlier did not include an answer to the question of “non-human and other-than-human.” That was because I saved it for last. Here is ChatGPT’s answer:

More-than/other-than-human readings of data science examine the ways in which dominant epistemic forms in data science are shaped by and reinforce anthropocentric assumptions, as well as the ways in which data science can be used to understand and support non-human entities and ecologies. This includes questioning the ways in which data science reduces complex systems to discrete variables and ignores the interdependence of human and non-human actors, *as well as exploring the ways in which data science can be used to support more-than-human forms of knowledge and ways of being.*

I highlight that one phrase intentionally. It is clear the data scientists and company leaders don’t take the advice of the summaries their own models create. Or more likely, they don’t ask the right questions to

understand what their own models spit back at them.

More imagining the consequences of these technologies is needed. Better understanding of the datasets that are the training substrate is needed. More transparency and reflectiveness is needed. This should not be news to anyone.

I want to emphasize that I am excited about these emerging capabilities. I’m certainly excited that we are actively reflecting on human information search and retrieval needs and activities, and what can change with the help of powerful tools. And that the incumbents are getting an energizing shake-up. However, the negative and assumedly unintended consequences of LLM-based “conversational” tools were entirely predictable.

When will technology leaders stop repeatedly throwing technological spaghetti against the wall just to see what sticks? When will they hire and/or take seriously the advice of professionals whose training and interests focus on the social and societal consequences of these tools rather than fetishizing technologies, focusing on business “me-first-ism,” and releasing poorly implemented, half-baked implementations?

Let’s hire and take seriously the advice of people who know how to ask, *What if?*—people who care about the broader and longer term impact of tools like ChatGPT and Bard. Let’s get the experienced cooks in the kitchen—cooks who know how to assess whether the spaghetti is cooked without flinging it at a wall.

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Zehua Zeng, Intel



Leilani Battle,
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Using Graphical Perception in Visualization Recommendation

As data continues to grow at unprecedented rates, we encounter unique challenges in helping analysts make sense of it. A prime example involves visualizing the data, where an analyst may have to reduce thousands of data columns and billions of data records to a single visualization. This often involves selecting which columns to visualize; sampling, filtering, or aggregating the data down to a manageable number of records; and mapping the results to intuitive visual encodings such as positional axes, bar heights, or color hues.

Every step of the way, the analyst must grapple with what to focus on *and* how to translate the focus into a compelling image. We see a small slice of this problem in Figure 1: We can generate many different visualizations for a movie dataset, but the default design choices can be problematic. For example, the line chart in Figure 1 is just a blob of blue pixels. How can visualization tools help analysts navigate this complex and even frustrating web of interconnected design decisions?

We have seen an explosion of visualization recommendation tools responding to this challenge. These tools aim to reduce decision fatigue by automating part or even all of the visualization design process. We summarize how these tools behave based on what they aim to automate [2]: which parts of the data to focus on (recommending data columns, rows, queries, etc.), which visual encodings to apply (recommending scales, colors, shapes, etc.), or both.

Graphical perception research



measures how well people perceive different encoding choices, which could inform the development of visualization recommendation tools. However, when we surveyed current tools [2], we noticed a surprising pattern: They seem to reference few if any findings from graphical perception when recommending visual encodings. This result led us to another important question: Why aren't current visualization recommendation tools

incorporating experiment results and guidelines from graphical perception research?

A natural starting point is to review the graphical perception literature and figure out which parts are most relevant to visualization recommendation tools. This led us to review 132 interesting works in graphical perception [3], from visualization textbooks to decades-old experiments of how people perceive bar charts to studies of what happens when you add iconography or other embellishments to visualizations, among others. The sheer breadth and depth of work was at times overwhelming, and we started to see the problems that developers were running into. For example, it's a struggle to separate the papers (and textbooks) that are relevant to visualization recommendation from those that are

Why aren't current tools incorporating experiment results and guidelines from graphical perception research?

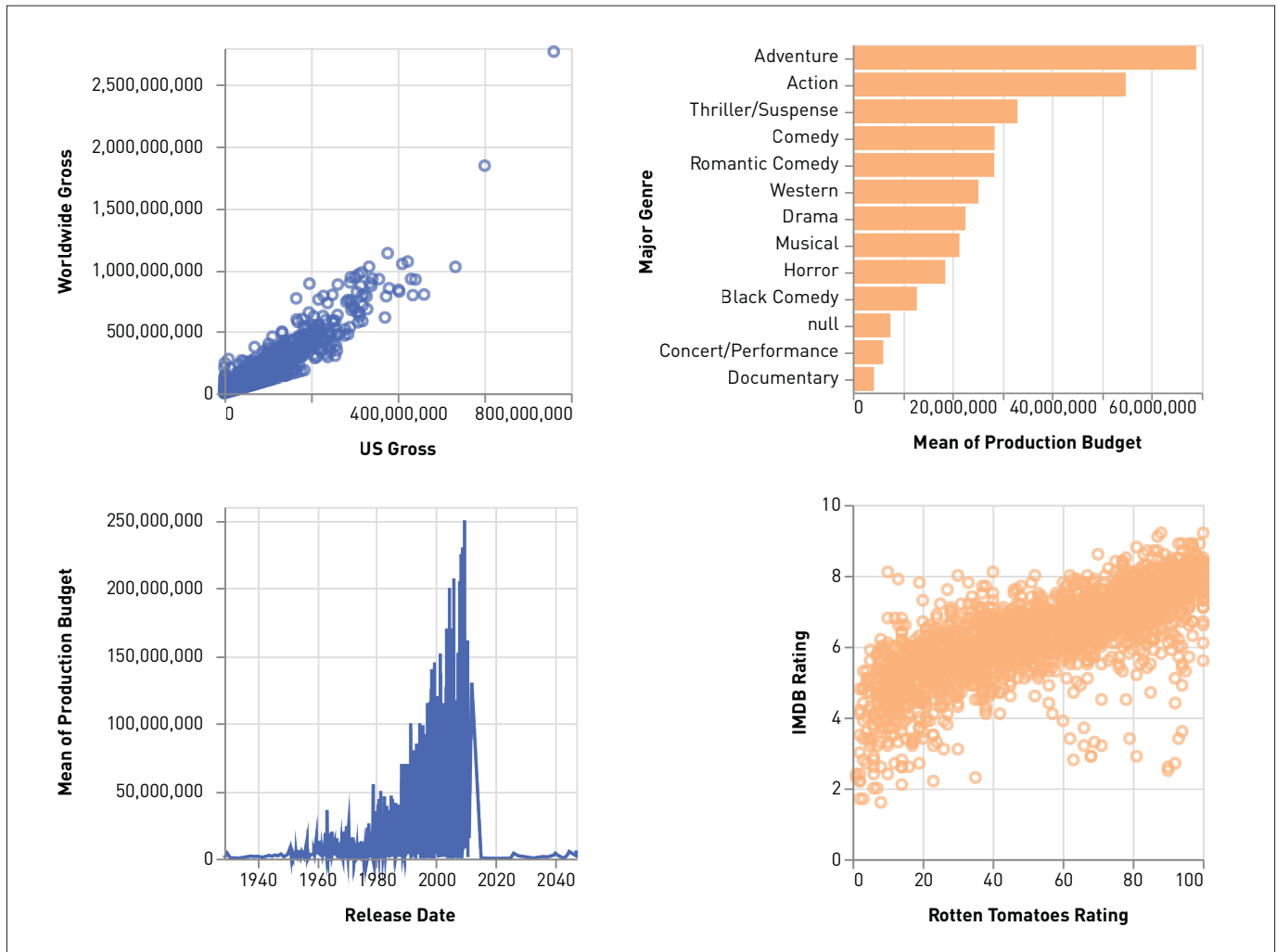


Figure 1. Even a simple movie dataset can be visualized in many different ways (data source: [4]).

not. After reviewing 132 papers and books, we found that less than half of them (59 out of 132) were actually directly relevant for visualization recommendation.

Even when relevant papers are found, it's not obvious how someone outside of graphical perception would translate them into actionable guidelines or code. Most of the papers we reviewed only provided recommendations for future studies that could be conducted, or high-level suggestions that have unclear applicability to visualization recommendation, such as how visual embellishments might be used in the abstract rather than how they could be generated within a specific tool [4].

Put another way: We observed a *mismatch* between the available *outputs* from the graphical perception literature (unstructured diagrams,

graphics, text summaries) and the expected *inputs* to visualization recommendation tools (executable models, concrete encoding rules, actionable design guidelines).

Our results reveal an entirely new perspective on navigating the handoff between graphical perception and visualization recommendation: Rather than expecting developers to

We observed a mismatch between the available outputs from the literature and the expected inputs to visualization recommendation tools.

manually map graphical perception breakthroughs into visualization recommendation code, what if we develop a *pipeline* for translating results from graphical perception into data that could be imported into visualization recommendation tools? A systematic approach to addressing the problem would not only help graphical perception researchers expand the impact and reach of their work but also help tool developers avoid reimplementing what graphical perception researchers have already done. Furthermore, a pipeline could be reused in the future, so new studies in graphical perception could easily be incorporated into current and future visualization recommendation tools.

To this end, we revisited all 59 papers from our literature review and translated each into a corresponding data file in an easy-



















Task	Metric	Rank	Ref.
sort	accuracy	 \approx  \approx 	[58]
	time	 \approx  \approx 	
aggregate	JND	 \approx  \approx 	[75]
filter		 \approx  \approx 	[74]
correlate	accuracy	 \approx  \approx 	
cluster		 \approx  \approx 	

Figure 2. An example table from our research (see Table 5 from [6]) summarizing the relative performance of different color palettes under specific perceptual tasks.

to-use JSON (JavaScript Object Notation) format. Together, these 59 data files yielded *the largest graphical perception dataset to date* for use by visualization tool developers. We carefully structured the JSON files to be easy to load into almost any visualization tool. Furthermore, with a JSON format, the files could even be loaded into JSON-supporting database management systems such as MongoDB. For this reason, our dataset is easy to query and filter for graphical perception papers matching a developer’s desired criteria, such as papers that include bar charts.

But what exactly is contained in one of these JSON data files? Each file specifies the exact visualization designs that were studied by the corresponding paper, such as line charts, bar charts with embellishments, parallel coordinates plots, and so on. The file also records how the designs were compared in user studies, for example, comparing bar and pie charts under certain perceptual tasks [5]. Finally, we recorded the results of these comparisons, such as whether bar charts showed a statistically significant advantage over pie charts. If user studies were not conducted—for example, if we came across a theory paper rather than an experiment paper—we recorded that as well.

Some study insights, however, were not as easily captured by our dataset. When two papers disagree,

for example, how should we record it, since the corresponding data files are designed to be self-contained? Similarly, when several papers reach a consensus, where should this be recorded in our dataset?


In response, we synthesized complementary design guidelines in the form of skimmable tables (an example is provided in Figure 2). These tables summarize major recommendations proposed by graphical perception researchers. We emphasize actionable guidelines in our tables, to ensure that they provide immediate value to visualization and tool designers. In the future, we aim to detect consensus and disagreement automatically. Currently, we are investigating how Draco [6], a research-oriented visualization recommendation framework, uses constraint-based problem solvers to break ties and disagreements within our dataset.


Now that we have this data, how should people use it? We hope to see visualization designers referencing our tables when designing visualizations by hand. Our tables can help designers quickly avoid common design pitfalls in visualization, as well as select optimal encodings for certain perceptual tasks. We also hope to see researchers and tool developers importing our data into their visualization tools, thereby enabling them to automatically select perceptually effective encodings.

This work also opens the door to new ideas in graphical perception. For example, our dataset reveals an opportunity to evaluate graphical perception studies based on how they shift the behavior of visualization recommendation tools. In the future, we hope to see exciting perception-driven recommendation work building on our dataset.

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Daria Loi,
Fishtail

Diamonds of Sadness

A Story of High-Tech Greed, Power, and Hypocrisy.

This ongoing irresponsible behavior will no doubt be remembered in history as one of the greatest failures of humankind.

— Greta Thunberg

In *Triangle of Sadness*, director Ruben Östlund points the finger at what increasingly seems to fuel our society: greed, power, and hypocrisy. After seeing the movie, it's hard not to draw parallels between the crude reality on-screen and the crudity within moments and contexts one experiences as a professional in the high-tech sector.

As Naomi Fry [1] writes in her *New Yorker* article about the film: “In Östlund’s conception, the entirety of contemporary life has become structured according to the unequal, savage logic wrought by capitalism, a fact that is barely occluded by the blandly sleek, comforting banalities that capitalism itself produces.” In the movie, a cast of archetypal characters gleefully showcase sanctimonious behaviors, self-serving biases, mercenary attitudes, shameless hypocrisy, and narcissism. While their contexts differ, each character is driven to satisfying their selfish desires for wealth and power, and is defined by a staggering ability to sanitize the nature of their actions as if they were acceptable mundane behaviors. Over dinner, a British arms manufacturer describes how his products “have been employed in upholding democracy all over the world”; an attractive influencer states that her relationship with her boyfriend is simply “good for business”; and stewards continue serving lavish courses despite their customers’ seasickness, seemingly unfazed by the surrounding cascades of vomit. The *what* (outcome), the

how (method), and the *why* (values) of each character is excessively and uncompromisingly depicted. Their goal is to accumulate more, and such an end justifies any means.

One could argue that the high-tech community, too, has become structured “according to the unequal, savage logic wrought by capitalism” [1] and I’d argue that its *what* (outcome), *how* (method), and *why* (values) are frequently rather questionable.

Several years ago, after viewing a demo of a new technology, I asked the inventor if he could imagine ways in which his design might be harmful. With a puzzled look, he replied, “Absolutely not.” After I listed a handful of very problematic and likely misuses of his creation, his response was that he could not be held accountable for what other people might do with his technology. Technically, he was not incorrect. Another time, I asked a colleague if he would put his newly designed surveillance system in his own home. With an incredulous look, he replied, “Of course not.” When I asked him why he thought others should put it in *their* homes, he said he was confident that marketing would create the right value propositions to monetize such a highly efficient system. Sadly, he was right. Earlier in my career, I was offered the opportunity to be on a fast-promotion track by focusing on a research agenda centered on leveraging behavioral manipulation to

increase product sales. When I refused to jump on the opportunity due to the insidiousness of the proposed scope, not only did my manager laugh at what she felt was pure stupidity but also a number of colleagues took the opportunity without hesitation. They were indeed promoted, several years ahead of me.

Over the past two decades, I have collected many examples like the ones above. Ongoing discussions with colleagues and mentees confirm that I am not the only one experiencing such puzzling dynamics. Like characters in a movie, we—the high-tech sector—gleefully put on golden blinders and keep moving in one direction, toward satisfying our selfish desires for wealth and power.

We seem to have stopped questioning whether something *should* be designed. We seem to have forgotten the delicate relationship between *what* is created and *how* to create. We seem to believe that the values we cherish in private life do not apply when we clock in. Our *what*, *how*, and *why* are too frequently distorted and, like one of Östlund’s characters would say, we seem blissfully comfortable “*in den wolken*” (in the clouds), far from everyday reality. This may sound harsh, yet, let’s face it, we are shallower than we dare to admit.

Similar to the Eastern European character in *Triangle of Sadness* who shares how he became a millionaire (“I sell shit,” he says, laughing), the high-tech industry more frequently than not seems to be self-absorbed in endless manure production—because, it turns out, some will buy manure that they do not need if the surrounding apparatus makes the manure look and feel like must-have gold.

We seem to have stopped questioning whether something *should* be designed.

Let's unpack these strong statements with some examples.

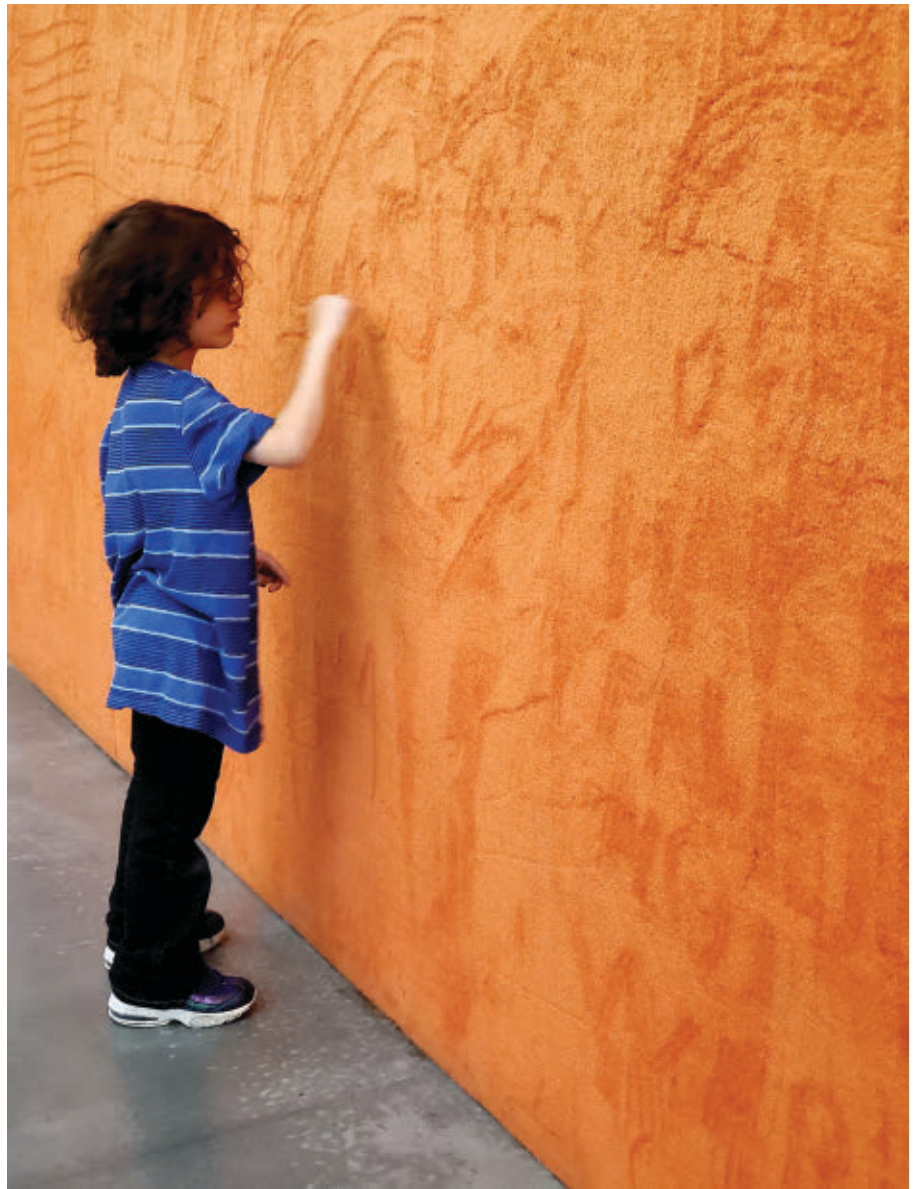
In a 2019 *New York Times* op-ed, Charlie Warzel [2] discusses how the past few years “have taught us that there’s an Occam’s razor quality to any explanation of the toxicity of our online platforms” and that the original sin is a pure prioritization of growth—“above all else and at the expense of those of us who use the services.”

