Akira Li | synthesis0x42

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About

Curious, resourceful, and lively 17 year old student with passion and experience in **quantum computing research**, all things **computer science**, and bubble milk tea! Samples of my code can be found publicly hosted at `/synthesis0x42` on **GitHub**.

Skills

Languages: Python, C++, HTML5, CSS, JavaScript (**primarily Python**). Happy to learn more as required.

Spoken Languages: English (Native), Japanese (Semi-fluent).

Developer Tools: Qiskit, LaTeX, JuPyter, NumPy, cirq, TensorFlow, QuTiP, PyTorch (learning), libsodium, GitHub, GitLab, NeoVim, Visual Studio Code

Experience

Code Camp — Greater Sydney, Australia
Casual assistant tutor — *Jul. 2024 - Present*

- **Casual, part-time** work assisting Head Teachers in providing **one-on-one help to students** during programming classes to keep them on track.
- Working with children in a **collaborative team environment** to foster a love of learning and computer science.

UTS Centre for Quantum Software and Information — Broadway, Australia
*Research work experience - code available **here*** — *Jun. 2024*

- Year 10 work experience five day research internship done under the supervision of Dr. Christina Giarmatzi, contributing to her **research in non-Markovian quantum error**.
- Created a **neural network** with an accuracy of **95+%** that would take in inputs of complex matrix **representations of quantum systems**, generate quantum state tomographies, and then output amount of **negativity** and **vonn Neumann entropy** for each system.
- Learned **TensorFlow** and **QuTiP** within a tight timeframe in order to contribute to **pioneering research in quantum error correction.**

Education

James Ruse Agricultural High School — Carlingford, Australia
Year 12, Class of 2025 — *Feb. 2020 - Present*

Highly competitive and academically rigorous selective high school.

- **Current HSC courses:** Mathematics Extension 2, Science Extension, English Advanced, Physics
- **Completed HSC courses (accelerated):** Software Design and Development (2023), Japanese Continuers (2024)

- **Notable co-curriculars:**
  I was formerly **club executive + leader** at Ruse Art Club, and stepped down to focus on study.
  In 2023, I competed in my school's **National Science and Engineering Challenge** team, and our team won **second place nationally**.
  That same year, I played the a leading role in my school's musical and won the **Colin Anderson Award for Best Male Performance** in School Musical.

Qubit by Qubit's Introduction to Quantum Computing Online
Full course student *Sep. 2023 - Apr. 2024*

Received a scholarship for this in depth online course for high school students going into quantum computing–graduated with a **final grade of 107.89%** (Americans with their extra credit...out of 100, it's a grade of **98%**).

Projects

Quantum-resistant E2E Encrypted Messenging Web App
Available soon? *Jan. 2025 - Present*

Work in progress **JavaScript** implementation of Double Ratchet Protocol with **perfect forward secrecy** with `libsodium` primitives, written for me and my friends out of frustration with current secure messenging apps. Not yet publicly available.

- Created and distributed user surveys to limited audience in order to **determine design specifications.**
- Messages encrypted with the **quantum resistant XSalsa20-Poly1305 cipher**, which is not affected by Shor's period-finding algorithm unlike RSA or Elliptic Curve Cryptography.
- **No phone number needed for registration.**
- Hosted on a subdomain of my personal website.

Quantum State Estimation with Stein Variational Gradient Descent
*Code available **here*** *Jun. 2023 - Present*

Research project with Prof. Christopher Ferrie from University of Technology Sydney.

- Implementation and testing of **Bayesian quantum state tomography** using a variational inference algorithm that minimises KL divergence between probability distributions.
- Utilises **Qiskit** and **PyMC** libraries within interactive Python notebooks.

Personal Site
*Available at **synthesis0x42.digital*** *Jan. 2025 - Present*

It's my site. Coded entirely **by hand in HTML**, **CSS** and **JavaScript**, ZERO static site generator fluff or templating. It's **responsive** and looks good on mobile, **accessible**, uses flexbox a lot, and loads fast (because it's a static site). It also looks pretty cute if I do say so myself, but it's nothing special. Just a **lightweight landing page** that doesn't look generic!