How do communicative goals guide which data visualizations people think are effective?

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Overview

Data visualizations are powerful communication tools. Psychophysical studies have largely focused on comprehension of data visualizations rather than how people generate informative ones.

We explored how well people can select graphs that make it easy for other people to understand key patterns in data.

Hypotheses

We considered three strategies people might use:

"On average, what is the rating of Action movies?"

Stimuli

Graphs & questions generated from 8 datasets varying in topic (e.g., hurricane speeds, marathon race times, pizza orders)

question goal

retrieve values

make comparisons

determine range

needs 1 panel to answer

needs 2+ panels to answer

needs 1 panel to answer

needs 2+ panels to answer

example dataset: movie ratings

On average, what is the rating of Action movies?

On average, what is the rating of 1990s movies within the Action genre?

On average, how much higher are ratings of Drama movies compared to Comedy movies?

How much higher are ratings of movies from the decade with the highest ratings compared to the decade with the lowest rating?

Methods

Graph selection task

n=398

Do people believe different graphs are better for answering different questions?

Graph comprehension task

n=542

Which graphs are better at helping people answer those questions?

"On average, what is the rating of Action Movies?"

Select the best graph to answer:

"On average, what is the rating of Action Movies?"

Leveraged graded variation in graph comprehension to inform audience-sensitive model of graph selection behavior

Model comparison

Jensen-Shannon divergence to behavioral results

Minimally informative and audience-sensitive strategies were not differentiable

Ongoing work

Exploring sensitivity to different levels of informativity

Evaluating intuitions about different graph types of the same data

Measuring intuitions about effective graph design across education