Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

PhD Scholarship in Decision-Focused Learning, Model Multiplicity and Causal Recourse in Financial Services

Location: Trinity College Dublin
School: School of Computer Science and Statistics
Funding for: EU and non-EU students
Funding amount: €25,000/year
Closing date: 24 May 2026 - 23:59 (Europe/Dublin)
PhD starting time: 1 September 2026

Project details: In financial services, machine-learning systems are increasingly used to support decisions such as whether to approve a loan, set a credit limit, or flag a case for review. A major challenge is that there is often not just one "best" model. Instead, many different models can perform almost equally well on the same data, while producing quite different outcomes for customers. One model may be simpler and easier to explain, another may be fairer across groups, and another may offer more realistic ways for a person to improve a future decision. This problem, known as model multiplicity, is especially important in high-stakes settings where small technical differences can lead to very different real-world consequences.

Most current systems still follow a "predict first, decide later" paradigm. They are trained primarily to optimise predictive performance, while issues such as fairness and recourse are considered only afterwards, for example when selecting among models in the Rashomon set [1]. This sequential approach fails to jointly optimise predictive quality and explainability. A more principled alternative is to incorporate explainability constraints directly into the learning objective, thereby producing a smaller Rashomon set consisting only of models that are both near-optimal and explainable.

This project will develop new methods based on this idea. It will use decision-focused learning (DFL) [2], which trains models for the quality of the decisions they induce – including fairness, social burden, market segmentation, and other downstream objectives – rather than predictive accuracy alone. Building on this framework, the project will identify near-optimal models within a refined, decision-focused Rashomon set that differ in counterfactual explanations and robustness. It will also incorporate causal recourse, so that when an individual receives an unfavourable outcome, the system can provide realistic and actionable guidance on what changes could improve future decisions.

You will be registered as a PhD in Statistics and physically hosted in the School of Computer Science and Statistics at Trinity College Dublin. You will work under the supervision of Dr Mimi Zhang (https://www.tcd.ie/research/profiles/?profile=zhangm3) and Dr Eoin Delaney (https://e-delaney.github.io/), and will also collaborate closely with Prof. Alessandra Mileo at Dublin City University and Dr Joshua Tobin at PayPal.

Salary: The scholarship is jointly funded by Research Ireland Centre for Data Analytics and Central Bank of Ireland.

The successful candidate will receive a full scholarship for a four-year structured PhD program. This scholarship covers all university fees for the duration of the program and includes a tax-

free stipend of €25,000 per annum for four years. Additionally, a generous budget is provided to support conference travel, equipment, training, and publication costs.

Candidate description: We are looking for candidates with a Bachelor's degree in statistics, mathematics, computer science, or a closely related subject. A Master's degree is desirable but not essential. Candidates should have solid theoretical and practical knowledge of statistics, as well as strong programming skills. Experience with machine learning, optimisation, causal inference, fairness, explainable AI, or financial applications would be an advantage. Similarly, demonstration of open-source project work (e.g., GitHub repositories), and familiarity with machine learning and deep learning frameworks in python is a plus.

How to apply: Applications should contain the following in pdf format

1. Cover letter
2. CV
3. Undergraduate and (if-applicable) postgraduate transcripts
4. English language certifications, if required (according to English language requirements on https://www.tcd.ie/study/apply/admission-requirements/postgraduate/index.php)
5. Names and contact details of two academic referees

Applications should be sent to Dr Mimi Zhang at mimi.zhang@tcd.ie. Please use the subject line: **PhD Application – Decision-Focused Learning and Model Multiplicity**

Shortlisted candidates will be contacted during the week beginning **25 May 2026**. Interviews are expected to take place during the week beginning **1 June 2026**. Early application is strongly recommended.

Insight

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