Sketching a palette of visualization theories
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The growing diversity of visualization applications and stake-holders (e.g. journalism, politics, sciences, humanities, industry) is a challenge for developing vis theories. Because visualizations must ultimately connect with and have meaning for their intended audience, notions of vis evaluation and guidelines may end up being as splintered as the applications are diverse. On the other hand, a single unifying theory has an enduring appeal.

We propose a simple palette to relate vis theories. The first axis is how overtly mathematical is it. Tufte and Cairo extol and expand upon the ideals of Excellence and Truth in their very popular books, but tend to avoid math. More mathematical approaches include information theory (Chen et al.), statistical inference (Wickham et al.), distance metrics (Demiralp et al.), and algebra (Kindlmann and Scheidegger). On the mathematical end of this axis, we also separate between quantitative (e.g. information theory) versus non-quantitative (notably Hibbard's Lattice Model).

Additional degrees of freedom are needed for such a palette, but are harder to describe without controversy. Actionability matters: how well does the framework empower the user to critique and improve a given visualization?  Algebraic visualization design (Kindlmann and Scheidegger) helps describe what can go wrong in a vis (failures of representation invariance, vs disambiguity, vs correspondence), offering steps for improvement. It is less clear how information theoretical approaches can do this. Actionability may hinge on questions like "for what domains?" or "with what amount of training?", which will be interesting to discuss.

Another consideration is how transmission: how does a new user learn and understand the framework? Tufte and Cairo cultivate many followers with a mix of evangelism and apprenticeship. Munzner's Nested Model, however, may be applied right after reading the paper. Even further, Tableau embodies fully automated guidelines. The distinction here may hinge on whether the theory serves visualization as a commodity, versus as part of open-ended critical thought, which may intersect with more delicate considerations of how visualization research is funded.