Improving Scientific Data Visualization

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Motivation

Scientists’ feedback

Visualization examples + Intent Description → Taxonomy of Design Problems → Problem matches/mismatches → Solution matches/mismatches

The iterative process for diagnosis and refinement of design problems in existing visualizations of terrestrial biosphere model analysis and inter-comparison.

Examples of design problems

Rainbow color maps cause inaccuracy, scale inconsistency causes misinterpretation and juxtaposing too many maps may cause inefficient comparison.

Suboptimal choice of colors cause clutter, inappropriate choice of visual variables cause inefficient visual search

Original Visualizations

Compare spread of multiple output variables (productivity, respiration, and net ecosystem productivity) for different eco-regions for prognostic and diagnostic models.

Improved Visualizations

Converting the scatter plot into a box plot enables user to clearly compare the spread and addition of grid lines focuses our attention along the columns, which are the eco-regions.

Multi-dimensional projection of pairwise model correlation; relative distances show similarity.

Improved layout of the maps conveys the degree of similarity, with similar model outputs are plotted closer to each other.

The taxonomy helped us apply visualization best practices for improving existing designs

Visualization Best Practices

Do!

Encoding

Color Map → Comparison Strategy

Error → Distortion → Clutter

Level of Detail

Applicability of Taxonomy: The Big Picture

Systematization of design problems can enable terrestrial biosphere modelers to avoid certain design consequences for specific visualization usage scenarios.

For Additional Information