



Patrick Nappa

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Languages

C, C++, Python, Java, F#, SQL, Go, Bash, Datalog, HTML, CSS, TS/JS, React

Experience

Co-founder – Kashcade (2022-)

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Started a company streamlining the way startups/scaleups can grow with capital.
<https://kashcade.com/>

GPU Compiler Engineer – Apple (2020-2021)

Optimising the LLVM compiler generated machine code with respect to power, performance, and size for the Apple Silicon GPU chips – these industry-leading chips achieve so much, in part due to the efficient code-gen. Involved ██████████, programming in C++/Python, building ██████████, and developing confidential high-performance ██████████ systems.

Lead Developer – InsideOut Institute (2019-2020)

Full stack development including holistic security analysis, database design, migration of data across systems, rebuilding system to accommodate high security for medical data, with high-performance backend code. Involved writing a custom compiler for high-level expression of permissions to enable scalable design of a user-friendly access model.

Research Assistant – University of Sydney (2019)

Updating a Java application used for analysing soccer matches using computational geometric methods. Analysing AS Monaco games to evaluate improvements to games, as well as classifying passes.

Research Associate – University of Sydney (2019-)

Empirical analysis in Computational Geometry on 1-local routing algorithms. A full implementation of several state-of-the-art routing algorithms, as well as historical approaches, integrated into a software suite that includes: a web-visualiser/graph editor that supports live incremental evaluation of routes (interacting with a backend via WebSockets); a benchmarking platform including data-analysis; and covering unit tests. The project is written in modern Java 11 relying heavily on functional programming, in addition to d3.js and ES6 JavaScript for the front-end.

Research Assistant – University of Sydney (2018-2019)

Used C++ and OpenMP to optimise equivalence relations in a Datalog compiler (Soufflé, by ORACLE Labs), this research resulted in:

- Achieved an estimated 50 million times speedup for an OpenJDK static code analysis (variable points-to)
- Integrated into the mainline repository
- Published as part of the 28th International Conference on Parallel Architectures and Compilation Techniques (PACT 2019)
- Received 4 Artifact awards as part of a process to ensure reproducibility

Undergraduate Course Development – University of Sydney (2018)

Principles of Security and Security Engineering (INFO3616)

Developed lecture content, assignments, and tutorials covering web-application security + common attacks, system access control, and providing course mentorship.

Data & Information Management (ISYS2120)

Developed tutorial content to supplement coursework, covering Python (*SQLAlchemy*) Database Object Relational Models (ORM), and their integration with SQL databases.

Developer – Helian Systems (2016)

Design and development of Python API.

Academic Tutor – University of Sydney (2015-2018)

Information Technology Capstone Project (Masters, COMP5703) Object Oriented Design (INFO3220, Masters INFO9220), Data Structures (INFO1105), Operating Systems and Machine Principles (COMP2129), Principles of Distributed Systems and Networks (COMP2121), Foundations of IT (Mentor, INFO1003).

Awards

University Postgraduate Honour Roll (2018)

Achieved the highest mark across the cohort in the postgraduate security subject, COMP5617. This subject covers threat modelling, vulnerability triage (STRIDE/DREAD), emergency remediation, automated tools, and building high-performance web scanners.

University Medallist (2018)

This merit is only awarded to students that have an aggregate mark over 90 in Honours, and is presented only with recommendation of the faculty board.

Cyber Battle Winner (2018)

First place in the NSW State Government's CTF, launched as part of their Cyber Security Industry Development Strategy.

Dean's Excellency Award (2017)

The prize recognises the highest performing students who have completed the previous year of study with a WAM (weighted average mark) of at least 85 and studied 48 credit points, and is awarded on recommendation of the Dean.

Summer Scholar (2017)

High Honour Roll (2014-2015)

The prize is awarded for high performing students who achieve top marks in subjects or have a WAM of 85 or above.

Education

Bachelor of Computer Science (Adv.) Honours – University of Sydney

Graduated with First Class Honours with University Medal
Research honours explored and implemented a multi-layered, parallel, data-structure to implicitly and efficiently represent equivalence relations using novel find-union data-structures, and custom high-performance concurrent lists. Also explored lock- and wait-free memory complexity techniques using probabilistic optimistic allocation.

Assorted Projects

CLImage

<https://github.com/pnappa/climage>

A command line application that converts images to ANSI encoded escape sequences for display in terminals. Supports many modes of operation, including using unicode to display higher quality images to terminals that support it. Implemented using fast kd-tree to efficiently select the closest colour reduction, in addition to memoisation to squeeze as much performance out as possible. Install with `pip3 install climage`

SubprocessCPP

C++ header-only library to provide a native, idiomatic method to spawn subprocesses, without writing any C. Currently undergoing an extension to support cyclic directed subprocess networks.

Doodles

<https://pat.sh/shirts/>

Stylised cartoons created in my spare time that I stencil onto t-shirts.