

Richard Willie

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Education

- 2020 – 2024 📖 **B.Eng. Computer Engineering, National University of Singapore. Research-focused Pathway (RfP).**
Thesis title: *Detecting Atomicity Violations in Compressed Traces.*

Experience

- 2024 – 2024 📖 **Teaching Assistant.** School of Computing, National University of Singapore.
- Parallel and Concurrent Programming (CS3211), AY23/24 SEM 2.
 - Feedback from students:
 - * Richard makes tutorials very engaging, quite frankly one of the best tutorial experiences I've had.
 - * Richard genuinely cares about student learning outcomes.
 - * Richard is very clear when teaching and goes at a good pace, while also clearly putting in a lot of effort into his slides.
- 2023 – 2024 📖 **Research Assistant.** School of Computing, National University of Singapore.
- Contributed to a **state-of-the-art research on algorithmic techniques for analysis of concurrent software.**
 - The work culminated in a **novel algorithm for detecting certain concurrency bugs from compressed traces of programs.**
 - Developed an experimental program analysis tool (**over 5000 lines of codes**) with **C++**, **Python**, and **Java**.
 - Keywords: **Program Analysis, Formal Verification, Automata Theory.**
- 2023 – 2023 📖 **Teaching Assistant.** School of Computing, National University of Singapore.
- Parallel Computing (CS3210), AY23/24 SEM 1.
 - Feedback from students:
 - * Richard's class is the only class I find worth traveling to school for.
 - * Richard is extremely knowledgeable. He makes learning interactive and fun.
 - Data Structures and Algorithms (CS2040C), AY23/24 SEM 1.
- 2022 – 2023 📖 **Research Assistant.** School of Computing, National University of Singapore.
- Contributed to a **state-of-the-art research on 3D volumetric video streaming.**
 - Worked on a project with over **500 thousand lines of C++ codes.**
 - Keywords: **Algorithms, Computer Graphics, Computer Vision.**
- 2022 – 2022 📖 **Teaching Assistant.** School of Computing, National University of Singapore.
- Data Structures and Algorithms (TIC2001), AY22/23 SEM 1.
 - Taught a class of "lifelong" learners (aged 24 to over 60).
 - Feedback from students:
 - * Richard is very detailed in his explanation.
 - * Richard is a very dedicated and passionate teacher.
 - * Richard is well-versed in a lot of topics. He is able to introduce concepts that stretch out learning beyond the syllabus.
 - Software Engineering & Object-Oriented Programming (CS2113), AY22/23 SEM 1.
 - Feedback from students:
 - * Richard is knowledgeable and structures his tutorials well.
 - * Richard cares about students.

Projects (continued)

- 📌 **Hornet 6.0 Autonomous Underwater Vehicle**
 - The architecture was developed using **ROS (Robot Operating System)**, **Python**, and **C++**.
 - Implemented a system of **Computer Vision** and **Optical Flow** using **OpenCV** to enable environmental tracking and autonomous movement.
- 📌 **Autonomous Robotic Car**
 - **Led a team of three** in developing an autonomous robotic car, equipped with **RTOS (Real-Time Operating System)**.
 - The overall system was developed with **FreeRTOS**, **C**, **C++**, **Assembly**, and **JavaScript**.
- 📌 **Search Engine for Legal Cases**
 - Built a search engine for legal case retrieval with **Python** and **NLTK**.
 - Capable of executing boolean and wildcard queries.
 - Implemented with several index construction/compression, and query refinement techniques.
- 📌 **Chess Engine**
 - Built a classical AI chess engine with **Python**.
- 📌 **VisuTrader**
 - A full-stack paper trading web application, developed using **React**, **Django**, and **PostgreSQL**.
- 📌 **NUS Buddy**
 - **Led a team of four** in developing a **Java** application for NUS students to manage their tasks, lessons, and modules.
 - Responsible for quality assurance (e.g., **all PRs were reviewed**; code were tested with **JUnit**).

