

How Prediction Visualization Improves Bar Charts Interpretation and Data Recall?

MINH LE KRISTINA STRIEGNITZ (ADVISOR)

COMPUTER SCIENCE DEPARTMENT, UNION COLLEGE



INTRODUCTION

- Interaction between visualizations (graphs) and internal representations (prior knowledge, background, beliefs) can improve learning outcomes of charts [1, 3, 4].
- Visual elicitation tasks are found to be effective in connecting people's internal and the external representations of data [2].
- A common concern in visualization is the use of misleading graphs to bias readers' opinion of controversial issues. Whether knowledge elicitation can help people overcome these misleading effects is not yet studied.

QUESTIONS

- 1 Does prompting users to interact with their internal knowledge improve the recall of data values in bar charts?
- 2 Does the effectiveness of elicitation tasks hold for misleading charts?

ELICITATION TECHNIQUES

- **Prediction:** before viewing the correct data, prompt the users to make a prediction (by dragging up/down the bar to set the height).
- **Self-Explanation:** after observing the charts, ask users to self-explain the gap between their expectations and the actual data.

HYPOTHESIS

H1: Participants in elicitation conditions outperform the baseline in normal charts.

H2: Participants in Predict-Explain condition will recall data better than both Predict-only and Explain-only conditions.

H3: The effects of prediction and self-explanation are larger for participants of low familiarity with the dataset.

H4: The effectiveness of elicitation tasks holds true for misleading charts.

EXPERIMENT DESIGN

1. 6 Study Conditions:

- *Normal:* None, Predict-Only, Explain-Only, Predict-Explain
- *Misleading:* None, Predict-Explain

