Jay Bae

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Physicist specializing in modeling complex systems (PDEs, Monte Carlo, ML) and computer vision with experience in developing and deploying high-Sharpe-ratio strategies, seeking a quantitative researcher role to discover and model new market alphas.

Education

Ph.D. & M.S.	*Physics*	**Cornell University**	*Aug. 2022*
B.S.	*Physics*	**University of Rochester**	*May 2016*

Experience

Quantitative Research Projects — *Mar. 2020 - Present*

- Developed and deployed live, market-neutral crypto strategies using CoT (Commitments of Traders) report data from CFTC (Commodity Futures Trading Commission), achieving a 1.8-2.1 Sharpe ratio.
- Authored and maintain an open-source Python project (EasyIB) for the Interactive Brokers API, supporting stock and option trading. The project has achieved over 100 stars on GitHub and thousands of downloads on PyPI.
- Researched fast realization on Post Earnings Drift (PED) effects and built strategies (1.6-1.9 Sharpe ratio) based on various Standardized Unexpected Earnings (SUE) signals. Concluded PED is most prominent in Japan and Korea market.

Samsung Electronics — Hwasung, South Korea

Staff Engineer (CL3) — *Dec. 2023 – Present*

- Engineered image processing workflows to extract critical failure-mode metrics from high-noise electron microscope images. Developed custom filters and contour detection algorithms to isolate and measure nanometer-scale defects.
- Developed a custom computer vision machine learning solution to automatically classify wafer map failure patterns, reducing reporting cycle time by over 80%. Implemented the full data pipeline from ETL to model training.

Cornell University — Ithaca, NY

Research Assistant - High intensity, femtosecond photoemission (283 citations) — *Oct. 2016 – Aug. 2022*

- Achieved a 1000x speedup in electron beam simulation by developing machine learning surrogate models, which predicted electron beam properties (horizontal/vertical emittances and beam sizes) with 98 % accuracy.
- Predicted an unconventional correlation between electron beam properties and laser intensity used for photoemission. Solved the Boltzmann equation (PDE) numerically to calculate the time-dependent Fermi-Dirac distribution of electrons.
- Built a Monte Carlo simulation code to compute the photoemission properties of GaAs under high-intensity laser operation conditions. Calculated the nonequilibrium electron dynamics based on Fermi's Golden Rule.
- Improved III-V semiconductor (GaAs, GaN) photocathodes lifetime by an order of magnitude with unconventional CVD recipes (Cs-Sb, Cs-Te) for spin-polarized electron source applications under ultra-high vacuum (~10^{-10} Torr) conditions.

Skills

Programming: Python, C, C++, Java, MATLAB, SQL, Dart, Mathematica, LabVIEW, LaTeX

Libraries & Technology: Scikit-learn, PyTorch, TensorFlow, pandas, Git, Docker, REST, AWS, Microsoft Excel, GCP

Selected Papers

1. **Bae, J.,** *et al.* "Brightness of femtosecond nonequilibrium photoemission …" **JAP** 124, 244903 (2018) - **Editor's Pick**
2. Chubenko, O., **Bae**, *et al*. "Monte Carlo modeling of spin-polarized photoemission …" **JAP** 130.6, 063101 (2021)
3. **Bae, J.,** *et al.* "Operation of Cs–Sb–O activated GaAs in a high voltage DC electron gun …" **AIP Advances** 12, 095017 (2022)