The Role

Maynooth University is committed to a strategy in which the primary University goals of excellent research and scholarship and outstanding education are interlinked and equally valued.

We are seeking an energetic and enthusiastic postdoctoral researcher to work on techniques for formalising specifications for software verification. Our overall goal in this research, is to provide for the automatic generation of formal specifications, and to support the traceability of the requirements from the initial software design stage through the systems implementation and verification.

The Project

VERIFAI: Traceability and Verification of natural-language requirements

To verify the correctness and reliability of safety critical software, we express safety properties of the system as a collection of formal specifications that are unambiguous and that can be reasoned about mathematically. Verification of these formal specifications is achieved through methods such as deductive verification, model checking and runtime verification.

A major burden in this process is the generation of the formal specifications. The requirements elicitation process starts with natural language requirements which are often ambiguous, leading to incorrect properties of a system being specified, and systems that are under-specified due to the assumptions of the domain knowledge. Furthermore, traceability from the original system requirements through to the properties of the implemented system is often missing. With the use of machine learning in systems development, requirements traceability becomes even more crucial: as a software system learns, we must ensure that safety properties identified at the design stage are maintained in the final system; as the system evolves we must track the changes to the original software requirements, to give a better understanding of the behaviour of the AI; and we must monitor the impact of the training data used, to direct learning so that safety properties are maintained by the system.

This project will address these challenges through providing support for the automatic generation of the formal specifications, and the traceability of the requirements from the initial software design stage.
through the systems implementation and verification. In this way we can ensure that when a system is implemented, we not only build the correct system, but we also build the system correctly. In addition, if an error occurs in the expected behaviour of the system, we can trace to where and when the source of the violation occurs. Approaches which will be explored as part of this project include Natural Language Processing, use of ontologies to describe the software systems domain, reuse of existing software artefacts from similar systems (e.g. through similarity –based), and large language models to identify and declare the specification as well as use of artificial intelligence to guide the process.

**Funding:** This project is funded via ADAPT research centre platform funding (Phase 2). ADAPT, the world-leading SFI Research Centre for AI-Driven Digital Content Technology, brings leading academics, researchers, and industry partners together to deliver excellent science, engage the public, develop novel solutions for business across all sectors and enhance Ireland’s international reputation. Coordinated by Trinity College Dublin and co-hosted by Dublin City University, ADAPT’s partner institutions include University College Dublin, Technological University Dublin, Maynooth University, Munster Technological University, Technological University of the Shannon: Midlands Midwest, and the National University of Ireland Galway.

**Principal Duties**

- Working under the supervision of Professor Rosemary Monahan and Dr Diarmuid O'Donoghue in the Department of Computer Science, Maynooth University.
- Leading project tasks and carrying out administrative work to support the programme of research as appropriate.
- Evaluating existing techniques for the formalisation of software requirements.
- Designing and implementing tool support for the generation of formal specifications from natural language requirements, focusing on the traceability of requirements from initial elicitation to the final verification of the system properties.
- Agglomerating a corpus of natural language requirements and their formal specifications
- Developing a practical case study to demonstrate practicalities of our research.
- Actively assisting and contributing to the writing and presentation of reports and academic papers for publication and wider research dissemination.
- Assisting in the development and submission of new research proposals.
- Carrying out additional duties as may reasonably be required within the general scope and level of the post.

**The ideal candidate will have:**

**Mandatory:**

- A PhD in a relevant area such as computer science, maths, engineering, or related disciplines.
- To be appointed at the Senior Post Doctoral researcher grade, candidates will have a minimum of 2 years post PhD relevant, relative research experience.
- Experience of tools and techniques for software verification such as those used in deductive verification and model checking.
- Knowledge of requirements engineering, natural language processing and machine learning.
- Knowledge of large language models (LLM) for text and/or code.
- A track record of peer-reviewed publications.
- The ability and eagerness to work effectively as part of a team.
- Excellent attention to detail, flexibility, initiative and good problem-solving abilities.
- Excellent research, analytical, oral and written communication skills.
- Ability to work with autonomy, manage workloads, deadlines and responsibilities.
- Ability to meet project deliverables.
- Excellent interpersonal skills.
Desirable:

- Experience of conducting research projects with industry partners.
- Experience conducting systematic literature review.
- Experience in applying for funding (i.e., H2020 EU or national funding schemes).
- Experience of working in international teams.

Faculty and Research Institutes

The Faculty of Science and Engineering comprises the departments of Biology, Chemistry, Computer Science, Electronic Engineering, Experimental Physics, Mathematics and Statistics, Psychology, and Theoretical Physics. The role of the Faculty is to co-ordinate the academic activities of individual departments, to oversee the strategic development of departments and to support interdepartmental programmes. The University has also developed a number of interdisciplinary institutes to support excellent research and to build research capacity across disciplines.