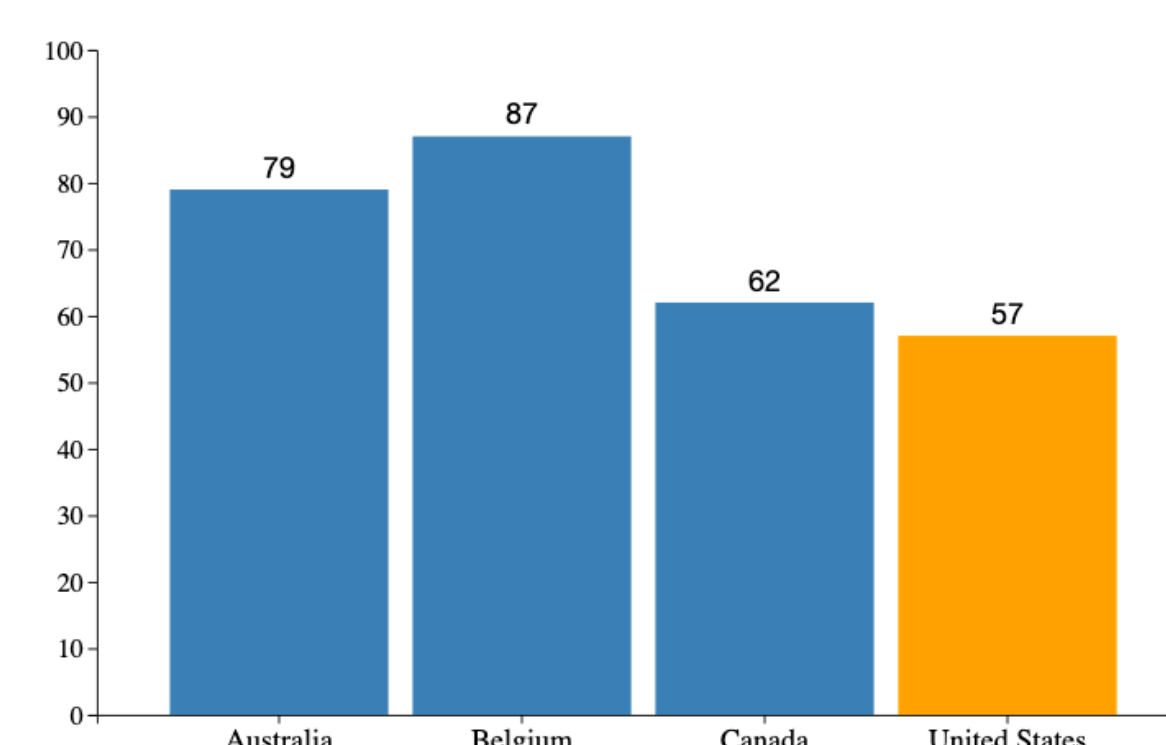


FIGURE 1: Normal Chart

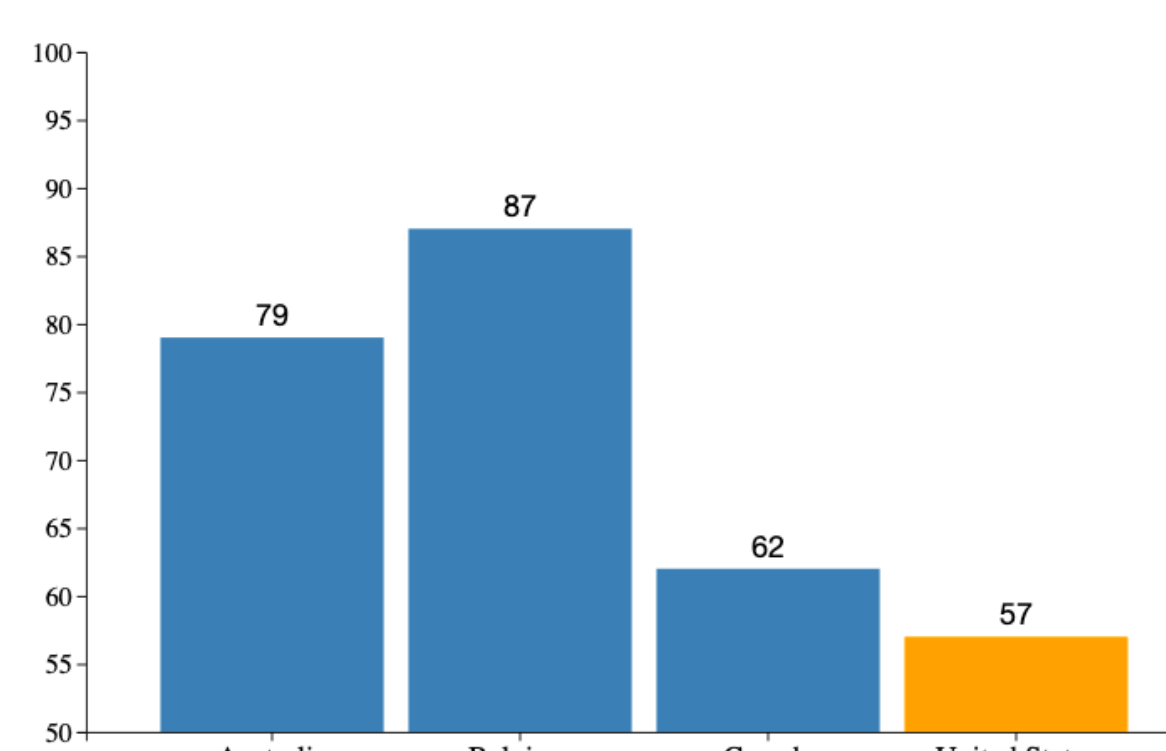


FIGURE 2: Misleading Chart

2. Procedure:

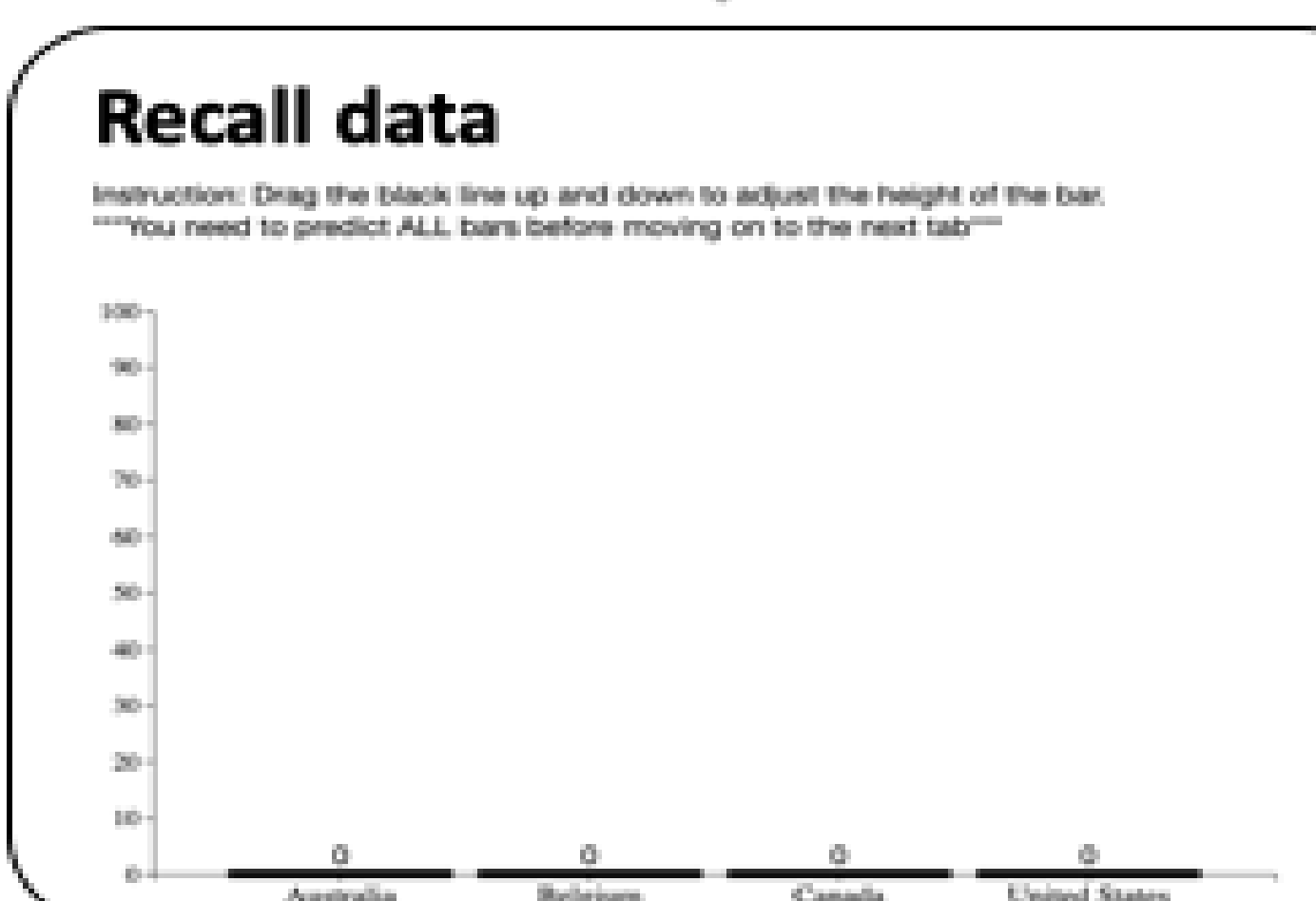
