Joe Loach (he/him)

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Profile

Highly motivated and results-oriented Software Developer specialising in high-performance computing, real-time systems and Rust development. Strong background in parallel computing, GPU acceleration, and reliability-focused software and hardware design. Seeking a challenging developer role to contribute to cutting-edge technology and research.

Education

Bachelor of Computer Science   Sep. 2021 - Jun. 2024
The University of Manchester

- Achieved a High 2:1, with a First-Class grade for third-year dissertation.
- Top 5% of class for innovative AI model implementation and creative project approaches.
- Designed front and back of 'Money Tracker' website in NodeJS and Vue, winning creativity award.

A Levels   Sep. 2019 - Jun. 2021
The Ecclesbourne School

A* Computer Science, A* Mathematics, A Physics

Professional Experience

Software Developer | C#, Unity   Jun. 2023 - Sep. 2023
Digital Spirit Ltd

Developed a suite of custom graphical tools within Unity:
- Reducing artist-tooling friction, streamlining UI development, using non-destructive 2D UI editing system featuring complex mesh effects.
- Enhancing designer ergonomics through custom editors with multi-object and undo support.

Key Projects

Web Card Game | Rust, axum, tokio, NativeDB   Dec. 2024 - Present

Engineered a highly scalable web server and client, utilising:
- Vertically scalable, multi-threaded asynchronous Rust code.
- Robust and error tolerant game state machine protocol.
- Real-time processing of events, serving thousands of clients concurrently.
- Custom authentication middleware layer and JWTs to secure routes.
- High crash tolerance using transactional databases.
- Tightly integrated logging using tracing for maximum debuggability.

Third Year Project & Dissertation | Rust, WGSL, Vulkan, WebGPU   Sep. 2023 - Apr. 2024

Delivered a high-performance, hardware-agnostic path tracer for real-time black hole rendering, leveraging:

- Highly accurate and adaptive numerical methods (RK4, Bogacki-Shampine) to compute integrals of gravitational fields.
- GPU kernel implementation using Vulkan Compute shaders for significant performance gains.
- Real-time simulation using multi-threaded SIMD optimisations.
- Achieved 30x speedup using GPU compared to multi-threaded CPU performance.

Coursework Highlights

Implementing System-on-Chip Designs | Verilog, Cadence   Jan. 2024 - May. 2024
- Developed, debugged, and verified a CPUs FSM module inside a real-world environment.
- Integrated an ASIC Mandelbrot hardware accelerator with a VGA controller.

Natural Language Understanding | Keras, Python   Jan. 2024 - May. 2024
- Designed deep learning models for textual evidence detection, leading a small team to deliver high-accuracy results.
- Utilised novel DNN architectures adapted from state-of-the-art research.

Teaching Experience

GCSE Maths and Physics Tutor   Jun. 2021 - Sep. 2021
- Delivered structured tutoring to secondary school students, focusing on creative explanations to fill knowledge gaps.

Technical Skills

Programming Languages

Rust, C#, C++, Python, JavaScript, TypeScript, Verilog, C, HTML, CSS, Lua, Haskell, Java

Technologies

git, cargo, Cadence, MATLAB, VSCode, Visual Studio, OpenCV

Interests

- **Sports**: Enthusiastic Squash player with 10 years of experience, actively participating in university society competitions.
- **Music**: Self-taught guitarist, experimenting with music creation and recording using Reaper software.

References available upon request