Jasper Sands

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RESEARCH INTERESTS

Quantum algorithms and complexity, hybrid quantum-classical optimization, quantum machine learning (algorithmic foundations), quantum error correction and fault-tolerant considerations

EDUCATION

Columbia University September 2025 - May 2027
Master of Science in Computer Science, GPA: 3.91/4.0
Thesis Track Advisor: Professor Henry Yuen
TA: Introduction to Quantum Computing
Relevant Coursework: Quantum Simulation and Computing Lab, Quantum Optimization and Machine Learning, Quantum Engineering

Washington University in St. Louis August 2021 - May 2025
Bachelor of Science, GPA: 3.81/4.0
Majors: Computer Science, Economics
Minor: Political Science
TA: Reverse Engineering and Malware Analysis, Parallel and Concurrent Computing
Relevant Coursework: Machine Learning, Artificial Intelligence, Computer Security, Analysis of Algorithms, Algorithms for Biosequence Comparison

PUBLICATIONS & PREPRINTS

Manuscripts in preparation.

RESEARCH EXPERIENCE

Graduate Researcher September 2025 - Present
Cidon Systems Research Lab, Columbia University
- Collaborating with Dr. Asaf Cidon and Barracuda Networks on machine learning methods for phishing detection
- Designing and evaluating classification pipelines that integrate language model embeddings with real-world email telemetry
- Studying precision and recall tradeoffs and false positive minimization in large-scale production email systems

Graduate Researcher September 2025 - December 2025
Desdr Open Insurance Toolkit, Columbia University
- Contributed to the ongoing development and extension of an open-source insurance modeling toolkit with Dr. Eugene Wu for NGOs and governments serving rural farming communities
- Processed SMS based survey data into actuarial and climate-risk features under severe data sparsity constraints
- Assisted in building models and dashboards to estimate expected losses and support micro-insurance program design

Graduate Researcher May 2025 - December 2025
Complex Resilient Intelligent Systems Lab, Columbia University
- Conducted research under Dr. Venkat Venkatasubramanian on improving reliability in AI-driven drug discovery workflows
- Developed ontology and graph based methods to ground AlphaFold predictions and reduce hallucinations in generative outputs
- Integrated molecular graph data and systems engineering principles to produce interpretable protein-structure reasoning pipelines

Undergraduate Researcher September 2024 - June 2025
Foster System Database, Washington University in St. Louis
- Worked under the supervision of Dr. Ian Fillmore on a system enabling cross-state policy comparison and interactive analysis of foster-care outcomes
- Fine-tuned LLaMA 3 models using Unsloth for question answering over a corpus of 50k foster-care policy documents
- Implemented human-in-the-loop reinforcement learning workflows deployed on Hugging Face Spaces

Undergraduate Researcher September 2024 - June 2025
Computer Vision & AI Lab, Washington University in St. Louis
- Conducted research with Dr. Umar Iqbal on large-scale analysis of online behavior and privacy-related trends
- Built distributed data-collection and processing pipelines parsing billions of Reddit posts
- Applied statistical modeling to study population-level behavioral and demographic patterns in online discourse

TEACHING EXPERIENCE

Common responsibilities across all appointments included holding office hours, grading homework and exams, and providing one-on-one student support.

Teaching Assistant, Columbia University January 2025 - Present
Introduction to Quantum Computing
- Designed problem sets involving quantum circuit simulation and algorithm analysis
- Supported students on conceptual foundations including measurement, entanglement, and basic quantum algorithms

Teaching Assistant, Washington University in St. Louis January 2025 - May 2025
Parallel and Concurrent Computing
- Designed and evaluated assignments on concurrency, synchronization, and performance analysis

Teaching Assistant, Washington University in St. Louis August 2024 - December 2024
Reverse Engineering and Malware Analysis
- Assisted with instruction for an upper-level undergraduate systems and security course
- Led review sessions during project and exam periods

INDUSTRY EXPERIENCE

Security Engineer Intern, Highnote May 2024 - August 2024
- Designed and deployed a company-wide SIEM integrating AWS, GCP, and Datadog logs into Elasticsearch
- Built ingestion pipelines supporting over 1 TB/day of security telemetry across agents, data streams, and APIs
- Implemented 100+ rule-based and ML assisted alerts for suspicious authentication, command, and data access activity

Software Engineer Intern, Mindtrip June 2023 - August 2023
- Developed internal admin dashboards using JavaScript and Ruby on Rails via Retool
- Enabled secure production data access and operational controls, eliminating manual database interventions
- Reduced operational overhead by over 250 engineering hours per month

Associate Application Security Engineer, Bugcrowd May 2020 - August 2020
- Conducted vulnerability triage and validation for submissions from a global researcher community
- Collaborated with enterprise clients to prioritize remediation and improve long-term security posture

TECHNICAL SKILLS

Quantum Algorithms and Computing
Quantum algorithms and complexity, amplitude amplification and estimation, Hamiltonian simulation, quantum phase estimation (QPE), quantum walks, variational and hybrid quantum-classical algorithms (VQE, QAOA), quantum error correction

Programming Languages
Python, C++, C, MATLAB

Machine Learning and Scientific Computing
PyTorch, TensorFlow, NumPy, SciPy, Pandas, NetworkX, scikit-learn

Quantum Software and Simulation
Qiskit, Cirq, PennyLane; statevector and noise-aware simulation, circuit optimization and transpilation, backend execution and benchmarking

Mathematics and Theory
Linear algebra and numerical methods, tensor methods, probability theory, optimization, quantum complexity theory (BQP, QMA), oracle and query complexity, asymptotic analysis

Systems and Research Tooling
Linux/Unix, Git, Docker, Jupyter, LaTeX, CUDA

COMPETITIONS

- **Overall Winner**, iQuHACK 2026; Qualified for NYUAD Quantum Hackathon for Social Good, April 2026
- **Audience Favorite**, Hamoniqs Quantum Design Hackathon 2026
- **Runner-Up**, Qualcomm Snapdragon Multiverse Hackathon 2026

LEADERSHIP & SERVICE

- **CU Quantum Algorithms Research Reading Group —** Founding Member
- **St. Louis Tutor Me Program** — Volunteer Tutor (K-12 math and reading)
- **WashU Gymnastics Club —** Team Captain
- **WashU Votes** — Student Organizer (voter registration and advocacy)