This paper describes objective technical results and analysis. Any subjective views or opinions that might be expressed in the paper do not necessarily represent the views of the U.S. Department of Energy or the United States Government.

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Impact of small multiples' dataset size on task performance

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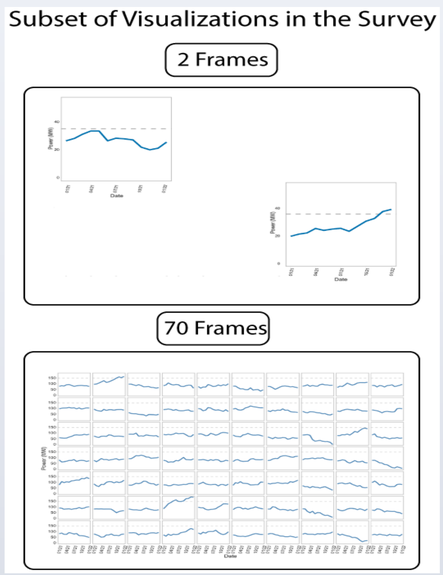
INTRODUCTION

- Small multiples present different views of one dataset using multiple small frames with the same scale and axes on a grid layout [1].
- There are no clear guidelines about the optimal number of small multiple frames to display in a single graph. The challenges of displaying large datasets using small multiples are likely exacerbated when the user has time constraints.
- The current study evaluates how 1) the number of frames, 2) the size of the frames, and 3) the presence of time constraints impact performance when participants are given a range of visualization tasks with small multiples.



METHOD

Participants: 360 collected via Prolific [2].
Design: Mixed-design.

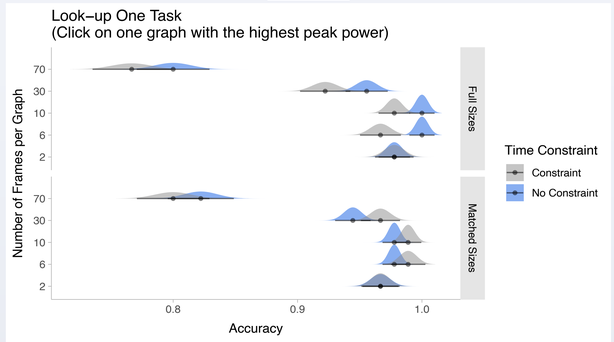
- Between conditions: 2 (Time: time constraint versus no time constraint) x 2 (Scale: differing frame sizes versus matched frame sizes)
- Within conditions: 7 (7 visualizations tasks [3]) x 5 (frame numbers: 2, 6, 10, 30, 70).

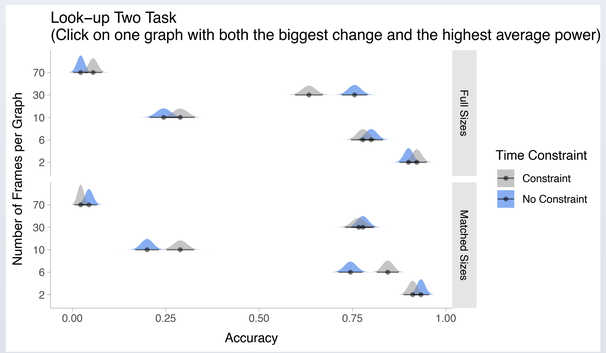
METHOD CONTINUE

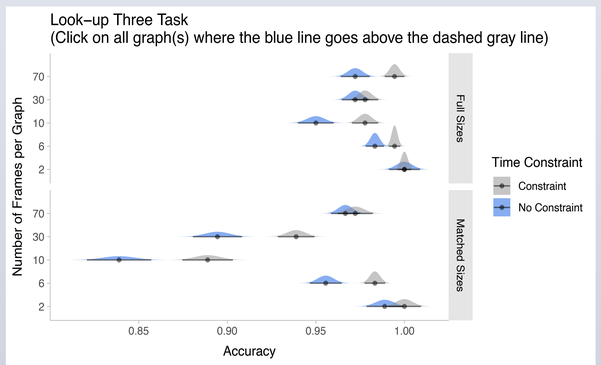
Procedure:

1. Participants answered seven questions, repeated five times for the five small multiple frame numbers, for a total of 35 trials.
2. For the no-time-constrained groups, we measured how long they took to answer each question. For the time-constrained groups, they had 40 seconds to answer each question.

