Jason Dominguez

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Education

University of Manchester — Manchester, UK
Completed 1st year of Comp Sci. PhD in Generative Deep Learning — *Sep. 2021 – Mar. 2023*

University of Manchester — Manchester, UK
1st class MPhys in Physics (82%) — *Sep. 2017 – June 2021*

Thomas Hardye Sixth Form — Dorchester, UK
A levels: Maths (A), Physics (A*), Music Tech (A), AS Further Maths (A)* — *Sep. 2015 – June 2017*

Technical Skills

Languages: C/C++ (7+ years), QML, Python, Rust
Softwares & Frameworks: CMake, Qt, Git/GitHub, Qt Creator, VS Code

Experience

C++ Software Developer — Nov. 2023 – Current
Vochlea Music — *Remote/London, UK*

Company & Product Overview:
Vochlea is an innovative ML-centric music tech startup developing dubnote, an iOS audio analysis app. Working directly with the CTO, I use a QML/Qt/C++ tech stack with Objective-C++ for iOS APIs. I have developed the app from prototype to release, recently architecting a distributed cloud collaboration system enabling real-time multi-user sync.

My Role:
I specialize in performance-critical backend systems, focusing on low-level optimizations, memory management, and concurrent programming. I design and architect solutions, integrating the C++ backend with the app UI. My work centers on developing the core C++ engine that powers real-time (sub-ms) audio processing and ML inference pipelines.

Key Technical Achievements:
- **Distributed Systems:** Architected cloud collaboration system using CRDTs with Hybrid Logical Clocks and operation dependencies for out-of-order operation handling, WebSocket real-time sync, and REST APIs for file upload/download
- **Real-time:** Implemented lock-free queue solution for low-latency audio processing pipelines with deterministic performance characteristics for ML model inference
- **Concurrency Engineering:** Resolved critical data races by implementing proper data isolation between threads, using copy and move semantics to eliminate shared memory access
- **Performance Tuning:** Identified and resolved 2-second UI freezes through performance profiling, moving blocking file I/O to background threads with asynchronous callbacks
- **Memory Optimization:** Eliminated 200MB memory leaks by implementing RAII principles and smart pointer patterns in performance-critical C++ code

Technical Summary:

- Implemented high-performance **C++** backend systems for real-time audio processing
- Optimized memory usage and eliminated race conditions in concurrent, performance-critical code

- Applied performance-critical **C++** techniques including lock-free data structures, asynchronous I/O, and zero-allocation patterns
- Developed unit testing suite using **QTest** framework
- Profiled and optimized system performance using native tooling on **macOS/Unix** platforms
- Architected distributed cloud collaboration system using CRDTs for conflict-free real-time multi-user synchronization

Associate C++/Qt Software Developer Apr. 2023 – Nov. 2023
Carallon *London, UK*

Company & Product Overview:
Carallon is a lighting systems company. Their products include hardware used in theatres & theme parks, incl. Disneyland, to control lighting setups, as well as desktop apps used for creating presets & scheduling of lighting systems.
Whilst at Carallon I was responsible for bug-fixing in both Windows desktop app code & firmware for the lighting systems devices, using a Qt/C++ stack.

Summary:

- Development & bug-fixing using **Visual Studio** for **Windows** desktop apps and firmware
- Problem solving with the UI (**Qt**), backend logic and networking between devices (TCP/IP, Lon)
- Used **Git** for version control and Jira for workflow management

Programming In My Degree Sep. 2017 – June 2021
University of Manchester *Manchester, UK*

- 4^{th} year: Object-Oriented Programming in C++ (96%)
- 4^{th} year: Machine Learning (ML) and Optimization (91%)

Projects

Award-Winning Publication in ML for Liquid Crystals | *Python, TensorFlow* 2020 - 2023
- Applied ML computer vision to identify different liquid crystal phases from their textures
- Published three co-authored papers in top-tier soft matter physics journals. Available HERE
- One of these publications was the winner of The 2023 Luckhurst-Samulski Prize

Options Pricing | *C++, Options Pricing, BSM, Binomial* 2024 - Current
- Currently working on implementing pricing methods for different financial options, furthering my understanding of financial derivatives pricing. Available HERE
- Understanding of American, European & exotic put/call options
- Understood & implemented BSM and Binomial models for pricing

FastFix - Zero-Copy FIX Parser | *Rust, FIX Protocol, Systems Programming* 2025 - Current
- Developing a zero-allocation FIX protocol parser in Rust to understand low-latency systems design principles used in electronic trading. Available HERE
- Focusing on zero-copy parsing techniques to minimize memory allocations in performance-critical paths to improve upon an existing Rust FIX parser
- Learning FIX protocol fundamentals including message structure, field encoding, and validation

Hobbies

Music | *Drums, Guitar, Vocals, original compositions*
- I play musical instruments including: drums, guitar, bass, Canarian timple
- I've written music which has been professionally recorded, available HERE