School of Mathematics and Statistics

Faculty of Science, Technology, Engineering and Mathematics

2018 PhD Projects

Project title	Extremal metric and symmetry properties of graphs and their embeddings
Principal supervisor	Jozef Širáň
Second supervisor	Robert Brignall
Discipline	Pure mathematics
Research area/keywords	Vertex-transitive and Cayley graphs, degree-diameter and degree-girth problem, symmetric embeddings of graphs on surfaces
Suitable for	Both full time and part time applicants

Project background and description

The project will focus on links between graph theory, group theory and surface topology provided by vertex-transitive and Cayley graphs. A lot of extra information about a graph with a high level of symmetry is encapsulated in its automorphism group, and abstract groups can in turn be studied by their actions on vertex-transitive and Cayley graphs, and on embeddings of such graphs on surfaces. Particular topics within the project will include construction of large vertex-transitive and Cayley graphs of given diameter and degree (and, dually, smallest vertex-transitive and Cayley graphs of given degree and girth), and construction of highly symmetric embeddings of vertex-transitive and Cayley graphs on compact surfaces.

Background reading/references

- M. Miller and J. Širáň, Moore graphs and beyond: A survey of the degree-diameter problem, The Electronic Journal of Combinatorics, Dynamic Survey DS14 (May 2013).
- J. Širáň, How symmetric can maps on surfaces be? In: Surveys in Combinatorics (London Mathematical Society Lecture Note Series 409), Cambridge University Press, 2013, 161–238.