Darren Y. Key

dyk34@cornell.edu | (404) 849-3621 | darrenkey.github.io | github.com/DarrenKey/ | linkedin.com/in/darren-key/

EDUCATION

Cornell University, College of Engineering **Ithaca, NY**
Bachelor of Science in Computer Science *Expected May 2025*

- Cumulative GPA: **3.988**
- Relevant and Current Coursework: Graduate Reinforcement Learning • Operating Systems • Natural Language Processing • Large-Scale Machine Learning • Computer Systems • Algorithms • Functional Programming • OOP and Data Structures
- **Honors and Awards: 2024 Cornell BOOM Info Sci Faculty Choice for Best Project, 2023 Cornell BOOM CS Faculty Choice for Best Project** (out of 100+ participants, end-of-year project exposition for Cornell) • **Rawlings Presidential Scholars Program** (~1%, Cornell Undergraduate Research Program) • **Best Use of Google Cloud** (Big Red Hacks)

EXPERIENCE

Quantitative Trader Intern, IMC Trading **Chicago, IL**
Equity Options Intern *June 2024 – August 2024*

- Created accurate PNL forecasting model via gradient-boosted trees resulting in a strategy increasing simulated PNL by 36% over 10 symbols; programmed robust backtesting engine and engineered well-normalized features to increase PNL capture
- Placed 1st in automated trading simulation game via fast and automated theoretical price adjustments

NASA, Ames Research Center **Mountain View, CA**
AI & ML for Air Traffic Management, OSTEM Intern *June 2023 – August 2023*

- Used Natural Language Processing (NLP) to automate extraction of information from Federal Aviation Administration (FAA) webinars for use in operations planning; bolstered performance of previous best model from 51% accuracy to 77% accuracy
- Created a bag-of-words and TF-IDF SVM, bi-LSTM with global attention, and BERT transformer model in Pytorch and SpaCy
- Utilized under-sampling and class weights to deal with extreme class imbalances and improved recall to 0.83 via thresholding

PUBLICATIONS

[1] Tang, H., Key, D., & Ellis, K. (2024). WorldCoder, a Model-Based LLM Agent: Building World Models by Writing Code and Interacting with the Environment. arXiv preprint arXiv:2402.12275.

- **14 Citations, Accepted in NeurIPS 2024**

[2] Key, D., Li, W., & Ellis, K. (2022). I Speak, You Verify: Toward Trustworthy Neural Program Synthesis. arXiv. https://doi.org/10.48550/arXiv.2210.00848

- **21 Citations, Presented at the 2022 Workshop on Dependable and Secure Software Systems at ETH Zurich**

[3] Key, D., He, A , Bulling, M., Chang, A., Shapiro, S., & Lee, E. (2024). HLSTransform: Energy-Efficient Llama 2 Inference on FPGAs Via High Level Synthesis. arXiv preprint arXiv:2405.00738.

- **2 Citations, Accepted into 2024 ICML Workshop on Efficient Systems for Foundation Models**

PROJECTS

AI-Generated Lo-fi Music | https://darrenkey.github.io/AILofiGenerator/ **May 2023**

- Implemented cross-attention layers with T5 embeddings using Pytorch and Huggingface via test-driven development
- Trained transformer models with TensorFlow: Museformer (Microsoft's SOTA model for music generation) and Transformer-XL
- Constructed frontend using React and Tone.js, finetuned cascading diffusion models and hosted models via Google Cloud

MathSearch | https://github.com/CornellDataScience/MathSearch/ **December 2022**

- Built with a team of 12 a search engine utilizing computer vision to find user-specified LaTeX formulas in scientific papers
- Trained YOLOv5 for object detection and VGG-16 in Pytorch with a contrastive learning objective for image semantic search
- Created REST API backend in Flask to process requests; used AWS S3 buckets to save PDFs and EC2 instance for deployment

24 Battle Royale | https://github.com/DarrenKey/24-Battle-Royale- **May 2022**

- Led team of 3 to develop an online multiplayer game involving real-time simultaneous gameplay and a working chat system
- Structured the project with Agile, and used OCaml for backend and Next.js + React for frontend
- Developed concurrency via OCaml's built-in library for promises, Lwt, and created an equation parser using abstract syntax trees

iOS Application: YEP Chat | https://github.com/YEP-Chat/YEP-Chat---BTTV-and-FFZ-Emotes-on-iOS **June 2021**

- Designed and programmed an iOS app to enhance viewer experience on the livestreaming website Twitch using OAuth
- Structured app with MVC design pattern and Object-Oriented Programming (OOP) fundamentals
- Received over 4000 installs and discussed app with Twitch's Director of Developer Relations

LEADERSHIP AND COMMUNITY INVOLVEMENT

Cornell Data Science Project Team - Team Lead for Data Science **January 2022 – Present**

- Led team of 26 students in creating machine learning projects to help the Cornell community, such as MathSearch

TECHNICAL SKILLS AND ADDITIONAL INFORMATION

Programming Languages: Python • Java • C • OCaml • Swift • SQL • JavaScript • TypeScript • HTML • CSS
Software Development: Pytorch • Sklearn • Pandas • Numpy • HuggingFace • Matplotlib • React • Git • Docker • Jupyter Notebook