Project title  Minimal classes of unbounded clique-width
Principal supervisor  Robert Brignall
Second supervisor  Jozef Širáň
Discipline  Pure mathematics
Research area/keywords  graph theory, clique width, permutation graphs
Suitable for  Full time applicants

Project background and description
In the study of graphs, *clique width* is a parameter that has received much attention in recent years due to its significance in the study of tractability of algorithms on certain classes of graphs. For a (very) recent survey, see Dabrowski, Johnson and Paulusma [2].

This project concerns the study of clique-width in “hereditary” classes of graphs, examples of which include the classes of bipartite graphs, triangle-free graphs, and planar graphs, and (of particular relevance here) the circle graphs and permutation graphs.

It has been known for a few years that there exist hereditary classes in which there exist graphs whose clique-width is arbitrarily large, in which case we will say that clique-width is *unbounded* on this class (otherwise it is *bounded*). This project will work on the classification of the *minimal* ones: i.e. those classes which have unbounded clique-width, but every hereditary subclass has bounded clique-width. Several such examples are already known, including the unit-interval graphs, the bipartite permutation graphs, and (more recently) split permutation graphs and bichain graphs, see, for example, [1].

Following a talk at (among other places) the 2018 SIAM Conference on Discrete Mathematics [3], we now know that every such minimal class must itself be a subclass of the circle graphs. Equipped with this knowledge, the successful applicant will identify many more minimal classes, and (ideally) work towards a complete classification of these.

Applicants should have attended at least one course on combinatorics and graph theory during the course of their studies, and will ideally have undertaken a masters-level project in combinatorics, graph theory or a closely-related discipline.

Background reading/references


How to apply for this project

1. Read the Guide for applicants to check eligibility, especially entry and English language requirements.

2. Informal enquiries can be directed to the Director of Research.

3. Complete an application form, and send to the Director of Research by 8th March 2019.