

# KARTHIK SELVARAJ

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## SUMMARY

Entry-level candidate with strong quantitative, programming, and financial modeling skills. Experienced in algorithmic development, statistical analysis, and financial instruments. Eager to apply academic knowledge and internship experience to trading roles in fast-paced, data-driven environments.

## EDUCATION

**Purdue University** – West Lafayette, IN

May 2025

- B.S. in Computer Engineering, *Concentration in AI* (2024)
- B.S. in Mathematics and B.S. in Statistics (2025)
- **Coursework:** Probability, Statistical Inference, Introduction to AI, Computer Vision, Python for Data Science, Data Structures in C, OOP in C++, Discrete Math, Ordinary Differential Equations, Linear Algebra I and II, Algebra, Real Analysis, Complex Analysis, Signals and Systems, Compilers, Operating Systems, Operations Research – Optimization

## EXPERIENCE

**Mizuho Bank** – New York, NY

May 2023 – Aug 2023

Equity Derivatives

- Implemented index-based Quantitative Investment Strategies (QIS) trading products for investments in the commodities market through various financial instruments including swaps, options, futures, and forwards contracts.
- Analyzed requirements for two trading desks, Convertible Bonds and Equity Derivatives, to define requirements for a new Order Management System, to drive the delivery of a third-party vendor through daily standups and weekly status updates to stakeholders.
- Automated the delivery of 31 quantitative reports, the calculation of implied volatility of options contracts, and the extraction of bilateral swap data from the Murex trade database.
- Conducted study to determine applicability of Quantum Computing and its future effects on banking and financial service institutions industry-wide for senior management.

**Siemens EDA** – Wilsonville, OR

May 2022 – Aug 2022

Software Engineer

- Designed 3 parsing algorithms to translate chip configuration files, in less than 827 ms, to Calibre Interactive layouts by applying analytical thinking skills. Chip-verifiers can now quickly spin up "Calibre Interactive" chip verification software with all characteristics and requirements preloaded.
- Automated regression testing to quantitatively validate and detect regression for 67 applications.
- Standardized the method for creating local Calibre environments across development teams by creating automation to dynamically deploy stand-alone environments.

## PROJECTS & RESEARCH

**Options Pricing Application** – Personal Project

Jun 2024 - Present

- Developed streamlit web app that prices European options contracts to support developing trading strategies and learn about financial markets. Accepts user-inputted information such as spot price, strike price, time to maturity, interest rate, dividend yield, and volatility using various models.
- Developed quantitative model by implementing the Black-Scholes Model, Monte-Carlo Method, Binomial Pricing Model, and Trinomial Pricing Model to return prices of both call and put options.
- Implemented quantitative script to calculate Value at Risk (VaR) and Conditional Value at Risk (CVaR) for some models.
- Interactive web app can be found here: <https://ks-option-pricing.streamlit.app/>

**Lane Detection Research** – Purdue Vertically Integrated Projects (VIP)

Aug 2023 - Present

- A committee of 3 professors selected members to collaborate in a teamwork-oriented group of 19 students to solve complex problems in image processing and computer vision by implementing and optimizing deep learning models of 17 selected research papers.
- Responsible for mentoring and providing practical training to new members of the team.
- Organized the creation and presentation of results to the professors weekly.
- Implemented modified YOLOv1, YOLOv2, and YOLOv4 CNN-based architectures to produce lane line and lane segmentation predictions using PyTorch on the BDD100K dataset which includes dashcam images of cars driving in various weather and lighting conditions.
- Applied problem solving skills to optimize the LaneSegNet and BEVFormer architectures to create more accurate lane mapping results that include geometric and topological road information utilizing a dataset of 6-second long videos of cars driving with multiple camera angles.
- Wrote research paper detailing LaneSegNet and BEVFormer optimizations and findings here: <https://arxiv.org/abs/2406.15946/>

## SKILLS

- Python, PyTorch, NumPy, Pandas, Scikit-Learn, Matplotlib, Plotly, Streamlit
- C, C++, Verilog/SystemVerilog
- MATLAB, Unix and Linux systems, git
- Java, JavaScript, HTML, CSS