Alex O'Brien

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Computer Science student with experience in IT and software development and a passion for robust and well-engineered systems.

Skills

Computing

Fundamentals Deep understanding of hardware and software architecture — all the way from CPU architecture to operating systems implementation.

Programming Experience in a variety of languages and paradigms, including object-oriented and functional practices. Most fluent with Rust and C/C++, with working knowledge of Python, TypeScript, Java, Go, x86_64 assembly, LaTeX, and others. Very capable of learning on the fly and picking up new technologies quickly.

Security Understanding of security best-practices and fundamentals with common services (e.g., Apache and nginx), with experience in implementation of real systems. Experience in the theory of software exploitation, and binary reverse engineering with the Ghidra software.

Operations Experience both in a personal and professional context with the administration and maintenance of common enterprise technologies, including Active Directory, Open Directory, Profile Manager, and Unix-descended systems (Linux and FreeBSD in particular).

Communication

Written Strong written communication skills both in an informative and argumentative style.

Spoken Experience and success in competitive speaking and debate.

Instruction Served as a teaching assistant/mentor in mathematics for a year 10 mathematics class in 2019.

Language Spoken and written experience in Spanish.

Other Interests

Systems Knowledge of operating systems design and implementation. Currently implementing a kernel and a web server. *(see projects)*

Compilers Presently designing and implementing a rudimentary C compiler. *(see projects)*

Physics Deep interest in the field, particularly in particle physics, astrophysics, and cosmology.

Education

2020–2022 **Bachelor of Science/Master of Data Science (Graduate Degree Package)**, The University of Melbourne

Majoring in Computing and Software Systems. Maintaining an average grade of *First-Class Honours*.

2019 **Mathematics Extension (MTH1040)**, Monash University

Achieved a *High Distinction* average.

2018–2019 **VCE**, John Monash Science School

- ▷ ATAR: 99.1
- ▷ Achieved academic excellence awards in Algorithmics, Physics, Literature, and Mathematics Extension
- ▷ CERN Beamline for Schools competition – *Shortlisted, see projects*
- ▷ Debate team captain
- ▷ Debaters Association of Victoria – *Swannie Award* (best speaker in region)

Experience

References available upon request.

2020 **Software Developer (Contract)**, Embedthis Software

Embedded
Web
Security

Backported security fixes and modernized code to create version 2.2 of the GoAhead embedded web server. This involved both security research and significant code cleanup to bring a legacy codebase up to modern standards, all while maintaining compatibility and stability for existing customer applications.

2019 **Waitstaff**, Royal Brighton Yacht Club

Catering
Customer Service

Worked over summer and during school on a casual basis, developing useful experience in customer service and relations.

2016–2017 **IT Technician**, University Prep

IT
Technical Support
Systems Administration

Worked two summers full-time in general IT and support, involving a variety of tasks in multiple areas of expertise, including:

- ▷ Maintained images across multiple platforms and OS versions with FOG and Casper Suite.
- ▷ Delivered a new library checkout system using Raspberry Pis as thin clients.
- ▷ Managed device setup for new staff and equipment – testing, imaging, and communication with end-users.

Projects

Names are hyperlinked to repository/reference.

2020-present **Short Circuit**, Web Server

Servers
HTTP

A web server for Linux using io_uring. Capable of over $100,000$ requests per second.

2019-present **3cc**, C Compiler

Compilers
Parsing

A C compiler in Rust. Features a lexer and hand-written recursive descent parser. Currently implements most unary and binary operators and has early support for `int`-typed local variables.

2017–present **Syzygy**, Kernel

Operating Systems
Computer Architecture

A kernel implemented in Rust, currently featuring physical and virtual memory management, an initramfs, and interrupt handling. Presently working on multitasking.

2019 **Beamline for Schools**, Physics Competition

Particle Physics
Written Communication

A CERN competition in which secondary school teams submit proposals for an experiment to be conducted using a particle accelerator. Project was among 20 globally shortlisted.