The Algorithm and the User: How Can HCI Use Lay Understandings of Algorithmic Systems?

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Abstract
In studying the increasing role that opaque, algorithmically-driven systems, such as social media feeds, play in society and people's everyday lives, user folk theories are emerging as one powerful lens with which to examine the relationship between user and algorithmic system. Folk theories allow researchers to better see from users' own perspectives how they understand these systems and how their understanding impacts their behavior. However, this approach is still new. Methods, interpretation, and future directions are up for debate. This panel will be an active discussion of the contribution of folk theories to HCI to date, how to advance a folk theory perspective, and how this perspective can bridge academic and industry study of these systems. Our panel gathers key folk theory HCI researchers from academia and industry to share their perspectives and engage the CHI audience.

Author Keywords
folk theories; user understanding; lay theories; algorithm studies; user perception; algorithms

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H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

Introduction

In recent years, the study of the algorithmically-driven mechanisms at the heart of many social media platforms and apps (e.g., the Facebook news feed or Instagram feed) has been a major focus for the HCI and social computing communities. Early work established the importance of studying these systems' effects on individuals and society (e.g., [9]) and cataloged the potential pitfalls of algorithmically-driven systems, such as introducing bias [2], obscuring decision making [11], and complicating social processes such as self-presentation [3].

In studying these systems, some HCI researchers have turned to exploring how individual users perceive and adapt to these powerful systems. In particular, we have turned to user *folk theories* or *lay understandings* as an analytical frame, using this lens to explore topics including audience perception [1], algorithmic understanding [6], self-presentation [4], how platforms are affectively perceived [7], and user resistance to algorithmic change [5].

In all of this work, folk theories have been a useful lens for centering and exploring the user's place in systems that are often black-boxed and difficult to study [9, 11]. However, different streams of research have resulted in very different perspectives on what folk theories have been found, how we should investigate user folk theories, and how the resulting knowledge can (and should) be used. In fact, there is even disagreement as to what folk theories are, and how mechanistic and causal they can be expected to be, stemming from the concept's disparate roots in different fields. In HCI work drawing on folk theories, we have seen four definitions, sourced respectively from anthropology, cognitive science, and two recent HCI-native works on the topic, all of which agree on informal knowledge but vary regarding causality, intuitiveness, and other factors:

- "intuitive causal explanatory theories that people construct to explain, interpret, and intervene in the world around them" [8]
- "ways of understanding the natural and artificial world that arise more informally and not as direct reflections of formal instruction in scientific principles" [10 p. 826]
- "non-authoritative conceptions of the world that develop among non-professionals and circulate informally" [6 p. 2372]
- "intuitive, informal theories that individuals develop to explain the outcomes, effects, or consequences of technological systems" [5 p. 3165]

To move forward and enrich all folk theory work in HCI, there is a need to connect, contrast, and potentially integrate these different approaches, from the low level of definitions to the high level of implications for research or design. This panel aims to bring key researchers together to debate differences and establish commonalities.

Given the ubiquity of algorithmically-driven systems and the emergent popularity of this approach, it is likely that others may benefit from and be drawn to a discussion of this approach. Folk theories are, in practice, a lens that places focus directly on the user perspective. This has seen limited use in HCI thus far, concentrated on algorithmic awareness and social processes such as self-presentation. A folk theory perspective can potentially provide deep insights on

how people develop algorithmic awareness and how understanding shapes social processes across domains. Audience participation in the panel will establish possibilities for future work, from panelists and audience alike. We anticipate that dialog with a CHI audience will allow discussion of new areas to which the folk theory lens can be applied, and identify new problems it could help the CHI community address. We will give audience members a chance to engage with this perspective and set of novel tools to approach problems in their own domains. We also aim to bring fresh eyes and perspectives to discussions of the problems already approached through the folk theory lens, moving toward novel solutions.

In pursuit of these practical solutions, it is also essential to bridge the academia/industry divide, as the bulk of the extant folk theory-based work in HCI (e.g., [4, 5, 6, 7]) explicitly addresses black-boxed platform algorithms and often does so from academia, with the black box fully intact. We believe, and initial work (e.g., [1]) suggests, that the folk theory perspective is useful in both industry and academia, and recognize that academics and industry professionals bring different, and complimentary, perspectives on these systems to the table. A panel at CHI represents a unique opportunity for essential bridging work, as panelists and audience members from both academia and industry will be able to share their perspectives, make new connections, and check each other's assumptions, all in service of supporting users in understanding benefiting from these systems.

In the rest of this extended abstract, we lay out three key areas of discussion: differences in what folk theories we have found, differences in methods for identifying and eliciting folk theories, and possible future directions for integrating folk theories into future HCI scholarship and practical design. We then detail panel format and panelists.

All Kinds of Theories

Thus far, the folk theory approach has allowed us to identify several perspectives on how users conceive of algorithmically-driven systems such as social feeds. Initial work by Bernstien et al. identified folk theories as simple heuristics about what individual factors might influence the display of one's posts on a social feed (e.g., likes and comments, tie strength) [1], while later work by Eslami et al. found higher-level, more detailed folk theories that encompass both feed and the social context of the feed, such as personal engagement with other posters and past behavior differentiating users into "loud" and "quiet" posters [6]. Later work by DeVito et al. found that, in addition to these higher-level folk theories, there are abstract theories employed by users with minimal knowledge on the level of algorithm as mysterious influence and interloper [5], while work by French and Hancock posited folk theory understanding via operational metaphors through which users frame the algorithmic system [7]. Most recently, work by DeVito et al. has asserted that multiple sources of information combine into complex, multi-part folk theories which inform behavior [4], opening up the potential for different kinds of folk theory to coexist.