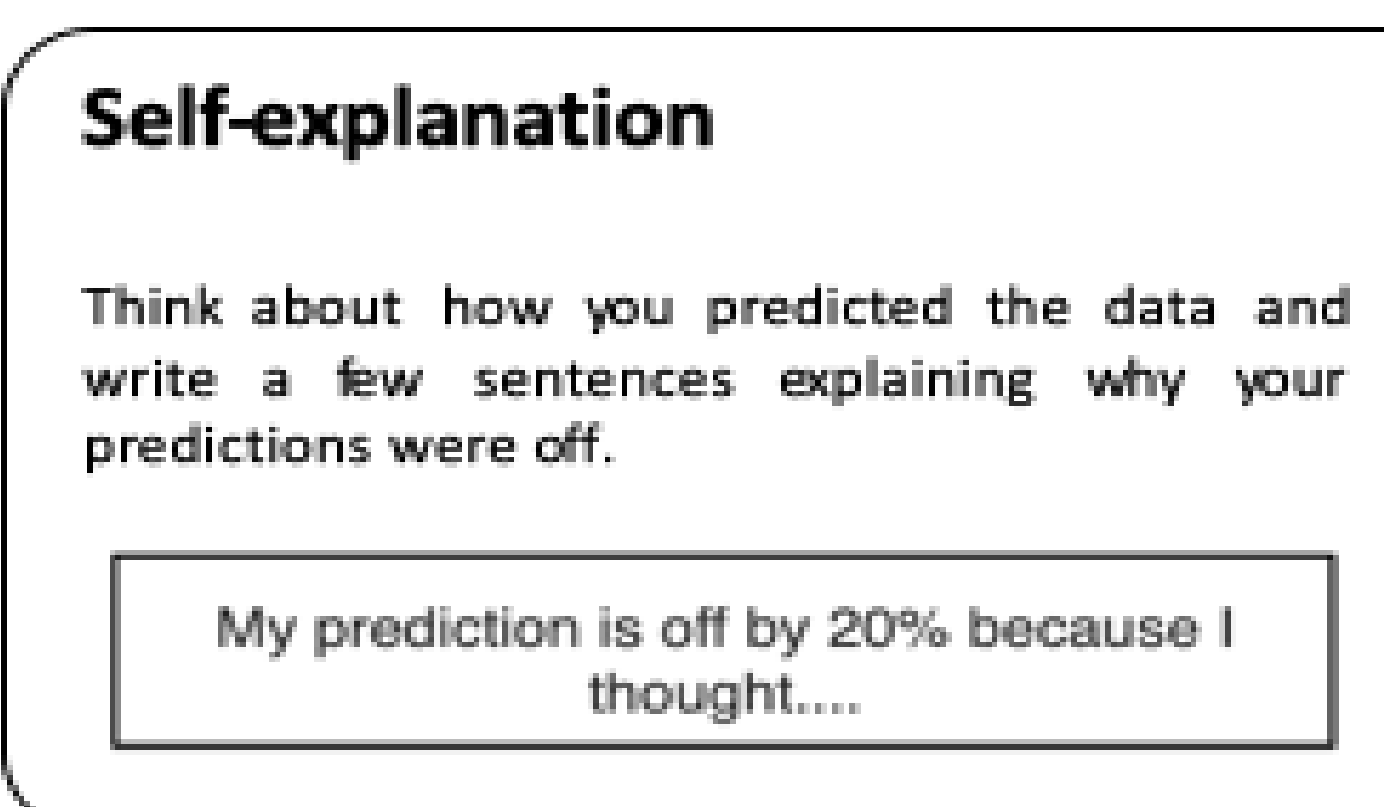
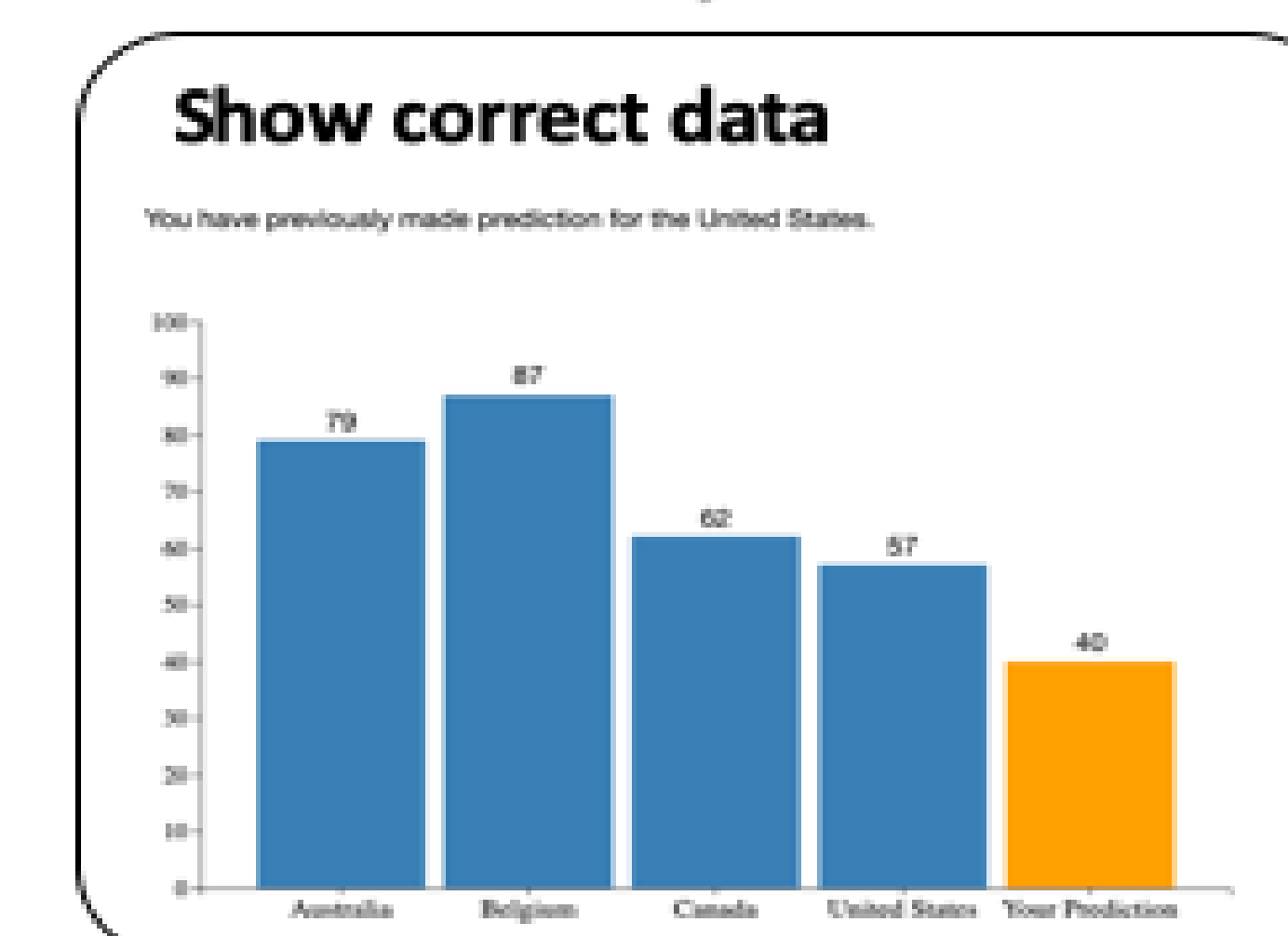
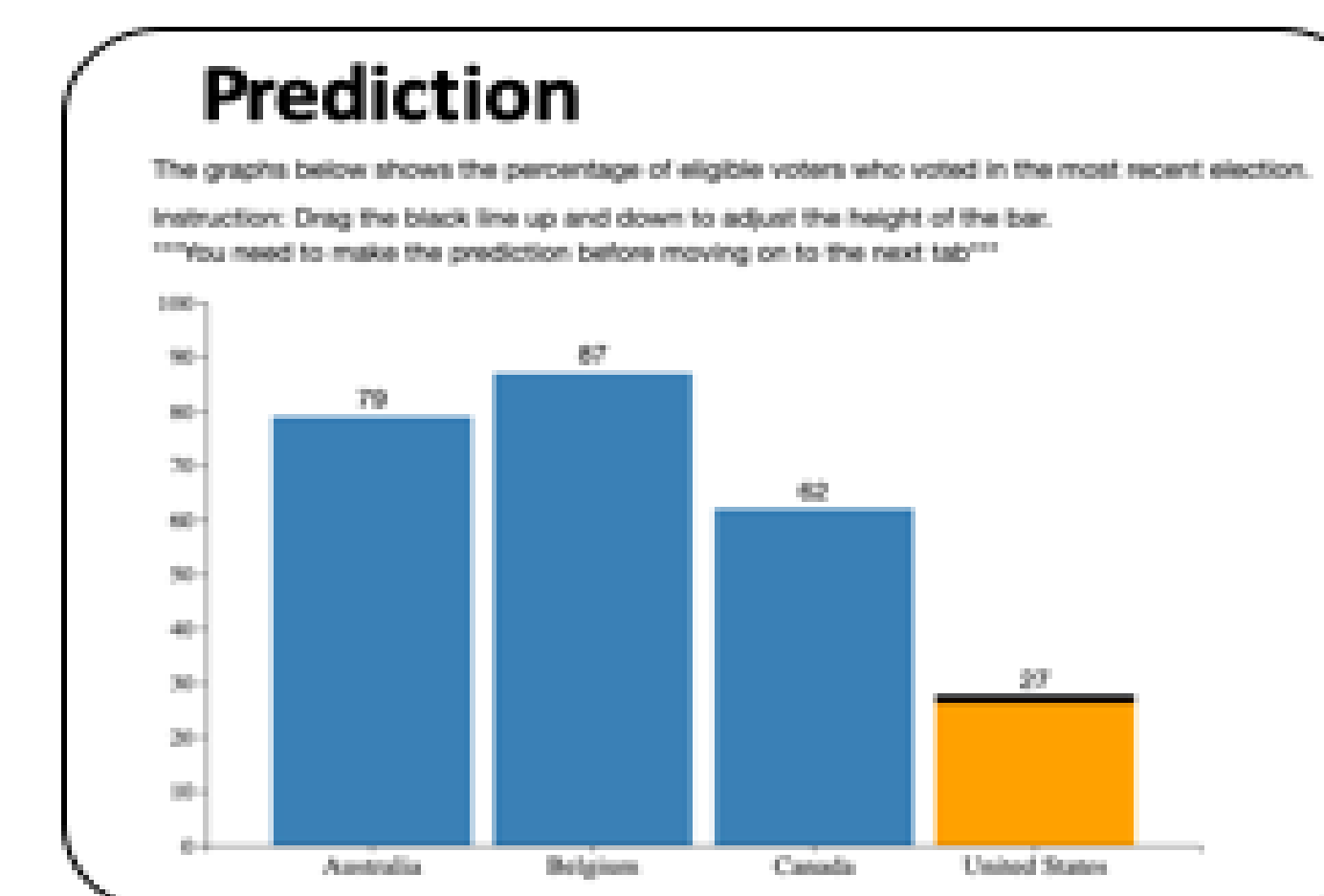


FIGURE 3: Steps of the online experiment

ANALYSIS

- Use R to conduct statistical analysis. The t-scores produced by R will be used to calculate the p-value and confidence intervals of the results.
- Compare the accuracy rate of participants in the elicitation conditions to those from the baseline:
 - Absolute errors: absolute difference between users' recall and actual data.
 - Trend errors: whether users recall the relative height of the charts correctly.

EXPECTED RESULTS

- Elicitation tasks help improve data recall, especially for people with low familiarity.
- Elicitation tasks are effective for misleading charts.
- People with higher spatial ability report lower recall errors.

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