ALEJANDRO JACKSON

Quantum Software Engineering | MSc Candidate, Sorbonne Université
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EDUCATION

Sorbonne Université - M.S. Quantum Information — Paris, France | Expected June 2027
Coursework: Basic Quantum Physics for CS, Quantum Physics for CS, Quantum Circuits & Query Complexity, Shannon Theory (Information Theory)

Brown University - ScB Computer Science (Software Principles & Design Pathways) — Providence, RI | May 2025
Coursework: Graduate Software Engineering, Designing Humanity Centered Technology, UI/UX, Design & Analysis of Algorithms, Responsible CS in Practice, Logic for Systems, Machine Learning.

QUANTUM & TECHNICAL SKILLS

Quantum & Numerical Computing: Python (NumPy, SciPy), Linear Algebra, Matplotlib, Statistical Modeling, Statevector simulation, Noise modeling (amplitude/phase damping), Benchmarking (mean ± std, fixed seeds), Qiskit Runtime, Quantum Compilation, Quantum Simulation, Quantum-Classical Hybrid, Quantum Machine Learning
Systems & Performance: MPI, OpenMP, SIMD, AVX2, Grid5000, Profiling, Memory scaling analysis
Technical: Software Requirements/Specifications Documents, High-Level Architecture Diagrams, AWS, Git/GitHub
Programming: React, TypeScript, TailwindCSS, Node.js, Spark, Next.js, Postgres, System Design, Data Storage, Java, JavaScript, Python, CSS

FEATURED PROJECTS

Details and repos: alejandrorjackson.vercel.app

Quantum Algorithm & Simulation Benchmark Suite | Python, Qiskit, NumPy, pytest — Feb 2026
- Measured gradient variance scaling via parameter-shift rule on IQP circuits (n=4–12 qubits, d=2–10, K=20 trials): tied parameters yield positive log-variance slope (+0.26 – +0.33); untied exhibit barren plateau (−0.24 – −0.35).
- Benchmarked shot-noise tradeoffs: mapped Pareto frontier of accuracy (mean_abs_error) vs runtime; identified shot threshold for <1e-2 error.
- Implemented transpilation optimization passes (gate cancellation, rotation merging); quantified depth reduction across Qiskit optimization levels 0–3.
- Config-driven, deterministic seeds, CI-tested; all results trace to trial-level logs and publication-style plots.

Quantum Circuit Simulation & Noise Analysis Suite | Python, NumPy, Matplotlib, pytest — Sept – Dec 2025
Pure-Python quantum simulation framework: statevector engine, decoherence dynamics, quantum measurements, Bloch sphere visualization across 11 modules.
- Designed and validated a statevector quantum circuit engine supporting N-qubit circuits with 167+ validation tests.
- Implemented 3 Kraus-operator noise channels (depolarizing, phase/amplitude damping) with 70+ validation tests and µs-level performance benchmarks.
- Animated Bloch sphere decoherence trajectories visualizing state evolution under repeated noisy gate application for 4 initial states.
- Benchmarked scaling (2–8 qubits, 10–20µs per noise op) confirming expected $O(2^n)$ runtime growth and $2^n \times 16$ bytes memory model.

Distributed Meet-in-the-Middle Attack | C/MPI/OpenMP/AVX2, Grid'5000 — Nov – Dec 2025
Hybrid distributed MITM attack combining MPI, OpenMP, and AVX2 SIMD (8-way vectorized Speck64/128) achieving 171× speedup on 512 MPI ranks.
- Achieved 171x speedup (33.5% efficiency) at n=36 and 120x at n=40 via distributed dictionary sharding, OpenMP threading, and 8-way AVX2 vectorization.
- Enabled n=40 by introducing a 9-pass time-memory tradeoff under 60% RAM cap; analyzed scaling bottlenecks (dict_probe + communication).

SOFTWARE ENGINEERING EXPERIENCE

Kyron Medical, *Director of Technical Engineering (Part-Time, Concurrent with MSc)* — Nov 2024 - Feb 2026
- Most senior engineer across 13 production subdomains (11 HIPAA-regulated clients); architected HIPAA-compliant infrastructure (DB design, API layer, access control, encryption) supporting 103 API endpoints.
- Built ML-based Denial Intelligence pipeline analyzing >$5M in claims data; deployed voice-AI automation across 4 call workflows (eligibility, claim-status, prior auth, appeal follow-up).
- Designed blue/green deployment architecture for zero-downtime releases across 11 client subdomains.

Kyron Medical, *Technical Consultant*
- Delivered full-stack systems and infrastructure automation for early-stage healthcare platform.
- Built QA/QC operations pipelines standardizing deployment validation across 11 client environments.
- Implemented secure database schema and foundational API layer supporting HIPAA-compliant workflows spanning 23 database tables and FHIR R4-compliant data exchange.
- Led infrastructure setup across 11 clients enabling first deployment within 1 day of client sign-on.

Brown University, *Head Teaching Assistant* — Providence, RI | Oct 2024 – May 2025
Head TA for CS0320 – Intro to Software Engineering
- Led and mentored a team of 11 TAs supporting ~130 students in a semester-long full-stack engineering course.
- Defined grading rubrics and architectural standards enforcing testing, modularity, and production-quality code across 6 multi-week assignments.
- Conducted twice-weekly code reviews (checkpoint + final) and held 2 hrs/week of office hours debugging TypeScript/React projects.
- Acted as technical lead between professor and staff, aligning evaluation standards and resolving escalated technical issues.
- Previously served as UTA (Nov 2023 – Oct 2024), reviewing ~160 student codebases and authoring reference solutions in TypeScript/React.

HONORS & LANGUAGES

Hispanic Scholarship Fund Scholar, 2021 **Languages:** English (Native) · Spanish (advanced) · French (B1+)