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From algebraic actions to C^* -algebras and back again

Each algebraic action of a semigroup gives rise to a concrete C^* -algebra generated by the left regular C^* -algebra of the group being acted on together with the Koopman representation for the semigroup action. I will explain how to find groupoid models for the C^* -algebras arising from non-automorphic algebraic actions which leads to results on simplicity and pure infiniteness. Surprisingly, the concrete C^* -algebras in question may be exotic groupoid C^* -algebras. The groupoids from this construction turn out to exhibit a rather surprising form of rigidity: For special classes of actions, we can recover (much of) the initial action from our groupoid, or, equivalently, from the C^* -algebra together with its canonical Cartan subalgebra. I will also briefly explain this rigidity phenomenon. This is joint work with Xin Li.