Jack **Geary**

PhD Student

39 Simpson Loan, Edinburgh, EH3 9GW, United Kingdom

(+44) 7743-411-422 | jack.geary@ed.ac.uk | Justme21 | jackdgeary | Jack Geary

About Me

Currently a postgraduate researcher at the University of Edinburgh, examining the application of Randomised Classifiers to Strategic Classification. I have 3 years of experience in developing and testing Natural Language Processing tools used for tackling financial crime, and 5 previous years of experience of researching Game Theoretic methods for modelling decision-making in interactive environments with applications to Autonomous Driving. Curiosity driven and mathematically minded, with an interest in the development of rigorous models of interactions with real world applications.

Publications

Strategic Classification with Randomised Classifiers *Pre-print*

2025

- This work proposes the development of randomised classifiers to produce robust classifiers in Strategic Classification settings. We present theoretical results proving that, under mild assumptions, optimal randomised classifiers can outperform optimal deterministic classifiers. We further prove that randomised classifiers have the same learnability guarantees as deterministic classifiers in this setting.

Active Altruism Learning and Information Sufficiency for Autonomous Driving *Pre-print*

2021

- This work uses Active Learning methods to perform parameter inference in a Game Theoretic decision-making problem with unknown players. We demonstrate how these methods encourage vehicles in an autonomous driving setting to perform exploratory actions to estimate the altruistic tendency of other drivers.

Resolving Conflict in Decision-Making for Autonomous Driving *Robotics: Science and Systems 2021*

2021

- This work augments the results presented in "Altruistic Decision-Making for Autonomous Driving with Sparse Rewards" by producing results from human-subject experiments demonstrating that altruism-based decision-making models match human behaviour better than altruism-agnostic models. We further show that our novel altruism-formulation matches human behaviour in interactive scenarios better than conventional altruism definitions.

Altruistic Decision-Making for Autonomous Driving with Sparse Rewards *Robotics: Science and Systems 2020*

Interaction and Decision-Making in Autonomous-Driving Workshop *2020*

- This work identifies an issue arising from independent computation of equilibria in Stackelberg Games. We demonstrate how incorporating altruism into decision-making reduces this problem and propose a novel formulation of altruism minimising the incidence of this error.

Education

University of Edinburgh *Edinburgh, United Kingdom*

Ph.D. Informatics *2024 -*

- Explored the application of randomised classifiers to Strategic Classification.
- Provided empirical and theoretical proofs demonstrating the optimality of randomised classifiers over deterministic classifiers in strategic settings.
- Produced learning theoretic bounds proving the learnability of randomised classifiers in strategic settings.
- Developed novel methods for constructing randomised, strategically robust classifiers.

University of Edinburgh *Edinburgh, United Kingdom*

M.Phil. Informatics *2017 - 2021*

- Investigated probabilistic methods for modelling interactive behaviour in autonomous driving settings.
- Used Game Theoretic tools to perform interactive decision-making in autonomous driving settings.
- Identified a potential weakness in current interactive planning methods and proposed novel alternatives.

University of Edinburgh *Edinburgh, Uniteed Kingdom*

M.Sc. Artificial Intelligence *2016-2017*

- First Class Honours
- Studied Game Theoretic methods for decision making as well as theoretical Machine Learning and Probabilistic methods.
- Evaluated a naturalistic driving dataset using various metrics to determine it's suitability for model training.

Trinity College Dublin

Dublin, Ireland

B.A. Mathematics

2012-2016

- First Class Honours
- Received Gold Medal for academic excellence.
- Studied Algorithm design and C++ programming as well as Data Analysis and Statistics courses
- Explored Steganographic methods for embedding messages in audio signals

Work Experience

University of Edinburgh

Edinburgh, UK

Postgraduate Researcher

June. 2024 -

- Provided set of conditions that are sufficient for randomised classifiers to be optimal in the presence of strategic agents.
- Developed novel methods for learning randomised classifiers that are robust to strategic behaviour.

Ripjar

Edinburgh, UK

Data Scientist

June. 2021 - June. 2024

- Contributed to large-scale machine learning-based pipelines for extracting and processing entity information from raw text data.
- Designed and developed system and statistical tests to measure performance and prevent capability regression.
- Implemented and maintained state-of-the-art entity linking algorithms on large datasets.
- Chaired and led the company's Machine Learning Reading Group, keeping on top of the latest developments in the field
- Represented the company and presented at international academic conferences.

University of Edinburgh

Edinburgh, UK

Postgraduate Researcher

Sept. 2017 - May. 2021

- Published novel method for performing interactive decision-making using Game Theoretic methods.
- Developed an approach for performing active parameter inference in real-world interactive decision-making settings.
- Designed and implemented a setup for running simulated driving experiments.

Technical Skills

- Programming: Fluent in Python. Familiar with C/C++ and Prolog.
- Comfortable with PySpark, PyTorch, Pandas, scikit-learn.
- Familiar with Deep Learning theory.
- Academic Research: Have pursued research independently and as part of a team. Have been through the publication process multiple times.
- Experienced in LaTeX