University College Dublin

School of Computer Science

Guide For Applicant

PhD Scholarship 2026

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1. PhD Scholarship

The fully funded scholarship starting in September 2026 is for 4 years full-time research studies in UCD School of Computer Science. It includes a tax-free stipend of €25,000 per annum for four years, annual registration fee, €3,000 for research travel expenses to enable the applicant to carry out activities related to the research project and a new laptop.

In addition, all doctoral candidates will do some paid demonstration and/or teaching assistant hours in the school as part of their career development.

2. Eligibility

Minimum requirements
The applicant must have a first-class or upper second-class honours bachelor degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not have a minimum of a 2.1 grade bachelor or equivalent degree, they must possess a minimum of a 2.1 grade master degree.

The applicant must complete their undergraduate studies by June 2026 to be eligible for the scholarship.

Desirable requirements
Other desirable requirements are outlined in the Project Descriptions offered this year

One Submission Only
Candidates can submit one application only. If more than one application is submitted the candidate will be deemed ineligible.

3. Guidelines Application Form

This symbol * represents a mandatory field. Application submission will fail if fields containing this symbol are answered incorrectly or the right document is not uploaded.

The online application does not have a “save and return” option and a submitted application cannot be edited. The applicant is advised to prepare the application offline and when fully satisfied to copy the answers and submit the online form. The template of the application form is available in Section.6 of this document.

Degree and Transcripts

The applicant must upload an official English language version of the degree results. The document has to be endorsed by the academic institution that released it.

If undergraduate examination results are not known at the time of application, the applicant has to upload official transcripts. UCD School of Computer Science may make a provisional offer of a scholarship on condition that the scholar's bachelor's degree result is a first-class or upper second-class honours.

The official english document(s) has to be a single PDF file.

English language

Non-native English speakers require at least IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE).

Uploading the English test is not mandatory at the application stage. Applicants who have not provided proof of IELTS or an equivalent test in the application will be asked to send the document if they are invited to an interview.

Applicant's Research Project

The applicant has to provide a short research project description that fits into one of the Research Area of UCD School of Computer Science. Details of the research areas are available on the school website. The proposed project cannot exceed 500 words and has to include aims and research objectives, how existing literature on the topic has been used to inform the project and how the project will advance state of the art and make a contribution to existing knowledge.

It is expected that the proposed research project is entirely the applicant's own work. Random sampling for evidence of plagiarism and excessive duplication will be carried out during the evaluation and award process. In the instance of plagiarism or excessive duplication is identified the application will be deemed ineligible and award offers will be withdrawn.

Plagiarism means using the work of others without acknowledging the original source. This includes presenting ideas, theories, concepts, methodologies or data from the work of another person (including other students, friends, family, or purchasing work from a third party) without acknowledgement and appropriate citation.

Research Project offered by the school

The applicant has to select a project offered by the school and justify their choice. Successful applicants will be working either on the project that they have proposed or on the selected research project proposed by the school.

Referees

Referess will be contacted if the applicant is shortlisted for an interview. We recommend to inform the referees at application stage.

4. Assessment Process

The applicant will be evaluated through a three stage selection process:

Stage.1 Application form

To assess track record, research potential, evidence of indipendent thinking, clarity of the proposed research project.

Stage.2 Interview

To assess match between the applicant, the proposed project and the selected project .The applicant can be invited to complete a technical assessment and/or a one-to-one interview with a faculty member of the school.

Stage.3 Competency-based interview

An interview panel will assess the match between the applicant and the research culture in the school of computer science

Key Dates	
Application deadline	13 Febr 2026 at 17:00 (Irish Time)
Technical interview	February-March 2026
Competency-based interview	April 2026
Scholarship offer	May 2026
PhD Start Date	1 Sept 2026

5. Notification

The applicant will be informed of the outcome at each stage of the selection process but due to the high volume of applications the school of computer science will not be able to provide individual feedback on the application and interview.

The school will not reply to inquiries on the status of personal applications and applicants should check the email spam folder regularly.

6. Contact

For questions related to the scholarship and whose answers are not provided in this document, please contact the research manager in the School of Computer Science: antonella.ferrecchia@ucd.ie

7. Template Application Form 2026

Contact Details

Email*

First Name*

Last Name*

Academic Track Records

Bachelor's degree institution*

Insert the name of the institution

Bachelor's degree graduation date*

If you have not yet completed your master's degree please indicate your expected completion date.

dd/mm/yyy

Bachelor's degree full qualification type and name*

Insert your answer

Q4. Bachelor's degree final grade or grade point average*

Please clearly describe the grading scheme that your grade is based on (for example the minimum and maximum values of the scale; e.g.: 9 on a scale of min:5 and max:10).

Insert the name of the institution

Bachelor's degree transcript - upload*

On the online form upload an official English language version of your Bachelor's degree transcript document(s) in a single PDF file. Please also include a description of the grading scale used by your institution. Please name your file "Bachelors_Transcript_FN_LN.pdf" where your FN is replaced with your first name and LN is replaced with your last name.

Master's degree Type

If you do not hold a master's degree leave blank this and the following related questions. If you have yet to complete this degree enter your expected graduation date and leave the final grade section blank

Delete as appropriate

Taught / Research

Master's degree institution

Insert the name of the institution

Master's degree graduation date

If you have not yet completed your master's degree please indicate your expected completion date.

dd/mm/yyy

Master's degree full qualification name

Insert your answer

Master's degree final grade or grade point average

Please clearly describe the grading scheme that your grade is based upon (for example the minimum and maximum values of the scale; e.g.: 9 on a scale of min:5 and max:10).

Insert your answer

Upload an official English language version of your master's degree transcript document(s) in a single PDF file and include a description of the grading scale used by your institution.

name your file "Masters_Transcript_FN_LN.pdf" where you FN is replaced with your first name and LN is replaced with your last name.

Are you a native English speaker or have you completed your studies through the medium of English in the last two years*

Delete as appropriate

Yes / No

If you are not a native English speaker, please upload a copy of your official English language certification or proof that you carried out your studies through the medium of English within the last two years
For illustration, the list of UCD minimum language requirements is available here:
https://www.ucd.ie/registry/admissions/elr.html
Please name your file "English_Certificate_FN_LN.pdf" where you FN is replaced with your first name and LN is replaced with your last name.

Further Track Records

Other Education*

Please provide details of any additional educational achievements not detailed in the previous section (for example other degrees or qualifications).

Insert your answer

Research Achievements*

Please provide any additional information regarding your research achievements to date such as final year projects, publications, research awards, creation of data sets and databases, conference papers, patents, etc. *[Max 250 words]*

Insert your answer

Journal/Conference/book/etc - Name

If you have one or more publications, select one that you think is most relevant and indicate the venue of the publication (e.g.: name of the journal/conference/book/etc).

Insert your answer

Journal/Conference/book/etc - Description

Tell us the novel concepts and approaches of the above publication and how you contributed to the paper *[Max 250 words]*

Insert your answer

Technical skills & achievements*

Describe your current level of proficiency in maths, programming (e.g. C++, Java, Python, R) and **knowledge in one of the School research areas.** Provide evidence to support your assessment. Also provide information regarding your technical achievements to date such as significant systems built, contributions to open source projects, etc. *[Max 250 words]*

Insert your answer

Work Experience*

Please provide details of any relevant work experience, including voluntary work, to date which should include employers' names, job titles, nature of duties and responsibilities, as well as duration of employment. *[Max 250 words]*

Insert your answer

ORCID ID

include an ORCID ID to list publications

Github Repository

include a Github Repository to show examples of coding projects

Google Scholar page

include a Google Scholar page to list publications

Personal Statement

Motivation*

Please address the following questions:

• Why do you want to pursue a PhD?

