

Joseph Rance

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I am a Computer Science student at Cambridge University, about to begin my second year. I love how simple mathematical rules can create complex systems that learn to “think” in a way similar to how a human would think in order to produce elegant solutions for real world problems.

Education

University of Cambridge

BA COMPUTER SCIENCE (2021-2024). Class I in first year

Modules covered in year 1: Databases, Digital Electronics, Discrete Maths, OCaml, Graphics, Java, Scientific Computing, Maths, Algorithms, Machine Learning and Real-world Data, Operating Systems, Interaction Design, Probability, Software and Security engineering

Colchester Royal Grammar School

A LEVELS (2021) A*A*A*A*A in Maths, Further Maths, Physics, Computer Science, EPQ

GCSEs (2019) 9999999776A* in Maths, Physics, Computing, Chemistry, Biology, French, Tech., Art, Eng. Lit., Eng. Lang., F. Maths

CyberFirst advanced programme

Two week course on computer security with a CTF at the end (Summer 2020)

SCQF level 6 qualification standard

Experience

Research internship

University of Cambridge Computer Laboratory (Summer 2022)

I wrote a paper proposing three new methods of inserting backdoors into machine learning models. The backdoors are inserted into the ML pipeline using data augmentation which makes them a more practical threat than many previous methods. The paper is currently being reviewed for ICLR2023.

Deutsche Bank, AI4Good Hack from Home

October – November 2020

I worked as part of a team to create and evaluate a set of algorithms to simulate the spread of coronavirus in refugee camps.

Projects

Robotic arm with object detection

I coordinated a project to write an unsupervised object detection algorithm for a robotic arm as part of my school's student run computing society. [Link to GitHub](#)

Generating images using a VAE-GAN

I generated images of faces using a VAE combined with a GAN to achieve a more semantic loss function than the usual pixelwise distance metric for a VAE. I trained the model on a gathered by automatically cropping faces from images on the internet. [Link to code](#)

Reinforcement Learning to improve decision making in the sport of fencing

Worked on developing a set of machine learning algorithms to generate tactical policies for the sport of fencing. Created 3 different agents to learn from data gathered about my own competition bouts and generated predictions to learn about how I can improve decisions I make during matches. [Link to code](#)

Skills

I have substantial experience programming in Python (numpy, TensorFlow/Keras, pytorch/Lightning, ...), Java, C#, SQL, OCaml, as well as experience with Git and Linux.

Awards and achievements

Arkwright scholarship (2019-2021)

This prestigious engineering scholarship was awarded to me after a rigorous selection process, providing a financial award to support my studies.

UKMT Team Maths Challenge

Represented my school in the UKMT Team Maths Challenge in 2020 placing 2nd in the region.

Jack Petchey Achievement award

Received the award for leading and developing the school's Sixth Form's Computing Society during lockdown through online tutorials, talks, debates and challenges (2019-2021). [Link to GitHub](#)

Achievements in the sport of fencing

Represented England for under 17 men's foil in Paris and am ranked 23rd in Great Britain for under 20 men's foil. I am currently the Eastern Region Senior champion.