In all of these cases, authors have used different definitions, cutoffs, and methodological approaches to find and analyze folk theories. In each case, they have led to different overall conclusions about how users see algorithmically-driven systems, and the role that perception plays in their behavior. As this area of study

continues to advance, deliberate awareness and discussion of these differences is essential, both for current folk theory researchers and audience members who may be interested in our approaches or results.

Methodological Differences

As different as findings across folk theory studies are, there are even deeper divides when it comes to methods and data. In the existing literature, methods range from direct elicitation via interviews and walkthroughs [4, 6] to survey work [1] and indirect elicitation via analysis of public tweets [5]. There has been little public consideration of how these methods differ, and how these differences might affect our findings and perspectives on the user experience of algorithmically-driven systems.

In addition to this basic methodological divide, there are key issues to consider around the academia/industry divide straddled by the CHI community. The systems under examination in current folk theory studies are, by their nature, purposefully obscured black boxes [9, 11]. Necessarily, researchers inside and outside of the companies which own these algorithmic systems will have different access to data, and, potentially, radically different perspectives on how close folk theories get to actual knowledge of a platform. This divide is also ripe for exploration, as a gap between those with knowledge of how a platform works and those who research how a platform is perceived to work represents the potential for lost knowledge and collaboration opportunities.

Towards A Practical Agenda

Finally, while folk theory work on algorithmically-driven systems has thus far produced theoretical insights and, in some cases, bolstered support for practices such as seamful design, there is no collective roadmap for bringing the practical side of these findings to the larger CHI community. A conversation and debate between those leading the way in folk theory research, with the input of a CHI audience and its mix of scholars and practitioners, has the potential to uncover new applications for current folk theory work. Moreover, it can point the way towards a practical research agenda for the future which satisfies the need to simultaneously update theory and provide real, practical benefits to end users.

Aiming towards an agenda for future research also provides an opportunity to discuss the ethics of folk theory research, as any research that delves into user understanding has the potential to yield knowledge that can both support and manipulate end users. This is also an important area in which to again discuss the divide between academia and industry, as goals regarding folk theory work may differ, and ethical implementation of folk theory findings in order to support users in achieving their goals requires coordination between these two facets of the CHI community.

Session Goals

Ultimately, the goals of this session are threefold:

1. To showcase the utility of the emerging folk theories lens for user-centric HCI research, exposing additional researchers to this potentially valuable toolset.
2. To provide an opportunity for disparate folk theory researchers to compare and contrast their approaches and findings while engaging

valuable insights from both academic and industry members of the CHI community.

3. To bridge industry and academic concerns in order to establish a shared agenda for ethically implementing folk theory research, both in terms of future research and practical adoption of folk theory findings to support end users of algorithmically-driven systems.

Session Format

In order to achieve our goals this session will be highly interactive. We will circulate among panelists a list of the hard questions facing folk theory researchers, as compiled by the moderator and organizers. At the panel session, each panelist will have ~2 minutes to introduce themselves and their research/perspective on folk theories in order to orient the audience to their perspective. From that point, however, the panel will be fully interactive, with a moderated open discussion of the circulated questions.

The moderator will also aim to engage the audience, who can provide a valuable perspective on this emerging area. Though some of the hard questions will be specific to folk theory researchers, the bulk of the questions will relate folk theories to broader CHI research, and aim for broader engagement, especially in terms of how folk theory work can increase its practical relevance to the CHI community and actual platform implementation.

Panelists

Panelists have been selected for their expertise in folk theory and related work, and the diversity of their positions on the concept. In general, panelists have been on opposite, or at least different, sides of all the divides noted above.

Jeffrey T. Hancock (Moderator) is a Professor in the Department of Communication at Stanford University and Director of the Stanford Center for Computational Social Science. Professor Hancock works on the psychology of social media, including deception and trust, emotional dynamics, intimacy and relationships, folk theories and well-being.

Judd Antin is Director of Research at Airbnb, where he leads a multi-method team of researchers across all Airbnb's products. Prior to joining Airbnb in 2015, Judd was Research Manager at Facebook, where he led research on products such as News Feed, Groups, and Feed Ads.

Karrie Karahalios is a Professor of Computer Science at the University of Illinois Urbana-Champaign, where she directs the Social Spaces group. With her collaborators, she has authored key works on algorithmic awareness and auditing algorithms, including work on user folk theories of social feeds.

Stephanie Tong is an associate professor in the Department of Communication at Wayne State University. Her research explores how users of online dating systems perceive their algorithmically-driven matching systems, and how it affects user behavior.

Irina Shklovski is an associate professor at the IT University of Copenhagen. Her projects address online information disclosure, creepy technologies and the sense of powerlessness people experience in the face of massive personal data collection. She coordinates an

EU-funded collaborative project VIRT-EU, examining how IoT developers enact ethics in practice in order to design interventions into the IoT development process to support ethical reflection on data and privacy.

Megan French is a Ph.D. student in the Department of Communication at Stanford University. Her dissertation work explores how folk theories of algorithmic systems shape how people infer meaning from personalized recommendations. In her current research, she takes a context-specific approach, conceptualizing folk theories in relation to a person's trust in the system.

Michael A. DeVito is a Ph.D. student in the Media, Technology, and Society program at Northwestern University. His research focuses on how users form folk theories of complex algorithmic systems, and how users, in turn, use their folk theories to adapt their own behavior and larger social processes such as self-presentation to an algorithm-driven landscape.

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