School of Computing, Engineering, and the Built Environment
Edinburgh Napier University

PHD STUDENT PROJECT

Application instructions:
Detailed instructions are available at :
https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply

Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.

Project details

Supervisory Team:

- DIRECTOR OF STUDY: Dr Kevin Hughes (Email: k.hughes@napier.ac.uk)
- 2ND SUPERVISOR: tbc

Subject Group: Engineering & Mathematics

Research Areas: Mathematics: Pure Mathematics

Project Title: Arithmetic and Analysis

Project description:

This project has multiple options in and between Fourier analysis and analytic number theory. The number theory options build on the recent substantial progress in our understanding of solutions to Diophantine equations in many variables through the use of mean value estimates and the circle method e.g., the use of Vinogradov's mean value theorems in Waring's problem. The Fourier analysis options build on recent progress in maximal functions defined by averages over geometric objects such as curves or hypersurfaces and their ergodic implications. There are many projects that utilise a combination of these ideas and methods in discrete harmonic analysis.

See my seven most recent papers on the arXiv for an idea of what my current interests are: https://arxiv.org/a/hughes_k_1.html

References:

[1] Stein & Shakarchi’s Princeton Lectures in Analysis (Fourier Analysis, Complex
[2] Analysis and Real Analysis)
[3] Tao's notes on Fourier analysis (see https://www.math.ucla.edu/~tao/247a.1.06f/)
[4] Hardy & Wright’s An Introduction to the Theory of Numbers
[5] Davenport's Analytic Methods in Diophantine equations and Diophantine inequalities
[6] Vaughan The Hardy--Littlewood Method

Candidate characteristics

Education:

A first-class honours degree, or a distinction at master level, or equivalent achievements in Pure Mathematics

Subject knowledge:

- Fourier analysis
- Number theory
- Harmonic analysis

Essential attributes:

- Experience of fundamental pure mathematics including real analysis, complex function theory
- and basic number theory
- Competent in pure mathematics at the undergraduate level
- Knowledge of Pure Mathematics including analysis
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:

- Desire to learn any topics you are unfamiliar with and to undertake long-term research projects.