• Which of your attributes demonstrate your capability to be a good researcher, e.g. motivation, commitment, thirst for knowledge?

• What research area in Computer Sicence you are interested most and what skills you think you need to build to work in this domain ? *[Max 500 words]*

Insert your answer

Research Project

Research Project*

Provide details of your proposed research project to include
(a) aims, objectives and central research questions of the project,
(b) how existing literature on the topic has been used to inform the project
(c) how the project will advance state of the art and make a contribution to existing knowledge
[Max 500 words]

Insert your answer

Select a thematic Research Area for the proposed project.*

Delete as appropriate

- ■ Bioinformatics and Health Informatics
- ■ Data Science, Machine Learning & Artificial Intelligence
- ■ Emerging Topics
- ■ Foundations of Computing
- ■ Human-Computer Interaction
- ■ Information Systems
- ■ Intelligent Sensing and Multimedia
- ■ Security and Networks
- ■ Software Engineering and Distributed Systems

Name of Collaborator in UCD CS

If you have developed this research project with an academic of UCD School of Computer Science please name them here.

Insert your answer

Research Preference

Indicate the research project proposed by us you are most interested in. If you are offered a scholarship you will develop one of these projects in a co-creating style with the academic who will supervise you.

Indicate your highest preference of project offered by UCD School of Computer Science*

Select the title of the project from the dropdown list. **Refer to Sec.7 for the full list of projects**

Justification for choosing this project*

Please outline your reasons for choosing this project and if you have already some knowledge about the topic

Insert your answer

IRC Application*

Have you applied to the "IRC-Postgraduate Scholarship Programme 2025" Call?

Delete as appropriate

Yes/No

IRC Application - Supervisor's Name

Provide the name of the academic that supported your proposal if you submitted an application to the "IRC-Postgraduate Scholarship Programme 2025"

Insert your answer

Referees

Contact details of two referees who we will contact if you will be invited to an interview. Include name, institution, email address, phone number, and a short description of your relationship to the referee. Please inform your referees about this application and required reference.

Referee 1*

Name and Surname

Insert your answer

Email*

Insert your answer

Institution*

Insert your answer

Relationship to the applicant*

Insert your answer

Referee 2*

Name and Surname

Insert your answer

Email*

Insert your answer

Institution and relationship to the applicant*

Insert your answer

Relationship to the applicant*

Insert your answer

Demographic Details

How do you currently describe your gender identity?

To assist us in ensuring diversity among the student cohort, we request an indication of gender.

Delete as appropriate

Female/Binary/Male/Transgender/Other/Prefer Not to Say

What's your nationality, i.e.: your passport-Issuing country?*

Insert your answer

In what country are you currently located?*

Insert your answer

How did you hear about this PhD Scholarship?*

Select one and delete the remaining

- Linkedin
- Facebook
- Twitter
- Jobs.ac.uk
- Computer Science Website
- Friend
- My Supervisor
- Websearch
- FindaPhD
- Google Group
- Other:

8. Research projects offered by UCD School of Computer Science

Research Area

Cyber-Physical Systems

Project Title

Intelligent and Sustainable Orchestration for Next-Generation Edge–Cloud Systems

Project Overview

Future digital infrastructures, from smart cities to AI-driven services, rely on distributed edge–cloud systems. These systems must support demanding workloads and strict performance requirements. At the same time, they face increasing challenges due to fluctuating workloads, heterogeneous resources across edge and cloud nodes, and the need for autonomous management and recovery. This project investigates how to address these issues through sustainability-aware and AI-Ops–driven orchestration techniques.

The PhD student will explore carbon- and energy-aware scheduling and resource allocation methods to optimise where and how services run across diverse computing nodes. In parallel, the student will investigate AI-Ops mechanisms that enable autonomous system management, including the use of lightweight LLM@Edge models and distributed AI agents to support adaptive decision making, root-cause reasoning, and self-healing behaviours across the edge–cloud continuum.

The project integrates system design, optimisation, and machine learning to create orchestration frameworks that reduce carbon footprint while improving scalability, responsiveness, and operational resilience. The student will evaluate these mechanisms using deployments on our edge–cloud testbed and UCD's Sonic HPC/AI cluster, equipped with advanced NVIDIA GPUs for large-scale experimentation.

This project is ideal for students interested in distributed systems, sustainable computing, AI-driven system management, AI-Ops, and next-generation cloud–edge architectures. Successful applicants will gain expertise at the intersection of AI, sustainability, and autonomous computing, skills highly valued in both academia and industry.

Keywords

Edge Cloud Continuum, Sustainable Computing, Carbon Aware Orchestration, AI Ops, LLM at Edge, Distributed AI

Desirable Requirements

Background in distributed systems, cloud/edge computing, or machine learning. Experience with container orchestration (e.g., Kubernetes), AI-based optimisation or adaptive system control, sustainable computing, or deploying lightweight LLMs at the edge.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics,

Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.

- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Cybersecurity and Digital Forensics

Project Title

AI-Driven Forensic Readiness and Evidence Attribution in Remote Access Tool Ecosystems

Project Overview

Remote access tools (RATs) like AnyDesk, TeamViewer, and emerging AI-assisted remote-control platforms are increasingly used in fraud, social engineering, and covert intrusion operations. The forensic traces left across hosts, cloud services, and network infrastructures remain fragmented and volatile, posing significant challenges for law enforcement agencies worldwide.

This PhD project aims to develop a comprehensive forensic readiness architecture and analytical framework for RAT ecosystems. The research will (1) systematically map artefacts produced across Windows, macOS, Linux, and mobile devices; (2) design automated evidence-collection pipelines using machine learning to identify suspicious RAT behaviours; (3) create attribution-focused AI models capable of correlating local artefacts, command-and-control activity, and cloud metadata; and (4) validate the framework using real-world datasets from controlled experiments and anonymised LEA case scenarios.

The project will advance operational Digital Forensics by delivering:
- a cross-platform RAT artefact atlas;
- an AI-enhanced detection and triage engine;
- a forensic-readiness blueprint for policing organisations; and
- a validated attribution model applicable to fraud, cyberstalking, and remote-access abuse.

This work supports EU priorities on cybercrime, aligns with ISO/IEC 27043 incident investigation frameworks, and offers practical, deployable solutions for front-line investigators dealing with rapidly escalating remote-access crimes.

Keywords

Remote Access Tools, Forensic Readiness, Digital Forensics, Machine Learning, Evidence Attribution, Cybercrime Investigation

Desirable Requirements

Experience in Python and machine learning

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1

grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.

- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Cybersecurity and Digital Forensics

Project Title

Automating AI Incident Threat Intelligence

Project Overview

Artificial intelligence (AI) systems will soon seamlessly share and process information, aid businesses, governments and healthcare. This rapid integration of AI comes with challenges. Sometimes, AI systems will fail and generate potentially dangerous incidents, despite the risk management and AI governance controls envisioned by the EU AI Act. To respond promptly, cyber threat intelligence (CTI) systems automate the sharing of incident data. Managing AI incidents would benefit from similar incident-sharing systems, and enable integrating AI incident handling with cyber incident handling.
The primary aim of this research is to enhance the efficiency, accuracy, effectiveness of AI incident data sharing and the development of new models, tools and methods for AI incident classification, analysis, reasoning and AI Incident threat intelligence sharing, especially by leveraging symbolic methods like the AI Risk Ontology and combining them with neural processing techniques.

