We know rainbow color maps are bad, but experts insist on using them. Why?

Our community argues that rainbow color maps are ineffective, in part, because they implicitly discretize encoded data into hue-based bands\textsuperscript{1,2,3}.

No existing research shows:
- what this discretization looks like
- whether it is consistent across individuals
- what this means for different spectral schemes

Reasons Rainbow Color Maps Are Harmful
1. Hue is not perceptually ordered
2. Have regions that hide data variation
3. Have false boundaries that highlight non-existent data relationships

Our prior work\textsuperscript{4} showed that discrete encodings of continuous data are not necessarily problematic and sometimes even beneficial.

Exploratory Study
Where do people perceive color category boundaries?

Stimuli varied color map and data type.

Can variation in lightness and chroma predict perceived color category boundaries?

Participant’s color category boundary placements aggregated by color map and dataset. Opaque regions highlight stronger response trends across participants.

Results
We found trends in the boundary placement locations across individuals for each of the rainbow color maps, but not gray-scale.

High curvature appears to predict a subset of these trends, though it is not clear whether luminance or chroma is driving the effect.

The remaining trends, however, shift dramatically depending on the data being visualized.

Conclusions
Our results suggest that rainbow color maps do implicitly discretize data and do so in a consistent way across individuals. That said, this implicit discretization is highly dependent on some aspect of the encoded data.

This provides us a new, alternative hypothesis for what really makes rainbow color maps so harmful.

References
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