

Rylan Noah Malarchick

(832) 803-2737 | rylan1012@gmail.com | linkedin.com/in/rylan-malarchick | github.com/rylanmalarchick | **US Citizen**

EDUCATION

Embry-Riddle Aeronautical University <i>BS/MS Engineering Physics (Accelerated), Spacecraft Instrumentation Track, Comp. Math Minor</i>	Daytona Beach, FL <i>Expected May 2027</i>
---	---

WORK EXPERIENCE

NASA Goddard Space Flight Center <i>OSTEM Intern – Atmospheric Remote Sensing</i>	May 2025 – Aug 2025 <i>Greenbelt, MD</i>
<ul style="list-style-type: none">Developed ML framework for cloud base height retrieval from 1,426 NASA ER-2 airborne observations across 5 research flights (3 used for final analysis), engineering 38 atmospheric features (10 ERA5 base + 28 physics-derived)Achieved $R^2 = 0.744$ with $MAE = 117.4\text{m}$ using rigorous per-flight cross-validation; discovered catastrophic domain shift ($R^2 = -15.4$) in cross-flight validation, developed few-shot adaptation recovering $R^2 = 0.57\text{--}0.85$First author on preprint: <i>“Atmospheric Features Outperform Images for Cloud Base Height Retrieval”</i>	

PROJECT EXPERIENCE

QubitPulseOpt – Quantum Optimal Control <i>QuTiP, Python, GRAPE</i>	Oct 2025 – Present
<ul style="list-style-type: none">Developed pulse optimization framework achieving 99.14% X-gate fidelity in 20ns ($77\times$ error reduction vs. fixed-amplitude Gaussian baseline) using GRAPE with Lindblad master equation for T_1/T_2 noise modelingHardware-aware workflow via IQM Garnet 20-qubit processor API for calibration retrievalStrict engineering standards (RAII, zero-warning builds, CI/CD): 864 unit tests, 74% coveragePreprint: arXiv:2511.12799; GitHub: github.com/rylanmalarchick/QubitPulseOpt	
High-Performance VQE <i>PennyLane, JAX, OpenMPI</i>	Oct 2025 – Jan 2026
<ul style="list-style-type: none">Achieved 117\times speedup on H_2 ground state computation via JIT, GPU, multi-GPU, and MPI optimization on ERAU Vega HPC (4\times H100 GPUs, 192 AMD EPYC cores)Preprint: arXiv:2601.09951 (with A. Steed): <i>“Parallelizing the Variational Quantum Eigensolver: From JIT Compilation to Multi-GPU Scaling”</i>	
Quantum Circuit Optimizer <i>C++17, CMake – Complete</i>	Dec 2025
<ul style="list-style-type: none">Production C++ quantum compiler: OpenQASM 3.0 parser, DAG IR, 4 optimization passes, SABRE routing (linear/grid/heavy-hex); 340 unit tests; designed for cross-layer fidelity analysis	
CUDA Quantum Simulator <i>CUDA, C++17 – Core Complete</i>	Dec 2025
<ul style="list-style-type: none">GPU-accelerated state vector simulator with optimized gate kernels; RAII memory via <code>CudaMemory<T></code>, Lindblad noise models, 9 test suites; up to 29 qubits on single GPU	
LLVM Loop Unroll Analyzer <i>LLVM 18, C++, Scalar Evolution</i>	Dec 2025
<ul style="list-style-type: none">Custom LLVM pass for loop analysis and unroll optimization using Scalar Evolution; foundation for quantum compiler infrastructure work	
AIRHOUND – UAV Pursuit System <i>YOLOv8, ROS2, NVIDIA Jetson</i>	Sept 2024 – Present
<ul style="list-style-type: none">PI and perception lead on team of 7 developing autonomous UAV pursuit system; accepted for presentation at SPIE Defense & Commercial Sensing 2026 (April 28, 2026)	

TECHNICAL SKILLS

Programming Languages: Python, C/C++, MATLAB, Bash/Shell
Compilers: LLVM (custom passes, Scalar Evolution), OpenQASM 3.0, DAG-based IR, circuit optimization
Quantum Computing: PennyLane, QuTiP, Qiskit, JAX, GRAPE optimization, quantum simulation
High-Performance Computing: CUDA, OpenMPI (mpi4py), GPU acceleration (NVIDIA H100), JIT compilation
Machine Learning: PyTorch, TensorFlow, scikit-learn (XGBoost, LightGBM), NumPy, Pandas
Developer Tools: Git/GitHub, Docker, Linux/Unix, CI/CD (GitHub Actions), pytest, CMake

INVOLVEMENT & AWARDS

Athletics: NCAA Division II Cross Country and Track – 5k/10k (Aug 2023 – Present); 136th at 2025 NCAA D2 XC Nationals
Awards: Goldwater Scholarship Campus Finalist, USTFCCCA Academic All-American (2024, 2025), ERAU Dean’s List