The proposal spans AI incident management, knowledge graphs, cybersecurity, and natural language processing. A gap exists in machine-readable reporting in AI incidents, and AI-generated incidents are often overlooked in cybersecurity. This research aims to fill these gaps, paving the way for new advances in effectively governing AI to make it more trustworthy by enabling a more controlled and automated response to AI incidents.

Keywords

Cybersecurity, AI governance, knowledge graphs, machine learning

Desirable Requirements

Cybersecurity qualifications or experience, knowledge graph experience, NLP expereince

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Cybersecurity and Digital Forensics

Project Title

Privacy-Preserving Large Language Model (LLM) Based Multi-Agent Systems

Project Overview

Large Language Models (LLMs) such as GPT and Claude have enabled the rise of multi-agent systems (MAS) where multiple autonomous or semi-autonomous agents collaborate to solve complex reasoning and coordination tasks. These systems are increasingly used in decision support, software engineering, and healthcare analytics. However, when LLM agents communicate, share memory, or jointly reason about data, they can inadvertently expose sensitive information through prompt leakage, residual memory persistence, and indirect inference attacks. Unlike traditional distributed systems, LLM-based agents exchange rich contextual narratives rather than structured numerical states, making existing privacy-preserving mechanisms such as differential privacy or secure aggregation insufficient. This project addresses the critical problem of how to design and verify privacy-preserving mechanisms for LLM-based multi-agent collaboration. The research will investigate formal privacy threats specific to multi-agent communication graphs, such as cross-agent inference leakage and prompt contamination.

Keywords

LLM, Multi Agent, Privacy

Desirable Requirements

IELTS, Strong background in LLM and privacy preserving techniques

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Cybersecurity and Digital Forensics

Project Title

Explaining the unexplainable: A methodology for the introspection and digital forensic examination of AI models

Project Overview

As AI models, large language models, and AI agents become embedded across sectors such as health care, manufacturing, and transport, their decisions will inevitably face scrutiny when failures occur. The actions of both users who may over-trust AI systems and the systems themselves will increasingly form part of civil and criminal proceedings. At present, responsibility for erroneous or harmful AI-driven decisions is neither clearly identifiable nor proportionately attributable. The forensic investigation of AI systems (distinct from AI-assisted forensics) remains in its infancy. The non-deterministic, opaque nature of modern models, particularly large language models, further complicates lawful attribution. Ideally, explainable AI would be built in from the outset, but this is rarely the case.

As part of the UCD Forensics and Security Research Group, this project aims to develop a methodology and corresponding evaluation framework for situations where little or no explainability is available. It will define requirements for the lawful investigation of AI models and address three scenarios: the investigation of AI models, large language models, and AI agents. Each will be explored using representative datasets, such as AutoDFBench for digital-forensic LLM validation, and DeepEval and HumanEval for assessing automated code-generation agents.

Each scenario presents distinct challenges and will require tailored adaptations of the core investigative methodology, varying according to the level of information available about the system under scrutiny. By automating the evaluation of AI systems within this investigative framework, large numbers of structured tests can be conducted, informing iterative refinement of the methodology. The resulting process will offer a reproducible means of assessing decisions made by opaque AI systems. Rather than yielding single definitive conclusions, it will aggregate evidence across many tests to identify, with a quantifiable degree of certainty, the decisions such systems are likely to have made.

Keywords

Digital Forensics, Investigation of AI, Explainable Blackbox AI, AI Regulation

Desirable Requirements

Experience in AI Frameworks

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.

- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Urban Analytics Framework

Project Overview

We invite proposals that advance innovative methods for understanding, modelling, or visualising urban environments using satellite imagery and other geospatial data. As cities change rapidly, new approaches are needed to extract fine-grained, reliable, and temporally aware information from large-scale overhead observations. Such information may include building-level changes (e.g., footprint changes, structural damage, deriliction), street and mobility patterns (new road segments, pedestrian infrastructure, network change), environmental conditions (tree canopy dynamics, heat island intensity, waterbody changes), infrastructure status, and land-use transitions across time.

Projects may explore a wide range of topics, including: Techniques for generating enriched representations of urban areas, such as alternative viewpoints, 3D reconstructions, or detailed surface and material estimates; 1) Fusion of heterogeneous data sources (street-level imagery, 3D datasets, sensor networks, or administrative records) to infer human-scale details not directly visible from overhead imagery; 2) Methods that incorporate spatial geometry or temporal change to improve consistency, interpretability, and analytical value; 3) Machine learning or generative approaches that increase adaptability, and user control in urban modelling or visualisation.

We particularly welcome projects with clear real-world relevance, including applications in urban planning, accessibility analysis, infrastructure monitoring, environmental assessment, disaster preparedness, and the creation of digital twins.

Keywords

Urban Dynamics, Computer Vision, Artificial Intelligence and Image Processing

Desirable Requirements

Experience working with urban data

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Gen-AI and multi-omic foundation models pipeline for Cancer Gene Prioritization

Project Overview

Identifying which genes genuinely drive cancer is one of the most important unanswered questions in modern biomedical science. Despite decades of research, evidence about cancer-related genes remains scattered across vast scientific literature and rapidly expanding biological datasets. This makes it difficult for researchers and clinicians to pinpoint which findings are truly meaningful. At the same time, two powerful advances in artificial intelligence have emerged: language models capable of analyzing millions of research papers, and omics-aware AI models that learn directly from patient and cellular data. Each of these approaches captures a different side of the story, yet they are rarely combined in a systematic way.
This PhD project aims to bridge that gap by creating a hybrid AI framework that brings these two perspectives together. The student will investigate how modern language models can identify and prioritize genes that consistently appear in credible cancer studies. They will then explore how these shortlisted genes behave in biological systems using omics-aware models, helping to verify whether patterns reported in the literature align with what is observed in real data. By integrating both sources of evidence, the project aims to produce clearer, more reliable, and more practical rankings of cancer-driver genes.
The long-term vision is to support cancer researchers and clinicians with AI-assisted tools that make it easier to focus on the genes that truly matter for early detection, diagnosis, and treatment planning. This project offers a unique opportunity to work at the forefront of AI, genomics, and precision medicine, contributing to next-generation approaches that could shape how cancer research is conducted in the years ahead.

Keywords

Cancer genomics, hybrid AI, gene prioritization, literature mining, omics models, precision medicine

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Abstention and Explanation of Classification of Images

Project Overview

Abstention of prediction and explanation of the reason for abstention is a very important field, which is more relevant as mode AI systems become a part of our day to day life.
Classification models can make predictions if a datapoint is from a class or another. Such models are used in many practical and often critical applications. Sometimes it is better not to predict the class of a datapoint because it is ambiguous with respect to the models, so that the decision can be left to the human experts. To assist the human experts it would be also beneficial to explain why the model did not predict and consider the datapoint ambiguous, give generated examples of what changes to the datapoint would have made the model to confidently predict that datapoint, etc. This project will focus on the image domain to develop methods which can abstain from prediction which it is not confident, provide explanation of the reason for abstention, as well as provide robust counter-factual and semi-factual explanation datapoints which avoids ambiguous regions.