The post holder will be based in the Department of Computer Science. They will also be part of the Hamilton Institute which has members from each of the faculties in Maynooth.

Department of Computer Science

The Department of Computer Science was established in 1987 and has a current complement of 35 full-time staff. The members of the department, including academic staff, post doctorates, and PhD students are active in a number of key research areas with established groups in: Artificial Intelligence, Cognitive modelling, Computer Science education, Computer vision, Data analytics, Dependable software; DNA and Molecular computing; Formal Methods and software verification; Foundations of Computer Science, Geocomputation, Image and optical processing; Information theory; Machine Learning; Multimedia signal processing; Natural language processing; Robotics; Theoretical computer science;

The Department offers a vibrant learning environment for taught undergraduate and postgraduate programmes including:

- BSc Computer Science and Software Engineering
- BSc Computational Thinking
- BSc Multimedia, Mobile and Web Development
- BSc Robotics and Intelligent Devices
- MSc in Software Engineering
- MSc in Computer Science applied
- Erasmus Mundus Joint MSc in Advanced Systems Dependability
- Higher Diploma in Software Development

The department's staff, post doctorates, and PhD students also contribute to research centres and institutes in the University, in particular to the Hamilton Institute, the National Centre for Geocomputation, Assisted Living and Learning (ALL) Institute, Innovation Value Institute (IVI), and the Lonsdale Human Health Institute.
The Hamilton Institute

Maynooth University's Hamilton Institute promotes interdisciplinary research spanning applied mathematics, computer science, engineering, and statistics. It aims to bridge the gap between theory and its application in science and technology. It boasts over thirty-five affiliated faculty drawn from departments across the university, and currently hosts six internationally recognised research teams working in applied probability, data privacy, molecular computing, telecommunications, and statistics and machine learning. It has strong links to a broad range of national research centres, including the SFI Research Centres CONNECT, ICRAG, I-FORM, INSIGHT and LERO. It hosts European Research Council, Science Foundation Ireland, and EU Horizon 2020 grants. It co-hosts the €22M Science Foundation Ireland Centre for Research Training in the Foundations of Data Science, which provides a steady stream of funded PhD studentships as well as pre-existing relationships with industry and enterprise to cognate faculty.

The Institute’s commitment to real applications work is reflected in its long history of industry links. It’s commitment to research excellence is reflected in its research output, active links with leading international research groups (at Harvard University, Imperial College London, Institute Curie, the Massachusetts Institute of Technology, and many others), and consistently high ratings in external quality reviews carried out over the last 20 years as part of research project assessments and university governance. The Institute hosts a sizeable PhD cohort, has an active international visitor programme, and organises a number of high-profile international workshops each year.

The University

Maynooth University is a very distinctive university, a collegial institution focused on science and engineering, humanities, and social sciences, and equally committed to research, teaching and community engagement. Located in Ireland’s only university town, its distinctive features and character owe much to its unique history and heritage. It provides a high-quality educational experience to over 15,000 students on a campus with 18th century roots and 21st century dynamism.

The strategic trajectory and accomplishments of Maynooth University, in the 25 years since its establishment as an autonomous public university, are exceptional, and a source of great pride to the university community, staff, students and alumni. Maynooth University is now acknowledged to be one of the leading young universities in the world, and in 2022 ranked # 1 in Ireland in the latest Times Higher Education (THE) Best Young University Rankings. Maynooth University’s growing global reputation is based on the originality, quality, importance and impact of its research and scholarship, commitment to teaching and learning, the quality of academic programmes, and its leadership in widening participation in higher education. The sources of success are the dedication of its staff and the energy and engagement of its students.

Maynooth University is a place of lively contrasts – a modern institution, dynamic, rapidly-growing, research-led and engaged, yet grounded in historic academic strengths and scholarly traditions. With over 15,000 students Maynooth offers a range of programmes at undergraduate, postgraduate and doctoral level in the humanities, science and engineering and social sciences, including business, law and education. The University also offers a range of international programmes and partnerships.

Maynooth’s unique collegial culture fosters an interdisciplinary approach to research, which its world-class academics bring to bear in tackling some of the most fundamental challenges facing society today. The University’s research institutes and centres consolidate and deliver this impact as vibrant communities of learning, discovery and creation. Research at Maynooth also is very much central to its teaching and the University prides itself on placing equal value on its research and teaching missions.
Principles and Values

Maynooth University is committed to the following values:

- Scholarly rigour;
- Academic freedom;
- Integrity and ethical behaviour;
- Collegiality, transparency and trust;
- Equality, inclusiveness and social justice;
- Operational excellence, organisational flexibility and responsiveness;
- Dignity, respect and care for the individual.

