Postgraduate Scholarship Information Sheet (Advert)

Scholarship Project Title	Applications of Riordan arrays in the analysis of partially directed self-avoiding walks
Advert Reference number	SETU_2024_214
Supervisor(s)	Dr. Aoife Hennessy (SETU Waterford), Prof. Paul Barry (SETU Waterford) Dr. Nikolaos Pantelidis (DkIT)
Department /School/Faculty	Department of Computing and Mathematics/School of Science
Duration	4 Years/48 Months
Status: Full-time / part-time	Full Time
Funding information	SETU 2024 Presidents Scholarship Programme
Value of the scholarship per year for four years	Stipend: €18,500 per annum Fees of €5,750 per annum Research costs- €2,000/€3,000 per annum
Closing date and time	**11th September 2024@ 4PM Irish Time**
Interview date	**To be confirmed**
PhD commencement date	**To be confirmed**

Project Key Words: (enter 3 to help advertise on online platforms) *Mathematics, Combinatorics, Riordan matrices*

Post summary

Applicants are invited to submit applications to undertake a PhD entitled 'Applications of Riordan arrays in the analysis of partially directed self-avoiding walks.'

Riordan arrays are a group of matrices that was first defined in 1991, originally defined as a matrix group that unified many themes in enumeration. However, in recent times, Riordan matrices have been identified as a powerful tool in solving algebraic and enumerative combinatorial problems. Applications of these matrices have been found in many areas such as algorithm analysis, cryptography, wireless communications, and structural biology.

The primary focus of this 4-year study is to use Riordan matrix techniques to study properties of partially directed self-avoiding walks (PDSAW), defined as self-avoiding walks with restricted steps. Random walks are central to stochastic processes and are applicable to a wide range of areas such as image processing, genetics and materials. A random walk that does not intersect with itself is self-avoiding. Self-avoiding walks have particular importance in polymer science. This project aims to use the inherent combinatorial structures present in Riordan arrays to study PDSAWs and use the structures to help find exact solutions for restricted partially directed walks models.

A secondary focus of this project is to deepen theory of Riordan matrices, with a view to further applications in the study and analysis of random walks.

Knowledge & Experience

Essential

- Applicants must have a relevant Mathematics degree (minimum level 2.1).

- Applicants must be familiar with relevant mathematics software (eg. Python, Mathematica, Sage or MATLAB).

Desirable

- A relevant Masters in Mathematics or a related discipline.
- Experience using LaTeX.

Skills & Competencies

Essential

- Applicants whose first language is not English must demonstrate on application that they meet SETU's English language requirements and provide all necessary documentation. See Page 7 of the Code of Practice
- In order to be **shortlisted for interview,** you must meet the SETU English speaking requirements so please provide evidence in your application.

Further information

For any informal queries, please contact Dr. Aoife Hennessy on email **aoife.hennessy@setu.ie**

For queries relating to the application and admission process, please contact the Postgraduate Admissions Office researchadmissions@setu.ie or telephone +353 (0)51 302883.

For queries relating to the funding programme, please email scholarships2024@setu.ie

University Website https://www.setu.ie/

Application procedure

Download the R and return the completed application to researchadmissions@setu.ie quoting S**ETU_2024_214** in the email subject line.

Please note that paper submissions will not be accepted.

The University may decide to interview only those applicants who appear from the information they provided, to be the most suitable in terms of experience, qualifications and other requirements of the post.

The University will short-list and interview those applicants who provide the most suitable information in terms of experience, qualifications and other requirements relevant to the scholarship.

HR EXCELLENCE IN RESEARCH

SOUTH EAST TECHNOLOGICAL UNIVERSITY (SETU) IS AN EQUAL OPPORTUNITIES EMPLOYER