Research Interests

James Parkinson

Broadly speaking my interests are in Lie Theory, with a particular (and perhaps perverse) interest in the theory of *buildings*. In fact buildings are the unifying feature of essentially all of my research.

Some specific aspects of my research include:

1. *Probability theory on affine buildings and related groups.* Here we use the buildings to study the groups that act on them. For example, in joint work with Bruno Schapira we use harmonic analysis on the affine building, and the representation theory of an associated affine Hecke algebra, to prove very precise limit theorems for 'radially symmetric' random walks on p-adic Lie groups. In joint work with Wolfgang Woess we develop a p-adic analogue of Kaimanovich's "regular sequences", and use this, along with the CAT(0) geometry of the affine building, to analyse more general classes of random walks on affine buildings and related groups.

   Th realm of probability theory on infinite non-affine buildings and the related Kac-Moody groups is currently relatively uncharted territory.

2. *Buildings in combinatorial representation theory.* A key result bringing buildings into combinatorial representation theory is Gaussent and Littelmann's description of the Littelmann paths from the representation theory of semisimple Lie algebras as images of certain paths in the affine building under a retraction from infinity. More generally affine buildings have played an important role in understanding and clarifying the geometric Satake correspondence of Mirkovic and Vilonen. My current interests in this area include developing a combinatorial model for the representation theory of semisimple Lie algebras via retractions of convex hulls in the affine building.

3. *Automorphisms of (twin) buildings.* Recently I have been interested in the fundamental question of how automorphisms of twin buildings interact with the "opposition relation" of the twin building. In joint work with Hendrik Van Maldeghem this has led to the classification of automorphisms of generalised polygons which map no flag to an opposite flag (so called *domestic automorphisms*).