Joshua Lin

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Education

Princeton University, A.B. Mathematics (Expected) Aug 2023 - May 2027

Minors in Computer Science, Statistics & Machine Learning *GPA: 3.8/4.0*

– Relevant Coursework: Linear & Nonlinear Optimization†, Machine Learning Theory†, Functional Analysis†§, Complex Analysis, Algorithmic Game Theory, Theory of Algorithms, Probability & Stochastic Systems.

– Awards & Activities: Princeton Physics Pyka Memorial Prize for "promise in independent research," ACM Competition Chair, Tournaments Officer for Princeton Quantitative Traders, Tour Director for the Princeton Debate Panel.

† Denotes graduate coursework. § Denotes upcoming fall coursework.

Experience

Statistical Astrophysics Researcher Oct 2024 - Present

Princeton Astrophysical Data Laboratory *Princeton, NJ*

– Developing message-passing neural network in PyTorch-Geometric using individual properties of over $\mathcal{O}(10^5)$ galaxies and optical fibers to optimize interactions. Current model attains 87% performance of a constraint-free upper bound.

– Designed heterogeneous bipartite graph to model a class of high-dimensional combinatorial optimizations with $\mathcal{O}(10^{10})$ binary variables, constructing a noisy family of smooth functions to discretize the output. See blog post.

– My work will guide the Prime Focus Spectrograph's second-year exposures later this fall. [The PFS is an international consortium of over twenty-five universities/national laboratories studying galaxy evolution.] Advised by Peter Melchior.

Directed Reading Program Participant Jun 2024 - Aug 2024

Princeton Mathematics Department *Hybrid | Princeton, NJ*

– Accelerated one-on-one study of topics in general relativity and cosmology, with the requisite semi-Riemannian geometry.

– Studied under Anthony Coniglio; program coordinated by Sergiu Klainerman.

Mathematics Teaching Assistant Jun 2024 - Aug 2024

Jane Street Capital *New York, NY*

– Taught topics in probability, combinatorics, and number theory at the Academy of Mathematics and Programming.

– Facilitated probability games, market-making simulations, and the Electronic Trading Challenge.

Computational Physics Researcher Jan 2023 - May 2023

NASA Jet Propulsion Laboratory *Pasadena, CA*

– Developed numerical methods to approximate the ages of lithospheric bands and identify regions of geologic co-/re-activation in Europa's nondeformed and chaos terrains using NASA's geographical information system (GIS) databases.

– Fundamentally characterized unmapped regions on Europa by applying modern physical models to *Galileo* data.

– Advised by Robert Pappalardo, Erin Leonard, and Michelle Selvans. Presented at NASA-JPL summer research conference to physicists on the *Europa Clipper* science team.

Projects

Emergency Signaling System Nov 2023

Top Prize, HackPrinceton *Princeton, NJ*

– Developed "Moco" to discretely execute preset emergency calls, texts, and other customizable actions, triggered by customizable wrist gestures pre-calibrated with iOS app.

– Implemented gesture matching between live Apple Watch accelerometer/gyroscopic data and calibrations using iterative closest point for spatial transformations and dynamic time warping for temporal mappings.

Skills, Interests, & Awards

Skills	Languages: C, C++, Python. Libraries: PyTorch/PyG, CVXPy, Tensorflow, Pandas, Scipy.
Interests	Mathematical optimization; statistical learning theory; asymptotic statistics; high-dimensional probability.
Awards	Top Prize at Jane Street Electronic Trading Challenge, Bill and Melinda Gates Scholarship, USAPhO Semifinalist with Honorable Mention, Wells Fargo Wealth Management Competition National Champion.