Kaitlyn Pak

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EDUCATION

Carnegie Mellon University, B.S. in Electrical and Computer Engineering — **May 2028**
Minor in Statistics — *Pittsburgh, Pennsylvania*

EXPERIENCE

Research Intern - Gravitational Wave Cosmology | Carnegie Mellon University — *August 2025 - Present*

- Developed a PyPI-installable Python package used for gravitational-wave localization analysis, generating reproducible statistical outputs and figures across 50+ events
- Implemented a parallelized sky-map ranking system performing 300+ BAYESTAR/BILBY comparisons per run, achieving order-of-magnitude speedups over serial workflows
- Integrated automated best-skymap selection into an event-overlap pipeline, enabling fully automated, production-level processing of overlapping gravitational-wave events

INDEPENDENT RESEARCH

Reinforcement Learning for Market Making under Realistic Microstructure Constraints *January '25 - Present*
Python, C++, Reinforcement Learning, Market Microstructure

- Designed and implemented a realistic limit-order-book–based market simulation for RL-driven market making
- Modeled execution uncertainty, inventory constraints, and latency effects to avoid common simulation artifacts
- Developed an evaluation protocol decoupling training rewards from performance metrics to prevent reward hacking
- Assessed robustness using out-of-sample testing, inventory risk, and PnL stability across market regimes

PROJECTS

Limit Order Book Simulator | C++, CMake

- Implemented a high-performance limit order book with strict price-time priority using integer tick sizes
- Built a core matching engine supporting market and limit orders, partial fills, and cancellations while preserving bid–ask invariants
- Developed an event-driven market simulator with Poisson order arrivals for realistic market dynamics

Neural Network from Scratch | C, Linear Algebra

- Built a fully connected neural network in C for XOR classification using only standard libraries
- Implemented forward/backpropagation, sigmoid activation, and stochastic gradient descent
- Achieved >95% accuracy across 10,000 training epochs with convergence analysis

TECHNICAL SKILLS

Languages: Python, C, C++, MATLAB

Skills: Probability, Bayesian Inference, Monte Carlo Simulation, Reinforcement Learning

Tools: Numpy, Pandas, scikit-learn, SQL, Git, Linux, CMake, Parallel Processing

ACTIVITIES

Carnegie Mellon Solar Racing | *Optimization* | Display Lead — *August 2025 - Present*

- Built real-time sensor visualization pipelines using Arduino and Raspberry Pi

Carnegie Mellon Racing | *Finance* — *June 2025 - Present*

- Managed six-figure budget allocation and implemented procurement and forecasting processes