Empowering Humanity through Relationships with Technology

Technology has exciting potentials for helping humanity, not just by improving productivity, but further, in service to human expression, mutual understanding, and equity. At the same time, technology has disturbing potentials for functioning as means for surveillance, division, and subjugation of human beings. As I complete a 3-year term as NSF program director, I find myself at a turning point in my career. I have become a leader in understanding what it means to achieve and combine intellectual merit and broad impact. I have also accomplished beautiful and inspiring projects.

In the next cycle, my goal is to elevate, to make transformative contributions, on the scale of humanity, toward the greater good of empowering human beings through relationships with technology. To accomplish this, I will build on what I have learned at NSF and my prior work as researcher and artist, in order to, as I have for my whole life, develop new foci in our evolving context of what becomes significant in life and work amidst the world.

Among the most critical contemporary problems facing humanity, in regard to computing, is making AI serve in human-centered roles (HCAI). My role will be to empower people by framing critical problems and the role of computing in solutions. A broad, humanity-oriented research space that I identify as worthy of immediate attention and investment at scale, involves recognizing, responding to, and rewarding the expression and well-being of embodied humans in individual and social contexts. Creativity, cooperation, participation, and discovery are vital processes. Contexts span project-based learning, the future of work, democracy in practice, equity, social media writ large, and crisis informatics. Human rights to privacy and empowerment with regard to data emerge as cross-cutting themes.

Elevating the contributions of my research will require shifting to pursue innovation and equity in larger projects. While I intend to continue to spearhead new projects as sole principal investigator (PI), I will substantially shift my role to work as facilitator. In particular, in new large scale, transdisciplinary, research projects involving human-centered AI, I will recruit top level collaborators to contribute state-of-the-art expertise regarding inclusion, ethics, and machine learning—including supervised and unsupervised learning, interpretable models, natural language processing, and misinformation—and particular domains, such as economics, labor, education, health, and design. My role will be based in human-computer interaction methods for design, data gathering and analysis, system architecture, and interaction, as well as conceptual framing and integration of expertise and fields. My role will also involve understanding large scale funding programs, how to formulate research contributions, and the development and management of relationships with funding agency personnel.

Privacy and Data Empowerment

The problems of privacy and the need to empower people with their data are fundamental societal issues that cut across application domains. Zuboff delineates a framing: “Surveillance capitalism feeds on every aspect of every human’s experience… [I]t strips away the illusion that the networked form has some kind of indigenous moral content, that being ‘connected’ is somehow intrinsically pro-social, innately inclusive, or naturally tending toward the democratization of knowledge” [41]. So much work is necessary to make collecting and computing with human subjects’ data function as democratization, rather than exploitation. To combat surveillance capitalism, I will work to understand people’s needs for sensemaking their own data, at scale. To begin to meet these needs, I will work to develop new sociotechnical infrastructures that give people knowledge and power regarding our own data.

Embodied Interactive Experiences

Human beings are fundamentally expressive creatures. Practitioners across fields—including philosophy [29, 11, 23], cognitive psychology [5, 6, 37], choreography [28, 7] and human-computer interaction [2, 12,

10, 13]—have investigated how expression is based in the body, in the senses, in corporeality. My lab's prior research in embodied interaction has addressed modalities—such as free-air [30], pen and hands [40, 39], and cross-device [3]—in design education, ideation, and gaming contexts. I will instigate new research in this field to situate emerging sensing and display devices, including AR and mobile—in contexts of work, play, education, and care—and to design new experiences integrated with services [4]. For example, I intend to leverage my own experiences as a ½-marathon runner to address personal informatics and as a single parent to address housework with kids. I will also continue to research embodying creativity and design.

Creativity and Design

My research involving creativity and design is motivated by understanding that these areas are both inherently valuable in our experiences and key to individual and societal success [31] in transformative innovation. My background enables me to bring art, creative cognition, social science, and human-computer interaction perspectives to bear. I take a mixed-methods approach to investigate creativity and design, employing qualitative [16, 24], visual [22], and quantitative data, while emphasizing field studies in meaningful situated contexts. I am a leader in the derivation and use of quantitative ideation metrics that measure facets of creativity and visual design [17, 20, 21, 15], including with AI [14], as well as in the value of visual data as a way of seeing [1] what people make and how [27, 9, 25]. My Interface Ecology Lab has developed a series of spatial information curation systems, which have been used, in field studies, on assignments by over 9000 students in 75 course offerings involving 21 professors [17, 18, 38, 19, 26, 8]. In the next phase of this research, I intend to advance the roles of AI and embodied gestures in creative / design processes for individuals and teams in education and the workplace, while building on the Interface Ecology Lab's computational infrastructure for multiscale curation. Part of this is to sustain efforts to transform people's online communication and collaboration experiences beyond the matrix of Zoom.

Diversity and Participation

Real democracy requires sharing power and control. Meanwhile, our society at large and STEM, in particular, tend to concentrate power, e.g., in whites, males, straight, cis-gender, and urban centers. Equitable participation is a key to creativity, innovation, and justice. The more inclusive voices are cultivated, heard, and respected, the more they will constitute diversity of sources of significant new ideas [32, 21], which can be expected to improve ideation. Increasingly, communication—including in education, work, meetings, creative processes, and social media—is conducted online. Fundamental research questions arise. How can new technologies recognize inclusion vs. imbalances of participation? How can new technologies promote and reward more equitable participation? My approaches will be based in spatial organization, embodied interaction, and using AI to generate social alignments and diversities in teams, organizations, and crowds.

Crisis Informatics and Social Media

As climate change and social conflicts increase globally, the significance of crisis informatics, including but not limited to disaster response, grows. Social media, including community formations and misinformation, play an outsize role. We need to discover new methods for rewarding trustworthiness and social connectedness. My team's prior work emphasized the role of community and democratizing actions in an ethnography of Twitch, a popular social media platform for streaming game play [8]. Our firefighting communication practices ethnography developed design implications for teaching responders [33]. This served as the basis for design and situated evaluation of novel games and evaluation methods for teaching team coordination [34, 36, 35]. My new research in crisis informatics will build on prior work by spotlighting community building, communication practices, teaching approaches, and evaluation, in conjunction with social media and misinformation.

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