The overall high level objectives of the project are:
1. Generate a robust image classification system to identify ambiguous regions and quantify it
2. Use this to abstain from prediction
3. Generate visual examples (counterfactual/semi-factual, saliency maps) to explain why the abstention was done

Keywords

machine learning, abstention, robustness, xAI, image processing

Desirable Requirements

Familiarity of machine learning algorithm internals, experiment methods will be a plus.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Examining the Feedback Loop between Data, Model and Explanation for Time Series Analysis

Project Overview

This project explores the feedback loop between learning and explanation with a focus on time series classification (TSC). It builds on our prior work on evaluating classifiers and explainable AI (XAI) methods for TSC and actionable XAI. We will investigate how to best use the interaction between the data, predictive models and explanations to improve both the data and the models.
We will address the following research questions: (1) How can we use XAI to enhance learning methods in terms of accuracy, efficiency and robustness? (2) How can we leverage XAI methods to improve or reduce the input data? (3) What is the optimal design for a feedback loop to optimise both the data and the model? (4) Which combination of models and XAI methods yields the best performance? We have access to 100+ datasets for TSC (e.g., UCR/UEA benchmark) and extensive surveys about which classifiers are most accurate for different data domains . When it comes to XAI for time series data, this area is much younger and under active development and we aim to focus on this gap.

Keywords

machine learning, time series, explainable AI

Desirable Requirements

research experience, background in ML, time series and/or XAI, evidence of excellence (eg high grades, awards, software, publications)

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Machine Learning for Combinatorial Discovery and Algorithm Analysis

Project Overview

Machine learning techniques have achieved remarkable success in uncovering complex structures in the natural world, a prime example being AlphaFold's ability to predict 3D protein structures from amino acid sequences. The goal of this PhD project is to transpose this success to the realm of theoretical computer science, specifically to discover combinatorial structures that aid in proving bounds on the worst-case complexity of algorithms.

We will investigate fundamental geometric problems—such as the Maximum Independent Set of Rectangles—where a significant discrepancy exists between the known lower and upper bounds of approximation algorithms. Crucially, this project addresses a fundamental challenge in modern AI: how to effectively integrate domain knowledge into learning techniques. Rather than treating these problems as generic inputs, we will explore how specific geometric and combinatorial constraints can be embedded into the learning architecture itself. To do this, we will utilize Graph Neural Networks (GNNs), Hypergraph Neural Networks, and Transformers (e.g., Pattern Boost) to discover instances that elicit worst-case algorithmic behaviors.

Beyond theoretical analysis, we anticipate that the techniques developed will directly translate to solving practical Combinatorial Optimisation (CO) problems. Consequently, the project will also explore learning-based heuristics, such as variable selection for branching strategies.

This project builds upon our research group's extensive expertise in the intersection of ML and optimisation. Recent contributions include:

1. Effectiveness of SDP rounding using Hopfield Networks (Learning on Graphs, 2024)
2. A scalable learning approach for the capacitated vehicle routing problem (Computers & Operations Research, 2024)
3. Learning fine-grained search space pruning and heuristics for combinatorial optimization (Journal of Heuristics, 2023)

Keywords

Combinatorial Optimisation, Discrete Algorithms, Discovering Combinatorial Structures, Graph Neural Networks, AI for Mathematics

Desirable Requirements

A strong background in Computer Science, Mathematics, Physics, Engineering, or Business Analytics. Candidates with specific expertise in algorithms or theoretical computer science are particularly encouraged to apply.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Generative Methods for Recommender Systems

Project Overview

This project aims to exploit the extraordinary ability of large language models (LLMs) to improve the performance of recommender systems. Recommender systems try to learn user preferences so they can suggest an item or service which the user will prefer. However, in many situations, additional contextual information about the user preferences is missing. Large language models are good at generating synthetic information which can be used to augment the training data for recommender systems. This LLM augmented data can enhance the personalisation of recommender systems, improve the training time and increase the performance. This research project will examine ways to enhance knowledge graph structures which can be exploited by the recommender system to improve its performance. Some knowledge of recommender systems and large language models is desirable.

Keywords

generative AI, recommender systems, machine learning, personalisation, LLMs

Desirable Requirements

2.1 Computer Science

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Unlocking Parliamentary Records with Large Language Models

Project Overview

Parliaments are fundamental to modern democracies, yet citizens often find it challenging to keep track of their activities. Although open access data policies aim to promote transparency, the sheer volume of information and the limitations of existing user interfaces often prevent the public from fully benefiting from these initiatives. This project aims to address these challenges by integrating large scale, open access parliamentary records with recent advancements in large language models (LLMs), with the goal of enhancing transparency around parliamentary activities.

The methods developed during the project will employ retrieval augmented generation (RAG) architectures to enable users to perform natural language queries on parliamentary data, simplifying the process of finding information relevant to their interests in specific topics and policy areas. Building on recent advances in RAG systems, the project will explore adaptive retrieval mechanisms so that responses are grounded in authoritative parliamentary sources.

To ensure the accuracy of the information provided, key objectives include: (1) mitigating the risk of potential hallucinations, where responses appear coherent but are factually incorrect, through a multilayered framework combining structured prompt design, evidence grounded generation, and post response verification; (2) implementing context sufficiency evaluation to assess whether retrieved information provides adequate support for accurate response generation; and (3) supporting verification by providing clear citations to original parliamentary sources, allowing users to check claims against authoritative documents.

Keywords

Large language models, natural language processing, text as data

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Scalable Vision-Language Models for Multimodal Environmental Monitoring

Project Overview

The proposed PhD will design a new generation of vision-language models (VLM) tailored for environmental monitoring through satellite and ground-based observations. While large multimodal architectures have transformed natural image understanding, their potential for interpreting Earth observation data remains largely untapped. This project will explore how to build scalable, data-efficient models that can connect visual patterns in satellite imagery with language-based environmental insights.

The research will integrate diverse sensing modalities, including optical and thermal imagery, radar data, Aerosol Optical Depth (AOD) products, and ground-based greenhouse gas and meteorological measurements. The goal is to create an adaptive architecture capable of fusing these streams into coherent, interpretable representations of the atmosphere and land surface. The student will investigate model designs that balance computational efficiency with cross-modal reasoning, enabling robust predictions of environmental indicators such as pollutant concentrations, surface albedo, and radiative forcing.

Our group has extensive experience in AI for climate and environmental analytics, with a strong foundation in satellite data processing, deep learning, and model interpretability. Building on this expertise, the student will have access to high-quality datasets, compute resources, and collaboration networks across computer science and Earth observation.
This PhD offers an opportunity to contribute to the rapidly evolving landscape of large-scale multimodal AI, while addressing pressing global challenges related to air quality and climate resilience. It will appeal to students eager to work at the intersection of machine learning innovation and environmental science, shaping how vision-language models can help us see, understand, and protect our planet.

