ALGEBRA SEMINAR

Linear groupoid structures and representations up to homotopy

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ABSTRACT: The notion of representation for a Lie groupoid has the annoying problem that it isn't generally possible to define a good adjoint representation. To fix this problem, Arias Abad and Crainic introduced the notion of "representation up to homotopy". In this talk, I will show how 2-term representations up to homotopy are related to linear groupoid structures, which play the role of semidirect products. There is a one-to-one correspondence at the level of isomorphism classes, but at the level of objects, the correspondence is non-canonical, so it is possible for certain constructions to be "natural" in one perspective but not the other.

A key example that illustrates the value of linear groupoids is the adjoint representation. To define the adjoint representation up to homotopy of a Lie groupoid G, one needs to choose a distribution transverse to the source fibers. On the other hand, the linear groupoid that corresponds to the adjoint representation is canonical; it is simply the tangent bundle TG. This talk is based on joint work with Alfonso Gracia-Saz (arXiv:1007.3658)

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DEPARTMENT OF MATHEMATICS