

# Mackenzie Blackaby

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## PROFILE

I am a British third-year undergraduate at Lancaster University, on track to graduate with First-class honours in Computer Science. With a strong proficiency in low-level programming and front-end development, I am adept in optimising hardware workflows and creating SDKs in C/C++ for microcontrollers. My front-end experience spans eight years in C# and three in Java, including developing personal Unity-based games and collaborative Java applications. Currently, I am building a Nintendo Gameboy emulator in Java as my final-year project, combining my low-level, high-level, and front-end programming expertise.

My recent course studies in AI and Machine Learning in MATLAB include projects exploring classification algorithms, decision trees and KNN, with plans to expand into genetic algorithms, neural networks, and generative AI in the coming weeks. I would love the opportunity to develop in and explore this innovative field, combining it with my other programming experiences. Driven by a commitment to Islamic ideals and support of Saudi Arabia's 2030 vision, I aim to join KAUST and am attracted by its innovative research environment and support for unparalleled technological advancement. My interests in AI, low-level integrated systems and networks align with KAUST's own research goals and commitments to advancing computational research.

## EDUCATION & QUALIFICATIONS

**Lancaster University** - Bachelor's degree Computer Science: First-class Honours 2025

**GRE** – Quantitative Reasoning: 160 (94.1%) 2024

Verbal Reasoning: 155 (91.1%)

Analytical Writing: 4

**King's School Macclesfield** - A Level Maths: A\*

Chemistry: A

Computer Science: A 2022

**King's School Macclesfield** - Cambridge IGCSE Maths: 9

English Literature: 9

English Language: 9

Chemistry: 9

Biology: 9

Physics: 9

Music: 9

German: 9

Geography: 9

Computer Science: 9 2020

## KEY SKILLS

- Low-Level Programming
- Object Orientated Programming
- Data Analysis

- Machine Learning Algorithms
- Experiment Design
- Algorithm Optimisation
- FAT16 File System Development
- GIT Version Control
- Leadership and Team management
- Low-Level MCU Programming: Arduino, Microbit, Raspberry Pi Pico
- Linear Algebra, Calculus, Formula Interpretation
- Technical Academic Writing
- Critical Thinking, Problem Solving
- Collaboration and Teamwork
- Network Logic
- Full Fluency: Java, C, C++, C#, HTML, CSS, Python
- Intermediary Experience: SWL, ASM (MIPS, Z80), JS, MATLAB
- Elementary Experience: Erlang, PHP, Swift

## PROGRAMMING EXPERIENCE

### Second Year Group Project: Less Powerful Point | Java | Lancaster University Grade: 21/24 (A)

A Collaborative project undertaken in my second year as the main piece of coursework; we were tasked to plan, develop and ship a PowerPoint-style software in Java designed for programmers.

- I took on a leadership role, stewarding a team of eight, where I meticulously managed tasks and assigned sub teams, alongside my own work, to meet each deliverable's deadline.
- The project used the AGILE framework for development and was a remarkable success, achieving a high grade. I was also responsible for the front-end development as well as other features across the development stack.

### MicroBit Low-Level Programming | C++ | Lancaster University Oct 2024

I had to work with the schematics of the NORDIC NRF51822 processor and bare-metal C++ to manipulate the hardware of the Microbit MCU to develop a variety of applications.

- I first manipulated and programmed a multiplexer display to count in binary both on a clock and with button and touch sensor inputs. I then read an analogue voltage from a potentiometer via an analogue-to-digital converter, before finally using the analogue voltage, along with tuned scheduling, to create an automatic breathing effect on an RGB LED, using the potentiometer to control its colour.
- This task involved much independent research on the processor itself, as well as the schematics of the components with which the tasks must be performed. This also gave me an incredible foundation on integrated systems and inspired me to begin developing my own Arduino-style SDK for the Microbit.

### FAT16 File System Console Development | C | Lancaster University Grade: 21.4/24 (A)

I was tasked with the creation of a CLI for a FAT16 volume in C, replicating functions from standard operating systems.

- I had to read the File Allocation Table and access the boot sector and BIOS block, before reading the root directory and building a directory tree.
- I also programmed the ability to read long file names, file attributes, the dates and times last read and then reading the files' contents.

### Distributed System Development | Java | Lancaster University Grade: 24/24 (A+)

With the foundations of knowledge on network engineering and distributed systems laid, I developed a secure auction system that allows a client to connect and return the details of items that are for sale.

- This involved the use of cryptography and Sealed Objects to ensure the security of data transferral over the network.
- This coursework is still ongoing, with each section building on each other. In the following weeks of development, the full functionality of the auction system will be implemented, with a server that allows clients to connect and start auctions, bid, end auctions, set reserve prices and win auctions, all done securely and dependably.

## ADDITIONAL INFORMATION

My website [www.blackaby.uk](http://www.blackaby.uk) is an interactive version of this document, highlighting my front-end programming and website development skills.

For my final-year project, I am currently reverse-engineering a Gameboy console and learning the Zilog Z80 assembly to create a Java emulator. This would involve reading the ROMs of the game cartridges, with a fully implemented Z80 instruction set, and programming ways of emulating the visual display, 8-bit sound and input system of the Gameboy. This project remains in the planning stages and will be actioned in the coming weeks, but will involve extensive research, development, and design for niche technology.

My recent AI coursework has introduced the fundamentals of machine learning and Artificial Intelligence. The work in this module has inspired my own continued research into this vast and ever-expanding field after the module's completion, with an interest in generative AI and neural networks taking my attention.

Training – Completed Udemmy Course on 2D & 3D Game Development in Unity [2024], I attended a 10-day InvestIN Internship with UCL university about advanced technology like AI with companies such as Tesla [2021] I also have three years of experience working as a children's sports coach, where I developed leadership skills by organizing, supervising, and creating engaging activities for the children.

Languages – English (Native); German (Working Standard); Arabic (Elementary)

## INTERESTS

Video games, usually single player story-telling games

Books

Travelling

Film critique

Cooking & Baking

Pets - Mostly caring for my Gecko.

Making electronic music in Ableton

## ACADEMIC REFERENCES

Dr Andrew Scott | PhD MSc IEEE Microsoft MVP | Senior Lecturer | [a.scott@lancaster.ac.uk](mailto:a.scott@lancaster.ac.uk)

Dr Phillip Benachour | PhD MSc | Senior Teaching Fellow | [p.benachour@lancaster.ac.uk](mailto:p.benachour@lancaster.ac.uk)

## OTHER REFERENCES

Stephen Cannon | MBE MSc CEng Lt Col | Head of Engineering | [stevecanon3183@gmail.com](mailto:stevecanon3183@gmail.com)

Phillip McKenzie | MSc | Head of Computer Science | [phillip.mckenzie@kingsmac.co.uk](mailto:phillip.mckenzie@kingsmac.co.uk)