# 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 am working on implementing backdoors into Machine Learning models and investigating how these backdoors can be inserted using preprocessing techniques such as GAN-based preprocessing.

## Projects

### Deutsche Bank, AI4Good Hack from Home
Worked with the ai4good organisation to create a set of algorithms to simulate the spread of coronavirus in refugee camps.

### Robotic arm with object detection
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
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

**Google CodeIn 2019**
Completed 10 tasks in total (9 for TensorFlow; 1 for Appertium). 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 Autodesk Inventor.

# 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 though 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.