Jessica Ryan

+44 7855020196 • j.ryan.2@research.gla.ac.uk

Research Interests

My main research interests are in **algorithmic graph theory** and **computational complexity**, with a particular focus on parameterised complexity and problems with real-word applications. I am also interested in graph matching problems and graph theory more generally.

For my PhD project, I am developing efficient algorithms for analysing **multi-layered networks**. Multi-layered networks allow us to model different kinds of relationships between entities, or relationships that exist at different points in time. Indeed, most real world networks are inherently multi-layered. In the past, multi-layer networks have typically been analysed by ignoring these different kinds of connections, or by considering each type of connection in a separate network. A major advantage of this approach is that there exist efficient algorithms for answering various questions about single-layer networks. Many similar questions about multi-layer networks are known to be NP-hard. However, analysing the system as a multi-layer network gives us a richer and more precise representation of the data, leading to more accurate analyses.

I am developing *parameterised algorithms* for studying multi-layer networks. That is, for a given NP-hard problem, I develop algorithms which perform efficiently on multi-layer networks with specific structural properties. This approach is known as ***parameterised complexity***. An algorithm which is efficient for fixed values of some parameter of the input is called a *fixed-parameter tractable (FPT) algorithm*.

Awards and Scholarships

- Won the annual **Haya Freedman Prize for the best dissertation** produced by a student on the MSc in Applicable Mathematics at the London School of Economics from a cohort of 31 students.
- Awarded a **PhD Studentship** (£56244) by the Engineering and Physical Sciences Research Council (EPSRC).
- Successfully applied for a **Travel Scholarship** ($900) from TCS Women to attend the 50th Annual ACM Symposium on the Theory of Computing (STOC 2018) in Los Angeles, California.
- Obtained **funding from the Sigma Network** (£2400) in 2015 to develop online mathematics revision resources for economics undergraduate students after proposing the idea to Newcastle University's E-Learning Unit.
- Secured a **Vacation Research Scholarship** (£1456) from Newcastle University to work on a mathematical modelling research project during the summer of 2014.

Education

PhD in Computer Science
University of Glasgow *2017 – 2020*
Award: EPSRC PhD Scholarship
Thesis Title: Parameterised Algorithms for Edge-Coloured Graphs
Supervisors: Dr Kitty Meeks and Prof. David Manlove

MSc in Applicable Mathematics - *Graduated with Distinction*
London School of Economics and Political Science *2015 – 2016*
Award: Haya Freedman Prize for the best dissertation in mathematics
Thesis Title: Covering Edge-Coloured Graphs by Monochromatic Paths and Cycles

BSc (Hons) in Economics and Mathematics
Newcastle University *2012 – 2015*
Award: Newcastle University Vacation Research Scholarship

Technology Summary

- **Coding:** Java, T-SQL
- **Environments:** Windows, Linux, Microsoft SQL Server

Presentations

Random Graphs and Random Processes workshop — **King's College London**
Subgraph Counting in Practice — *9th April 2019*

STOC 2018 — **Los Angeles, California**
Subgraph Counting in Practice (Poster) — *25 – 29 June 2018*

25th Postgraduate Combinatorial Conference — **London School of Economics**
Partitioning edge-coloured graphs into monochromatic subgraphs — *4 – 6 June 2018*

2018 Colloquia in Combinatorics — **London**
Counting Subgraphs Efficiently (Poster) — *8 – 9 May 2018*

FATA Research Seminar — **University of Glasgow**
Counting Subgraphs Efficiently — *10th April 2018*

CETL-MSOR Conference 2015 — **University of Greenwich, London**
Online Maths Revision Resources for Economics Students — *8 – 9 September 2015*

Academic Events Attended

- AlgoUK Workshop, Liverpool University (September 2018)
- One-Day Meeting in Combinatorics, University of Oxford (May 2018)
- Glasgow Workshop on Mechanism Design and Behavioural Economics, University of Glasgow (May 2018)
- Scottish Combinatorics Meeting 2018, University of Edinburgh (April 2018)
- AlgoUK Workshop, King's College London (February 2018)
- MATCH-UP 2017, Microsoft Research New England (April 2017)

Employment

University of Glasgow — **Glasgow, UK**
Course Demonstrator — *January – May 2019*
- Assist in lab demonstration classes for **Algorithms and Data Structures** master's degree course.

CoderDojo — **Glasgow, UK**
Coding Teacher — *October 2018 – present*
- Inspire and encourage children to learn to code.
- Organise and teach coding sessions in Scratch, Java, Python and HTML.

Inform Information Systems Limited — **Maidenhead**
Software Developer — *February – October 2017*
- Implemented multiple software systems from planning and design phase through to post go live with a strict deadline.
- Developed the company's first automated software test scripts.
- Taught colleagues how to write automated test scripts in Java.
- Created an automated email alert system for monitoring SQL Server job failures.

Newcastle University — **Newcastle**
Mathematics and Statistics Summer Internship — *June – September 2015*
- Awarded funding to develop online mathematics revision resources for economics undergraduate students after proposing the idea to the university's E-Learning Unit.

Newcastle University — **Newcastle**
Mathematics and Statistics Summer Research Internship — *June – August 2014*
- Obtained funding to work on a mathematical modelling research project.