Keywords

VLM, AI

Desirable Requirements

No prior research experience is required beyond meeting UCD's standard entry requirements. The ideal candidate should have a strong curiosity about artificial intelligence and an eagerness to work on impactful research in the broad areas of vision-language models and their applications in environmental monitoring and climate science.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are

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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

AI for mining, understanding and augmenting news distribution

Project Overview

News distribution and public discourse are a cornerstone of decision-making in democratic societies. This PhD project will develop AI-powered systems to mine, understand and augment news distribution and public discourse. To mine news distribution and public discourse, the PhD candidate will innovate AI-based systems for extracting representative signals about user engagement from millions of social media and news media data points. Our mining techniques tend to be more accurate than traditional methods, e.g., before the 2024 U.S. presidential election we forecast with groundbreaking low, 1% error, popular support for Donald Trump by correcting biases in thousands of election polls published on X (see socialpolls.org). To deepen our understanding of news distribution, the PhD candidate will study news feed algorithms and content moderation, while identifying misinformation, bias, and polarization. For instance, our prior research suggests that the news feed algorithm of X amplified political extremes before the 2025 German and Polish national elections (Tanzin Prama, 2025). This research was broadcasted by the German public TV channel ZDF during the respective election week. To augment public discourse, the PhD candidate will pioneer fair and explainable AI-powered news feed algorithms and content moderation systems that address biases and misinformation by aiming for representativeness (Scarano, 2024; Grabowicz, 2022). The research will involve development and deployment of AI-based systems analyzing millions of news articles, social media posts and users. This research will span the areas of data science, natural language processing, responsible and explainable AI, computational social science, and social computing. The project involves collaborations with some of the best researchers in the U.S. and Europe. The PhD candidate will contribute to making our AI systems and digital media of tomorrow accountable, representative, explainable, and ready to interact with our open world for public good.

Keywords

AI, NLP, recommendation algorithms, content moderation, social media, news media

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Argumentation Mining from Legal Texts

Project Overview

Given the heavy textual dependency of the legal profession, legal documents have become a key application domain for modern Artificial Intelligence (AI) and Natural Language Processing (NLP) methods, including the use of Large Language Models (LLMs) and other Machine Learning (ML) techniques.

Extracting and modelling argumentation from lengthy legal texts are seen as key tasks in the pursuit of explainable and trustworthy legal text analysis, and can contribute to such activities as text summarisation, argument evaluation and education. Legal texts (e.g. court judgments) often build arguments with reference to various authorities such as submissions from relevant parties, and appeals to judicial precedent and legislation. The argumentation mining task involves extracting those clauses from a document that form part of arguments, classifying their role within an argument or multiple arguments (e.g. acting as a premise or conclusion), and identifying and modelling potentially complex relationships between argumentative clauses (e.g. a premise may support or attack a particular conclusion).

Theorists have developed several models of argumentation (e.g. those by Toulmin and Walton), and several annotated datasets have also been developed to aid with the task of automatic argumentation mining (including those based on the European Court of Human Rights, the Appellate Body of the World Trade Organization, US Court of Federal Claims).

The objective of this PhD project is to leverage modern NLP and Deep Learning approaches to address the legal argumentation mining problem. Most current approaches have significant limitations in terms of accuracy and/or explainability, and recent advances in LLMs in particular offer tremendous potential for advancement in this field.

It is expected that this PhD project would be co-supervised by an academic from a legal background.

Keywords

Artificial Intelligence, Law, Argumentation Mining, Natural Language Processing

Desirable Requirements

Training or experience with law and/or regulation is an advantage.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence

Project Title

Graph Evolution for Financial Prediction Explanation

Project Overview

Artificial intelligence-based knowledge extraction from unstructured data and various sources enables machines to understand relationships between companies, people, products, etc. Rather than building and utilising a static graph, this project aims to generate dynamic graphs that reflect not only the relationships among entities but also their shifting, and to further integrate them into financial prediction tasks and generate prediction explanations.

Keywords

Dynamic graph, Financial Prediction

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence; Human-Centred Computing

Project Title

Normative Multi-Agent Systems in Socio-Technical Contexts: A Machine Ethics Approach

Project Overview

This PhD project will investigate the interplay between machine ethics, normative multi-agent systems (MAS), and socio-technical systems, focusing on creating ethical frameworks for autonomous agents that operate in complex societal contexts. As machine decision-making increasingly influences daily life, ranging from healthcare systems to autonomous vehicles, ensuring ethical behaviour is critical for safety, fairness, and social acceptance.

The research will begin by examining existing normative theories in machine ethics, assessing their applicability and limitations in the context of MAS. The project aims to develop a robust ethical framework that enables autonomous agents to interact and negotiate within socio-technical systems while adhering to established moral norms and values.

A particularly important research direction is the design of adaptive normative systems that allow agents to learn from their interactions and adjust their behaviour based on ethical considerations. This will involve creating algorithms that incorporate ethical reasoning capabilities, enabling agents to evaluate actions not just by outcomes, but also by intentions and moral implications. The project aims to contribute to the development of autonomous systems that operate ethically and responsibly.

The project will also require interacting with ethicists and community representatives, since a participatory approach can help to refine ethical guidelines, and ensure their relevance across different cultural and societal contexts. Possible case-studies include social robotics, and online platforms. These can provide empirical data and real-world scenarios for testing the proposed frameworks.

Keywords

agentic AI, machine ethics, normative MultiAgentSystems

Desirable Requirements

A minor in applied ethics or previous experience in working with non-STEM professionals

Mandatory Requirements

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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence, Human-Centred Computing

Project Title

AI-Driven Clinical Tools for Speech Disorder Detection

Project Overview

The diagnosis and treatment of speech disorders present significant challenges for clinicians, neurologists, and speech and language therapists (SLTs). Assessing and planning therapy often requires lengthy, expert-led sessions with patients. For example, the Aachen Aphasia Test (AAT), used to identify language impairments resulting from brain injury, can take as long as eight hours for a single assessment. Such processes create major constraints, as diagnostic accuracy and treatment planning rely heavily on clinician availability and specialised expertise. In recent years, machine learning (ML) approaches have shown promise in addressing some of these difficulties. Advances in the field have demonstrated the effectiveness of methods like self-supervised learning (SSL) on speech-focused tasks, including speech recognition and mispronunciation detection. Alongside strong performance, SSL-based models demand far fewer labelled examples, making them especially valuable in low-data clinical contexts.

This project aims to (O1) examine the limitations of current techniques and the practical challenges clinicians encounter when diagnosing speech disorders, (O2) investigate state-of-the-art technologies and speech-driven applications that can help mitigate these issues, and (O3) design and assess data-driven models for detecting speech disorders.

The work will involve close collaboration with clinicians to specify model inputs, outputs, and structured prediction requirements, ensuring that design choices are grounded in clinical practice and decision-support needs. Cutting-edge SSL models will be leveraged to develop explainable decision-support tools rather than opaque classifiers. The project will further establish guidelines for integrating large unlabelled multilingual corpora with labelled fine-tuning data and will evaluate model generalisation across diverse speech-disorder datasets and multilingual scenarios.

Keywords

speech disorders, SSL, healthcare AI

Desirable Requirements

Ideally, some background in machine learning and speech processing

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence, Human-Centred Computing

Project Title

Prediction of long-term clinical risk from psychosis using multi-modal machine learning.

Project Overview

Psychosis represents a cluster of symptoms indicating a loss of contact with reality, affecting people through disrupted thoughts and perceptions. This state spans various diagnoses, including Schizophrenia—a significant neuro-developmental disorder with detrimental long-term health outcomes, and severe forms of bipolar disorder and depression. Recent studies indicate that people with psychosis can experience symptoms for an average of six months to a year before receiving treatment, highlighting a critical need for improved early detection and intervention strategies.

