Seeing the forest despite the trees:
Interactive Visualization Tools for Analysis and Storytelling with (Big) Data

by
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Abstract:

One defining aspect of our time is the rate and fidelity at which our society is generating and collecting digital information. However, to put this information to good use, we need robust computational tools to analyze and extract meaningful insights from the large data collections we continue to accumulate. Although many analysis tasks can be fulfilled by automated techniques (e.g., machine learning), there is a wide range of problems where human intuition and judgment are needed to fully appreciate the big picture behind the raw data. Interactive visualization tools are very useful to address this latter type of problems. By engaging the human visual-perceptual system to find patterns and spot outliers in the data, visualization enables people to see the unforeseen, and identify unusual structures and relationships that may be otherwise difficult to detect with computational methods alone.

My research is centered on developing visual analysis tools to enhance people's ability to see, interact with, and make sense of (big) data. In this talk, I describe novel visualization tools I developed in a number of science domains, including materials science, genomics, and population biology. Secondly, I discuss how empirical user-centered research can help inform the design of visualization systems by shedding a light on the human factors involved in visual analytics. Within this context, I describe my research on how display characteristics and form-factor affect insight acquisition in exploratory visual analysis. Thirdly, I consider the role of visualization in informal science education, and discuss my work in developing interactive museum exhibits that tell science narratives in a manner accessible to the general public. Through these examples, I outline my approach to research, which is rooted in collaboration with domain experts to solve real-world problems. I reflect on the role and value of interdisciplinary collaboration in computer science research, and attempt to elucidate, from my own experience, factors that contribute to the success of these collaborations.

Bio:

Khairi Reda is a Postdoctoral Researcher and an Argonne Scholar at Argonne National Laboratory, where he conducts research on data visualization and human-computer interaction. His research is focused on developing interactive visualization techniques for the analysis and exploration of large, scientific data collections. His work also explores the application of visualization and simulation to enhance science education, particularly in informal learning contexts. Khairi holds PhD and MS degrees in Computer Science from the University of Illinois at Chicago, and a BS in Computer Science from the University of Damascus. His research has been published at premier Visualization and Human-Computer Interaction venues (ACM CHI, EuroVis, and IEEE LDAV). His work has also been recognized with awards, including the Robert G. Sachs award at Argonne National Laboratory (2015), a Best Poster award and an Honorable Mention at IEEE LDAV (2014) and IEEE InfoVis (2015), respectively. Khairi is a member of the IEEE Visualization & Graphics Technical Committee and the ACM Special Interest Group on Human-Computer Interaction (SIGCHI).