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

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Overview

Data visualizations are powerful communication tools.

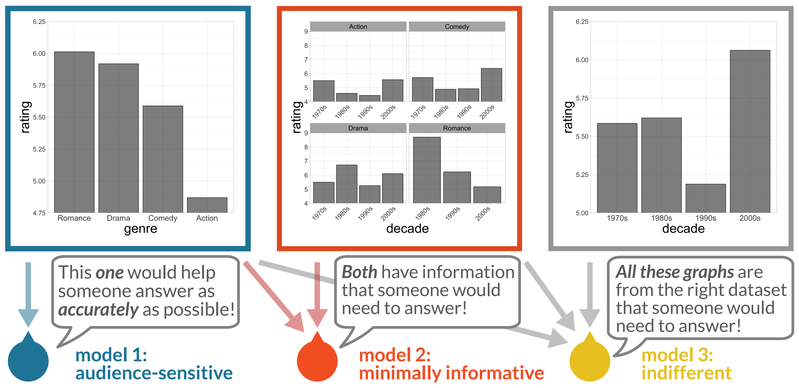
Psychophysical studies have largely focused on comprehension of data visualizations rather than how people *generate* informative ones.

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

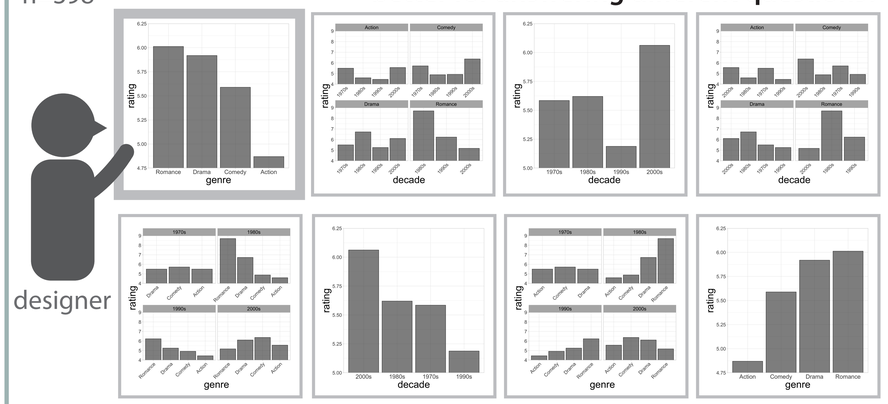
Graphs & questions generated from 8 datasets varying in topic (e.g., hurricane speeds, marathon race times, pizza orders)

question goal	example dataset: movie ratings
retrieve values needs 1 panel to answer	On average, what is the rating of Action movies?
retrieve values needs 2+ panels to answer	On average, what is the rating of 1990s movies within the Action genre?
make comparisons needs 1 panel to answer	On average, how much higher are ratings of Drama movies compared to Comedy movies?
determine range needs 1 panel to answer	How much higher are ratings of movies from the decade with the highest ratings compared to the decade with the lowest rating?