Think, for instance, about YouTube’s algorithm-tweaking strategy to hit 1 billion hours of viewing per day, despite employees’ cries to change its recommendation engine to quash misinformation, conspiracies, and incendiary content. As a former senior manager confessed in the original *Bloomberg News* article that reported the case [3], “We were so in the weeds trying to hit our goals and drive usage of the site, I don’t know if we really picked up our heads.”

A 2018 *New York Times* investigation showed yet another example of this *growth at any cost* philosophy, when we learned that Facebook executives ignored warning signs that their social media platform could “disrupt elections, broadcast viral propaganda and inspire deadly campaigns of hate around the globe” [2]. The rest of the story is, of course, history.

A third notable example comes from an industry I worked in for over a decade: consumer electronics. Think, for example, about the most beloved gadget in everyday life: the mobile phone. Tech companies are not forced to follow any significant repair and recycling standard and their never-ending push to roll out newer, slimmer, lighter, more-featured devices at a sustained cadence comes at a cost that is higher than the already high price tag. From proprietary screws to strong adhesives to planned obsolescence strategies, what we hold in our hands is frequently designed to be replaced, not fixed or properly recycled.

With 8.6 billion mobile device subscriptions worldwide as of 2021 [4] and a product life cycle that is frequently on a two-year cadence, it is easy to estimate what type of impact manufacturers’ avidity



The future, 2019.

and consumers’ lust for handheld devices bring to our planet yearly.

The high-tech sector has placed greed at the forefront of its decision making. Consequently, *what* is designed and its social as well as environmental impacts are conveniently parked backstage. I’d argue that our incapacity to focus on designing and producing the *right thing* (what) is frequently connected with our incapacity to recognize *how* to design.

Compare, for instance, human-centric processes such as the Design Council UK Double Diamond and its most recent framework for innovation [5] with how most tech firms design and develop products. Based on my

experience in multiple contexts, I’d argue that the vast majority of companies completely skip the first diamond, jumping right into designing and developing products without any clear understanding of *why* or *for whom*. The pattern of such a sad yet ever present phenomenon unfolds each time in a similar manner. First, speed and quantity are prioritized above quality and value. Market and user research are marginally executed, if at all. Design corners are cut, user testing skipped or ignored. Eventually something is quickly shipped with great fanfare and the motto “we shall fix it later on.” Then major issues bubble up, users do not seem to comply with projected sales, and



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the house of cards starts crumbling. Massive judgment errors and the lack of a grounded understanding of user needs and market trends result in having to fix things. So, time and effort are feverishly invested to place lipstick on what is (and will likely remain) a pig.

The tech industry is so stubbornly focused on answering questions quickly that it forgot *what* questions deserve an answer and *how* to approach the question-answer endeavor. Not only that, but success is measured using parameters that have little to do with the advancement of humanity and the thriving of our planet. Greed and power have become the key drivers and we seem incapable of stopping, breathing, reflecting, and fixing the mess we have created.

I understand—this is an awfully bleak and depressing way to look at things, yet I see no reason to sugarcoat it. Allow me to say that, despite it all, I remain an optimist. I believe we humans are capable of goodness and I am encouraged by recent progress, mostly made by the newer generation that, thankfully, is fed up with the mercenary logic of the past decades.

This is a fierce generation. They are not scared of standing up and pushing for quality instead of quantity. This is a generation that prioritizes equity and fairness instead of greed and power. A generation that was left with little wiggle room and knows relentless, fearless, and uncompromised action is the only way forward.

I am looking at role models such as Malala Yousafzai, Greta Thunberg, Colin Kaepernick, David Hogg, Marley Dias, Payal Jangid, Avery McRae, Xiuhtezcatl Roske-Martinez, Melati and Isabel Wijsen, Shamma bint Suhail Faris al-Mazrui, Isra Hirsi, Yara Shahidi, Jamie Margolin, and Mari Copeny, to mention a few. These young people do not shy away from the hard work, and their infectious focus and courage are inspirational. They push us to become a better version of ourselves by standing up against impossible odds, armed with clarity on *what* matters, *how* to achieve it, and *why*.

If there is something the high-tech industry needs, it's minds, hearts, and souls like these. People with clarity on what matters and no interest in selling their souls or compromising their integrity in exchange for massive salaries and perks. Unlike the end of *Triangle of Sadness*, where the characters cannot escape the capitalistic dynamics of the powerful and the powerless, I believe that the work that many have started in recent years will dramatically shift the high-tech sector to a point where technology will return to what it is supposed to be: a tool for the betterment of pluralist societies.

Greta Thunberg once said that “[h]ope doesn’t come from words. Hope only comes from actions.” I do not have the ability to bring hope with this column, but I can certainly ask us to act.

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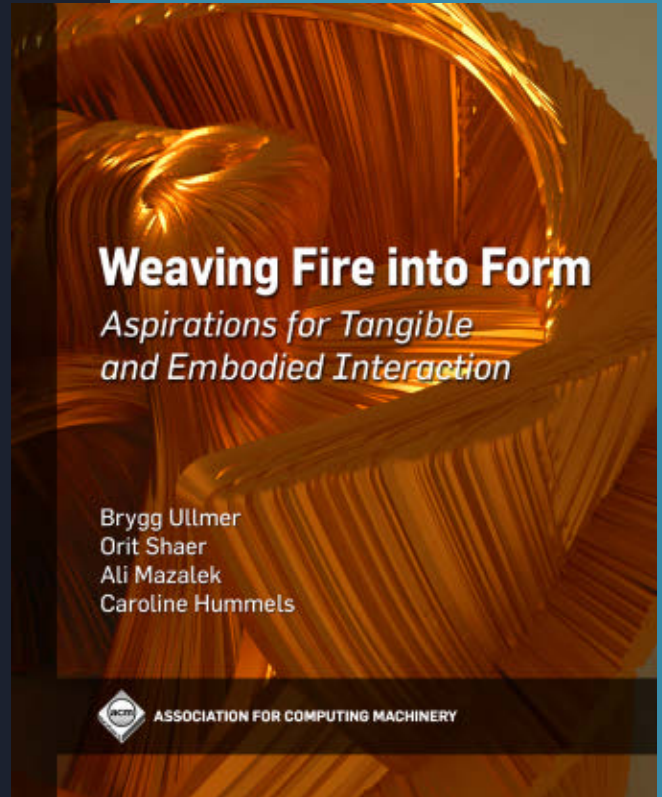


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This book investigates multiple facets of the emerging discipline of Tangible, Embodied, and Embedded Interaction (TEI). This is a story of atoms and bits. We explore the interweaving of the physical and digital, toward understanding some of their wildly varying hybrid forms and behaviors. Spanning conceptual, philosophical, cognitive, design, and technical aspects of interaction, this book charts both history and aspirations for the future of TEI. We examine and celebrate diverse trailblazing works, and provide wide-ranging conceptual and pragmatic tools toward weaving the animating fires of computation and technology into evocative tangible forms. We also chart a path forward for TEI engagement with broader societal and sustainability challenges that will profoundly (re)shape our children's and grandchildren's futures. We invite you all to join this quest.

- Introduction
- Tangible and Embodied Interaction
- TEI in the Wild
- Framing TEI
- Theories of Embodiment
- Mediating Technologies
- Aesthetics of TEI
- Evaluating TEI
- Paths Forward: Aspirations for TEI
- Summary
- Author Biographies
- Appendices



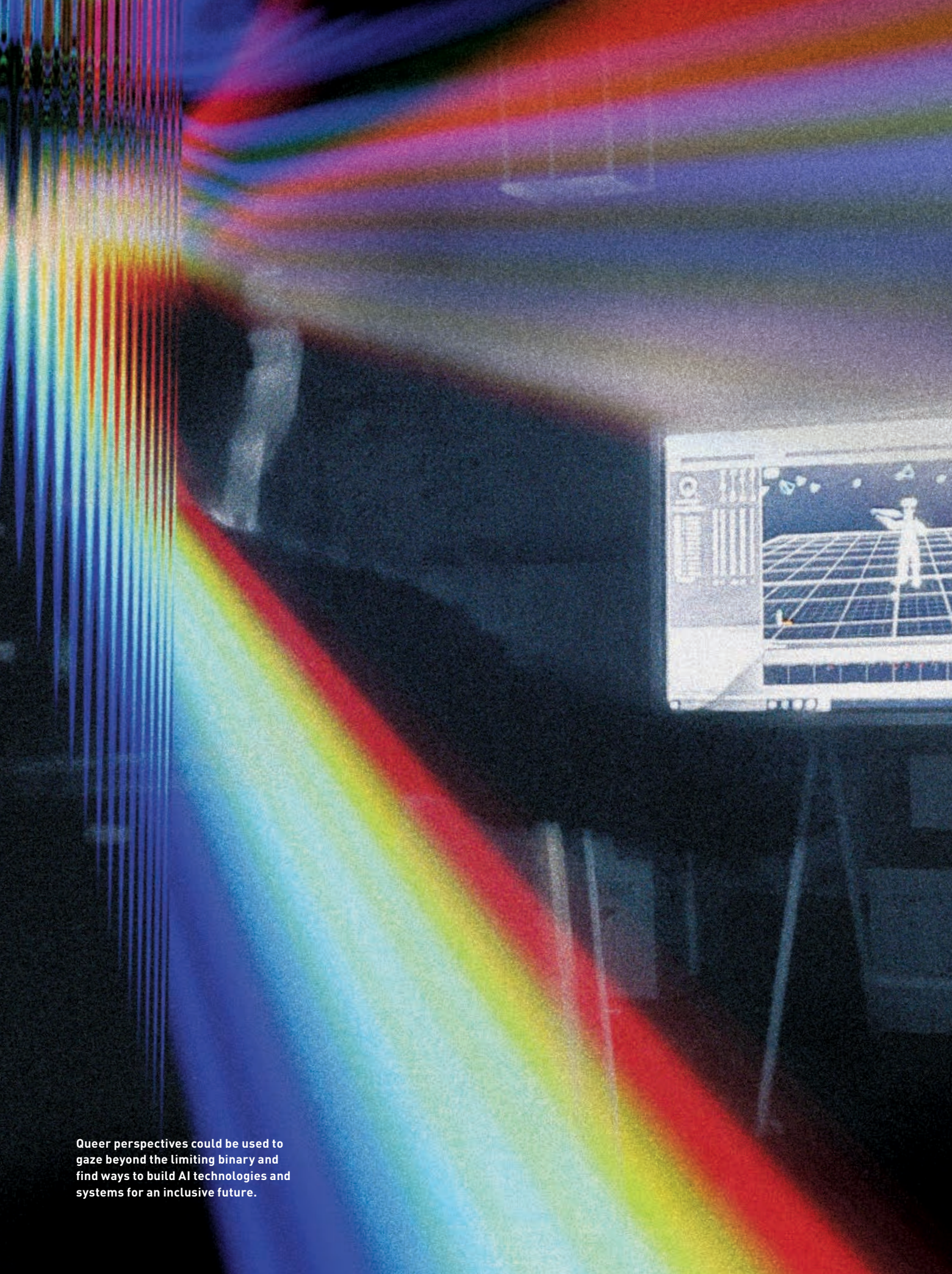
Weaving Fire into Form Aspirations for Tangible and Embodied Interaction

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Queer perspectives could be used to gaze beyond the limiting binary and find ways to build AI technologies and systems for an inclusive future.



Beyond the Binary— Queering AI for an Inclusive Future

 **Evelina Liliequist, Andrea Aler Tubella, Karin Danielsson, and Copp lie Cocq**, Ume  University

Nowadays it is somewhat outdated, perhaps even naive, to talk about artificial intelligence as something set in the future. AI systems are already integrated into everyday human life, although they're not the sci-fi-inspired robots some imagine as AI. In fact, there are AI systems that operate much closer to home, in or on the human body, to be more specific. A specific type of AI is facial analysis technology (FA), an application where a person's facial and bodily information such as face shape, features, skin color, movements, or makeup are captured, analyzed, and compared. This allows the development of systems that can match a recognized face against a database (face recognition), compare a recognized face against a given match (face authentication), or classify individuals (e.g., in terms of gender, race, scars, body geometry). Facial analysis technologies are already widely in use, for example, to allow you to unlock your phone just by scanning your face or to tag social media photos automatically. However, its use also includes more controversial applications, such as surveillance or recognition of crime suspects.

Many AI systems rely on labeling, that is, given an input, choosing from a selection of labels to describe it. This is also the case for FA tech, where the input is a face, and labeling is often based on binary systems, dividing data into categories such as man/woman, child/adult, and human/animal. In recent years, scholars in computer science, AI, and informatics have critically examined and highlighted problematic aspects of FA tech regarding race and gender [1,2,3,4]. Previous studies have identified key problems that raise concerns about how reliable or even how useful this technology can be. For example, the data used to train these systems is often not representative. In most cases, it is overwhelmingly white and male, which means that darker-skinned females have a disproportionate rate of misclassification, as has been found in comprehensive analyses of FA gender-classification systems [1]. Additionally, training datasets are often made up of images scraped from social media [5], which means (aside from privacy issues) that they capture only those who use social media, the specific

Insights

- Queer perspectives can help identify where risks concerning visibility and representation arise.
- Keeping a queer eye fixed on how AI systems are designed and trained, we aim at gazing beyond the limiting binary to find new ways of building AI technologies and systems for an inclusive future.

A queer perspective can help guide us into finding new ways for more-inclusive technology.

solutions to these problems involve making datasets more representative (i.e., including more images of underrepresented groups) and/or involving at-risk groups in the design process. Although, of course, those affected by FA should have a say in how it is designed, these solutions themselves bring challenges. In particular, decisions about sexual orientation information, including what should be disclosed, where, and to whom can be made as an ongoing context-based process: This means that ripping images from their original context to use for training unrelated systems can violate their original purpose and intentions. Similarly, involving at-risk communities in any process poses a risk of exploiting their experience and requires disclosing information that they may not wish to share [5]. Thus, if technology is to allow for visibility and representation, we need to take the utmost care to ensure that this visibility and representation are not exploited and perverted into harmful systems. We argue that a queer perspective can help us identify where these risks arise, as well as guide us into finding new ways for more-inclusive technology.

DIVIDE AND CONQUER— THE ISSUE OF DATA LABELING

A key issue surrounding AI technologies such as FA is the labeling itself. In our forthcoming book chapter [7] and in our ongoing research, we argue that not all humans wish to identify themselves within a binary and/or perform their gender and/or sexuality in stable categories. Our arguments originate from queer theory (e.g., [8]): Labeling is an act of division, and as such, ultimately is often also an exercise of power. In a large body of scholarly work, queer theoretical thinkers have identified hetero- and cisnormative structures as deeply rooted in dichotomies, with intimate ties to power. Divisions into normal/deviant, good/bad, right/wrong, and so on are maintained and re-created by encouraging and rewarding the identities and practices that are categorized as normative and desirable, and by invisibilizing, restricting, and punishing other gender expressions, bodies, and sexualities [8]. To differ from the constructed “normal” can have serious consequences, such as being punished with external violence and/or becoming inflicted with internalized homo- and/or transphobia, which can lead to mental health issues and self-destructive behavior such as suicide.

Further, there is a great risk for not only reproducing, but also cementing hegemonic norms of gender identities and performances, and/or sexualities, based on stereotypes. In that sense, FA is a particularly egregious example: By its premise, it suggests that gender can be determined directly from what can be read from a face. This implication is based

context of public photos, and whatever information people feel comfortable disclosing in their circles. But an image can represent many things—how we are expected to be viewed, how we see ourselves, and how we see ourselves and others beyond history’s assumptions, bias, and prejudices [6].

Often, the proposed

on an essentialist understanding of sexuality as a fixed identity reflected in our body, without regards for self-identification. Tomasev et al. [9] argue that reinforcement of stereotypes can risk “echo[ing] tenets of eugenics—a historical framework that leveraged science and technology to justify individual and structural violence against people perceived as inferior.”

Against this background, where the labeling acts as a fundament for how AI technologies like FA work, there is a risk that already marginalized identities and bodies become even more vulnerable. For example, transgender individuals report an overwhelming critique and negative attitude toward automated gender recognition [9].

By finding ways of queering data, we can imagine and create a more inclusive future [2,6]. Grace Turtle argues, “to the binary logic of AI, differently situated knowledge(s) and other/ed perspectives, are destabilising, thus demonstrating that binaries, be they imagined, cultural or technological are not natural nor always necessary” [2]. Along similar lines, we argue that queer perspectives could be used to find new ways forward, and hopefully reach beyond data labeling within the limitations of binaries.

(A) SPY WITH ITS LITTLE EYE—CONCERNS OF VISIBILITY AND RISKS FOR ANTI-LGBTQ USAGE

In the past two decades in a Swedish context, there have been many advances in queer socio-legal rights, which have led to a seemingly more open and queer-inclusive society. But looking back just a few decades, anonymity was an important and necessary part of the lesbian, gay, bisexual, trans, and queer community and queer lives, which can be understood in relation to the earlier, much harsher climate toward LGBTQ people. For example, until 1946, homosexuality was a criminal offense in Sweden according to chapter 18 of the Penal Code § 10, a law that forbade tidal law and “fornication against nature.” After decriminalization, homosexuality was still classified as a mental disorder by the World Health Organization until 1979. The National Board of Health and Welfare abolished the diagnosis “transvestism” as a psychiatric diagnosis as late as 2009, and it was not until 2013 that the requirement that transgender people be sterilized in order to receive gender-confirming care was deleted from the Gender Equality Act.