Current approaches into detecting and modelling psychosis have generally focused on unimodal data inputs such as behavioural, genetic, health record data or neuroimaging. While these approaches have demonstrated good performance, they have been mostly conducted in highly-controlled research settings and have not been translated to real world clinical environments.

This PhD research aims to develop a user-centred machine learning model to assess vulnerability to severe mental health outcomes. This model will incorporate multimodal data streams, including available clinical data, behavioural patterns and self-reported state with the aim of exceeding the current benchmarks of predictive performance (e.g., Area Under Curve metrics for psychosis prediction). With translation into real-world clinical practice in mind, this research will assess feasibility and acceptability of this model among individuals with psychosis and clinical professionals, with a strong focus on privacy and practical deployment in clinical settings. The research will be conducted in collaboration with clinical partners at the Dublin & East Treatment & Early Care Team (DETECT), a specialist service that supports individuals experiencing distressing perceptual disturbances. This setting will provide access to existing rich datasets essential for developing and validating the predictive model.

Keywords

multimodal prediction, psychosis, digital phenotyping, mental health

Desirable Requirements

Ideally the student would have a firm grounding in Data Science and Python or similar language.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence; Next Generation Network Technologies

Project Title

Satellite-Terrestrial Hybrid Quantum Communication for Sustainable Connectivity in Underserved Regions

Project Overview

Over 2.6 billion people lack reliable internet access, predominantly in rural regions where terrestrial infrastructure remains economically unfeasible. Meanwhile, conventional satellite systems consume enormous power and face escalating security vulnerabilities. This creates an urgent opportunity: leveraging quantum-enhanced satellite technologies with modern machine learning to address connectivity, sustainability, and security challenges simultaneously.

This research proposes developing theoretical frameworks for satellite-terrestrial hybrid quantum links that integrate advanced ML techniques to optimise energy use in underserved regions. The approach combines free-space satellite quantum key distribution (QKD) downlinks with cost-effective ground distribution networks. Deep learning-based atmospheric turbulence prediction and real-time adaptive compensation can reduce satellite transmission power by 35-45% while maintaining acceptable quantum bit error rates. Reinforcement learning algorithms enable dynamic resource allocation across hybrid quantum-classical channels, optimising energy consumption and throughput in response to changing atmospheric conditions. Transformer-based models predict link availability and automatically reconfigure network topology to minimise transmission power requirements. Additionally, quantum machine learning techniques enhance classical signal processing at ground stations, reducing computational energy overhead by 40-60%.

Research Objectives:

- Design intelligent quantum-classical multiplexing protocols using neural network-based optimisation, achieving 40-50% per-bit energy reduction while providing information-theoretic security without energy-intensive key refreshes
- Develop comprehensive theoretical models and simulation frameworks characterising ML-enhanced quantum communication architectures under realistic atmospheric and deployment constraints, establishing performance bounds and deployment guidelines for quantum-secure connectivity in telemedicine, education, and financial services

This PhD project illustrates how quantum technologies, alongside modern AI, can promote global equity while lowering the carbon footprint of connectivity, laying the theoretical foundations for sustainable quantum infrastructure deployment in developing nations.

Keywords

Quantum, Networks, 6G, AI

Desirable Requirements

Undergraduate or Masters in Computer Science, Electronic Engineering or equivalent

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence; Next Generation Network Technologies; Cybersecurity and Digital Forensics

Project Title

Robust and Explainable Generative Models for Code-Based Vulnerability Detection and Repair

Project Overview

Generative AI models such as CodeT5, CodeBERT and LLM-based code assistants show strong potential in automated vulnerability detection and patch generation. However, they remain fragile to adversarial perturbations, struggle with explainability, and cannot guarantee robustness in real-world, high-stakes cybersecurity settings.This PhD aims to develop a new class of robust and interpretable generative models for code-level cybersecurity. OBJ1: Design generative vulnerability-detection models capable of precise localisation and patch suggestion across multiple programming languages. OBJ2:Develop adversarial attack and defence methods for code models, ensuring robustness to realistic attacker manipulations.OBJ3:Integrate explainability modules that generate human-readable reasoning for vulnerability and patch predictions. OBJ4: Evaluate at scale using open EU code datasets, defining rigorous KPIs and enabling replicable benchmarks.

Keywords

GenerativeAI, VulnerabilityDetection, Adversarial Robustness, CodeRepair, ExplainableAI, Cybersecurity

Desirable Requirements

I prefer the candidate who obtained master's degree in an English speaking country.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence; Next Generation Network Technologies;

Cybersecurity and Digital Forensics; Design and Formal Verification of Security Protocols

Project Title

Cyber Threat Defence: Intelligent Attack Analysis, Real Time Detection and Adaptive Security for the Future Internet

Project Overview

Cyber attacks are becoming faster, smarter and harder to detect as modern systems grow more complex. Today's networks include cloud services, Internet of Things devices, software defined networks and large scale connected applications. These environments generate huge amounts of data and create many opportunities for attackers to hide their behaviour. Traditional security tools cannot keep up with this fast changing landscape. This PhD project explores how artificial intelligence, machine learning and large language models can build the next generation of intelligent and adaptive cyber defence systems.

The research will focus on understanding how advanced attacks behave in real time and how AI models can detect them before they cause damage. This includes analysing unusual behaviour in network traffic, spotting early signs of malware activity and identifying patterns that suggest coordinated or automated attacks. The project will use deep learning, behavioural modelling and adversarially robust techniques that are designed for modern cyber threats.

A major part of the work will explore large language models (LLMs) and how they can support cybersecurity tasks. The candidate will fine tune domain specific LLMs to interpret security logs, explain alerts, summarise incidents and assist with decision making during active threats. To make these models practical for real world environments, the research will also design lightweight retrieval methods that allow fast access to relevant knowledge even when computing resources are limited.

The project will involve creating or extending datasets that combine network behaviour, system events and real time threat activity. The system will be designed to learn from new attacks and continuously improve over time.

The expected result is a future ready cyber defence framework that uses AI, LLMs and real time behavioural detection to protect networks from advanced and emerging threats.

Keywords

Cybersecurity, Real Time Detection, Behavioural Modelling, Large Language Models, Machine Learning, Adaptive Defence

Desirable Requirements

I seek highly motivated and genuinely passionate researchers with strong interest in cybersecurity, AI and emerging threat defence. Candidates should have solid programming skills in Python and familiarity with frameworks such as PyTorch or TensorFlow. Background in networking, SDN, IoT or data analytics is

beneficial. Motivation to work with large datasets, model training, experimental evaluation and real time detection systems is highly desirable.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Data Science, Machine Learning & Artificial Intelligence, Quantum

Project Title

Applied Quantum AI for Economic Modelling

Project Overview

The PhD project aims at systematically evaluating and exploring the application of Quantum AI methods, i.e. quantum machine learning and/or quantum optimisation (as appropriate) for different applied use cases in computational economics and more generally economic modelling. The overarching objective of the research is to contextualise and measure the potential transformative societal and economic impacts of Quantum AI in under-explored use cases. Specifically, the research will involve exploring the theoretical foundations and practical implications of Quantum AI techniques and systematically evaluating them across different the broad domain of computational economics, game theory, and economic policy. This project will likely involve significant travel and a candidate well able to translate research findings for an audience of domain experts with no Quantum or AI background.

