Hidden smoothness for moduli spaces

Abstract:

A moduli space is a natural additional topological or geometric structure on a set of geometric objects. As examples, we can consider r-dimensional subspaces in a fixed finite dimensional vector space (Grassmannian manifold, or variety) or the complex holomorphic line bundles on a projective complex manifold (Picard group, which can be viewed as a complex commutative compact Lie group or as a complex abelian variety).

This kind of construction is very natural in algebraic geometry; however, the resulting moduli spaces are often singular (i.e., not manifolds). We discuss how, by choosing appropriate additional structures, we can view some of these spaces as being smooth. Examples of extra structures will include algebraic stacks, obstruction theories, and some flavours of derived algebraic geometry. We will also outline a few motivating applications of these constructions.

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