Despite an increase in queer visibility and acceptance in Swedish society, and several studies indicating an increased visibility of LGBTQ people in society, individuals may still feel a need to conceal their sexual orientation and/or gender identity or expression. One example is digital platforms, where LGBTQ people can feel a need to handle expectations of sharing and make strategic decisions around *what*, *where*, and *for whom* as disclosures regarding their sexual orientation. Sharing personal information about sexual orientation and expressions of being queer often heavily depends on the imagined audience on different social media sites. Such a strategy of selective self-presentation is akin to creating a “digital closet,” referring back to the concept of “the closet” as a metaphor for queer oppression, denial, and concealment. This also problematizes the binary logics of the closet—either you’re in or out—by instead pointing toward openness and visibility as an ongoing and context-based process [7].

Furthermore, the concept of selective self-presentation

immediately leads to questions on how images posted in—and meant for—specific contexts can be ripped from such contexts and used for other purposes. A highly debated study by Michal Kosinski and Yiland Wang [10] purports that classifiers can achieve a higher accuracy than humans in inferring sexual orientation from face images. This study used a training dataset of images obtained from online dating websites and validated on images obtained from Facebook, taken without explicit consent and validated for individuals who self-reported sexual orientation in a dating context or in a semipublic Facebook context. The possibility of data being used in such a way immediately leads to the question: What do we want to show online? If we dare to be visible in a certain way in a certain space, can that be taken from us and used to infer unrelated labels in a completely different context? The simple goal of having a system that identifies sexual orientation denotes a bigger problem in the machine learning space: the desire to draw strict categorizations in what is a fluid space.

Another issue that the critiqued study by Kosinski and Wang [10] raises is the question of usage. If such predictions of a person's sexuality actually *could* be made, for what would they be used? We argue that with such technology there is always a risk of anti-LGBTQ usages. Lest we forget, in large parts of the world, Sweden included, LGBTQ people are exposed to violence and discrimination. Further, homosexuality is still banned in many countries, in some under penalty of death. Even in cases where this type of prohibition legislation is rarely applied, it affects the social climate by legitimizing discrimination and violence against LGBTQ people, or people who are perceived to be LGBTQ.

QUEERING AI FOR AN INCLUSIVE FUTURE

Both because of its everyday applications and potential controversial uses, we argue that it is essential to analyze FA technology and its implications, with special care toward vulnerable groups in society. In 2022, Humlab (<https://showcase.humlab.umu.se/queer-ai>) at Umeå University organized a series of talks about queer perspectives on AI. The seminar discussions concluded that we, as designers, engineers, researchers, and citizens, need to understand the potential use and misuse of AI systems. Moreover, we must reflect on how we could and should design these systems, addressing possibilities, constraints, and risks from a variety of perspectives, including LGBTQ ones. Queer theory has great potential to assist us in addressing these issues. In our book chapter [7], we elaborate on this and argue for the necessity of casting a queer eye on AI to find new ways of relating to technology. In research we are currently planning, we will explore how AI systems can be designed to operate in a much more fluid and complex reality than what can be captured in a simple binary.

As a strong symbol of the future, AI is already integrated into society; the future is therefore already present. Still, every day brings new possibilities to change which directions and societal needs that AI technologies should be used for. Keeping a queer eye fixed on how AI systems are designed and trained, it is our most fervent hope to be able to gaze beyond the limiting binary and find new ways of building AI technologies and systems for an inclusive future.

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Seeing Like a Dataset

Notes on AI Photography

🔥 Eryk Salvaggio, Rochester Institute of Technology

The camera began to train photographers in 1816. Photography developed a set of rules, and a photographer may follow those rules when scouring the landscape for images, or else work with the camera to produce new ways of recording the world. Through repetition, the practices become instincts or habits. The camera, as a tool to capture what we see, changes how we see. As the philosopher Vilém Flusser writes, “Photographers have power over those who look at their photographs, they program their actions; and the camera has power over the photographers, it programs their acts” [1].

As an AI artist working on training *generative adversarial networks* (GAN) on my own datasets, I often take photographs of natural patterns found on walks along beaches or forest trails. These are for building a dataset of that outing, training a model, and then generating an extended, simulated wandering. I take a few hundred of these photographs at a time, the minimum required to train a GAN, or rather to extend the training of StyleGAN2 to produce images based on my own photographs. GAN photography is the practice of going into the world with a camera, collecting 500 to

5,000 images for a dataset, cropping those images, creating variations (reversing, rotating, etc.), and training for a few thousand epochs to create even more extensions of those 500 to 5,000 images. In turn, these GANs will make a study of the pixel arrangements of those natural patterns, assign them coordinates and weights, and then reconstruct these clusters and patterns into new, unseen compositions.

The aesthetic value of this output as photography is questionable. The output of these GANs is to produce endless variations of the dataset—in other words, to produce even more of these 5,000 images. The practice is instead a form of artistic research, a way of bringing the affordances of GANs into embodiment through my motions: scanning the landscapes, moving my body toward whatever dataset I am trying to construct. It is the act of constructing this dataset through a blend of artistic eye and mechanical detachment that forms the true body of the work.

As a result of this practice, my vision as a photographer has shifted. The rules of photographic composition are pointless to an AI eye. Just as the camera and norms of photography

Insights

- Photographing the world for artificial intelligence transforms the eye of the photographer.
- In building image datasets for GANs, photographers become biased toward patterns.



shaped how and what I saw, the AI—and what the AI needs—shapes it too. One learns to think like a dataset. I do not compose one image; I compose 500—ideally 5,000. With too much variation in the data, the patterns won't make sense; the results will be blurred and abstracted. Too little variation, and I overfit the model: lots of copies of the same thing.

So, I must seek continuities of patterns between each shot, with slight variations in composition. It is important to balance similar proportions of the elements within the frame. I aim to balance the splashes of apple-red maple leaves, patches of grass, and bursts of purple wildflowers, without introducing particulars, such as a discarded beer can or a mushroom.

This is an inversion of my photographic instincts, as well as my mushroom forager's instinct. Mushroom foraging has changed the way I see the forest. Once a birdwatcher, my interest in discovering fungi has shifted my attention toward the soil instead of the skyline. A photographer, and a mushroom hunter, will typically look for breaks in patterns. If I stumble across a mushroom, the instinct might be to capture it, on film or in a wicker basket. By contrast, the AI photographer looks away. The mushroom disrupts the patterns of the soil; it is an outlier in need of removal. The AI photographer wants the mud, grass, and leaves. We want clusters and patterns. We don't focus on one image; we focus

on the patterns across a *sequence* of images. We want to give the system something predictable. We seek to bias the dataset toward desirable outcomes: the production of images.

EXTENDING THE FOREST

Prediction, whether intended to generate photographs or inform a policy decision, is a matter of time and scale. With enough photographs of mushrooms one can start generating images of mushrooms. Likewise, a biased data scientist could select data points to support any conclusions. The underlying principle is the same: The AI photographer looks away from the *unique* subjects of the world, declares them off-limits, and looks instead to the *patterns* surrounding eruptions of variation.

This bias is revealed in the images that artists make with GANs. On the one hand, we might view it as flattening the world. On the other hand, it heightens my awareness of the subtleties of the dull. The singular is beautiful: birds, mushrooms, the person I love. Yet the world behind them, the world we lose to our cognitive frames, is compelling in its own way.

Much of this background world is lost to us through schematic processing [2]. We acknowledge that the soil is muddy and covered in leaves, and so we do not need



Left image: An image taken by the author of the forest floor in Western New York. Right sequence: An image taken by the author of the forest floor in Western New York (top), extended by OpenAI’s diffusion-based image generation model, DALL-E 2 (bottom).

to individually recognize every fallen leaf. Arrive at something novel in your environment, however, and you pause: What bird is that? Is that a mushroom rising from that log? What kind?

The benefit of schemata is also the problem with schemata. The world gets lost, until we consciously reactivate our attention. AI pioneer Marvin Minsky used schemata to organize computational processes. Whatever the machine sensed could be placed into the category of ignorable or interruptive:

When one encounters a new situation (or makes a substantial change to one’s view of a problem), one selects from memory a structure called a frame. This is a remembered framework to be adapted to fit reality by changing details as necessary. A frame is a data-structure for representing a stereotyped situation like being in a certain kind of living room or going to a child’s birthday party. Attached to each frame are several kinds of information. Some of this information is about how to use the frame. Some is about what one can expect to happen next. Some is about what to do if these expectations are not confirmed [3].

Minsky took a metaphor, meant to describe how our brains work, and codified it into a computational system. It is a model of a model of a brain. As an indirect result of brain metaphors being applied as instruction manuals for building complex neural networks, GANs behave in ways that align and reflect these human schemata. Schemata are not always accurate, and information that works against existing schemata is often distorted to fit. We may not “see” a mushroom when we expect to see only leaves and weeds.

An AI photographer is, therefore, a human mind looking for patterns for machines through the concept of human schemata adapted to that machine. As an AI photographer, I am looking for the visual noise I typically don’t see, the patterns lost to

my inattention. While the traditional photographer looks for the interruptive exceptional, the AI photographer looks for the ignorable. If the AI photographer behaves as a traditional photographer, GANs will create distorted images in the presence of any interruptive information: If one mushroom exists within 500 photographs, its traces may appear in generated images, but they will be incomplete, warped to reconcile with whatever data is more abundant.

A careful photographer can learn to play with these biases—call it the art of picking cherries. The dataset can be skewed, and mushrooms may weave their way in. We may start calculating how many mushrooms we need to ensure they are legible to the algorithms but remain ambiguous. A practiced AI photographer can steer the biases of these models in idiosyncratic ways.

DISCUSSION

GAN photography is about series, permutation, and redundancy. It is designed to create predictable outputs from predictable inputs. It exists only because digital technology has made digital images an abundant resource. It is relatively simple today to take 5,000 images, and this abundance is a precondition for creating 50,000 more. As a result, the “value” of AI photography is low.

The images in this article were not generated by GANs at all. Rather, images I collected for a GAN were uploaded to DALL-E 2 (a diffusion-based model) and extended through outcropping. The center of the image is real, the edges are not. I can type “image of the forest floor” to produce as many as I would want to see. These models are removed from my own direct experience in a way distinct from my GAN dataset. The outcomes of diffusion models are mediated from unknown sources, photographers, and locations. It is possible that



Left image: An image taken by the author of the forest floor in Western New York. Right sequence: An image taken by the author of the forest floor in Western New York (top), extended by OpenAI's diffusion-based image generation model, DALL-E 2 (bottom).

GANs will become obsolete, overtaken by these ready-made, pretrained models such as DALL-E 2 that generate images from broad, disparate datasets. As an artist, GAN photography is personal. The process is much more captivating for the artist than the eventual result is for any audience.

GAN photography is a strangely contemplative and reflective practice. Like Zen meditation techniques, where the student is instructed to constantly redirect attention to the air flowing in through their nostrils, the GAN photographer is constantly returning attention to the details we are inclined to drift away from. The particular and exceptional is often beautiful, but it's not the only form of beauty. In search of one mushroom, we might neglect a hundred thousand maple leaves.

On the other hand, beneath the images produced by GANs and diffusion models alike is the convergence of information and calculation, reduction and exclusion, that flattens the world into a generative abstraction. It is one thing to produce images that acknowledge the ignorable, but another thing to live in a world where these patterns are enforced at the expense of any exception. Beyond (and perhaps even within) the photographic frame, this world is unimaginative. It is the result of a process crafted to reduce difference, to ignore exceptions, dismiss outliers, and mistrust novelty. It is bleak, if not dangerous: a world of uniformity, a world without diversity, a world of only observable and repeatable patterns.

The GAN photographer develops a curious vision, steered by these technologies: a way of seeing aligned with the information flows that curate our lives. The GAN photographer learns to see like a dataset, to internalize its rules. Through practice, the rules become instincts or

habits. The data, meant to capture what we see, changes *how* we see. As an artist, the results of this sustained practice are counterintuitive and dull. The GAN produces endless variations of the same thing. By excluding outliers and selecting data for the model, the model excludes vast swathes of the world of growth and emergences, lost to their unfitnes for statistical presence.

There is a lesson here for data practices of all kinds. The practice of GAN photography encourages artists and data practitioners alike to shift focus between the abstraction of schemata and the observation of concrete details. We can scan the leaves for patterns *and* for the rare bright-red cap of an *Amanita muscaria*, against all odds. But once inside the model, the world is fit for the comforting reassurance of prediction from previous patterns, rather than the constant emergence and change that truly describes the world at the foot of the forest.

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Data-ing and Un-Data-ing

🔗 **Angelika Strohmayer**, Northumbria University
Michael Muller, IBM Research

Below is the outcome of a meandering conversation we had over a video call. We covered many different topics from a variety of perspectives and disciplines. After recording our chat, we tried to edit it into a more structured conversation for this piece, but we also wanted to keep some of the meandering.

Michael Muller: Hi, Angelika! Would you be interested in talking a bit about “data-ing” and “un-data-ing” in HCI? In our CHI 2022 paper, we called into question the “objectivity” of data in machine learning. Along with Naja Holten Møller and Melanie Feinberg, we showed that humans shape the data in many ways. What are the implications for the “grand narratives” of data science, if the data are *chosen*, *transformed*, and even *created* by humans, and if the data are correspondingly dynamic and changeable?

Angelika Strohmayer: Hi, Michael! Following on from that work, I’d like to think with you about what were to happen if we looked at data, in the data work and data science sense, differently?

MM: What if we start with the paper we wrote last year. In “Forgetting Practices in Data Sciences” [1], we talked about a lot of things related to Mimi Onuoha’s [2] concept of *data silences*—systematic gaps in an otherwise rich dataset. In our analysis, datasets can be seen as dangerous or beneficial, but seldom neutral. We talked about selective legibility, or how data are ignored or suppressed; we picked up Joni Seager’s idea that “what gets counted counts,” and we built on that by talking about data genocide, where people say, “Oh well, there’s not enough of those people to include in the dataset, or we certainly wouldn’t separate them out and look at the differences in their circumstances.” While all of this is happening, in an attempt to remain “objective” in data science work, we simultaneously want to assert that almost everything in our world is now data—data that is monetized—and that monetization and objectivity are often in service of different or even opposed priorities.

Insights

- Data become “data” when a human says they are data, and that happens only after humans transform the data.
- Data as a material of analysis reflect both *who* says they are data, and what they and others want to *do* with the data.
- What were to happen with our data practices if we moved beyond positivism and constructivism and instead allowed wonder, glow, and glitter into the process?

What would data science look like if the data, where it came from and what it includes, were foregrounded?

you and I might call *data work*, then the data just becomes a “resource”—almost an infrastructural resource, very much in the sense of Leigh Star and Geoffrey Bowker in *Boundary Objects and Beyond*, a thing that we don’t really look at anymore. It’s there, so we use it. It fades from consciousness. And then we tend to assume it’s perfect and systematically forget all that’s wrong with it, or we never find out because we bought it from someone. We need to ask questions like, *What would data science look like if the data, where it came from and what it includes, were foregrounded?*

AS: And I would add: What if we changed our frame of reference for defining and analyzing data? What would a data science be if we not only moved away from positivism but also talked about it entirely outside of positivism even as a frame of reference? When we’re not just talking about qualitative analysis but also about a world that is post-qualitative and post-coding? What would a data science look like if rather than having a systematic reason to look into finding “a truth” or having a fully structured response or analysis, we started looking at the data from knowing our own positionality in relation to it, or if we framed it as meaningful exploration that is materially rather than academically useful for affected communities?

MM: This makes me think of epistemologies and standpoints. Sandra Harding developed a scientific community around the concept of standpoint epistemologies—in essence, as Donna Haraway said in “Situated Knowledges,” there is no “view from nowhere.” Data are always seen *from somewhere, by someone, and during sometime*. Context always matters, and context includes the *human context* of how data are declared to be data; how, as Melanie Feinberg says, data are *designed*; and how, as Helena Mentis says, data are *crafted* into useful representations. Those are academic ways of describing data. But what did you mean by “materially useful”?

AS: I think “materially useful” can mean lots of things, but ultimately for me it refers to usefulness that can make a difference or have a consequence. So, while that can refer to, for example, producing reports, tools, guidance, or other kinds of “things” that are useful for the people we work with or that relate to our research, the “material” can also be less tangible. For example, how can the research, and research process, be used to build shared understanding or experience? How can we use it to build more confidence, power, or knowledge for specific people or communities, or to ask ourselves what role our research can play beyond the outcomes? This is where the process can be really useful or

There are a lot of data practices, which, if unrecognized and unexamined, then allow data to be “the new oil,” a seemingly homogeneous and interchangeable resource to be exploited, bought, sold, and, as Sandy Gould [3] showed, consumed as a commodity. After people have finished what the data scientists would call *wrangling*, what

important! I wonder if, or rather how, that also resonates in research that is much more focused on big datasets, or datasets that have been purchased?

MM: Well, eventually we have to accept our dataset and work with it. The kind of work that you do and the kind of work that I prefer to do with a dataset is to go incident by incident, interview by interview, observation by observation. We look at them and we say, “Well, this one is different from that one; and I know that for you that often relates to many contextual factors outside the ‘dataset’ as well. And oh, there’s a bunch of records or observations that are different from another bunch.” But a whole lot of HCI work with datasets doesn’t work like that. We often want to “do things with datasets,” losing detailed insights that we could find if we focused our attention *inside* the dataset. By which I mean focusing our attention *on* the data. At the level of the dataset, “the data”—usually perceived as a whole dataset—become infrastructural after a while, and that’s not a healthy data practice.

AS: I recently came across Maggie MacLure’s work related to post-qualitative analysis [4], which might be helpful in coming back to the detailed insights, and the ability to focus our attention back on those. She talks about our productive capacity of *wonder* in relation to our data, and in another article she talks about how in our data “some detail—a fieldnote fragment or video image—starts to glimmer, gathering our attention. Things both slow down and speed up at this point.” Taking this affective approach into this conversation, I wonder what were to happen if we asked what a computing dataset would look like if we analyzed it for what glowed, in MacLure’s sense, rather than for what was systematically included. Or if we acknowledged that the connections we make in the analytic processes continue to “smolder,” as they do “not stop at the point of writing”? When we’re talking about data genocide (as you did earlier), we’re minimizing certain things because they’re exclusions or data points that are far off and just “mess up” the data or stop it from being “significant.” Or there are social pressures to ignore certain data because the data are socially or politically inconvenient, or because the people described by those data are socially or politically inconvenient. And as you said earlier, we often assume that when we’re done, the data is done and becomes an infrastructure.