Keywords

Quantum AI, Optimisation, Machine Learning, Interdisciplinary, Game Theory

Desirable Requirements

The candidate needs to have either a background in AI or Quantum Computing. Exposure to economic modelling is desirable but not critical.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Human-Centred Computing

Project Title

Designing Value-Sensitive AI Technologies to Support Mental Health Help-Seeking in Young People

Project Overview

Young people are increasingly utilising digital tools, particularly conversational AI, for mental health information and support. However, many existing technologies often fail to encourage appropriate help-seeking behaviours, lack sensitivity to user values, and risk unintended harms such as misinformation, over-reliance, or reduced autonomy.
This interdisciplinary project addresses this critical gap by investigating how Value Sensitive Design (VSD) principles and participatory methods can be used to ethically and safely engineer AI-enabled tools that meaningfully support the mental health of young users.
The project employs a human-centred approach, grounded in VSD and responsible AI frameworks, and will proceed through three core, interconnected objectives:

1. Understanding Needs, Values, and Barriers: Qualitative research with young people, clinicians, and stakeholders to map core values (e.g., autonomy, safety, privacy), expectations, and barriers concerning AI-mediated mental health support.
2. Developing Value-Aligned AI Prototypes:Leveraging findings from Objective 1 to design and prototype novel AI technologies aimed at promoting mental health literacy and safer help-seeking engagement.
3. Evaluating Ethical and Behavioural Impacts: Mixed-methods evaluation to assess how prototypes affect user understanding, trust, and willingness to seek help, specifically measuring alignment with key identified values.

The research aims to deliver new theoretical insights into value-aligned human–AI collaboration, generate empirically grounded design guidelines for ethical digital mental health support, and produce deployable prototypes that demonstrate safer, more effective care pathways for young people.

Keywords

Digital mental health, HCI

Desirable Requirements

Prior experience with HCI, UX research, digital health; Experience conducting qualitative research; Background or demonstrated interest in mental health

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Human-Centred Computing

Project Title

REALMS project

Project Overview

The REALMS research project seeks to explore the use of world models to generate adaptive, pedagogically aligned STEM learning environments, with a long-term vision of deploying them in immersive Virtual and Mixed Reality (VR/MR). The project aims to adapt current Foundation world models like Genie 3 to Develop a VR-ready rendering pipeline capable of converting single-view outputs from real-time world models into wide-angle, stereo VR/MR scenes suitable for comfortable, long-duration use on standard hardware.
These REALMS will then be explored to find ones would suit as STEM learning experiences within AI-generated environments, ensuring accuracy, curriculum alignment, and measurable learning gains.

Keywords

LLM, VR, Foundation World Models, STEM learning experiences

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
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- Undergraduate studies completed by June 2026

Research Area

Human-Centred Computing

Project Title

HCI for Menstrual Health

Project Overview

Menstrual health is an area increasingly explored by the Human-Computer Interaction (HCI) community, with recent work exploring approaches such as soma design and more-than-human design, and drawing on the feminist HCI movement. Yet, the breadth and diversity of this design space are not reflected in the menstrual health technologies available on the market, which often adopt a narrow, medicalised focus on menstrual cycle and fertility tracking. In particular, solutions that support menstrual health literacy are largely missing, and technologies often fail to attend to the diversity of menstruating bodies and experiences.

This PhD aims to advance knowledge in HCI design for menstrual health, and contribute a technology design that meaningfully supports individuals in understanding and engaging with their menstrual health.

The PhD candidate will be expected to conduct qualitative research and HCI design work, adopting an inclusive perspective on menstrual health and menstruating bodies.

Keywords

menstrual health, femtech, feminist HCI

Desirable Requirements

Master’s Degree in Human-Computer Interaction

Mandatory Requirements

A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.

IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.

Undergraduate studies completed by June 2026

Research Area

Human-Centred Computing

Project Title

Designing Human-Centered AI for Mental Health

Project Overview

Mental health issues have been a significant concern of global health, with common issues such as depression, anxiety, and suicidal thoughts. Due to a shortage of mental health professionals, millions of people still receive no treatment or support for their mental health. To address the growing mental health demands, AI-powered technologies like chatbots are increasingly designed to offer accessible and cost-effective support.

In recent years, the rise of large language models has represented a significant shift in AI-driven mental health care, moving far beyond what previous AI tools could offer. Whereas previous models relied on predefined interactions and tasks, LLMs can generate context-aware and human-like conversations to provide tailored emotional support and adapt their responses to individual users' needs. These capabilities also enable new possibilities for training and enhancing mental health counselling skills or foundational helping skills. For example, LLMs can support counselor training by providing simulated conversations and automated feedback. They can also be used to develop basic helping skills (e.g., communication skills, empathy, collaboration, promoting hope) among both specialist and non-specialist mental health workers. Expanding this training capacity is essential for meeting the growing global demand for accessible mental health support.

This PhD project will explore how AI, particularly LLMs, can enable new approaches for training counselling and helping skills, and how human-centred AI systems can be designed to meaningfully support the development of mental health competencies. Using human-centered approaches, the candidate will investigate how mental health supporters interact with AI-based tools, identify design opportunities in real-world contexts, and envision novel designs to enhance their skills and confidence. As LLMs may introduce potential risks related to safety, bias, and privacy, the candidate will also consider responsible and ethically informed approaches to designing AI for mental health support.

Keywords

Human AI Interaction, Mental Health, LLMs, Responsible AI, User Centered Design

Desirable Requirements

(1) A Master's or strong bachelor's's degree in Human-Computer Interaction, Computer Science, Psychology, Cognitive Science, or a related discipline. (2) Demonstrated interest in digital mental health, human-AI interaction, or user-centered design. (3) Strong skills in qualitative/quantitative research methods. (4) Basic programming skills and willingness to work with AI tools, including LLMs. (5) Strong written and verbal communication skills.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Software Engineering and Distributed Systems

Project Title

Scalable Collective Communication Algorithms for High-Performance AI on HPC Platforms

Project Overview

Deep learning applications have become pervasive, energizing technological innovations in several fields, including speech recognition, autonomous driving, medical diagnosis, and natural language processing. Large-scale deep learning applications require training deep neural networks (DNN) on large datasets to make better predictions. However, the training times increase drastically with the size of the DNN. Therefore, accelerating the training of large-scale DNNs is a formidable challenge. Parallel deep learning has become a natural and effective strategy to address the challenge.

Parallel deep learning methods rely critically on a subset of optimized collective communication routines (allreduce and alltoall) to deliver high performance. The project aims to develop scalable and universal collective communication algorithms for this subset to improve the performance of large-scale deep learning on extreme-scale heterogeneous HPC computing platforms.

Keywords

deep learning, parallel computing, MPI, collective communication, allreduce, alltoall

Desirable Requirements

The candidate should be fluent in C programming language and parallel computing technologies such as MPI, OpenMP, and CUDA.

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Software Engineering and Distributed Systems

Project Title

Decentralised AI for tackling disinformation

Project Overview

Introduction and Problem Statement: The proliferation of sophisticated disinformation, amplified by centralised social media algorithms and generative AI, poses an existential threat to democratic integrity and public trust. Current countermeasures, often relying on opaque, centralized content moderation, lack transparency and scalability, leading to accusations of bias and slow response times against rapidly evolving manipulation tactics like deepfakes and coordinated narrative campaigns.