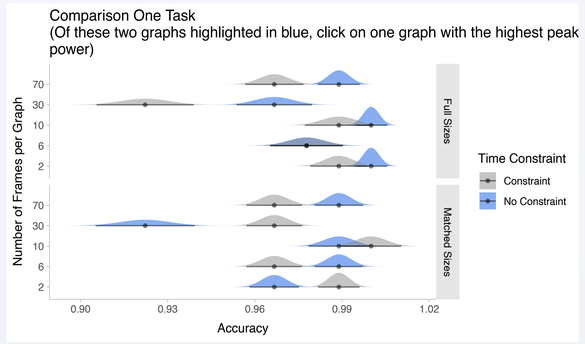
RESULTS

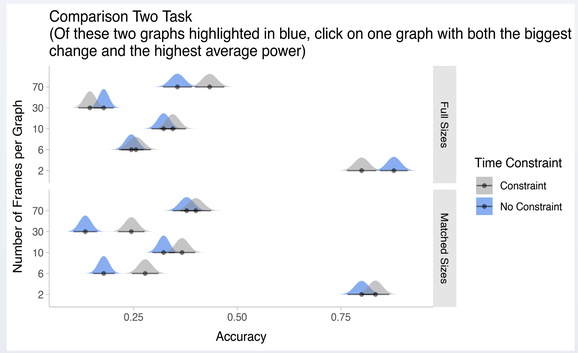


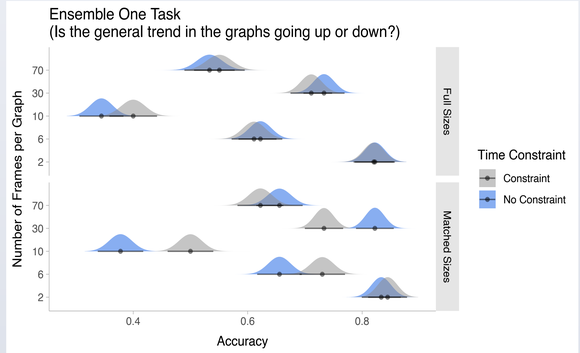


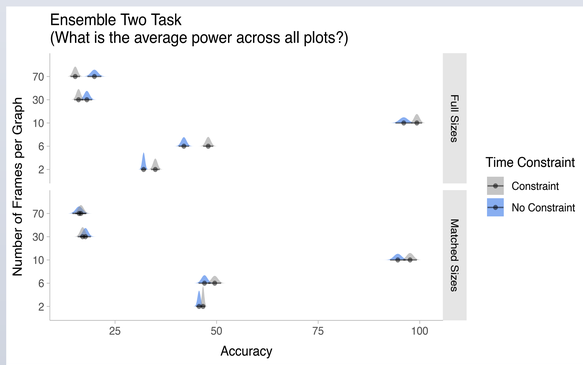


RESULTS CONTINUE









DISCUSSION and CONCLUSIONS

- **Look-up 1:** General increase in frame number lead to decrease in accuracy. Significant effect of time constraint.
- **Look-up 2:** General increase in frame number lead to decrease in accuracy. Significant effect of scale.
- **Look-up 3:** General in frame number lead to decrease in accuracy. Significant effect of time constraint and scale.
- **Comparison 1:** General increase in frame number lead to decrease in accuracy.
- **Comparison 2:** General increase in frame number lead to decrease in accuracy. Significant effect of time constraint.
- **Ensemble 1:** General increase in frame number lead to decrease in accuracy. Significant effect of scale.
- **Ensemble 2:** General increase in frame number lead to decrease in accuracy. Significant effect of time constraint and scale.

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[2] *Prolific*. (2014), Prolific, Ltd. [Online]. Available: https://www. prolific.co.
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