MM: Yes, I love your point about finding MacLure’s wonder and glow, and being open to what those unusual or nonconformant data can tell us, or what worlds they might open for us. Shaowen Bardzell and Sandra Harding talk about the margins, and that that’s where the information is. In her landmark 2010 paper, Bardzell wrote,

Feminist standpoint theory thus attempts to reconfigure the epistemic terrain and valorize the marginal perspectives of knowledge, so as to expose the unexamined assumptions of dominant epistemological paradigms, avoid distorted or one-sided accounts of social life, and generate new and critical questions [5].

I mean, the difference between “margin” and “outlier” versus “the core data” is just a question of numbers, an undersampling, which comes down to lack of access, lack of opportunity, lack of imagination, laziness, or exclusion: Data scientists haven’t gone far enough down a certain direction or didn’t go at all. This could be an example of a glowing that was not found: not acting on

a discovery that there was something different in an “outlier” and noticing it as unusual and then marking it for exclusion rather than for further inquiry.

AS: So, what would a dataset look like, how would it be “wrangled” and “cleaned” if we created it for exploration, allowing us to follow it based on wonder or glow rather than attempting to seek a “truth”?

MM: And what if rather than trying to corral the dataset into being “well behaved” in the conventional way, we instead allowed it to *make good trouble* (borrowing a concept from John Lewis), to disrupt, to be unruly in the liberatory sense? What if we were looking for trouble, *staying* (as Donna Haraway says) *with the trouble*, rather than “good data behavior?”

AS: There’s this really wonderful paper called “Glitter: A Methodology of Following the Material” by Rebecca Coleman [6]. She talks about following glitter in a workshop setting and how it goes into all the nooks and crannies, how it lingers and can never fully be gotten rid of. It can take different routes, routes that are material rather than simply based on “data.”

MM: That resonates strongly for me. I’ve been rereading Donald Schön’s [7] paper “Designing as Reflective Conversation with the Materials of a Design Situation.” The paper is such a deep look at the experience of designing and the experience of having the design materials talk back at you. Schön points out that design materials may be literal—like a visit to a design site—or representational (like a sketch or a display on a screen). I think the important aspect may be that we think while we design, and that what we design—the materials in our design—inform our thinking. Or we think and we design, and it’s all one activity. When we work with the data *in* a dataset, do the data also talk back to us? I think they do. And I think we do better analyses when we open ourselves to what the data have to tell us. Similarly, in our 2019 and 2021 CHI papers, we talked about data scientists often having a “feel for the data” as well—like a feel for the clay if you’re doing ceramics, or for the wool if you’re weaving. Or how in your embroidery, the materials talk back to you all the time too.

AS: This reminds me of an embroidery piece I made and how I worked *with* the materials, giving space for them to respond to my actions and then trying to hold steady the movements that were made by the threads and yarn—and how that made me think of research (Figure 1).

But I guess the difference is that in the craft settings you talk about, that material being part of the process is acknowledged and appreciated, and often wanted; whereas in the data science settings it’s trying to be objective.

MM: Yes, or it’s actually considered a source of problems and so then you try to beat them out of the data. Do you know the ancient Greek tradition of Procrustes?

AS: No.

MM: It’s a horror story in Greek mythology because it shows a violation of the cultural importance of hospitality. Procrustes would invite people to his house. He would feed them a nice dinner. Then he would say, “Here’s the bed you can sleep in,” and if they were tall he would lop off the parts that were longer than the bed. If they were short he would beat them until they spread out to cover the full base of the bed. People have actually talked about “Procrustean analysis,” although not for several decades—sometimes I think that’s what we do with our data. We lop off the parts we don’t like. We beat the parts that are otherwise nonconformant.

AS: What if instead of doing that—which sounds quite dangerous and very far from what we would call a truth to me—we stuck with the data, followed it in Coleman’s glitter sense? She writes, “I understand following glitter both in terms of a methodology that is responsive to the liveliness of objects and materials, and also as particularly appropriate to glitter as a material; a collection of tiny reflective or shiny pieces of plastic, or more recently biodegradable materials, one of its properties is its tendency to disperse, spread and scatter.” What if we let the material of the data use its reflective pieces to shine, disperse, scatter, or, in the craft sense we talked about before, become a part of the meaning-making process?

MM: In *Theoretical Sensitivity*, Barney Glaser asked, “What is this data a study of?” I think he was

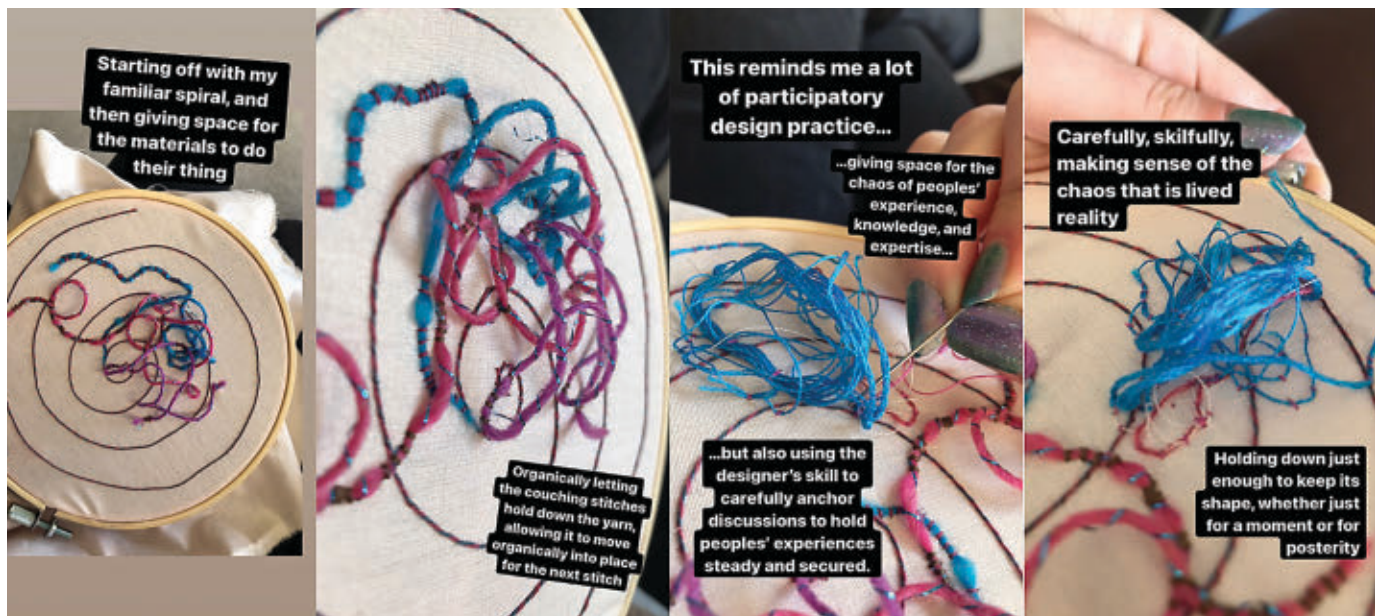


Figure 1. Annotated photos of an embroidery process and reflection carried out by Angelika.

saying that “the story in the data” has to be *discovered* incrementally, through immersion in the data. In *Constructing Grounded Theory*, Kathy Charmaz would say that the story has to be *constructed*. In the scenario that we’re discussing, we’ve not yet decided what the story is. I think some practitioners of grounded theory might resonate very much with what you’ve described from the glitter paper—which is exciting to me because I think that’s where we’re going to find the new stuff, rather than in the hypotheses that we already know to test. And Schön might have agreed, too, that discovery can happen when the data (in his case, the design materials) speak back to us.

AS: Interestingly, more and more I don’t always want to call things data because it can dehumanize everything it asks for. To me, the word *data* asks for positivism, and asks for truth and evidence and all of these things that I’m not necessarily looking for in my research. Similarly with the words *data analysis* or just *analysis* you present a certain epistemology and ontology: A colleague reminded me recently that you can also explore, you can refine. In response to this, I initially countered that all those words were a form of analysis, but she continued saying something along the lines of “but they don’t have to be.” They can just be explorations. Data can just be. And our work can relate to exploring and reshaping, reconstructing, following, noticing. Looking back at the conversation now, I think I understand more of what she meant.

MM: Analysis, as conceived in data science, can often be constructed very narrowly as hypothesis testing, or beyond data science very broadly as an organized description or series of inferences. In other (sub)disciplines, the concept of analysis can be much broader. It can describe how we think when we approach something that puzzles us or something that we want to work with. For some researchers, sensemaking (formal or informal) is a kind of tacit analysis that all of us humans do, all the time. In a different paper, Schön claimed that most or all professional practice is like design—a search for patterns, with an emphasis on patterns that can be of use.

AS: So I come back to the question: What would a data science look like if it sat outside the positivist frame it’s currently in? Going further than Catherine D’Ignazio and Lauren Klein’s *Data Feminism* [8], I wonder what a data science would look like if we gave space for the material to speak and if we acknowledged and responded to this? What would a data science look like if we were to define what its glitter might be and if we were then to follow it? What would the glitter of data science be and what might happen if we followed its materiality effectively? With traction, with friction, looking at what it is *and* what it does rather than just trying to define it? What would a data science look like if we let our positionality into the data and if we allowed the glitter to shine, if we followed its glow? Would such a data science even be possible? Or would data science co-opt this language, turning it into positivist goop?

MM: In some ways, I think you are advocating that data science should be conducted in-the-large and also in-the-small. I think you’ve been saying that it’s in-the-small where glow and glitter are more likely to become visible—perhaps

exactly because these pathways into new insights often occur at the margins, or where we don’t think we need to be looking, like a firefly at the edge of our vision? Or even if we *are* paying attention, it’s like Maya C. Popa’s poem “All That Is Made” [9]:

*that every bright thing has at its heart a hiddenness
it offers when you’ve just about stopped looking*

We’ve seen recent work to (re)introduce qualitative analysis to large-scale quantitative data science work, from the HCI, NeurIPS, and feminisms discourses. I feel like we’re still figuring out how to do this. Maybe adding ideas of wonder, glow, and glitter might be in this setting, and might help?

AS: I do wonder what were to happen to data science work if researchers went beyond the idea of qualitative analysis and looked beyond positivism. But I am almost even more curious about how far we can push that—what might happen if we moved beyond a post-constructivist frame and meaningfully incorporated materiality and onto-epistemologies of new materialism into the mix? What would glitter look like in a dataset? How would we be able to follow it? And coming back to our thinking from the paper with which we started this conversation: How would we document and discuss this process to avoid creating further silences in data work? I like to think that the world of AI and NLP would, and could, look very different if we started to think and do differently.

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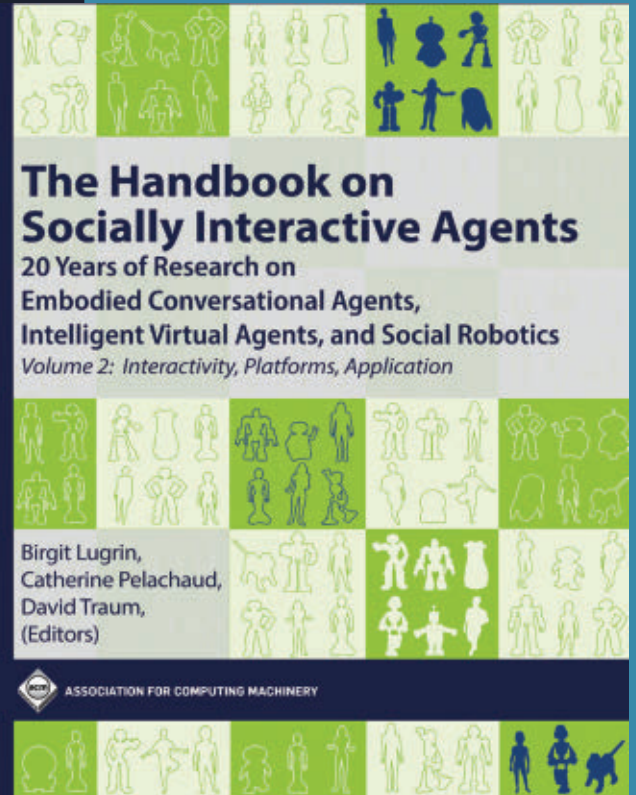
Collection II

The Handbook on Socially Interactive Agents provides a comprehensive overview of the research fields of Embodied Conversational Agents; Intelligent Virtual Agents; and Social Robotics. Socially Interactive Agents (SIAs); whether virtually or physically embodied; are autonomous agents that are able to perceive an environment including people or other agents; reason; decide how to interact; and express attitudes such as emotions; engagement; or empathy. They are capable of interacting with people and one another in a socially intelligent manner using multimodal communicative behaviors; with the goal to support humans in various domains.

Written by international experts in their respective fields; the book summarizes research in the many important research communities pertinent for SIAs; while discussing current challenges and future directions. The handbook provides easy access to modeling and studying SIAs for researchers and students; and aims at further bridging the gap between the research communities involved.

In two volumes; the book clearly structures the vast body of research. The first volume starts by introducing what is involved in SIAs research; in particular research methodologies and ethical implications of developing SIAs. It further examines research on appearance and behavior; focusing on multimodality. Finally; social cognition for SIAs is investigated using different theoretical models and phenomena such as theory of mind or pro-sociality. The second volume starts with perspectives on interaction; examined from different angles such as interaction in social space; group interaction; or long-term interaction. It also includes an extensive overview summarizing research and systems of human-agent platforms and of some of the major application areas of SIAs such as education; aging support; autism; and games.

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The Handbook on Socially Interactive Agents

20 Years of Research on Embodied Conversational Agents, Intelligent Virtual Agents, and Social Robotics, Volume 2: Interactivity, Platforms, Application

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What's Missing in the ACM Code of Ethics and Professional Conduct

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Insights

- The ACM Code of Ethics and Professional Conduct largely focuses on an ethics of the means to avoid harm, but does not clearly define ethical ends that computing systems should aim to achieve.
- The code is ineffective in flagging unjust and undesirable goals for which technologies are built or used.
- The code should embrace goals such as achieving equality and overturning unjust social and economic structures through technological inventions.

Two questions that are often encountered when evaluating the ethics of a technology project are *Who is your product or service meant to benefit?* and *Is somebody being harmed by your product or service?*

These questions require different frameworks to answer them. The first question requires clarity on the objectives of the technology system and consequently helps understand whose needs these objectives are meant to serve. Answering the second question, however, does not require clarity on the goals of the system. If harms being caused by the system can be identified, then

mechanisms can possibly be built to avoid these harms. But understanding the goals of the system need not be a prerequisite for that.

The ACM Code of Ethics and Professional Conduct (CEPC) largely focuses on the second question—of uncovering harm, avoiding harm, and speaking out against harm—but does not say much about defining the goals of systems built by computing professionals. CEPC at best prescribes broad goals such as building systems for the “benefit of society,” or slightly more specific goals such as “promoting fundamental human rights” or



“protecting each individual’s right to autonomy,” but these are discussed only briefly.

Why is it a problem when ethical considerations are placed on just the *means* and not the *ends* to which a technology project is deployed? To answer this question, I’ll provide some examples of technology projects where the goals are ambiguous or stated incompletely, and the projects have clearly led to unjust and undesirable outcomes. Yet the current formulation of CEPC is unable to flag such projects as unethical.

For instance, consider Facebook’s news feed algorithm. The goal of the

algorithm is left unspecified to the public, but external observations by several studies have revealed that the curation algorithm seems to maximize user engagement, which leads the algorithm to amplify sensational or fake news and consolidate echo chambers [1]. This of course does not imply that Facebook’s goals are unclear—its obvious goal is ad revenue maximization, which needs algorithms that recommend content to have users spend more time on the platform. The ethical concern, however, arises because of a conscious choice made to choose this goal as

opposed to a different goal—for example, for the genuine “benefit of society” by showing diverse content that may lead to pluralistic dialogue and strengthen democracy.

A system whose goals may in fact be unjust but are projected to be for the “benefit of society” is the Aadhaar biometric-based unique identity system in India. The stated goals are to reduce leakage in the provisioning of social welfare benefits to the poor: Authentication through a biometric-based identity will reduce corruption in the distribution of welfare benefits. Many researchers, however, have challenged this problem identification

and argue that leakages happen more prominently in ways other than identity fraud [2]. Further, such a tightening through technology-based authentication, without accounting for the risks of biometric failures or challenges faced by citizens in obtaining and maintaining an error-free digital identity, has resulted in many unfair denials of welfare benefits. These benefits are meant to be accessible to the poor as a right, but being able to precisely determine accountability in the complex sociotechnical system of Aadhaar has remained elusive. The ethical concern again arises on the choice of objective: Should the priority rest on reducing inclusion errors or eliminating exclusion errors?

Yet another example is the heavily VC-funded ecosystem of agritech start-ups. Many of these start-ups claim to exist to improve the livelihoods of farmers through increased productivity with better crop planning and precision agriculture, but they are also alleged to be data-grabbing agents of surveillance capitalism designed to shape farmer behavior in ways that can eventually dispossess them [3]. Nudges for monoculture cropping, commercialized production, and land consolidation increase the precarity of farmers rather than empowering them. Such underlying, unspoken goals of profiting off farmers are of course not highlighted, and are cloaked with goals that appear to be for the “benefit of society.”

Not only do these systems not state their true goals clearly or completely, lest the goals be questioned on their ethical merits, any harms that arise from their usage are further dismissed as “unforeseen” and “unintended” problems or “teething” issues. A focus on these harms has led to only minor tweaks being made

retrospectively in the systems, such as the deployment of fact-checkers on Facebook; or, in the case of Aadhaar, the introduction of new intermediaries who help citizens cope with a complex technology infrastructure in return for a fee; or compliance with data-sharing guidelines by agritech companies. The goals of the systems, however, are hardly ever questioned. Furthermore, operating in the realm of *means* without considering the *ends* of a technology project also makes it hard to place accountability for harms that may have arisen when the technology was used in unexpected ways. This is because accountability requires the attribution of causation and fault, but intentionality to create fault can be evaded easily when the goals are not defined clearly; the technology designers and managers can claim innocence because they did not look far ahead. This leads to blaming users for the harms, creates moral buffers between the technology and technologists, makes it easy to deny deliberate wrongdoings, and enables the outsourcing of morality to regulatory institutions through simplistic compliance procedures.