Project Objectives and Methodology: In this project, the research team will propose a novel framework for tackling disinformation using decentralized Artificial Intelligence techniques, specifically leveraging distributed learning (e.g., federated learning) and blockchain technologies. Our primary objective is to develop a transparent, community-governed AI-based system for content authentication and integrity scoring. The methodology involves training local AI models on diverse datasets to detect evolving disinformation patterns without centralizing user data. This system will integrate with an immutable public ledger (blockchain) to cryptographically verify content provenance and record fact-checker consensus, thereby establishing an auditable and bias-resistant truth layer.

Keywords

machine learning, decentralisation, cryptography, distributed consensus

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.

Undergraduate studies completed by June 2026

Research Area

Software Engineering and Distributed Systems

Project Title

Human–AI Co-Decision Making in Requirements Engineering Through Argumentation-Driven Multi-Agent Systems

Project Overview

This project explores how multi-agent AI systems can support human–AI collaborative decision-making in Requirements Engineering (RE). Activities such as elicitation, prioritisation, security analysis and architectural evaluation are inherently argumentative and context dependent. The project investigates how AI entities, each with different analytical or reasoning capabilities, can participate meaningfully in these processes alongside humans.

The first objective is to examine how AI agents can learn from human interactions. This involves investigating mechanisms for capturing conversational patterns, and negotiation strategies within RE discussions. Because expert data may be scarce, the research will explore alternative training sources—such as structured RE knowledge bases, security standards, code repositories, and curated examples—to support learning about argumentation and decision dynamics. A key challenge is understanding how AI entities can generalise from such heterogeneous material to reason effectively.

The second objective focuses on evaluating argumentation and decision quality through agent-based reasoning. The project will study methods for enabling AI participants to assess logical coherence, detect inconsistencies, identify unsupported claims, and evaluate alignment with project constraints. This includes integrating ideas from computational argumentation theory, logic-based reasoning, and constraint checking, and exploring how such evaluative capabilities can be communicated constructively during collaborative decision making.

The third objective investigates how AI entities can contribute contextualised, project-specific knowledge. This includes generating conversation-relevant project information, highlighting risks or dependencies, and synthesising insights from existing project artefacts.

These streams converge toward a broader understanding of how multi-agent AI can participate in and enhance RE decision processes. Empirical evaluation with students working on realistic project scenarios will provide insight into effectiveness, usability, and collaborative dynamics.

Keywords

agentic AI, requirements engineering, argumentation theory, LLM

Desirable Requirements

Multi-agent systems, Large Language Models, Software Engineering

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026

Research Area

Software Engineering and Distributed Systems; Cybersecurity and Digital Forensics

Project Title

Security Assessment of AI Software

Project Overview

Large Language Models (LLMs) such as OpenAI's ChatGPT and Meta's Llama have driven rapid advances in natural language processing. By April 2025, over 850,000 third-party apps had been published on OpenAI's GPT store alone, demonstrating the great business potential of an LLM-based app ecosystem. Despite this explosive growth, the LLM app ecosystem remains in its nascent stage. Prior research has raised general concerns about security and privacy, but key aspects of how these apps operate and the risks they pose are still insufficiently studied.

This project aims to conduct a systematic security assessment of the emerging LLM app ecosystem. The project will begin with ChatGPT, the first and largest of its kind. Specifically, we will refer to OWASP's guide on top LLM vulnerabilities and investigate threats that arise during app development and deployment, focusing on security and privacy risks to end-users. With the potential issues being identified, we will develop an end-to-end testing methodology for security testing LLM apps and then perform a large-scale security assessment of the apps on the ChatGPT platform. After that, we will extend our analysis to other ecosystems (e.g., ByteDance's Coze and Quora's Poe) and other platforms (e.g., AI agents). We will propose targeted guidelines, mitigation strategies, and technical solutions to improve ecosystem safety based on our findings. These measures can benefit relevant research towards trustworthy and reliable AI adoption. Our project would also contribute to more transparent and rigorous compliance with relevant regulations in the European Union, such as the ePrivacy Regulation (ePR), the General Data Protection Regulation (GDPR), and the AI Act.

Keywords

security, software engineering, program analysis, trustworthy AI

Desirable Requirements

A 2.1 grade (or equivalent) in a degree in Computer Science, Mathematics, IT, or a similar technical discipline. Non-native English speakers should have an IELTS with a minimum total score of 6.5 (with at least 6 in all components) or equivalent. Priority will be given to applicants with prior research experience in software engineering, security, or trustworthy AI, or to candidates with relevant industry experience in security (for example, CISSP-certified professionals or penetration testing practitioners).

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of

English in the last two years.

- Undergraduate studies completed by June 2026

Research Area

Software Engineering and Distributed Systems, Cybersecurity and Digital Forensics

Project Title

Mitigating Security Threats in Agentic AI Applications via Adaptive Guardrail Synthesis

Project Overview

Agentic AI applications are increasingly vulnerable to security threats, including unintended tool misuse, data theft, and privilege escalation. These systems operate in open-ended, user-defined workflows, rendering risks highly context-dependent. Traditional security methods assume uniform threats across applications and rely on static guardrails such as global rules, fixed prompts, and output filters. This one-size-fits-all approach often fails: guardrails either overlook critical vulnerabilities or over-restrict functionality, rendering agents ineffective in dynamic environments.

This PhD research proposes a sustainable security framework that empowers agentic systems to autonomously configure, verify, and refine context-sensitive guardrails tailored to their domain, needs, and usage. By leveraging ongoing behavioural modelling and automated safeguard generation, the framework minimises human intervention while adapting security measures to evolving threats.

The research is structured into four key activities:

1) Application Fingerprinting: This involves analysing application repositories and runtime behaviour to infer requirements, domains, and dynamic patterns. The goal is to define secure, approved behaviours specific to each setup, creating a baseline for anomaly detection.

2) Threat Discovery: Employing online unsupervised anomaly detection, diagnostic techniques, and lightweight automated red-teaming, this activity identifies harmful behaviours without predefined threat labels. It focuses on uncovering subtle, context-specific risks in real-time.

3) Automated Guardrail Synthesis: Transforming detected threat patterns into customised safeguards, such as prompt modifications, tool wrappers, approval checkpoints, or representation constraints. Both formal verification and empirical testing will ensure these guardrails block threats effectively while preserving core functionality.

4) Closed-Loop Refinement: Deploying synthesised guardrails in shadow mode to collect data on false positives and negatives. This enables iterative enhancements to behavioural models and guardrail generators.

Ultimately, this project aims to enable sustainable, adaptive security that evolves with agentic AI applications, ensuring robustness without compromising their usefulness.

Keywords

Agentic AI, Adaptive Security, Threat Detection, Threat Diagnosis, Guardrails Synthesis

Desirable Requirements

Mandatory Requirements

- A first-class or upper second-class honours bachelor's degree in Computer Science, Mathematics, Engineering, Science, or a similar technical discipline. If the applicant does not hold a minimum of a 2.1 grade bachelor's or equivalent degree, they must possess a minimum of a 2.1 grade master's degree.
- IELTS 6.5 (with at least 6 in all components) or equivalent (further details on equivalence of tests are available HERE) if a non-native English speaker and not completed the studies through the medium of English in the last two years.
- Undergraduate studies completed by June 2026