2023 VGTC Visualization Dissertation Award

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The 2023 VGTC Visualization Dissertation Award goes to Aoyu Wu. Aoyu is a postdoctoral fellow at the Harvard University, working with Prof. Martin Wattenberg and Prof. Fernanda Viégas. He received his Ph.D. from the Hong Kong University of Science and Technology in 2022, supervised by Prof. Huamin Qu.

His dissertation addresses the growing public demand for access to and analysis of data. With visualizations emerging as a primary medium for data communication, their proliferating use has introduced challenges in readability and quality. However, unlike common data formats like tables, text, and images, visualizations aren't treated as a "data type". This brings about a noticeable deficiency in effective techniques and workflows to manage visualizations at scale. As shown below, the overarching challenge can be decomposed into a series of research problems along two dimensions.

- Empowering the public to create high-quality visualizations. Creating effective visualizations is a challenging task, as individuals usually need to engage in a time-consuming process to craft designs that clearly convey information and insights, while satisfying aesthetic goals. This first dimension investigates quality problems of web visualizations and develops automated approaches for efficiently creating high-quality visualizations.
- Scalable analysis of existing visualizations for new values. With the increasing availability of authoring tools, a massive number of visualizations has been produced and shared online. There is growing research interest in developing scalable methods for exploring large collections of online data visualizations such as Covid graphs on Twitter. The second part formalizes this field by proposing the novel idea of visualization data and contributing formalisms for operating visualization data objects.

His dissertation explores these problems through a comprehensive blend of research methods, including literature reviews, empirical studies, and machine learning, yielding a diverse range of contributions.

- Theory and Model. First, the dissertation proposes the concept of visualization data and present the first survey about AI approaches for visualizations. It further contributes a formalism for processing multiple visualizations based on mathematical operations, opening up opportunities for analyzing existing visualizations to enable new applications.
- Empirical Study. Second, the dissertation presents two large-scale empirical studies revealing the challenges lay users face in creating visualizations and motivate the design of automated approaches.
- Technique and Algorithm. Third, the dissertation proposes three machine-learning methods for evaluating the quality of data visualizations and generating high-quality visualizations by learning from human judgment and evaluation data.
- System. Finally, the dissertation details a mixed-initiative system that integrates automated recommendations into interactive authoring of multiple visualizations for exploratory data analysis.

The dissertation and contributing research papers are available on his website: https://wowjyu.github.io/.

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