This distinction between the ethics of *ends* and *means* is important to understand. Ethical principles focused only on the *means*, such as “do no harm” guardrails, are not sufficient—like a ship without a compass to point it in the right direction. It could take the ship to many different destinations, not all of which might be desirable, whereas having clear end goals can help provide such a compass—a guiding light—to aim toward and to continuously steer decisions to meet those goals. This distinction has been highlighted in several domains. In the area of moral psychology and human values, Milton Rokeach in the book *The Nature of Human Values*

distinguishes between terminal values and instrumental values: Terminal values refer to desirable end states of existence, such as equality, world peace, freedom, and the welfare of others; whereas instrumental values refer to preferable modes of behavior as a means to achieve the terminal values, including honesty, politeness, responsibility, and sustainability. Terminal values are therefore clearly consequentialist, arguably more than consequentialist considerations demanded by instrumental values.

Similar to Rokeach, Amartya Sen in the books *Development as Freedom* and *The Idea of Justice* distinguishes between constitutive freedoms and instrumental freedoms for development. Constitutive freedoms are those that need no further justification, that is, they are constitutive of development itself and therefore are end goals, such as freedom from starvation, freedom from illiteracy, and freedom to participate politically. Instrumental freedoms are the means to achieve constitutive freedoms, such as the freedoms to participate in economic markets, to live a healthy life, and to scrutinize and criticize authorities. This is also the basis of Sen’s criticism of John Rawls’s theory of justice as fairness. The Rawlsian framework is somewhat restrictive in maintaining a distinction between *ends* and *means*. It does allow some end goals to be specified as basic liberties that should be available equally to everybody, such as several human rights, but only demands equity-based fairness guarantees in terms of some specific aspects, mostly related to the possession of material resources. To this, Sen responds that ensuring fairness alone on some metrics is not sufficient to specify what outcomes or social realizations will finally emerge. The situation is similar to that of a market, where simply having the freedom to participate and transact on equal grounds, and further impose equity measures like progressive taxation on inequalities that may emerge regardless, does not say anything about what the market will be used for or where it will take the world. Further, markets, and the world, are not level playing fields, and Rawls’s concept of the *veil of*

Intentionality to create fault can be evaded easily when the goals are not defined clearly; the technology designers and managers can claim innocence because they did not look far ahead.

ignorance, which is meant to ignore the current position in the world of the decision maker, therefore imposes an unnecessary informational restriction to improve equity and justice. In the book *Justice and the Politics of Difference*, Iris Marion Young adds to these limitations by further arguing that ensuring distributive equality on material resources is not sufficient to fix structural injustice in the world—the end goal that humanity should strive for is to remove the underlying processes of discrimination that create structural injustice in the first place.

Coming back to the subject of CEPC, it is divided into three sections: ethical principles, professional responsibilities, and leadership principles. All points in the first section, other than 1.1 (“contribute to society and to human well-being, acknowledging that all people are stakeholders in computing”), are clearly addressed at the *means*, such as to avoid harm, be honest, be fair, and respect privacy and confidentiality. The second section, on professional responsibilities, similarly is addressed at *means*: to produce high-quality work, acknowledge the work of others, provide reviews, carefully evaluate performance and correctness, assess risks, and foster public awareness. The third section, for those professionals in leadership positions, essentially builds upon the earlier sections by emphasizing the responsibility of leaders to create an environment conducive for their teams to adhere to the various principles. Principle 3.7 draws special attention to systems that become integrated into the infrastructure of society. Without having a clear emphasis on the end goals of computing, however, and potentially even identifying specific goals that computing professionals should work toward to define what is to the “benefit of society” and what is not, CEPC is limiting.

The importance of thinking about the end goals of technology is not a new observation. Norbert Wiener in his open letter “A Scientist Rebels” refused to share details of his

technology design with militarists for fear that they might use his work toward irresponsible ends [4]. He went further to illustrate how totalitarian governments or profit-seeking capitalists ignore genuine human welfare, and asked scientists to not be naive and to take responsibility for their inventions to keep them from being used for unethical private or political gain. W. Brian Arthur explains that technology rarely evolves from accidental or serendipitous discovery but rather is shaped by conceptualizations in the minds of the innovators that reflect their values and beliefs, and those of the funding bodies that support the research and development [5]. Similarly, there is wide ranging literature by Marxists like Harry Braverman [6], technology historians like David Noble [7], and science and technology researchers like Langdon Winner [8] who document the processes through which technology is often developed to serve the agendas of the powerful. More recent movements such as *ethical source licenses* are similarly grounded in defining acceptable and unacceptable goals toward which free and open-source software may be used.


I argue in my recent book *Technology and (Dis)Empowerment: A Call to Technologists* that computing professionals need to clearly define the purpose of their innovations, and especially to determine which goals should be considered unambiguously as meant for the benefit of society [9]. Not doing this stands the risk of having concepts such as social good be coopted by current systems of the state and markets and thereby lose their meaning and distinctiveness. I further argue, building upon the thinking of people such as Tim Unwin [10], that the purpose of technology should be to overturn unjust social structures and bring about power-based equality. If this is not the goal, then technology often tends to reproduce inequalities, being wielded more easily by those who can gain access to it or design it for their own agendas.

Given the large and intersecting challenges that humanity faces today,

including environmental collapse, inequality, exploitation, healthcare, and poverty, among others, and the double-edged nature of technology that often renders it a tool in the hands of the powerful to improve their situation at the cost of the poor and marginalized, it is imperative for computing as a discipline to move beyond narrow values of cost and time efficiency. Terminal values such as equality and the welfare of others and instrumental values such as plurality should be core elements of how computing professionals conceptualize research and development problems. Ethics codes such as CEPC can contribute toward building such an ethic for the entire computing discipline.

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From Immersive Experiences to the Metaverse

How Can We Engage More Users?

👤 Jie Li, EPAM

Insights

- Today people can experience a range of immersive experiences, from immersive museums to high-fidelity virtual worlds.
- The boundaries between immersive and real-world experiences are increasingly blurred.
- We need to find ways to engage a broader range of users in an inclusive and engaging metaverse by carefully considering content, interaction design, and accessibility.

I recently had a fascinating museum visit with my 6-year-old daughter, traveling through a giant “human body” at the Corpus Museum in Leiden, the Netherlands. The one-hour trip started at the knee and went all the way up. We witnessed how platelets helped heal a bleeding wound and how it felt to be inside a womb. We stood among the stomach, liver, and pancreas to watch them collaborate to make digestion work. We walked past the heart and the lungs to see red blood cells queuing up, catching oxygen by passing through the lung capillaries and releasing the oxygen to the rest of the

body with the help of the heart. The highlight was inside the mouth, where my daughter got excited counting how many teeth the giant had and jumping on its soft tongue, which lit up at different zones to explain the flavor it can taste (Figure 1).

Unlike professionally illustrated textbooks or encyclopedias, having such an immersive trip inside a human body is enchanting. It requires a lot of resources and work, however, to build and maintain the 5-floor-tall body. The experience is also difficult to diversify. Unlike other museums that frequently curate different exhibitions to attract return visitors, this human

body trip has an absolute “wow” effect for first-time visitors, but it’s not the type of museum people want to visit a few times a year.

CAVE: CUSTOMIZABLE IMMERSIVE EXPERIENCES

Without requiring physically building such a giant human body but still providing an immersive experience, a cave automatic virtual environment (CAVE) is another option. CAVE is typically a cube-like room with 3D images or videos projected onto its walls to create a walk-in immersive environment. The automotive industry has been adopting CAVE to aid its designs and to evaluate interior concepts such as instrument reachability, displays, and reflections in the windshield (Figure 2) [1]. The CAVE concept has been brought to the public in the format of “immersive art,” such as the 2019 immersive Van Gogh show in Paris, where visitors were immersed in Van Gogh’s masterpieces, walking among sunflowers or lying beneath the stars (Figure 3). In CAVE, experiences can be easily diversified by changing the projected 3D images or videos. You can bring family and friends and share this immersive experience with them. The CAVE cube sets a boundary between the real world and the projected one.

THE BOUNDARY BETWEEN THE VIRTUAL AND THE REAL WORLDS

In the previous two examples of immersive experiences, the boundary is a physical one: People can exit the giant human body through hidden side doors or leave the CAVE by stepping out of the cube. Today, be it a head-mounted display (HMD) or a smartphone screen, we can remove ourselves from the virtual world simply by putting away these devices. In the past two decades, the interface



Figure 1. The mouth of the giant human body at the Corpus Museum.

that we use daily to enter the virtual world has not fundamentally changed. Although the computational power has increased enormously and a tiny smartphone can do much more advanced things than a desktop computer could 20 years ago, the interface is still screen based, from big, low-resolution noninteractive monitor screens to high-pixel-density OLED touchscreens. Even though people complain about excessive screen time and gradually losing touch with the people around them, it is still simple to cut ourselves off from the infinite scrolling on social media platforms: Just turn off the screen.

With the rapid development of extended reality (XR) technology and commercially available HMDs, the rise of high-fidelity virtual worlds, and the various ways of crafting virtual avatars and interaction techniques, we are witnessing a big paradigm shift in how people engage in the virtual world. Popular applications, such as

the award-winning virtual reality (VR) games *Beat Saber* (<https://beatsaber.com>) and *The Under Presents* (<https://tenderclaws.com/theunderpresents>), have motivated many customers to buy an HMD. In *Beat Saber*, by holding two lightsabers, players compete in slashing the visualized music beats flying toward them in a neon virtual world (Figure 4). *The Under Presents* immerses users in virtual live theaters where they can explore novel, interface-free interactions, such as reaching their virtual arms out and pulling the destination toward them rather than teleporting to it.

Although millions of VR HMDs have been sold in the past few years thanks to these popular applications, mainstream adoption is still a long ways away. I often hear comments from HMD owners that the main issue of wearing an HMD is not just the ergonomic discomfort but also the isolation. It keeps you isolated from family members who are supposed to be enjoying the fun with you (unless, for example, you buy an HMD for each person). You could cast what you are seeing on the HMD to a TV screen, but watching on a 2D screen is far from the immersive experience you are having on the HMD. In this scenario, the boundary between the virtual world and home is an obstacle for families to adopt this new form of entertainment.

The main issue of wearing an HMD is not just the ergonomic discomfort but also the isolation. It keeps you isolated from family members who are supposed to be enjoying the fun with you.

DEFINITIONS OF THE METAVERSE

The **Corpus Museum** physically built a **giant human body** to offer visitors an **immersive trip**, but it is not the metaverse. *Second Life* (<https://secondlife.com>), a Web-based 3D virtual world, is a metaverse that has existed for nearly two decades and has millions of users. People “live” in *Second Life* in parallel to their real lives. Users can build social relationships and engage in entrepreneurial activities such as creating and selling virtual real estate and digital goods. It has an internal economy with a closed-loop virtual token called the Linden dollar. Users have embodied presence by creating their avatars. *Second Life* has many characteristics of a metaverse, but it is not the metaverse that we talk about today.

What is the metaverse? In Ancient Greek, *meta* is used as a prefix to mean “after” or “beyond,” which continues in the English language today. The term *metaverse* was coined in Neal Stephenson’s 1992 science fiction novel *Snow Crash*, as a combination of the words *meta* and *universe* [2]. So, *metaverse* literally means “beyond universe,” a reality that coexists with our reality. As described by Charlie Fink [3], in the metaverse “you will have a secure personal identity, and you will move seamlessly from place to place, just as you move from website to website. It will be spatial, 3D, and any device with a browser...will be able to access it. A headset won’t be a requirement. It has to be social. It has to have an economy, which means ways to make and sell stuff.” In other words, the metaverse will remove the barrier of geographical distance and physical limitations, enabling everyone to do things that they do in the real world and even things that they cannot. Users can smoothly travel between an infinite number of parallel virtual spaces and the physical world. In an interview with Mark Zuckerberg in the Verge [4], the author first summarizes venture capitalist Matthew Ball’s view that a metaverse “has to span the physical and virtual worlds; contain a fully fledged economy; and offer ‘unprecedented interoperability.’” She then

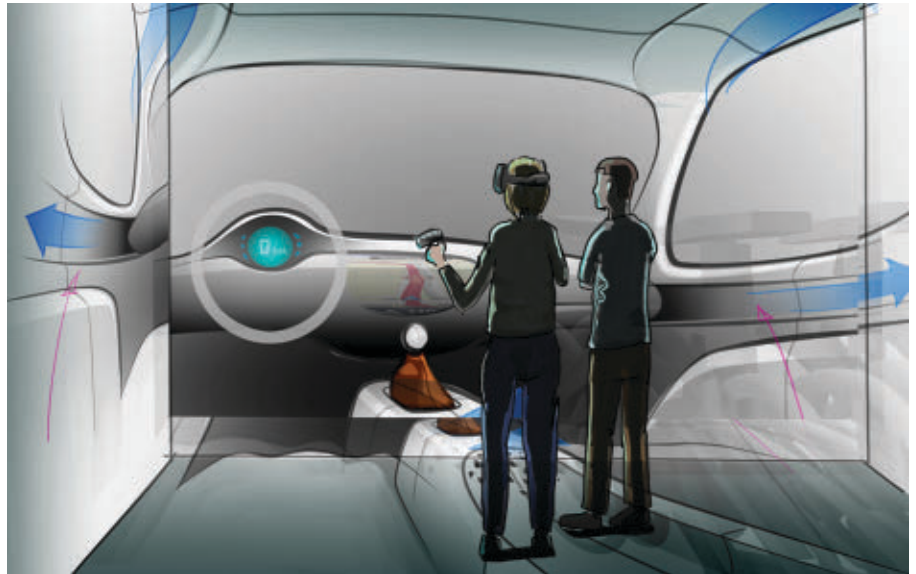


Figure 2. CAVE assists car designers in testing designs before production.



Figure 3. The 2019 immersive Van Gogh show in Paris.



Figure 4. A *Beat Saber* user playing in the neon virtual world.

FIGURES 1-4 WERE PAINTED BY THE AUTHOR.

paraphrases Zuckerberg, writing that the metaverse “will be an ‘embodied Internet,’ operated by many different players in a decentralized way.” In short, the metaverse is a network of digital reality that is cocreated by different players. It combines aspects of social media, online gaming, VR, augmented reality (AR), and digital currencies to seamlessly connect interactions in the physical world with interactions in these virtual ones.

ENGAGING USERS WITH LIFELIKE EXPERIENCES: LABORATORY PROTOTYPES

The reason why *Second Life* has been successful for two decades is that many people are still actively using it, creating experiences and sharing them. A promising future for the metaverse means that players are going to build an enormous number of virtual worlds. Inevitably, there probably will be many abandoned ghost virtual worlds. How do we keep virtual worlds prosperous? In the era of the experience economy, people are not easily satisfied with physical goods, which are fungible with many other products. People are time-starved and do not want to waste their energy on ordinary things; they’re craving diverse, unique experiences that are intangible but still memorable [5]. Engaging more users in the metaverse is not just about selling equipment or creating a fixed experience such that they only wow once (e.g., the giant human body trip). It is more about delivering diverse and lifelike interactive experiences.

Many industrial and academic laboratories have explored ways to provide these lifelike interactive experiences. Microsoft Research has presented an end-to-end system for AR and VR telepresence called Holoportation (<https://youtu.be/o00mn1XbClg>) [6]. The system demonstrates high-quality, real-time

3D reconstructions of an entire space, including people, furniture, and objects, using a set of depth cameras. These 3D models are transmitted in real time to remote users wearing VR or AR headsets to see, hear, and interact with other participants in 3D, almost as if they were all in the same physical space. Meta’s Reality Lab is pushing the limits of capturing hardware and trying to build lifelike codec avatars for diverse humans [7]. Codec avatars are built based on the captures by hundreds of high-resolution cameras, which are used to train AI systems. Google launched Project Starline, a 3D video chat system that enables users to look through a magic window and both see their loved ones, life size and in 3D, sitting across from them, and talk with them. Project Starline offers a feeling of presence similar to AR or VR, without the need to wear bulky headsets or trackers [8]. These systems require a lot of high-end hardware to run, however, so they are not easy to replicate outside of research laboratories.

In academic laboratories, researchers are trying to offer lifelike immersive experiences using lighter hardware setups. Our team [9] introduced a walk-into-the-movie experience (Figure 5). Each user was captured by three depth cameras and their 3D avatar was reconstructed and transmitted to a virtual apartment. When users met one another’s photo-realistic 3D avatar inside the virtual apartment, they had a sense of social presence and a feeling of walking into the movie. The idea behind this prototype is to demonstrate the future possibilities of watching a TV show or movie. Soon, when you are talking about a movie you watched last night, you might say, “I saw my friend’s hologram standing behind the detective. She read the forensic report the detective was holding.”

Compared to the capturing systems of Microsoft Research, Meta, and Google, the virtual movie setup is much lighter. Even so, we cannot imagine that users would set up and calibrate the cameras themselves at home. To enable more users to engage with the new experiences created in laboratories requires extended collaboration between industrial and academic players to further develop the technology—for instance, making the depth cameras smaller and easily installable at home and developing software to help users calibrate them.

ENGAGING A WIDE RANGE OF USERS WITH ACCESSIBILITY DESIGN

Whether using an HMD or walking into a CAVE, an immersive experience is still rare for most people because of the hardware investment required. To minimize the accessibility obstacles to virtual worlds, many Web-based applications (e.g., Mozilla Hubs, Virbela) have sprung up. Without a bulky HMD, users can enter a virtual world using a Web browser on a laptop or mobile phone. Building a Web-based accessibility solution is only a start to engaging more users. People with motor disabilities, impaired vision, or chronic pain may find virtual experiences less enjoyable if they require a lot of physical movement to get engaged, or if they contain primarily visual stimulations.

Furthermore, most of the available HMDs are not designed for children. I often need to hold the HMD on my daughter’s head to enable her to experience what an immersive three-dimensional virtual world is. The primary concerns regarding the digital-native generation are about addictions and problematic behaviors that may be caused by the combination of unique components in the virtual world and the gamification elements [10]. When designing for accessibility for children, finding a way to smartly implement intervening techniques is essential to ensuring supervised use of the metaverse.