Maynooth University Strategic Plan 2023 – 2028

The University’s Strategic Plan 2023 - 2028 builds on our rich academic history and strong foundations to set out an ambitious and forward-looking path for the future of our University. This roadmap underscores our commitment to adapt to a changing world while staying true to our values. Our vision is to be a university of excellence, opportunity and impact, having a significant stake in all three.

For more information about Maynooth University’s future direction, please visit: https://strategy.maynoothuniversity.ie/

Selection and Appointment

- Only shortlisted candidates will be invited to attend for interview;
- Candidates invited for interview will be required to make a brief presentation;
- Appointments will be approved by the President based on the report of the selection board;
- It is anticipated that interviews will be held during the week of the 8th July 2024;
- The appointment is expected to be effective from August 2024 or as soon as possible thereafter.

Equality and Diversity

Maynooth University is committed to being a community that promotes and advances equality, respects and values diversity, and develops a collegiate environment of excellence with equality, in which the human rights and diversity of all are recognised and respected. We value the enrichment that comes from a diverse community and seek to promote equality and diversity, prevent discrimination and protect the human rights of each individual. We aim to reflect the diversity of the community we serve and welcome applications from all individuals across our society.
To learn more about our commitment to Equality and Diversity, please read the Maynooth University *Equality and Diversity Policy* / *Polasaí Comhionannais agus Eagsúlachta*, and our policy on the *Employment of People with Disabilities*. Additionally, as an *Athena SWAN Bronze Award* Institute, we are committed to advancing gender equality across the University.

## Terms and Conditions

| **Tenure** | This is a temporary contract to 31/1/26  
Contract cannot exceed **31/01/2026**. Depending on date of commencement, contract duration may vary. |
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<td><strong>Location</strong></td>
<td>The place of work is the campus of Maynooth University, Maynooth, Co. Kildare.</td>
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| **Salary** | Postdoctoral Researcher (2023) €42,783 - €49,117 p.a. (6 points)  
Senior Postdoctoral Researcher (2023) €50,540 (1 point)  
Note: To be appointed at the grade of Senior Post Doctoral researcher, candidates must have a minimum of two years post-doctoral relevant relative research experience.  
Appointments will be made in accordance with public sector pay provisions. |
| **Hours of work** | A 37-hour working week is in operation in respect of full-time positions (pro-rated for part-time positions).  
This can be reviewed or adjusted from time to time through national agreements. |
| **Annual Leave** | Annual leave and public holidays are provided for in the University policy:  
https://www.maynoothuniversity.ie/human-resources/policies/annual-leave-policy  
Annual leave will be allocated on a pro-rata basis for part-time and temporary positions. |
| **University policies and schemes** | Employees of the University will be subject to the terms of the University policies and schemes, available on the University website at:  
https://www.maynoothuniversity.ie/university-policies  
https://www.maynoothuniversity.ie/human-resources/policies |
| **Pension** | This is a pensionable post. Employees of the University will enter into a public sector pension scheme, details of the schemes are available at:  
https://www.maynoothuniversity.ie/human-resources/pension-information |
| **Eligibility** | Applications from non-EEA citizens are welcomed, applicants should note that eligibility is determined by the Department of Enterprise, Trade and Employment. Further information regarding eligibility is available at:  
Non-EEA applicants are responsible for ensuring they can secure a visa to travel to Ireland. Any offer of employment is conditional on applicants securing the appropriate employment permissions.

**Former Irish Public Service employees - Certain Restrictions on Eligibility**

Eligibility of applicants formerly employed by an Irish Public Sector body, and who availed of an Irish Public Service Redundancy or Incentivised Retirement Scheme under the Schemes below, may be affected:

- Collective Agreement: Redundancy Payments to Public Servants
- Incentivised Scheme for Early Retirement (ISER)
- Department of Health and Children Circular (7/2010)
- Department of Environment, Community & Local Government (Circular Letter LG(P) 06/2013)

Applicants should ensure that they are eligible to be re-engaged in the Irish Public Service under the terms of such Schemes. Applicants should address queries with their former Irish Public Sector employer.

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<th>Garda vetting</th>
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<td><strong>Medical</strong></td>
<td>The University may require a medical examination as a condition of employment.</td>
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**Data Protection Law**

Applications to the University will be treated in accordance with the University Data Protection Policies. For information on the University’s Data Protection Policies and Privacy Notice, please see our website: [https://www.maynoothuniversity.ie/data-protection](https://www.maynoothuniversity.ie/data-protection)

**Application Procedure**

**Closing Date:**

23:30hrs (local Irish time) on **Sunday, 9th June 2024**

Please note all applications must be made via our [Online Recruitment Portal](https://www.maynoothuniversity.ie/human-resources/vacancies) at the following link:

Applications must be submitted by the closing date and time specified above. Any applications which are still in progress at the closing time on the specified closing date will be cancelled automatically by the system.

Late applications will not be accepted.

**Maynooth University is an equal opportunities employer**

**The position is subject to the Statutes of the University**