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[2]) has not been systematically examined. We ask:

What design features contribute to perceptions of visual complexity?

1 RELABEL THE MASSVIS DATASET

MASSVIS Dataset[1] (5800+ Visualizations) → **Design Features** (Text, Color, Data, Design) → **Visual Complexity Ratings** (1-100 Slider Response)

TEXT

Titles, Captions, Annotations, Axes Labels, Axes Text, Legend Titles, Legend Text, Text Only, No Text

Design

# of Charts, # of Chart Types, Bar, Circle, Diagram, Area, Map, Distribution, Line, Text, Trees & Networks, Table, Point, Grid & Matrix

Data

# of Quantitative Variables, # of Qualitative Variables

Color

# of Colors, Background Color, Black & White

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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