CONCLUDING REMARKS

Both academic researchers and technology companies will play an essential role in advancing the development of the metaverse and turning it into high-quality, accessible

People are time-starved and do not want to waste their energy on ordinary things; they’re craving diverse, unique experiences that are intangible but still memorable.



Figure 5. The walk-into-the-movie experience: The users' photo-realistic avatars copresent with the virtual movie characters in the virtual movie.

services for end users. New accessibility design standards and usability testing methods for metaverse services must be developed to widen the user group and, most importantly, ensure user safety and comfort. Next, the development of new technology and software solutions, such as more-user-friendly HMDs and more-portable depth cameras that are also easier to calibrate, is necessary to turn laboratory prototypes into market-available products. Establishing the metaverse economy is also important, which requires defining business strategies and enabling business owners to seamlessly monetize their products and services in both the physical world and the metaverse.

The metaverse is within reach. Before the smartphone era, many people read newspapers and paper books on public transportation. Now they are often busy with their phones. They may read on phones, but they also do many other things: working, grocery shopping, playing games, and just being absorbed in the little screen. With the metaverse, we will witness a new revolution in digital interactions. Hopefully, the future metaverse will not pull people into the little screen in front of them but instead offer an enormous network of virtual worlds in which to engage a wide range of user

groups, where people work, live, and connect. People are not limited to a screen but rather are open to incredible interaction possibilities, with the virtual environment and with other people. To ensure the metaverses are attracting users and everyone has an equal opportunity to get engaged in them, we need to consider the design of the content and interactions, the hardware and software, and the accessibility for the elderly, children, and people with disabilities.

ACKNOWLEDGMENTS

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What Are You Not Reading? Critical Race Theory for HCI

👤 Muhammad Adamu, Lancaster University

Insights

- What do we mean when we talk about the Black experience in HCI? What might we be centering or erasing through those answers?
- In HCI, we can reason ourselves out of the mindset of binary thinking. The future is not black and white; the future is multicolored.

Last year, after reading Katta Spiel's discussion of the political nature of one's reading and writing [1], I began pondering the sort of scholarly work shaping my thought beyond my current project interests. Since then, I have considered making the personal political by reflecting on some of the implications of the decision to engage (or not) scholarly with critical race theory (CRT).

As an early-career researcher, at first, I thought about the possibility that engaging more profoundly with issues such as race, gender, and class in my work might make clear the unintended consequences of digital technologies in

future (and defuturing) specific organizing features of communities in Africa. The prevailing argument in African HCI is how diverse social values, cultural attributes, and lived experiences can be drawn into conversations about the applicability and sustainability of HCI methods, approaches, and techniques to technology design projects. Within narratives about appropriation and localization, for example, issues of race and racism don't figure prominently, and my initial thought was, *What would CRT offer in furthering the understanding of the politics of design—ontologically and epistemologically?*

I wondered whether CRT should be approached as a critical perspective for understanding the situatedness of lived experience to better design with, not for, communities; or be adopted as an ideological frame to sensitize oneself to the deeply rooted power relations of “development-like” tactics shaping transnational ICTD/HCI4D projects; or rather be viewed as a theory that could enable describing/infering interesting insights about the complexities of the social world.

To avoid the legitimacy trap—a trap that “arises when the claims that one makes to the legitimacy of one’s practices become a limit on that practice” [2]—I did a quick scholarly search of the term *CRT*, and confirmed my suspicion that it is a North American term rooted in cultural imperialism that seeks to create or demarcate safe spaces for supposedly deconstructing systemic inequalities in social and institutional life. Although I contemplated the intellectual value of extensively engaging with its ideological assumptions and projections, I came to the conclusion, as suggested by Thomas Sowell in *Intellectuals and Race*, that one would be better off not leaning toward the ideals of *race hustlers*. I know what you might be thinking, dear reader, that labeling race theorists or critical race theorists as race hustlers is unfair (assuming they hold the same ideological stand). Well, what else does their perspective espouse? The social anomaly and symbolism of race and color, the prowess of black voices [3], and the intersectionality of interest toward historical legacies of oppression.

In HCI, engagement with the topic of race has developed on different assumptions. Some are calling for a critical analysis of the racial biases in technology, the unintended consequences of technological interventions, and the immaterial labor of technology design and use. Others are keen on developing allyship for

addressing the unresolved challenges of racial disparities, social justice, and institutional inequalities. More recently, the basis for adapting CRT to HCI’s diversification effort is to challenge the structural effect of unequal power relations—relations that could inform how research projects or technological interventions are imagined and practiced [4]. Regardless of its theoretical engagement in expanding technoscientific knowledge practices, I, as an African, find the issue of “race” as set forth in the original tenets of CRT dismissive of other forms of recognition (e.g., ethnicity, religion, gender, and class) that might not necessarily be intersectionally oppressive.

Therefore, this reflection is a response to the call to “re-engage, ever more vigorously, in the struggle against racism within ourselves, our communities, and in the socio-technical world” [4], and the intellectual invitation toward “a more just definition of what we consider the Black experience in the fields of HCI and design, and what tenets are perpetuated in how this experience is defined” [5]. In a way, I am attempting to further complicate the tension inherent in centering specific precepts as the focus of HCI’s engagement with issues of power, knowledge, and politics; but I am also pointing to the subtle risk of perspectivism, exceptionalism, and essentialism often associated with North America.

To further complicate the issue of race as a determinant of being is the conviction that “race” as a social construct came out of the pseudoscientific tradition of Europe for gaining an advantage in an economic “contest.” In other words, the idea of race was born out of Western economies’ contest over materialism—with racism as its unintended consequence. The common argument is that racism is an institutional system of power and not a mutation of

individual values and behavior—and that the Euro-North American black experience, regardless of its inherent hierarchies and contradictions, should be taken at face value in contemporary discourses. The first thing that comes to mind is, which historical episode, geographical location, and political standpoint should direct the analysis of the black experience? How should the sequence of lived events be contextualized in the counternarrative they are championed for? Are we to naively embrace the epistemological claim that situated perspectives from below are closed for contestation (or that subjugated standpoints position specific actors to produce strong, subjective, and objective knowledge by their ontological second sight of being marginalized)? Or that the community should politically espouse the essentialization of incidental experiences as the determining history and future of the colored perspectives? [3].

The issue I am raising here is that CRT, like any trendy slogan that focuses on race, will be a thing of the past, as the emphasis on “the black experience” might not translate to any substantial political and economic power for the collective. While some have argued that “sitting on the sidelines because one is not directly affected by discrimination is not sufficient...[to] address the systemic and institutional racism that has led Black people in computing to be pushed out of the field or exit the field” [6], one has to account for how those subjugated experiences might risk erasing or demonizing other situated ones. As such, CRT’s appeal toward qualifying the black experience of the darker sides of modernity might be considered as speaking for or about the “Other” in ways that foreground oppressor/oppressed narratives over everyday lived social relations. CRT could even be seen as perpetuating different facets of self-inflicted powerlessness by its insistence on belonging to and becoming a racialized being. As a collectivist vocabulary, CRT is drifting toward the retrogression of the collective, and as an African, one might not appreciate the prescription that the experience of the world ought to be classified and ordered according to the color of one’s skin.

To further complicate the centrality of the black experience in the scholarly

Are we to naively embrace the epistemological claim that situated perspectives from below are closed for contestation?

landscape, let's consider a complex political phrase that depicts how one's purview directs the (re)presentation of a specific timeline of history. In *The Isis Papers*, Frances Cress Welsing explores the paradoxical symbolism of the white supremacy system in showing how power operates beyond the social manifestation of certain logic [7]. Of specific relevance here is the case for understanding how symbolism binds the psyche and culture. In problematizing the political question of who the "original mother fuckers" (OMF) are, Welsing presents the case that white males in North America, specifically the South, are the OMF. The narrative presented depicts scenarios where the white male is consciously aware of the black male's genetic potential to annihilate the white population—thus engaging in an offense-defense game to ensure survival.

In the white supremacy game structure, the reference to the North American black man as a "mother fucker" psychologically and emotionally charges one as a "powerless baby," thus unconsciously triggering an often aggressive behavioral reaction. Welsing's position is that "white-skinned (albino) persons were most probably the genetic mutant offspring from Black parents"; therefore, the white man is continuously striving to be born again without defect or of the original sin, emphasizing that "the original sin in white supremacy's Christianity, on close examination, is the act of sex that produced the appearance of nakedness or the genetic mutation of albinism or white skin" [7]. The argument presented was that while it was common for *black females* to nurse *white babies* during slavery, often the *white man* unconsciously fantasizes about being nursed by his original *Black mother*. In Welsing's terms, "each time the white male imposed (imposes) himself sexually upon the Black female, at the deep levels of symbolic thought he can be viewed as having intercourse with the reflection of his original Black mother" and that "through the subtle and intricate dynamics and the unconscious underweavings of the white supremacy system/culture, the white male has projected *his* image of himself as 'mother fucker' onto the total Black collective throughout the world" [7].

However, a different interpretation of the provocative phrase might lead to an uncommon explanation of the emotionally charged reaction of North American *black males* being referred to (and referring to their peers) as "mother fuckers." As a result of the abolition of slavery, slave owners in the Deep South devised the investment policy of slave breeding. In Richmond, Virginia, and on Maryland's eastern shore, systematic breeding by white or black males and a pronatalist economic strategy was adopted to ensure the natural increase of slaves across the country. One of the most troubling aspects of the breeding strategy was that people were mated indiscriminately without consideration of maternal relationships, in so far as incest was encouraged among slave owners and breeders. The two interpretations of the phrase *mother fucker* presented above highlight an archival dilemma whereby at face value, both propositions are discursively logical, can be supported by historic data, and might be taken as a factual representation of events. But the issue that remains is how to negotiate the tension at play when varying historic accounts are presented to uphold a political standpoint.

At first sight, both positions can be considered as emanating from the compression of historical events, the recalibration of the building block of the records, and the invention of politically motivated narratives. In reading and writing against historic records, one is expected to continuously contest historical accounts for a greater perspective through the restoration of the sequence of events or shifting traces of the record. The point I am trying to make is that by placing an overly CRT emphasis on the "black voices," *specific North American white males* are the OMF; however, the question that then comes to mind is how is it that the statement is normalized within the black American population and its utterance triggers a particular reaction from within that same group? From Welsing's perspective, symbolism binds the psyche and culture, which in turn could point to the logic behind certain patterns of speech and behavior and their implications within the white supremacy system. From this perspective, *specific North American*

black males are psychologically preconditioned as powerless babies to embrace the "mother fucker" connotation and to respond to it—in most cases, aggressively. This then raises the question of how to better understand the symbolism binding the black psyche and the black American subculture as a pair, or as it has been perceived and practiced across North America.

The first point of contention is that there is no clear-cut demarcation of the black American subculture. In the abstract sense, there are differences in the supposedly colored subcultures across the globe, differences that can be attributed to the spatial social selection of the pattern of thoughts that are expressed in the sociability of a group of people. The Arabs, the Yorubas, the Dinkas, and the Zulus are different ethnic groupings of Africans; as a collective, they represent subcultures that are at times celebrated and contested. The second challenge is that of tracing the black American subculture to specific ethnic groups across the African subcontinent or elsewhere as a token of an "expression of an elementary *entanglement*" without separability [8]. One plausible direction is that since specific Africans were first enslaved by members of another ethnic grouping in Africa [9] and then re-enslaved and mixed and matched with other groupings across the Atlantic, they experienced epistemicide, linguicide, and culturecide [10]. Arguably, the subculture in the Deep South during and after slavery can be attributed to rural white laborers (often referred to as the rednecks or the Celts) who emigrated from the borderland of England and Scotland. This grouping of people lived in a disorderly land where the appeal for order was low, and the exhibition of inappropriate behaviors was high; therefore, there is a good chance that the enslaved population in the South were inbred into the "redneck" value system.

Fast-forwarding to recent historical events in North America, if the narrative advanced by CRT is that racism is institutional, one has to explain the swift ideological shift from the progressive to the liberal era about "the Negro problem" (W.E.B. Du Bois's term). During the

Progressive Era, socioeconomic differences were attributed to race, whereas in the Liberal Era the emphasis was that racism brought about sociopolitical differences. So, in a post-racial society, what utilities would CRT offer in a technoscientific contest? The reader might, of course, be thinking of equality, fairness, justice, and liberation. Isn't it the case that in a competition, one would prefer to align with one's own group over others? Isn't it the case that supposedly minority groups in the U.S. often champion preferential policies and palliatives? Isn't it the case that a significant proportion of the black American population only embraces the continental African cultural heritage when it serves a particular interest [11]? Isn't it the case that competition can be a good thing, as it encourages independence, imagination, curiosity, and creativity? My point is that there are subtle differences in the global colored subculture(s). Some are inborn and others inbred; we can sensibly celebrate and contest them without separability or complicity.

This reflection shouldn't be misunderstood as disregarding the Race in HCI Collective appeal underway [12], but rather be considered as an invitation that directs attention to how subtle power relations might have perpetuated a particular effort toward making HCI more race-conscious. The central argument of this piece is that the mere focus on a specific geographical perspective on "race" as a quick fix to longstanding power struggles in today's sociotechnical world will not deliver any substantial ontological and epistemological changes in the academy. And as identified by the Race in HCI Collective and others, race-oriented scholars in HCI "should avoid forcing racial identities on people in the name of diversity and inclusion" [12] and acknowledge that "those who do not suffer from racism still benefit from its absence" [4]. I am not intimately engaging with CRT as a theoretical lens or a pedagogical practice; however, I am open to persuasion if it doesn't risk erasing other situated perspectives.

With the proliferation of a "race-bound" framing of computing and the call for a more "racially inclusive" HCI, I am keen on how ideas about post-racialism or post-capitalism can be drawn into the counternarratives of race-bound discourse, partly to further demonstrate the complexities of embracing a historical perspective that starts with the figure of Man. One can learn from the performativity of the postcolonial computing tactics that turned out to be enclosing the supposed uniqueness of marginalized voices—an issue that has received considerable attention in discussions of decolonizing African HCI. One can also recognize how CRT's acceptance of Western-led racial dialectic might have given rise to the repetition of perspectives that manipulates historic events for the sake of a self-serving story. My appeal is that, as agential beings, we can reason ourselves out of the mentality that Blackness/blackness, with its fragmentation, is to be likened to oppression and the oppressed.

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1. Spiel, K. What Are You Reading? *Interactions* 27, 6 (2020), 23–26.
2. Dourish, P. User experience as a legitimacy trap. *Interactions* 26, 6 (2019), 46–49.
3. I am making a subtle distinction between *Black* and *black* here to denote how both biocentric categories function in historical discourses. The Black-on-black category as a closed entity is often assigned to a grouping of people or inferred as a collectivist identifier. For example, in postcolonial African studies, the emphasis has been on how the Black entity was adopted to represent the more recent inhabitants of sub-Saharan Africa, whereas its adaptation as an identifier by the Sudanese—from the Arabic word *Bilad al-Sud* that implies the country of the blacks—denotes the complication of dialectics. My use of the black category is to showcase the improper depiction of Blackness as a fixated state within Western grammatical structures. Therefore, in the context of this piece, I refer to African American experiences as the *black* perspective and that of continental Africa as the *colored* ones—with the *Black* perspective as a complicated example. This distinction "allows us to imagine sociality, in such a way that attending to difference does not

presuppose separability, determinacy, and sequentiality, the three ontological pillars that sustain modern thought" [8].

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10. Ndlovu-Gatsheni, S.J. Decoloniality in Africa: A continuing search for a new world order. *The Australasian Review of African Studies* 36, 2 (2015), 22–50. Note: *Epistemicide* involves the disposition of Indigenous knowledge systems; *linguicide* implies the devaluation of people's language of imagination and expression; and *culturecide* entails the continual destruction of the organizing principles of a grouping of people.
11. With the recent increase in transatlantic pilgrimage and heritage tourism, one has to recognize how, as identified by Louis Chude-Sokei, the "American lust for an identity that can be purchased and a history that can be exchanged" has created an unbridgeable divide between the Black and black experience. This is an issue that doesn't seem to interest CRTs, as it might demand decentering Blackness (whatever that means nowadays) from particular political geographies. See Chude-Sokei, L. Invisible missive magnetic juju: On African cyber-crime. *The Fanzine*. 2010; <http://thefanzine.com/invisible-missive-magnetic-juju-on-african-cyber-crime/>
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This forum is dedicated to exploring the notion of meaningfulness in design processes, taking the perspectives of community groups, nongovernmental organizations, and those who are marginalized in society as starting points. Authors will reflect conceptually and methodologically on practical engagements. — Rosanna Bellini and Angelika Strohmayer, Editors

Data Practices and Data Stewardship

Janis Wong, The Alan Turing Institute

Data protection laws and technologies limit the vast personal data collection, processing, and sharing in our digital society. These tools, however, may lack support for protecting individual autonomy over personal data, given the limited recourse individuals have when going up against large, multinational companies. Additionally, existing data stewardship solutions may not facilitate cocreated and collaborative solutions for supporting data protection rights and online safety. To address this, I propose the creation of a data commons for data protection to encourage cocreating data protection solutions and to redistribute power from companies back to individuals and communities.

In our data-driven society, personal data is increasingly, knowingly or unknowingly, being gathered about us (data subjects) by companies (data controllers) in an attempt to learn more about our behaviors and consumer preferences. Such data practices that encourage the vast collection of our data have led to increased data protection and safety-related challenges, amplified by surveillance networks and infrastructures [1].

With an increasing number of data breaches and privacy scandals, more people are becoming cautious about what information they put online, to take back control over their personal data and undo any data-related harms. To address these challenges, legal and technological tools have been developed to support new ways for individuals to control, manage,

and protect their personal data and increase their online safety. For example, data protection regulations such as the European Union General Data Protection Regulation and the California Consumer Privacy Act aim to protect individuals and their data through supporting the exercise of their data subject rights. Furthermore, industry-specific guidelines can also support practical considerations for companies when it comes to data protection and safety. ACM, for example, has its own Code of Ethics and Professional Conduct to guide the ethical conduct of computing professionals.

Privacy and data protection tools offer data subjects granular control over their data. These tools include Jumbo Privacy (a privacy and security assistant that protects users from online risks), Solid (a platform for linked data applications that are decentralized and under users' control rather than controlled by other entities), and the Data Transfer Project

(a common framework with open-source code that connects two online service providers, enabling direct user-initiated data portability).

