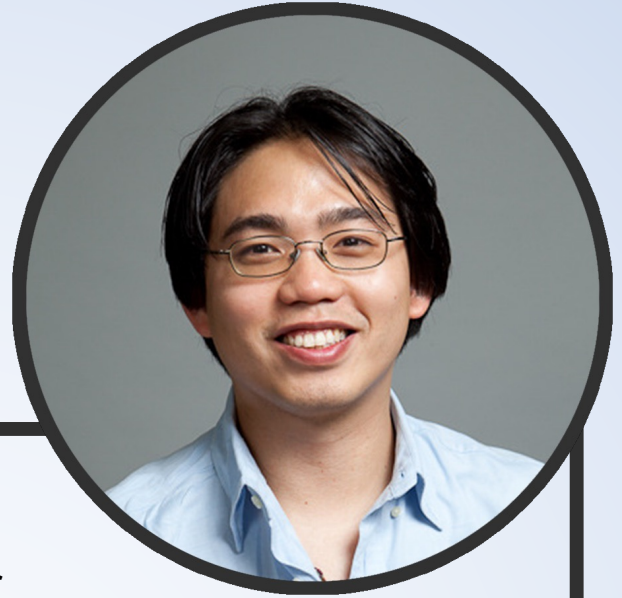




McPherson
Eye Research Institute
UNIVERSITY OF WISCONSIN-MADISON

MERI Visiting Scholar Lecture



Date: Monday, October 6th, 2025

Time: 4:00pm - 5:00pm

Location: CDIS Seminar Room (7th floor
Morgridge Hall)

A Visualization Is Worth a Thousand Queries: Towards a Foundation for Reasoning in Visual Analytics

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Abstract: As visual analytics continues to mature, so too must our understanding of its conceptual foundations. In this talk, I propose a framing of visualization in terms of functions, spaces, and grammar, offering a perspective aimed at formalizing how visualizations mediate between data, analytic tasks, and reasoning. We begin with the notion of visualization as a function: a mapping from data and interaction parameters to visual representations. This functional view positions visualizations as surrogates for query execution. More broadly, it invites us to consider query spaces: the range of potential questions a visualization can support, suggest, or help refine. At the heart of this framing is the concept of design-specific transformations, where visual encodings embed analytic computation directly into their form. These often-invisible transformations shape the interpretive work a visualization performs and influence the kinds of questions it can help answer. Making them explicit allows us to more precisely describe a visualization's analytic affordances. Building on this, we introduce a hypothesis grammar, a conceptual framework that captures the structure of analytic questions. This grammar makes it possible to represent ambiguous or underspecified queries as modifiable query spaces. By aligning user tasks with data transformations and visual encodings, it helps enumerate the space of testable questions a visual analytics system can meaningfully support. Together, these ideas suggest a path toward a more formal theory of visual analytics. By conceptualizing visualizations as functions, spaces, and grammars, we can bring data, task, and visual design into a unified framework—one that offers a more rigorous and operational foundation for the visual analytics community.