Skills

- Languages 📌 Fluent English, Fluent Bahasa Indonesia, Intermediate Japanese.
- Coding 📌 **C++**, **Rust**, **Python**, **Go**, **OCaml**, **C**, JavaScript, TypeScript, Java, C#, SML, Haskell, Coq.
- Web Dev 📌 HTML, CSS, JavaScript, TypeScript, React, Svelte, Sass, Tailwind.
- Frameworks 📌 Unity, OpenMP, CUDA, MPI.
- Misc. 📌 **Academic research, teaching**, consultation, \LaTeX typesetting and publishing.

Miscellaneous

Awards and Achievements


- 2022 📌 **Top Students for Software Engineering & Object-Oriented Programming**, National University of Singapore.
- 2021 📌 **Orbital - Apollo 11 (Advanced)**, National University of Singapore.

Certification





- 2024 📌 **Research-focused Pathway in Computer Engineering**, National University of Singapore.
RfP focuses on preparing students for the R&D sector. Thus, students are required to take graduate-level electives, conduct internship in Research Institutes/Laboratories and work on a research-focused final year project.

Miscellaneous (continued)














Hackathons

- 2022  **NUS Hackers Hack&Roll**
- An annual 24-hour hackathon and the largest student-run hackathon in Singapore.
 - Developed a monkeytype clone but with a little twist.
 - Competed for “Most Annoying Hack”.

Co-Curricular Activities

- 2020 – 2021  **NUS Bumblebee**
We design and build autonomous maritime vehicles capable of navigating underwater and on the water surface, performing complex tasks autonomously.
- 2021 – 2022  **NUS Games Development Group**
We are a group dedicated to making games.
- 2022 – 2023  **NUS PINUS Tech**
PINUS is a group of Indonesian Students in National University of Singapore (NUS) formally established in 2006. In Tech, we provide various software solutions to clients.
- 2023 – 2024  **NUS Comics & Animation Society**
We are a group of friends passionate about all sorts of Japanese Animation, Comics, Events and Games.

Notable Courses

- AY23/24  **CS5469 Fundamentals of Logic in Computer Science**
This is a graduate-level course taken by PhD students. It gives a formal and rigorous introduction to some fundamental results in logic from a computer science perspective, with particular emphasis on algorithmic and computational complexity components.
-  **CS5223 Distributed Systems**
This is a graduate-level course taken by master and PhD students.
-  **CS4212 Compiler Design**
-  **CS3234 Logic for Proofs and Programs**
The Curry-Howard isomorphism, i.e. the realization that mathematical proofs and computer programs are the same thing. This course serves as an introduction to the Coq Proof Assistant.
-  **CS3231 Theory of Computation**
What is the P vs NP problem and why does it matter? How do we decide if a problem is easy or hard? This course is the bedrock of computer science.
-  **CS3230 Design and Analysis of Algorithms**
- AY22/23  **CS4215 Programming Language Implementation**
-  **CS3211 Parallel and Concurrent Programming**
This course explores various concurrency paradigms through the lenses of different programming languages such as C++, Go, and Rust. Fun stuff.
-  **CS3210 Parallel Computing**
This course provides an introduction to the field of parallel computing with hands-on parallel programming experience on real parallel machines. Fun stuff.
-  **CS2107 Introduction to Information Security**
-  **CS2102 Database Systems**
- AY21/22  **CS2106 Operating Systems**
-  **CS2105 Computer Networks**

Miscellaneous (continued)

- **CG2271 Real-Time Operating Systems**

Academic Interests

- Theoretical computer science, particularly topics in computability and complexity theory.
- The theory, design, and implementation of programming languages.
- Program analysis techniques for detecting bugs in concurrent programs.
- Topics in algorithms and data structures.

Hobbies

- Books, Classical Guitar, Mathematics, Movies, Philosophy, Science Communication, Tea.