While the implementation of these laws, policies, and technologies represents a step in the right direction, it results in the responsabilization of data protection from data controllers to data subjects [2], where individuals, rather than data controllers, assume the burden of protecting their own personal data. Existing solutions rely on data subjects having a thorough understanding of both the law and the technological resources available for individual redress, often after data collection or processing. Furthermore, the focus on individual protections and safeguards disregards the power imbalance between users as data subjects and large corporations as data controllers: Do individuals know what rights they have? What can they do if a data controller isn't responsive to their data protection requests?

Even if such tools are effective, the fines that result from data breaches and privacy scandals may have little impact on the large market caps that big technology companies have. For example, plaintiffs in the U.S. successfully argued in a class-action lawsuit that user privacy was violated in the Cambridge Analytica scandal, which Meta agreed to settle and pay \$725 million to the 250 million to 280 million people affected. This amounts to only \$2 to \$3 per person, barely making a dent in Meta's \$319 billion market cap.

Ultimately, data subjects lack a meaningful voice when it comes to creating solutions that involve

Insights

- Data protection laws, technologies, and stewardship frameworks undo potential data harms, but generally focus on individualized solutions.
- A commons attempts to redistribute power to increase the personal and social value of data while ensuring its quality and secure storage through collaboration.
- A commons can help distribute the benefits of data as a resource widely and equitably, without commodifying or privatizing it.

protecting their own personal data both *ex ante* and *ex post* (before and after the event, respectively), as there are few opportunities to help improve individual and collective privacy and safety outcomes by pooling knowledge, resources, and expertise with other people's.

THE ROLE OF DATA STEWARDSHIP

More recently, to undo the potential harms caused by these data practices and address data subject and data controller power imbalances, data stewardship frameworks have attempted to provide data subjects with more agency over what and how their personal data is used. Data stewardship refers to the process by which individuals or teams within data-holding organizations are empowered to proactively initiate, facilitate, and coordinate data in the public interest. Those responsible for data stewardship, known as data stewards, may facilitate collaboration to unlock the value of data, protect actors from harms caused by data sharing, and monitor users to ensure that their data use is appropriate and can generate data insights. Data stewardship frameworks may help mobilize data protection by introducing new avenues for data subjects to directly confront large companies' motivations and ability to extensively collect, process, and share their data for profit.

Types and forms of data stewardship are wide ranging, each with distinct goals, functions, and infrastructures [3]. Data trusts apply trust law to establish fiduciary duties related to data management with the aim of redistributing power. Data foundations aim to minimize the risks of personal data breaches and other noncompliant data-related activities by building data usage, sharing, and reuse environments. Data cooperatives involve legal cooperative registration where pooled (collective) data is managed by its members, advancing their collective interests alongside societal considerations.

Domain applications of data stewardship models are also extensive. For example, Driver's Seat is a data cooperative owned by rideshare and delivery drivers. Its app allows drivers



to gain insights from their driving data with the aim of limiting power imbalances between drivers and platform companies in the gig economy. Another community-driven data stewardship approach is PescaData, a mobile application that small-scale fisheries in Mexico, Latin America, and the Caribbean can use to register as well as track their own fishing storage and expenses involved in fishing days. PescaData enables workers to offer

Existing solutions rely on data subjects having a thorough understanding of both the law and the technological resources available for individual redress.

their catch to local markets without intermediaries. These organizations and tools have allowed for greater agency and control of personal and nonpersonal data by their own communities, where such data has traditionally been in the hands of corporations that may not share community interests.

Data stewardship infrastructures are not without limitations, however. In the case of data trusts, operational strategy questions remain with regard to how they are deployed, as examples have only been tested theoretically, but not practically. Data subjects have limited rights in a data foundation compared with a trust, with limited opportunities for direct engagement. In data cooperatives, data subjects may not be able to act independently from the group given the cooperative's group aims, particularly where contract or incorporation to establish data-related rights may be difficult. Scale is also a challenge when it comes to

implementing data stewardship.

Additionally, although there are current initiatives that aim to standardize and produce practical guidance on how these data stewardship mechanisms could be implemented, not all of these mechanisms are focused on data protection and safety. Rather, they may be focused on data sharing and increasing the value of data through privacy-preserving means for commercial and economic benefits, without consideration of supporting data subject recourse in cases of data breach or the manifestation of data protection harms. Crucially, these processes may not include data subjects in the iterative process of adopting, building, and deploying the framework to cocreate data protection solutions, and still result in the responsabilization of the data protection process.

In sum, existing data stewardship frameworks incorporate data protection considerations and support practices that improve online safety. However, data stewardship may not include data subjects or encourage collaboration in the process itself, resulting in limited emancipation from the existing data-driven infrastructures that continue to be incentivized to collect, process, and share individuals' personal data.

THE COMMONS: CENTERING INDIVIDUAL AND GROUP COLLECTIVE ACTION

To address these data-related governance challenges, the commons, a framework that centers around individual and group collective action, trust, and cooperation, has been considered to limit the spillovers created by the reuse of data, thus increasing its value over time.

The commons, as developed by Elinor Ostrom in her key work *Governing the Commons* [4], guards a common-pool resource (CPR), a resource system that is sufficiently large so as to make it costly to exclude potential beneficiaries from obtaining benefits, thus reducing exploitation.

Commons governance follows several key principles. Respecting the competitive relationships that may exist when managing a CPR, the commons depends on human activities where CPR management follows the norms and rules of the community autonomously.

The CPR enables transparency, accountability, citizen participation, and management effectiveness, where each stakeholder has an equal interest in the commons. Crucially, governing the commons recognizes polycentricity, a complex form of governance with multiple centers of decision making, each of which operates with some degree of autonomy. Its success relies on stakeholders entering contractual and cooperative undertakings or having recourse to central mechanisms to resolve conflicts. The norms created by the commons are bottom-up, focusing on the needs and wants of the community and collectively discussing the best way to address any issues. Given these principles, the commons can encourage dialogue among data subjects, experts, policymakers, and additional citizens, creating new knowledge together for the common good with the aim of undoing harmful data practices.

To address the rise of distributed, digital information in our data-driven society, Ostrom and Charlotte Hess developed the information or knowledge commons, where knowledge is the CPR [5]. As new technologies enable the capture of information, the knowledge commons recognizes that information is no longer a free and open public good. Instead, it needs to be managed, monitored, and protected for archival sustainability and accessibility.

Crucially, the knowledge commons addresses data-related governance challenges that arise due to spillovers created by the reuse of data. The knowledge commons can increase the value of such data reuse where the data is linked together and shared,

Governing the commons recognizes polycentricity, a complex form of governance with multiple centers of decision making, each of which operates with some degree of autonomy.

creating new uses and value for the same data. Without a commons, the newly generated knowledge may not be available to the original creators of the data in the first place. As a result, the knowledge commons can support data subjects in accessing the personal and social value of their data while ensuring its quality and secure storage.

Ostrom's commons framework has also been applied to data commons that guard data as a CPR. Research data commons such as the Australian Research Data Commons, the National Cancer Institute's Genomic Data Commons, and the European Open Science Cloud all attempt to further open-science and open-access initiatives.

Traditionally, such data commons focus on data distribution and sharing rather than data protection. Recent research, however, has explored how the commons can practically answer questions of data ownership, storage, use, privacy, and regulation [6]. For example, a commons can be useful for considering the intellectual property rights of mass-participation content creation on social networking sites and in pervasive computing, where it could support the use of collective intelligence and knowledge sharing to address systemic problems that threaten the sustainability of institutions and physical infrastructures. A commons can help distribute the benefits of data as a resource widely and equitably, without commodifying or privatizing it. The commons has also been considered for governing emerging technologies, as it can help mitigate individual and collective risk.

REDUCING RISK AND INCREASING DATA SUBJECT SAFETY

So how can a commons be considered as a cocreated and collaborative solution to giving data subjects more agency over their personal data and increasing their online safety? When a commons is created and applied to a specific use case, such as choosing a data archiving service or social media platform that is privacy friendly, a data subject can specify to what extent they would like their data to be protected without prior knowledge of law, policies, or technical expertise. The data subject's



suggested actions are automatically generated by the system based on their preferences and specifications. Data subject decisions may override existing preferences, policies, or standards set by stakeholders, and data subjects can review and update their outcome, add their experiences, and participate in cocreation. Data protection and privacy rights, such as rights related to accessing data, porting data, and objecting to automated decision making, can be individually and collectively exercised against data controllers.

Ongoing research has tested the theoretical and practical aspects of creating a data commons in the context of data protection as well as other fundamental rights and values, where such opportunities to increase data subject agency is increasingly welcome and gaining traction among lawyers, computer scientists, data protection officers, and civil society [7].

In consideration of redistributing power away from data controllers and toward data subjects, when it comes to protecting our personal data, ongoing efforts by regulators, researchers, and activists have ensured that data and privacy protections are easier to understand and implement and are constantly improving for individuals and groups. This has allowed us to set new privacy preferences in our social media settings, opt out of automated decision making, and reject tracking cookies when we browse the Web.

Taking commons principles onboard, here are a few steps you can take to undo current data malpractices:

- *If in doubt, opt out.* With the rise of artificial intelligence and machine-learning technologies such as OpenAI's ChatGPT and Prisma Labs' Lensa, an increasing amount of data that individuals put online is being scraped to train their datasets. If you don't want your data to be included, search for ways you can opt out of the use of your personal data as well as optimization services.

- *Find out who your country or state data authority or ombudsman is.* Beyond exercising your privacy rights with the companies that collect your data, you can seek additional information or escalate any issues with authorities that have regulatory oversight.

- *Make a Freedom of Information Act request.* Public authorities in many countries are required to reveal information about how and what sorts of data are being collected and shared as well as how that data is being used.

- *Find your group.* If you have concerns over your data and online safety, ask your friends, family, and colleagues. It is likely that they have similar concerns. SIGCHI as well as other digital crowdsourced resources are widely available, such as the *Coronavirus Tech Handbook* and *A Comprehensive Guide to Tech Ethics and Zoom Class*. Don't assume you have to do it alone.

Beyond regulatory and technological

solutions, collaborative and multidisciplinary ones are necessary for data stewardship as big data and AI innovations continue to use more data to generate individual, social, and public value. This includes applying commons theories, principles, and practices to how we individually and collectively protect our personal data and online safety. While creating a commons is not a one-size-fits-all solution for solving privacy and safety issues, the framework represents an alternative sociotechnical solution that supports data subject agency to prevent and rectify data-related harms.

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In this forum we explore different perspectives for how to apply intersectionality as a critical framework for design across multiple contexts. — Yolanda A. Rankin and Jakita O. Thomas, Editors

Intersectional Computing— Where It All Began: A Sankofa Story (Part 1)

Jakita O. Thomas, Auburn University

Go back to the past in order to build for the future. — Sankofa

My journey toward intersectional computing began in 2015, when I took my daughter, Vivian, to the Grace Hopper Celebration of Women in Computing (GHC) in Houston. Vivian is an artist-scientist (as all three of my children are). She’s a beautiful dancer and singer who also loves science and engineering. She’s currently 12 years old, but back in 2015 she was 5. And she was *sooo* excited to not only go on a work trip with mommy but also to see women of all kinds in computer science.

During our trip, Vivian met a diverse set of women at GHC (Figure 1); she even had the opportunity to visit the Young Women’s College Preparatory Academy, a high school that focuses on engineering, computing, and technology for Black and brown girls. As a 5-year-old, Vivian was excited by the entire experience. As a mother of a little Black girl with an interest in computing, however, I found that year’s conference concerning for two reasons.

The first reason was that, although I had purchased Vivian a registration, only when we arrived did I learn that she was not allowed to attend any of the talks that year. They said she wasn’t old enough, so she would only be allowed on the expo floor. I thought, *What does that mean for mothers who may be nursing, who may be caring for toddlers and unable to secure childcare for the conference, which they need since on-site childcare*



Sankofa bird.

hasn’t been provided, or who wanted to expose their children at a young age to the field of computing? The literature speaks to the importance of early exposure for STEM careers, so for my daughter to be denied the opportunity to really see computing in action through the women in attendance was heartbreaking for me, and disappointing for her.

The second reason was the slate of featured speakers (Figure 2). Some of these speakers were incredibly well known both inside and outside of

computing, such as Sheryl Sandberg, whose book *Leaning In* had been published only two years earlier. Some were less well known outside of computing, but very well known inside of it. (In fact, one of the featured male speakers made a sexist comment that year onstage that made national news.) Different genders, races, and ethnicities were present and accounted for among the featured speakers. But something was missing. Neither I nor Vivian saw ourselves in those featured speakers. Where were the Black women? True, a very prominent Black woman in the field of computing did give a talk during the Black Women in Computing luncheon. However, it couldn’t really be called a luncheon because there was no food, though food had been provided for other groups.

You may be asking yourself, *Why did it matter?* Well, it mattered not only for me and my 5-year-old daughter but also because three years earlier I’d received a National Science Foundation Faculty Early Career Award to launch a program and research effort called Supporting Computational Algorithmic Thinking (SCAT). SCAT was designed to better understand how Black girls engaged in designing, implementing, adapting, and assessing algorithms in the context of designing games for social change; and by the third year, we’d started to see some incredible shifts in their computing identity and self-efficacy [1]. Many of them had moved on from perspectives such as “Black women don’t *do* computing” (because they hadn’t seen Black women in these roles in their everyday lives) to “Black women *do* computing,” as they had been



Figure 1: Five-year-old Vivian at GHC Expo.

surrounded by Black women computer scientists through their experience and then began seeing *themselves* as computer scientists and game designers. They had also developed video games, mobile games, and VR games and comic books that featured themselves as the superhero. They were using computing as a tool to imagine futures for themselves, and it bothered me that we'd created this safe, transformative space for them, but the field of computing did not see and embrace their greatness in the same ways our SCAT community did. I did not realize it at the time, but I was already engaged in intersectional computing and in fact running an intersectional study.

Back to the story of the 2015 GHC. The other Black women in attendance were also concerned. They had some of the same issues that I had. In what I like to call “the meeting after the meeting,” which is usually held at the close of a computing conference (or a women-in-computing conference) in someone’s hotel room, we’d pack ourselves in to talk about our conference experiences—the good, the bad, and the ugly. The community was buzzing. For so many years, we’d been attending conferences like these, supposedly designed for women, but never really meeting Black women’s needs or addressing our concerns. That year, the “meeting after the meeting” didn’t just take place in someone’s hotel room after the conference. Instead, meetings after the meeting took place in bathrooms, on couches in the lounge areas, and in hotel rooms during the conference.

By the time the conference ended, we had filed a set of complaints about all of the issues I have already described. The question that came back to us over and over was this: *How exactly are the experiences of Black women different from other women’s?* It appeared that from the conference’s perspective, they had designed an intervention (the conference itself) for women, and therefore, that conference should have met the needs of all women (Black women included). Notwithstanding the lack of Black women in leadership, the conference organizers seemed to be suggesting that, if they designed a conference experience that addressed their needs, it would automatically address everyone else’s needs.

Our issue was that we *felt* the invisibility, erasure, and marginalization. We *saw* the differences in the ways in which Black women were treated that were different from other groups (even other groups of women who have been historically marginalized in computing). But we could not point to any studies to answer their question because those studies did not exist. There was no literature.

WE ARE NOT ALONE

Since that time, the leadership structure of the Anita Borg Institute (ABI) and GHC has shifted significantly. Additionally, since that time, the challenges that Black people face in computing and tech have been more widely documented. A Black woman computing major being asked over and over if she is lost when she enters

the building where the computing department is located [2]. The highly problematic Google in Residence program, which sought to send Google employees (often with only BS degrees and no prior teaching experience or knowledge around pedagogy) to historically Black colleges and universities (HBCUs) to teach, often without regard for the historical legacies of those institutions or without knowledge of the fact that over 85 percent of Black Ph.D.s in STEM (computing included) received their undergraduate degrees at HBCUs. That means that HBCUs were already doing some amazing work in turning out Black computer scientists, engineers, doctors, chemists, and other scientists [3,4]. Instead of coming into these environments with a spirit of coalition, collaboration, and learning from one another, employees of Google and other companies often arrived aiming to “fix” students, faculty, and programs to align more with the company’s view of what computing is and how to best prepare for careers in computing [3]. Never mind that these institutions had been recruiting, retaining, and graduating Black students in these areas for decades.

In fact, Silicon Valley can (and should) learn something from HBCUs about recruitment and retention, especially given the very high-profile departures of Black people from prominent companies like Google and Meta over the past few years. The Kapur Center’s Tech Leavers report revealed what many Black and brown computing and tech professionals already know about the



Figure 2. Grace Hopper Celebration of Women in Computing featured speakers.

climates we often have to encounter in tech that cause us to decide to leave the field [5]. From Timnit Gebru’s very public ousting from Google to the recent creation of a fake Twitter account that not only attempted to impersonate a Black woman scholar-activist but also tried to simultaneously inflict emotional and spiritual harm on her, all because she questioned the equity of the peer-review process within CS education and often holds the CS education community accountable for its treatment of Black women, there are many examples of the chilly environments Black people must contend with in computing and tech, including HCI, where we are often told to assimilate or fix ourselves without also transforming these environments [6,7].

BLACK WOMEN GALVANIZE

So, we convened, holding a workshop in 2016 that brought Black women and a few others together to set an agenda for research and action (Figure 3) [8]. We identified themes that were important to Black women in computing. We discovered language to begin to articulate additional responses to the question around how our experiences were different from other women’s that allowed us to communicate how we were feeling and what we were seeing. In other words, we read and read and watched, and read some more—and we’re still reading (see [9] to access the reading list). We built a coalition and community with women scholars of color from education, mathematics, physics, gender studies, and Africana studies, both inside and outside of computing (e.g., [8]).

We organized, forming several organizations specifically designed to meet our needs. For example, Jamika Burge, Quincy Brown, and I formed

#blackcomputeHER as a direct result of what we experienced at the 2015 GHC (<https://www.blackcomputeher.org>). We theorized, collecting data about the experiences of Black women in various computing contexts to understand in even greater detail how our experiences were different from those of other women, even so-called women of color [8]. We learned and interrogated. For example, every year the Computing Research Association conducts the Taulbee Survey and then releases a report on the state of enrollment and degree production in computing (which includes computer science, computer engineering, and information), but it has only been disaggregating data since 2013. Figure 4 shows CS degree enrollments of Black women (in yellow) against CS degree production at the bachelor’s level for Black women (in blue). What we learned was that Black women have the highest intent to major in computing (based on their enrollments), but they are some of the least likely to be awarded B.S. degrees in computing fields. What is happening in those four to five years? We created not only a literature around Black women in computing but also other scholarly and creative works such as a mini-documentary [8]. In the words of Iyanla Vanzant, we “did our work.”

