Computer Science

Bias and Uncertainty in Information Visualization

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Abstract: We often turn to data to help us make sense of an uncertain world. However, the uncertainty in our data is often esoteric, complex, or counter-intuitive. It can be challenging to present this uncertainty, especially to audiences without backgrounds in statistics.

Charts, graphs, and other visualizations of data address this issue by making people into visual statisticians: we can estimate statistical properties through visual inspection. However, just as statistical measures can be subject to bias, visualizations can also introduce bias.

In this talk, I show how designers can intervene to create new visualizations that correct these biases, and improve the judgments of visual statisticians. From this perspective of designing for de-biasing, I focus on two common visualizations: error bars and thematic maps. I present visual alternatives for error bars that avoid within-the-bar bias while also promoting statistically grounded comparisons between means. I also present Surprise Maps, a technique for thematic maps that relies on Bayesian reasoning to highlight interesting regions that might otherwise be hidden in traditional maps. I conclude with a discussion of remaining challenges for visual de-biasing, and how we might use visualizations to encourage better, data-driven decision-making.

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