# Proper actions of groupoids on $C^*$-algebras.
# (Thesis Defense)

# Jonathan Henry Brown

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### Abstract

This thesis contains some results concerning groupoid dynamical systems and crossed products. We introduce the notion of a proper groupoid dynamical system and of its generalized fixed point algebra. We show that our notion of proper groupoid dynamical system extends both the notion of proper actions of groups on topological spaces and the notion of the proper group dynamical systems introduced by Rieffel in 1990. The main result states that the generalized fixed point algebra for a proper groupoid dynamical system is Morita equivalent to a subalgebra of the reduced crossed product. In order to do this, we develop the theory of induced representations of groupoid crossed products. As a separate result, we define a notion of a Brauer Semigroup for a groupoid, and show that if $G$ and $H$ are two equivalent groupoids then their Brauer Semigroups are isomorphic. The Brauer Semigroup of $G$ is an interesting object to study since it encodes information about the Morita equivalence classes of groupoid crossed products by $G$. It is our hope that our result on isomorphism classes of Brauer Semigroups can lead to some interesting results about proper groupoid dynamical systems.