Methods

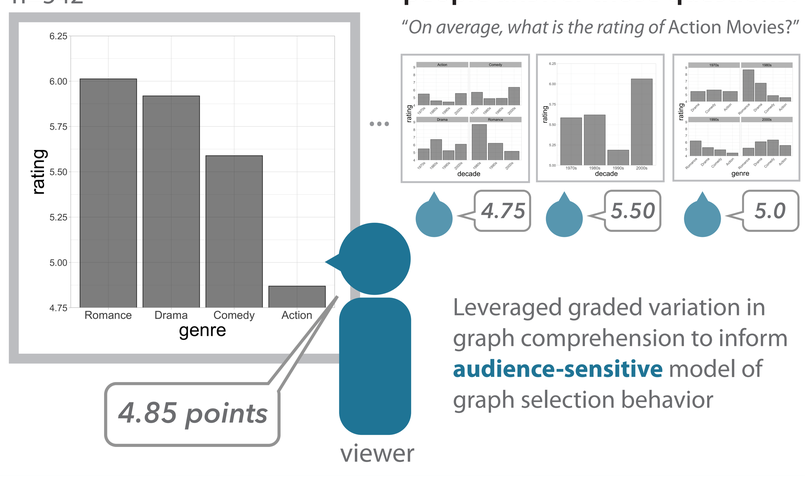
Graph selection task
n=398

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



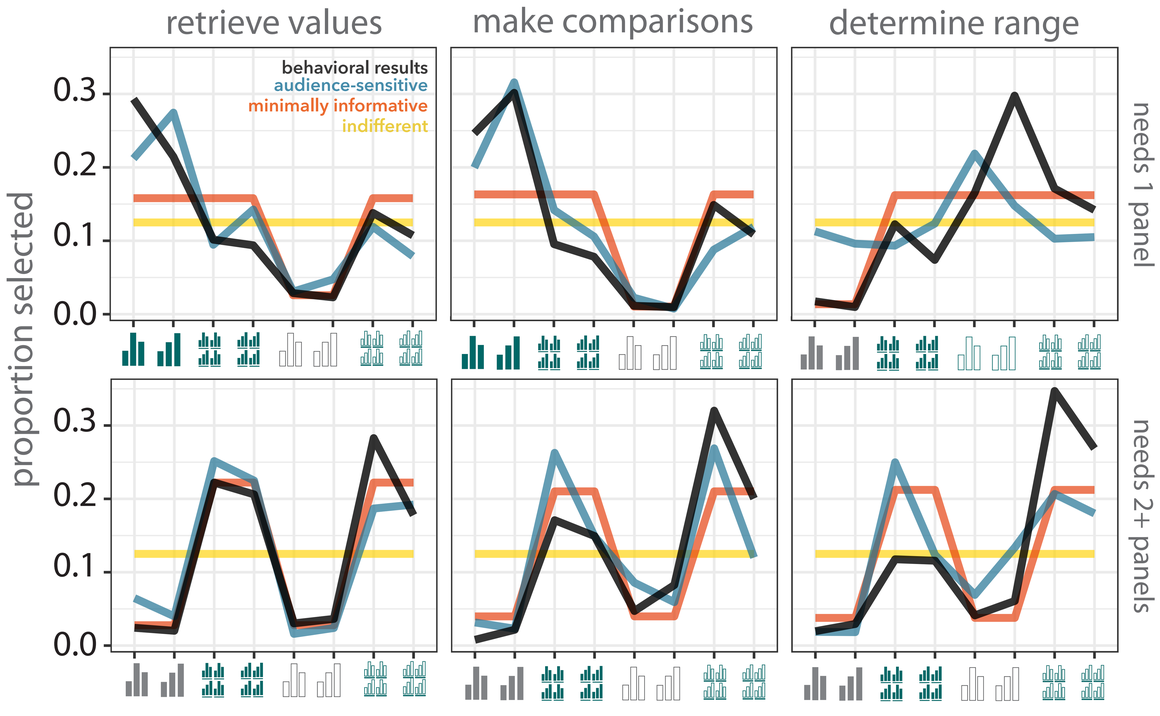
Graph comprehension task
n=542

Which graphs are better at helping people answer those questions?



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

Results: Evaluating sensitivity to different data visualization features



People selected graphs with the ***minimal information*** needed to answer prompts, but were not necessarily sensitive to graded variation in graph comprehension

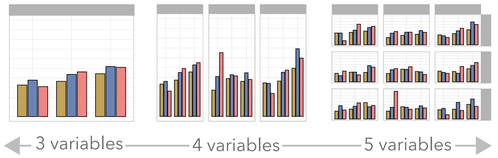
Model comparison

jensen-shannon divergence to behavioral results	indifferent	minimally informative	audience-sensitive
	0.51	0.12	0.15

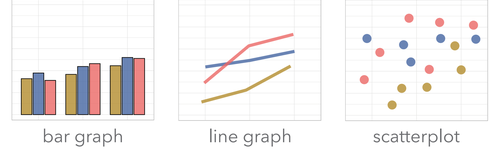
Minimally informative and **audience-sensitive** strategies were not differentiable

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