What is needed is a more complex understanding of the experiences of marginalized groups in computing.

WHAT ARE WE LEARNING?

We learned that intersectionality is “a way of understanding and analyzing the complexity in the world, in people, and in human experiences” and that “social and political life and the self... are generally shaped by many factors in diverse and mutually influencing ways” [10]. We learned that intersectionality has six core constructs: relationality, power, social inequality, social context, complexity, and social justice [11]. Along with these six core constructs are four guiding premises for intersectionality [11]:

- Race, class, gender, and similar systems of power are interdependent and mutually construct one another.
- Intersecting power relations produce complex, interdependent social inequalities of race, class, gender, sexuality, nationality, ethnicity, ability, and age.
- The social location of individuals and groups within intersecting power relations shapes their experiences within and perspectives on the social world.
- Solving social problems within a given local, regional, national, or global context requires intersectional analyses.

When looking at power configured in a particular way and exerting itself over time, which Patricia Hill Collins calls a *matrix of domination*, we see that power can be characterized across four dimensions [11]:

- *Structural*, which describes how organizations and institutions are structured and who holds power within them
- *Hegemonic* (or cultural), which describes the dominant narratives we tell ourselves (e.g., taking calculus prior to college is required for success in computing) without questioning where



Figure 3. First Black Women in Computing Workshop (later became blackcomputeHER.org).

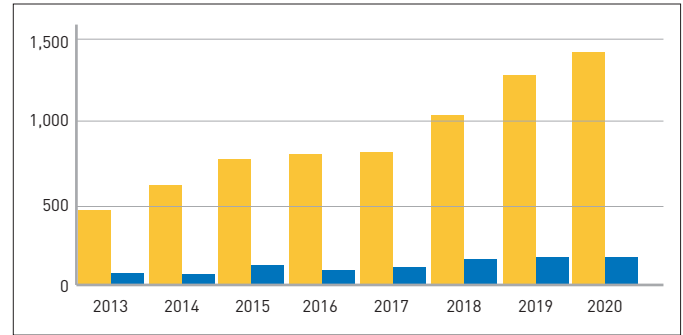


Figure 4. B.S. CS enrollments for Black women (yellow) and B.S. degrees awarded to Black women (blue) since the CRA Taulbee Survey has been disaggregating data by race and gender.

those narratives came from or whether they are actually true, how images and imagery are controlled, as well as messages about what is “normal” or “fit”

- *Disciplinary*, which creates the perception of a level playing field, but contains the unspoken rules that apply to and work for some but not others and, ultimately, determines who excels and who does not

- *Interpersonal*, which involves social interactions with others, who is considered deficient or deviant from norms, and whether or not that deficiency or deviancy can be addressed, mitigated, or overcome (e.g., asking Black women to fix ourselves and assimilate rather than addressing the environments that cause harm). The interpersonal dimension also speaks to who benefits from power and who does not.

What we’ve learned is that what is needed is a more complex understanding of the experiences of marginalized groups in computing who live at various intersections of racism, sexism, classism, xenophobia, heterosexism, ableism, and so on. We need intersectional computing.

In this four-part series, we will look back and examine how the field of computing (including HCI) has engaged and not engaged in sustaining the engagement of Black girls and women. We will look at some of the pioneers who called for intersectionality in computing and HCI prior to 2018, when studies began to become somewhat more visible within the field. We will interrogate various structures in the field and describe various configurations of power that seem neutral, objective,

and indifferent on their face, but whose organization and inner workings create different outcomes and, sometimes, challenges or barriers for Black girls and women to thrive in this field. We will also describe the difference between designing and conducting studies *about* intersectional populations and conducting truly intersectional studies. Sankofa is an Adinkra symbol that means “to go back to the past in order to build for the future.” *Se wo were fi na wo sankofa a yenki* is a Ghanaian proverb that means “It is not taboo to return and fetch it when you forget.” Black girls and women have been forgotten within this field, but it is always okay to go back and retrieve what has been forgotten. It is also always okay to transform, reimagine, and rebuild environments so that no one or nothing is forgotten going forward.

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→ <https://pearc.acm.org/pearc23/>

August

SCA '23: 22nd ACM SIGGRAPH/Eurographics Symposium on Computer Animation (Los Angeles, CA, USA)

August 4–6, 2023

→ <https://computeranimation.org/>

ICER '23: 19th ACM Conference on International Computing Education Research (Chicago, IL, USA, and hybrid)

August 7–10, 2023

→ <https://conf.researchr.org/home/icer-2023>



Neha Kumar,
ACM SIGCHI

With HCI and Friends

Nurturing the Interstices of HCI

The SIGCHI-sponsored HCI and Friends Symposium that took place December 9–11, 2022, at the Indian Institute of Technology Bombay campus in Mumbai, India, was the outcome of a few different plans that had been in the making over the past three to four years [1]. When “Expanding the Horizons of Human-Centered AI (HCAI),” the 2019 ACM SIGCHI-supported summer school, turned out to be a great success, plans were made to bring the event back the following year [2]. Akhil Mathur and Pushpendra Singh also secured support from the SIGCHI Development Fund to organize the event. But 2020 had other plans for us and the world. In 2022, we decided to give an on-site event another shot, organizing it alongside the SIGCHI Executive Committee (EC) meeting and taking up Anirudha Joshi’s offer to host the EC in Mumbai, for an event that would bring together those doing HCI and HCI-adjacent work in India and beyond.

The three-day event brought forth many enriching conversations—on design and development, health and sustainability, games and languages, and much more. There were 29 speakers, who led attendees through 10 sessions [1]. The event had more than 150 participants, including many students and early-career researchers in the process of deciding whether or not HCI was for them. Each day featured three 90- to 120-minute sessions, and each session was divided into two parts. Three or four speakers each gave 20-minute talks, followed by a 30-minute panel where all speakers for the session

discussed one another’s talks and answered audience questions. The event was predominantly on-site, but several speakers joined remotely, and sessions were available on Zoom.

A running theme throughout the conference was a reflective and critical stance on what technology can accomplish in light of social realities, and how we might leverage it effectively toward social change. Bill Thies reflected on his time at Microsoft Research and what he had learned from designing and deploying technology at scale. Armman’s Neha Madhiwalla presented her perspective from years of work on maternal and child health, pushing us to question the harms that technology can cause. Madeline Balaam ended her talk on interaction design for intimate health and well-being with a crucial reminder from Kevin Kumashiro that “we are not trying to move to a better place; rather, we are just trying to move” [3]. Jay Chen emphasized the importance of acting with urgency, in our varied capacities, to consume less. These are just a few examples of the many rich conversations we had on the future(s) that lie(s) ahead of us. It was clear that there is much to be learned from these interstices of HCI, the spaces where stakeholders come together, however briefly, and thoughts intersect.

The poster session, held on day two, offered an excellent space for research conversations to unfold, and three poster judges (thank you, Luigi De Russis, Dipanjan Chakraborty, and Dilisha Patel) discussed the work with the participants in great detail. The prizes went to the following participants, in this order:

- Sukhnidh Kaur (Microsoft Research, India) for her work on

“Experiences of Indian Journalists on Twitter in India”

- Gauri Bhatnagar (IIIT-Delhi) for her work on “Unpacking Tensions in Designing an Annotation System for Public Toilets to Support Menstrual Mobilities”

- Pranjal Jain (Swansea University, United Kingdom) for his work on “Worker Centric Supertools Driven by Tacit Knowledge.”

Much care went into the organization of the event (mainly thanks to Anupriya Tuli, though we all did our best to support her vision). When organizing any event of this size or larger, there are many choices, both big and small, to be made. Sustainability remained an intentional focus, and even as we covered travel costs for several participants, we also made efforts to minimize waste at the conference. We did not distribute plastic water bottles, and sent participants several reminders to bring their own bottles (most of them did!). We made a conscious effort to weave in sustainability when selecting merchandise for our participants (see photo). We used crochet lace for lanyards to encourage reusability, and name tags were made of eco-friendly handmade paper. We also made a point to support local businesses. The notebooks and tote bags we distributed were from the Kulture Shop [4], which, until its closing in March 2023, supported more than 100 local artists and has distributed over 1,000 artworks intending to “update the perception of India through art.” Richa Kedia, a Delhi-based illustrator, provided us with prizes for the poster-session winners [5]. Kedia directs her art toward “educating people about nature and



wildlife so that they fall in love, as generally we tend to protect what we love.”

SIGCHI-sponsored events have rarely been held in India (a shout-out to ACM ICMI, which was held in Bangalore in 2022!), or any locations in the Global South for that matter. The hope of the current SIGCHI EC

is this will change so that SIGCHI increasingly and intentionally recognizes the HCI communities that flourish in all parts of the world, and the sources of HCI knowledge develop and strengthen in regions we tend to hear less from. Conferences in general are typically quite expensive to attend, although hybrid modes have


begun to offer welcome alternatives for participation. There is much work that remains to be done within SIGCHI to get past long-held biases around who generates HCI knowledge and whose knowledge counts. As a minuscule step in this direction, all attendees at the symposium were given the opportunity to avail themselves of a complimentary membership to SIGCHI and were encouraged to participate in various ways. But ensuring that this SIGCHI membership can bring equal value to all our communities around the world remains a work in progress.

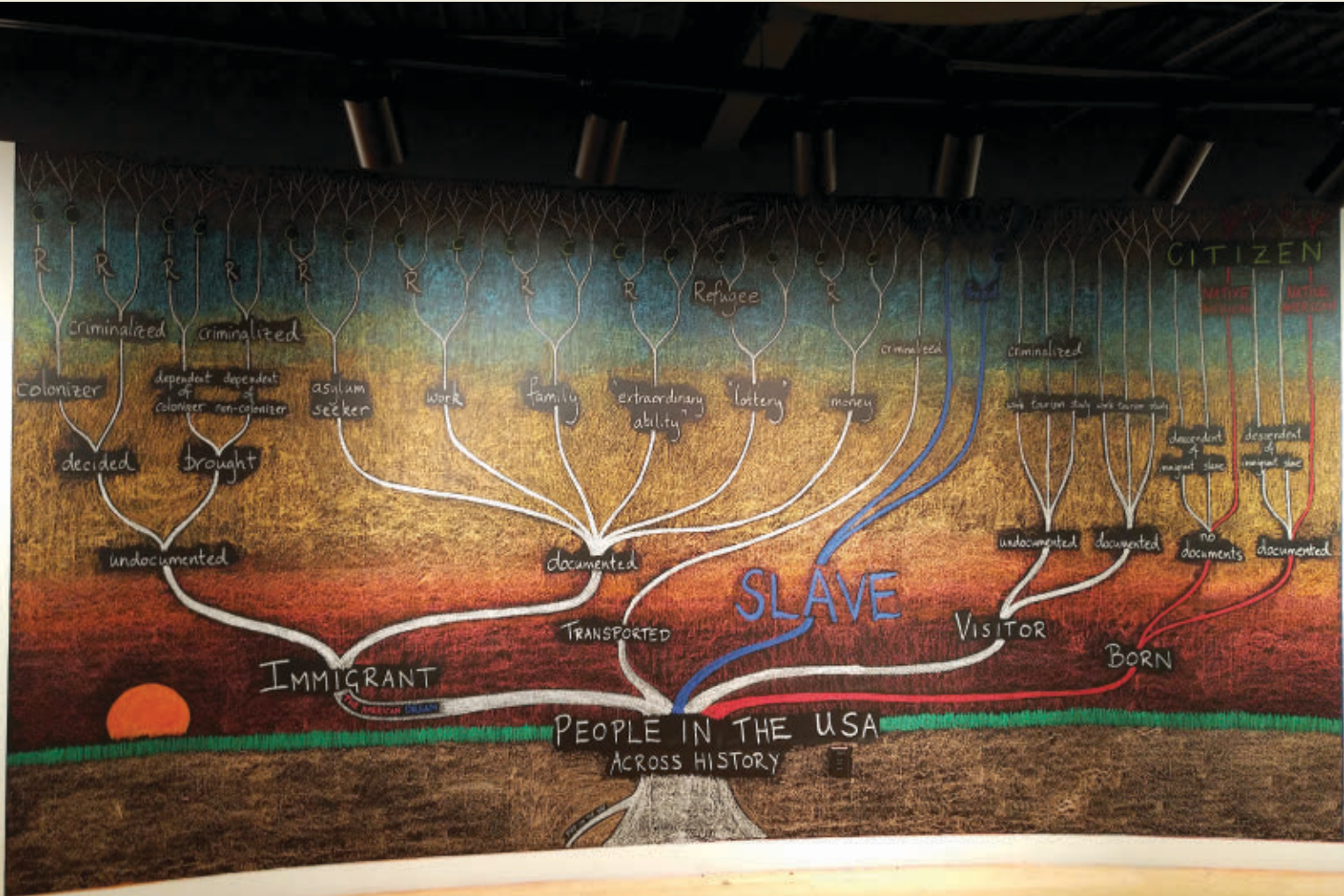
ACKNOWLEDGMENTS

Many thanks to ACM SIGCHI, iHub Anubhuti–IIITD Foundation, and Google for their sponsorship of the symposium, and we are deeply grateful to the General Chairs Anupriya Tuli and Akhil Mathur for making excellent use of those funds.

ENDNOTES

1. <https://namastehci.in/>
2. <https://nehakumar.medium.com/summer-schooled-on-human-centered-ai-f0a4fa70df7a>
3. Kumashiro, K. Toward a theory of anti-oppressive education. *Review of Educational Research* 70, 1 (2000), 25–53; <https://www.jstor.org/stable/>
4. <https://www.kultureshop.in/collections/art-prints>
5. <https://www.richakedia.com/>

 **Neha Kumar** is an associate professor at Georgia Tech, where she works at the intersection of human-centered computing and global development. Her research engages feminist perspectives and assets-based approaches toward the design of technologies for and with underserved communities. She currently serves as SIGCHI president. [→ neha.kumar@gatech.edu](mailto:neha.kumar@gatech.edu)



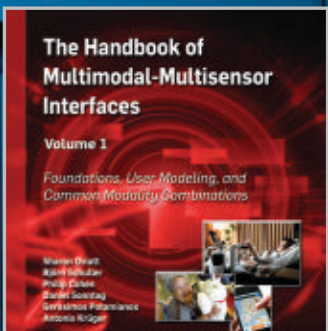
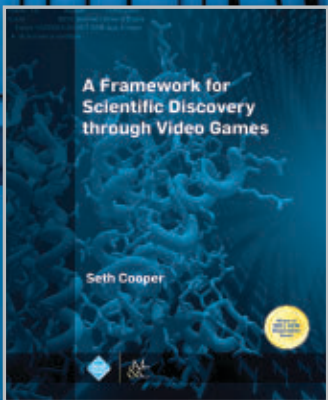
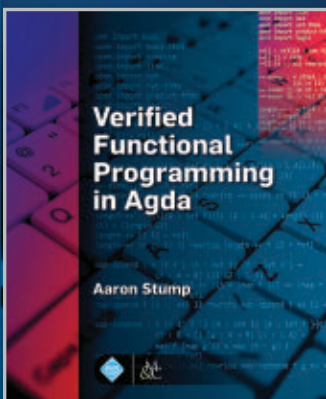
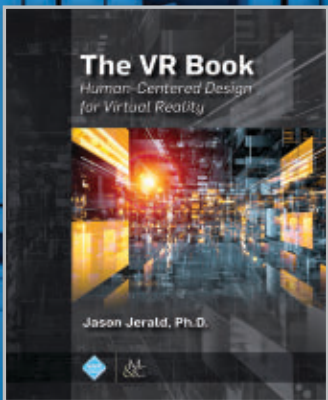
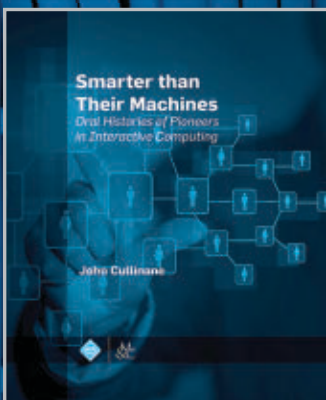
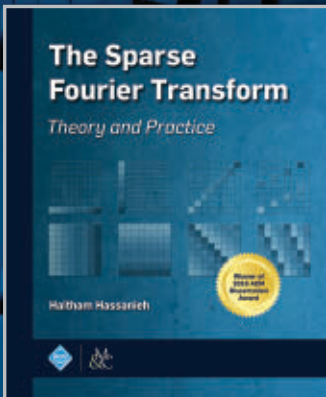
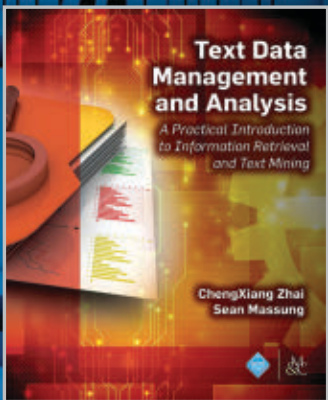
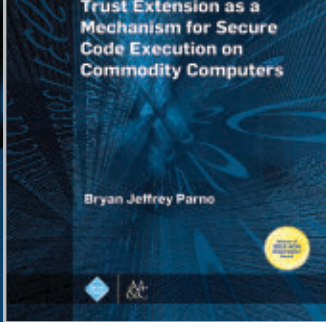
Sunset on the American Dream 2

Contributor: Eugenia Cheng, School of the Art Institute of Chicago
 → Curator/Editor: Nia Easley

In this large-scale wall drawing, artist and mathematician Eugenia Cheng applies mathematical thinking to depict different strands of being in the U.S. over the course of its history. Beginning at the bottom with five ways of being here, it branches upward through classifications that lead toward citizenship or not. The work emphasizes the many different ways of being an immigrant, and the fact that a majority of the population has immigrant roots, with the exception of those exploited by white immigrants: Native Americans and those forced into slavery.

This work was first commissioned by 6018 North for In Flux in 2018, then at the Lubeznik Center in 2019, and then at the Chicago Cultural Center in 2020.

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