Aaron Elias Zachariah

Mechatronics & Applied-AI Engineer

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SUMMARY

Engineer exploring the intersection of AI and hardware. I am passionate about building intelligent systems, with a strong interest in neural networks and leveraging automation to maximise human output.

EXPERIENCE

Technical Branch Lead · Monash DeepNeuron Jun 2026 - Present

Leading the technical branch at Monash DeepNeuron, the premier AI and optimised-computing student team at Monash, across the engineering teams. Overseeing around 100 members, mentoring and teaching the next generation of engineers in AI and optimised computing.

- Directing and guiding 15+ advanced AI and optimised-computing projects across the branch.
- Serving as a technical recruitment and assessment marker: reviewing applications and interviewing candidates to gauge engineering ability and help select strong additions to the branch.

Full Stack Engineer · Monash University Apr 2026 - Present

MoVA is a large, enterprise-grade RAG (retrieval-augmented generation) assistant built to serve the entire university, securely orchestrating retrieval across institutional student-data systems.

- Designed and built the core prompt version-control system from scratch to manage and serve modular prompt lifecycles safely across the platform's environments.
- Worked on the agentic ingestion pipeline that keeps the knowledge base self-maintaining rather than hand-curated: crawlers sweep institutional sources continuously, and agents parse, structure, and write them into the retrieval store.

Lead Engineer · MLAI (Contract) Apr 2026 - Jun 2026

Led a team of 8 across ML, backend, and infrastructure to build Watt The Hack, a PyPI-published simulation engine and a GKE Autopilot platform that securely ran and scored 160 participants' untrusted code on a live leaderboard.

Project Manager · Monash DeepNeuron Feb 2026 - Jun 2026

Led a team of four engineers building a wearable AR memory assistant for memory-impaired individuals, driving the architecture behind a custom vector-memory store and a low-latency streaming voice pipeline.

- Co-instructed C++ and optimised-computing workshops, lecturing and assisting 80+ students in person.

Optimised Computing Engineer · Monash DeepNeuron Jul 2025 - Present

Built GridLock, a physics- and market-accurate microgrid simulator (AEMO-calibrated battery wear, FCAS, carbon pricing) with adversarial optimisation scenarios and an anti-cheat state allowlist, backed by a substantial test suite. It later became the engine behind Watt The Hack.

Private Tutor & Learning Coach · Self-employed Dec 2022 - Jun 2026

Coached VCE students through Maths Methods and Physics, and just as deliberately through how to learn rather than only what to learn.

- Helped 15+ students reach a study score of 40+ in VCE Maths Methods and Physics.
- Built learning systems with them that outlast the exam, grounded in the evidence-based method from Justin Sung's ICanStudy course.

SELECTED PROJECTS

Watt The Hack Lead Engineer · MLAI · team of 8

A Kaggle-style competition platform that securely runs and scores untrusted competitor code at scale.

- Built the energy-grid simulation engine with MLAI behind a live hackathon for 160 participants over 22 teams, modelling solar curtailment, demand/price forecasting, frequency response (FCAS), and adversarial cyberattack scenarios.
- Architected and deployed a Kubernetes-based (GKE Autopilot) evaluation platform that automatically ran and scored every submitted control algorithm against hidden grid scenarios and optimal-cost baselines, powering a live leaderboard.

Stack: Python · FastAPI · Kubernetes · GKE · Docker · Kaniko · RabbitMQ · PostgreSQL
Live: watt-the-hack.vercel.app · Engine: AaronEliasZachariah/City-of-Melbourne-Watt-the-Hack-Advanced-Track

Locked In
Shipped · Chrome Web Store

A focus tool that blocks distractions based on what you're actually trying to do, not a fixed blocklist.

- A full three-tier system: an MV3 extension + a serverless GCP backend (Hono on Firebase Functions) + a React dashboard, coordinated through Firebase Auth.
- Goal-aware blocking: a quadratics video passes while a gaming video is blocked, served by Gemini 2.5 Flash with Zod-validated input and output.
- A local verdict cache cuts repeat checks from ~300ms to under 10ms.

Stack: TypeScript · React · Chrome MV3 · Firebase Functions · Vertex AI · Gemini · Hono
Live: lockedin.aeliasz.com · Source: AaronEliasZachariah/Locked-IN-AI

Prognosole
Startup · Monash final-year project · upcoming

A self-powered smart insole that captures gait and uses AI to track its variability as an early biomarker of dementia. Predictive, not diagnostic. Built to supplement a GP pathway.

- A CNN+LSTM model tracks short- and long-term gait variability as an early biomarker.
- Self-powered hardware: PVDF piezo energy harvesting with hybrid supercapacitor/LiPo storage, FSR pressure sensors and a 6-DOF IMU sampled at >=100 Hz on a Nordic nRF54L15.
- Sensor data bursts over BLE to a phone app that runs the model. FYP A (initial paper) is complete; FYP B is the final paper and prototype.

