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Categories Without Explicit Coherence

Category theory provides a unifying framework for studying a large variety of mathematical structures, by viewing them through the lens of objects and the morphisms between them. However there are naturally arising categories that contain even more data: higher order morphisms-between-morphisms. These are the focus of higher category theory. There are two standard ways of modeling higher categories. In the algebraic approach, compositions of morphisms are subject to "coherence conditions", which grow quickly in complexity, making working with these categories difficult in dimensions higher than 2 or 3. The geometric approach avoids explicit coherence conditions by viewing higher dimensional morphisms as higher dimensional topological spaces, and encodes the coherence conditions in the contractibility of these spaces. Unfortunately, reasoning about morphisms as high dimensional spaces can be quite delicate, and intuition quickly falls away.

In this talk we present a model for higher categories that avoids both explicit coherence conditions and dimensional growth of its morphisms, by relaxing the axioms of higher categories involving consistent choices of morphisms, to ones that only require the *existence* of morphisms. We will show how ordinary models of higher categories and their tools arise in this new setting and how certain constructions in category theory can be generalized to this model.