

Joseph Rance

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Education

University of Cambridge MEng in Computer Science <ul style="list-style-type: none">Modules: Explainable AI (L193), Natural Language Processing (L390), Machine Learning Systems (L46), Reinforcement Learning (R171), Proof Assistants (L81)	2024-2025
University of Cambridge BA in Computer Science <ul style="list-style-type: none">Dissertation: Evaluating attacks on fairness in Federated Learning (link)Supervisors: Filip Svoboda, Nicholas LaneFirst Class in all three years, CST department prize for Highly Commended Part II DissertationFull blue (fencing)	2021-2024
Colchester Royal Grammar School Alevels: A*A*A*A*A, GCSEs: 9999999776A*	2014-2021

Experience

Software Engineer Intern, Microsoft <ul style="list-style-type: none">Evaluated the performance of the Azure for Operators MLOps codebase under different loads.Designed and implemented updates to the MLOps codebase, leading to a 75% cost reduction by processing low-priority data at off-peak times.Advocated for a more general framework based on Rust proc macros, leading to my code's integration to the open-source Apache Arrow library (link).Presented my work to audiences of more than 30 managers and engineers.	Summer 2023
Research Intern, University of Cambridge <ul style="list-style-type: none">Developed and tested three new backdoor attacks, which were the first to use compromised data augmentation functions as an attack vector. Our attacks include one of a few existing methods for inserting backdoors with in-distribution data.Presented our paper at the ICLR BANDS workshop.Supervisors: Yiren Zhao, Iliia Shumailov	Summer 2022
Student Volunteer, AI4Good organisation <ul style="list-style-type: none">Worked as part of a team to simulate the spread of coronavirus in refugee camps.Produced a library of metrics help evaluate the accuracy of our simulation.Our simulation was used to inform decisions made in real camps.	Summer 2020

Publications

Can Private Machine Learning Be Fair? (link) Joseph Rance , Filip Svoboda	Preprint, 2024
Augmentation Backdoors (link) Joseph Rance , Yiren Zhao , Iliia Shumailov , Robert D. Mullins	BANDS @ ICLR 2023

Evaluating attacks on fairness in federated learning (link) Joseph Rance	Dissertation, 2023

Other Projects

Image generation with a VAE-GAN <ul style="list-style-type: none">Implemented the VAE-GAN architecture in TensorFlow.Trained a VAE-GAN to generate images of faces using a dataset I scraped from the internet.	2019
Using RL to evaluate decision making in the sport of fencing <ul style="list-style-type: none">Developed a set of RL agents to generate tactical policies for the sport of fencing.Achieved a 20% improvement in match outcome prediction over the naïve, score-based method.	2020

Robotic arm with object detection

2020

- Led a team of six students to build an autonomous robot arm that used computer vision to pick up objects.
- This project was funded by the Jack Petchey Achievement Award.

Automatic Entrepreneur

2023

- Worked in a team of six student to generate reports on companies based on automatically scraped data.
- Responsible for integrating LLMs into the generation pipeline and then using Flask to build an interactive WebApp.

Oort client sampling in the Flower framework

2024

- Implemented the Oort client sampler for the Flower FL framework.
- Submitted as undergraduate coursework; awarded 77%.

Skills

Languages: Python (TensorFlow, PyTorch), OCaml, Rust, Java, SQL, C/C++, Bash, Prolog, C#, JavaScript, TypeScript, Go, RISC-V assembly, SystemVerilog, \LaTeX

Tools: Git, Linux (Ubuntu), Docker, Slurm, Azure, AWS

Awards & Achievements

Awards:

- Robinson College Scholarship
- CST Department Award for Highly Commended Part II Dissertation
- Jack Petchey Achievement Award
- Arkwright Engineering Scholarship
- Cambridge Hawks Award

Competition Results:

- **2nd** UKMT Team Maths Challenge regional finals.
- **5th** 2023 Belgian U20 fencing championships
- **15th** Aix-en-Provence U20 fencing world cup 2023 (as part of the Belgian team)
- **1st** 2024 Cambridge Open fencing tournament
- **1st** BUCS Fencing Premier League South (as part of the Cambridge team)