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Coarse Moduli Spaces of Stacks over Manifolds

Consider a Lie group acting properly on a manifold. In the literature, the orbit space of the action has been equipped with various definitions of "smooth structure" for the purpose of extending differential geometry/topology to this space. Examples include differential structures and diffeologies. However, these structures often forget certain invariants induced by the group action. Stacks, on the other hand, encode many of these invariants into the so-called quotient stack.

In this talk, I will show how any stack over manifolds has an underlying coarse moduli space equipped with a diffeology which, in the case of a geometric stack, corresponds to the orbit space of a representative Lie groupoid equipped with the quotient diffeology. Moreover, there is a fully faithful functor from diffeological spaces into stacks. This gives us a unifying category in which we can directly compare, in the case of a Lie group action for instance, information encoded by the diffeology versus information encoded by the quotient stack. Time permitting, I will give an example of one such invariant.

This is joint work with Seth Wolbert.