

ALEXEI BROWN



AI / ML Engineer — Sensor Fusion, RF & Computer Vision

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AI engineer with hands-on ML experience and a strong sensor-fusion focus: SDR / RF (HackRF, Airspy, RTL-SDR, Whisper-on-signal), BLE behavioural analysis, wearable health-sensor pipelines, multi-face computer vision, and real-time inference on noisy, adversarial data. Comfortable owning experimental ML work end-to-end — from research and benchmarking through to production deployment in Linux / Docker environments.

TECHNICAL SKILLS

Languages Python (primary) · JavaScript / TypeScript · SQL · Kotlin / Java (Android) · Familiarity with C / C++ and Go

AI / ML PyTorch, TensorFlow, scikit-learn · pandas, NumPy, signal-processing pipelines · Deep learning, attention / transformer architectures · Computer vision (OpenCV, MediaPipe, ArcFace) · NLP, text classification, embeddings, LLM integration · Model evaluation, benchmarking, ablation studies · Behavioural intelligence over time-series sensor streams

Sensor & Signal Software-Defined Radio — HackRF / Airspy / RTL-SDR panoramic scanning, RF spectrum analysis · Real-time DSP: decimation, phase-continuous VFO mixing, anti-alias filtering (rfai-dsp library, 18 tests) · Live waterfall/spectrum visualisation, demod pipelines (WFM/NFM/AM/SSB), RMS-based VAD · Bluetooth Low Energy (BLE) — scanning, fingerprinting, GATT exploration, protocol analysis · Wearable / phone sensor fusion (sleep, HR, HRV, accelerometer, rPPG) · Real-time inference on noisy, incomplete, adversarial data · Speech: Whisper STT (GPU-accelerated via faster-whisper/ROCM), voice activity detection

Infra & MLOps Linux (Arch / CachyOS / NixOS) day-to-day · Docker / containerisation · Git, GitHub, automated CI/CD · OAuth 2.0 implementation · Cloud: Azure (Data Factory, Databricks), GCP (BigQuery), Cloudflare (Pages/Workers) · Edge / on-device inference: Ollama, ONNX Runtime Web, ROCm, quantised models

Robotics & HW MediaPipe-based gesture / hand / face tracking pipelines · Servo control (FEETECH ST-3215-C047) on InMoov i2 robotic hand · SO-ARM101 robot arm with MuJoCo simulation + imitation learning · 3D printing for drones, cinewhoops, payload grabbers, perching legs

EXPERIENCE

Developer Experience Engineer — Sahha · Remote (NZ-based company) · Current

Health Data Intelligence Platform — sensor data → behavioural intelligence

- Build applications and developer interfaces for a biotech health-data platform turning device sensor streams into behavioural intelligence
- Develop backend systems and APIs that transform sleep, step, heart-rate and HRV data into research-backed wellness scores and behavioural archetypes
- Work daily with noisy, incomplete real-world sensor data and ML pipelines that produce population-level insights
- Build integrations for wearables and smartphone health sources via the public showcases [healthconnect.vip](#) and [biomarker.fit](#)

AI Engineer — Hypadrive · Auckland, NZ (remote) · Jun 2022 – 2024

Machine Learning & NLP

- Built NLP datasets and pipelines for email classification and text-analysis tasks
- Tuned ML training parameters and ran structured benchmarking and testing cycles
- Delivered production-ready ML components integrated into commercial platforms
- Worked with custom ML models in healthcare and wellness contexts

Neurotechnology Researcher — Collaborative Academic Projects · 2019 – 2023

AI applications in neuroscience

- Published research on bio-AI systems and brain-computer interface applications
- Presented internationally on ethics and neurotechnology innovation
- Contributed to academic understanding of AI applications in medical technology

Legal Researcher (AI Ethics) — University of Newcastle Law School · Jun – Dec 2021

AI Regulation & Ethics

- Co-authored academic publications on AI regulation and ethics
- Contributed to policy-oriented legal research at the intersection of AI and IP law
- Presented internationally on neurotechnology ethics and innovation

SELECTED PROJECTS

Live demos and full write-ups on [qalarc.com/projects](#)

RFAI — RF Intelligence Platform qalarc.com/projects/rfai-monitor

SDR (HackRF / Airspy / RTL-SDR) → real-time demod → GPU Whisper STT → searchable archive — fully local

Multi-layer software-defined-radio intelligence stack: captures RF across UHF/VHF/HF/marine/aviation bands, demodulates in real time (WFM/NFM/AM/SSB), transcribes voice traffic with faster-whisper on AMD ROCm, extracts entities (callsigns, locations) and archives everything into a searchable SQLite/FTS5 database. The DSP core was extracted into a standalone library (rfai-dsp) with anti-alias decimation, phase-continuous VFO mixing and an abstract SDR backend.