Stack: Nordic nRF54L15 · PVDF energy harvesting · FSR + 6-DOF IMU · BLE · CNN + LSTM
Repo private · FYP B in progress, 2026

Viterbi
Beta · Google Play

The only infinite-canvas ink and handwriting app on Android: smooth vector strokes on a surface that never runs out of room.

- A pressure-aware vector ink engine: strokes are stored as resolution-independent paths, so handwriting stays crisp at any zoom on an effectively infinite canvas.
- Built natively with Jetpack Compose and a custom Canvas/graphics pipeline, with pan, zoom, and low-latency stroke capture tuned for stylus input.

Stack: Kotlin · Jetpack Compose · Android · Canvas / Graphics · Vector ink
Google Play: com.viterbi

Modus
In development · v0.13.0 released

A Windows 11 tray app that treats a whole working context (apps, a dedicated Chrome profile window, an exact multi-monitor layout) as one named workflow you activate on demand.

- DPI-safe window placement: positions are stored as fractions of each monitor's work area, so layouts survive DPI changes and a portrait rotation.
- Activating a workflow minimises every app outside its safelist, with four CLI verbs, a tray app with first-run onboarding, and a consumer installer.
- Ships publicly as a versioned Windows installer with a published SHA-256 checksum; verified live on a mixed-DPI two-monitor desktop.

Stack: C# · .NET 9 · WPF · Win32 API · Inno Setup
Releases: AaronEliasZachariah/modus-releases/releases

Omni AR
Completed · Monash DeepNeuron · team of 4

An AR assistant that watches a scene, remembers it, and answers questions about it later. Built for everyday recall, and for people living with memory impairment.

- A hand-rolled vector memory store with normalised cosine similarity, time-windowed recall, and disk persistence.
- A low-latency streaming voice pipeline: Whisper -> Gemini intent router -> sentence-chunked parallel TTS over SSE, tuned for time-to-first-audio.

Stack: Python · Flask · React · Gemini Vision · Whisper · SSE
Source: AaronEliasZachariah/Omni-AR

Quill · offline speech-to-text desktop app, a fork of Handy by cjpais.
Source: AaronEliasZachariah/quill · Upstream: cjpais/Handy

AutoSMS · AI-powered daily SMS scheduler for Android in MVVM Kotlin.
Google Play: com.elias.autosms

Heritage · plain-English to compliant Australian tax invoices on real ATO logic.
Live: heritage-invoice.vercel.app · Source: AaronEliasZachariah/heritage-invoice

Forge · local-first TypeScript AI agent framework, early scaffold.

Real-Time Multiprocessor Image Processing System · FPGA edge detection, two Nios II, 10x speedup.

Warman Design Challenge · autonomous ball-collecting rover with a SolidWorks scoop.

SKILLS

Languages	TypeScript · Python · Kotlin · C · C++ · C# · Rust · JavaScript · Verilog · MATLAB · SQL · Bash

Embedded & hardware	Embedded C for microcontrollers · FPGA development (Verilog, Nios II) · uC/OS-II RTOS · Real-time multiprocessing · Nordic nRF54L15 · BLE · PVDF piezo energy harvesting · FSR & 6-DOF IMU sensor integration · Analogue & digital circuit design · Arduino prototyping · PCB prototyping & soldering · Oscilloscope debugging · SolidWorks CAD · Simulink
AI / ML	Applied LLMs · RAG · Agentic pipelines · Prompt versioning · Vector stores / embeddings · Structured outputs (OpenAI, Zod) · CNNs / CNN+LSTM · Whisper (ASR) · Gemini · Claude Agent SDK · PyTorch · CUDA C++
Backend / infra	FastAPI · Hono · Flask · Node.js · PostgreSQL · Drizzle · RabbitMQ · Kubernetes (GKE Autopilot) · Docker / Kaniko · GCP (Vertex AI, Firebase Functions) · CI/CD
Frontend & app UI	React · Next.js · Astro · Jetpack Compose · WPF · Tauri · Chrome MV3 extensions · Expo / React Native
Tooling / practice	Git & GitHub · Linux & Bash scripting · vitest · zod · Claude Code · Testing & CI

EDUCATION

Bachelor of Engineering (Honours) in Robotics and Mechatronics Engineering, AI stream — Expected 2027
Monash University · Minor in Smart Manufacturing · Melbourne, Australia

CERTIFICATES

SOLIDWORKS CAD Design Associate — Jul 2024
Dassault Systèmes (academic exam, Monash University) · **Certification held** · ID C-4NQ9BRAZVD

Fundamentals of Accelerated Computing with Modern CUDA C++ — Jul 2026
NVIDIA · **Certification held** · ID k5GcGF8uQ1OVIA0JJESlhw

iCanStudy
Dr Justin Sung · Completed