



# What Makes a Visualization Complex?

Exploring Design Features Related to Visual Complexity

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**Overly complex visualizations** overwhelm their audiences. However, the extent to which design choices impact people's perceptions of visual complexity (the "amount of detail or intricacy" in an image<sup>2</sup>) has not been systematically examined. We ask:

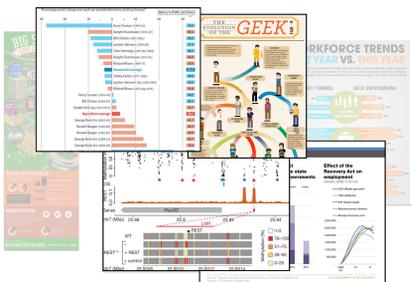
## What design features contribute to perceptions of visual complexity?

### 1 RELABEL THE MASSVIS DATASET

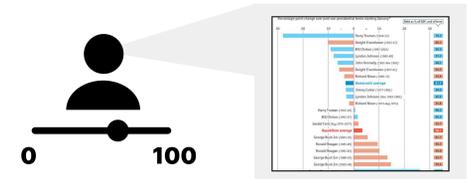
**MASSVIS Dataset<sup>1</sup>**  
(5800+ Visualizations)

**Design Features**  
(Text, Color, Data, Design)

**Visual Complexity Ratings**  
(1-100 Slider Response)

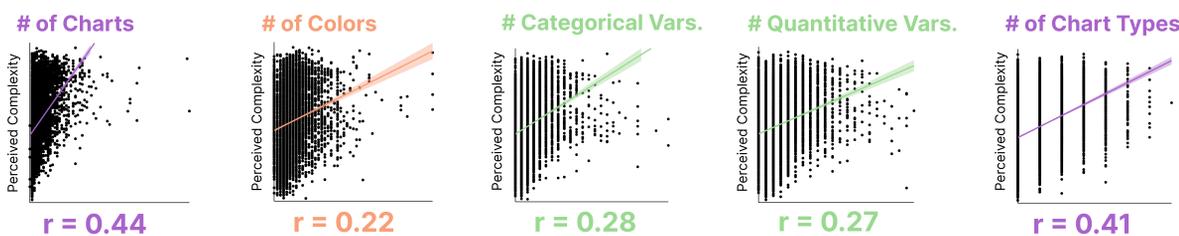


TEXT	Design
<ul style="list-style-type: none"> <li>Titles</li> <li>Captions</li> <li>Annotations</li> <li>Axes Labels</li> <li>Axes Text</li> </ul>	<ul style="list-style-type: none"> <li>Legend Titles</li> <li>Legend Text</li> <li>Text Only</li> <li>No Text</li> </ul>
Data	Color
<ul style="list-style-type: none"> <li># of Quantitative Variables</li> <li># of Qualitative Variables</li> </ul>	<ul style="list-style-type: none"> <li># of Colors</li> <li>Background Color</li> <li>Black &amp; White</li> </ul>

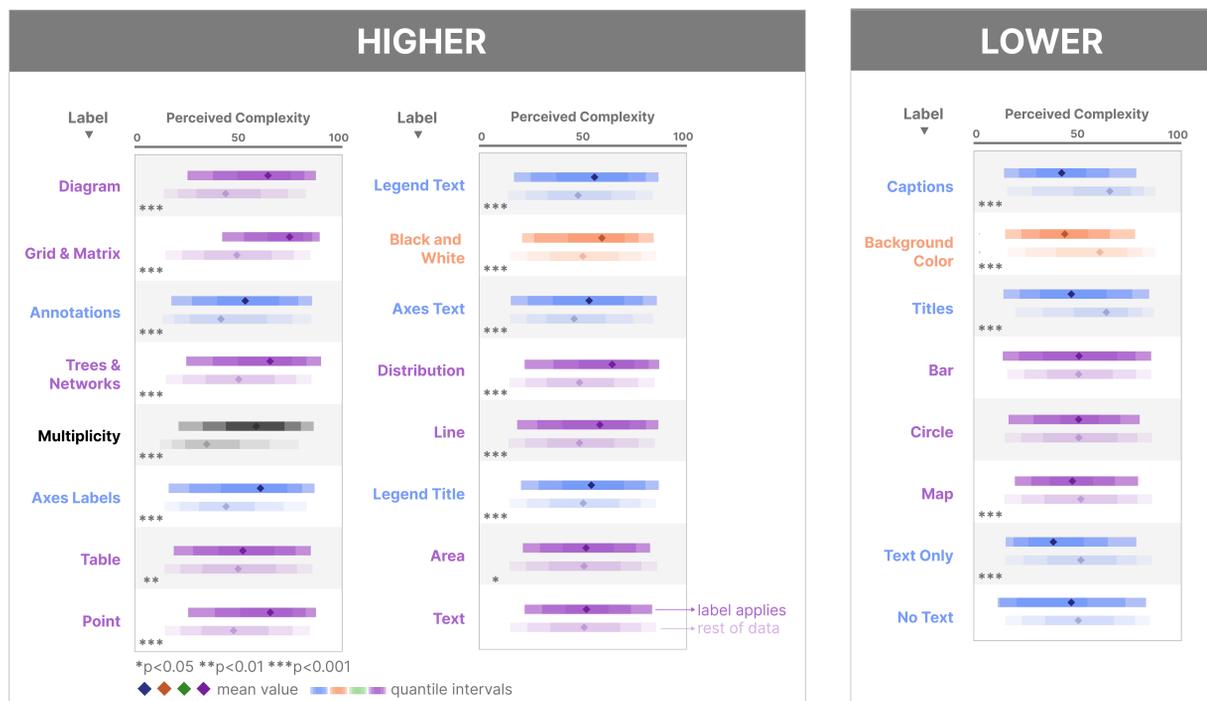


### 2 ASSOCIATIONS WITH COMPLEXITY

For all continuous labels, higher values correlate with higher complexity:



Mean perceived complexity was higher/lower when certain labels applied to a visualization:



Features ranked by importance, generated by Random Forest model

### 3 FINDINGS

The **more visual elements** a visualization contains, the greater its perceived complexity. Other findings are a **mix** of intuitive/less intuitive. For example:

- **Intuitive:** Visualizations with **annotations** are rated as more complex.
- **Less intuitive:** **Black and white** visualizations are rated as more complex on average, but the **number of colors** is positively correlated with complexity.

### References

[1] M. A. Borkin, A. A. Vo, Z. Bylinskii, P. Isola, S. Sunkavalli, A. Oliva, and H. Pfister. What makes a visualization memorable? IEEE transactions on visualization and computer graphics, 19(12):2306–2315, 2013. 1 [2] J. G. Snodgrass and M. Vanderwart. A standardized set of 260 pictures: norms for name agreement, image agreement, familiarity, and visual complexity. Journal of experimental psychology: Human learning and memory, 6(2):174, 1980. 1



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