Stack: Python · PyQt5 · HackRF / Airspy / RTL-SDR (SoapySDR) · DSP (rfai-dsp) · faster-whisper + ROCm · SQLite/FTS5

Blue Truth — BLE Scanner qalarc.com/projects/blue-truth

Android BLE scanner with device fingerprinting, GATT explorer and Claude AI analysis

Advanced Android BLE scanner: device fingerprinting, GATT explorer, signal traces over time, behavioural pattern detection (proximity, dwell, repeat encounters), and built-in Claude AI analysis of captured BLE data.

Stack: Android · Kotlin / Java · BLE protocols · Time-series analysis

Smart Glasses Face Tracker qalarc.com/projects/smart-glasses-face-tracker · [live demo](#)

Wearable ISR: glasses → home computer (face recognition) → phone — custom ONNX demographic models

Real-time computer-vision pipeline for smart-glasses use cases: MediaPipe Face Mesh (468 landmarks), ArcFace recognition, multi-face tracking at 30fps with a persistent identity library — all in-browser. Ships custom-trained 'Folkus' demographic models (2.3 MB INT8 ONNX, running via ONNX Runtime Web) that beat commercial APIs: gender 92.1%, age 5.37y MAE, ethnicity 72.2% across 7 groups. Camera glasses stream to a host computer that recognises faces and feeds AI context back via phone.

Stack: JavaScript · MediaPipe · ArcFace · ONNX Runtime Web · Custom ONNX models · WebGL

Visual Biomarker Analyzer qalarc.com/projects/camera-biomarkers · [live demo](#)

Heart rate, HRV and SpO₂ from a webcam — 100% in-browser rPPG

Browser-based remote photoplethysmography pipeline extracting heart rate, HRV, SpO₂ and stress indicators from regular webcam video. No wearable required — pure signal processing on a noisy real-world input.

Stack: JavaScript · rPPG · Signal processing · Browser ML

Qalarc Voice qalarc.com/projects/qalarc-voice

On-device voice-AI stack — TTS, STT and round-trip evaluation

Local voice stack for the qalarc AI-OS: TTS, STT, voice-cloning experiments and a round-trip evaluation harness covering radio-protocol-style edge cases.

Stack: Python · TTS · Whisper · Edge-case evaluation

Path Walker — Face-Trackd 3D Parallax qalarc.com/projects/parallax-threejs · [live demo](#)

Off-axis 3D projection driven by face tracking

Three.js-based virtual room using off-axis projection driven by webcam face tracking, so head movement parallaxes the entire WebGL scene in real time.

Stack: JavaScript · Three.js · MediaPipe Face Mesh · WebGL

EDUCATION

University of Technology Sydney

Master of Intellectual Property and Patent Law · In Progress

University of New South Wales

Bachelor of Science (Honours), Neuroscience & Pharmacology · First Class Honours

Generation Australia

Data Analytics Graduate Program

- Full-time, project-based training in data analytics, Python, SQL and data visualisation
- Led sprint planning, stand-ups, retrospectives and team coordination
- SQL, Python (pandas, NumPy, Seaborn), Power BI, advanced Excel

PUBLICATIONS & PRESENTATIONS

- Published research on AI applications in neurotechnology
- International presentations on AI ethics and neurotechnology innovation
- Research on tactile perception relevant to VR interfaces and prosthetic feedback
- Contributions to academic work on AI regulation and intellectual property

KEY COMPETENCIES

RF / SDR HackRF panoramic scanning, waterfall + spectrum visualisation, RMS VAD, Whisper STT on captured signals

Multi-Modal Fusion Combining BLE proximity, RF, vision and wearable sensor streams into actionable inferences

Real-World Data Noisy, incomplete, adversarial datasets — sensor cleanup, time-series fusion, behavioural archetypes

Custom ML Models PyTorch / TensorFlow, attention / transformer architectures, structured benchmarking and ablations

Computer Vision MediaPipe, ArcFace, OpenCV — multi-face tracking, gesture recognition, rPPG biomarker extraction

Production Deploy Docker, Linux, CI/CD, on-device inference, model evaluation and post-deployment monitoring

