Irving Liang

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EDUCATION

Carnegie Mellon University   *Aug 2021 – May 2025*
B.S. in Computer Science (Minor in Machine Learning and Mathematics), GPA: 4.0/4.0

- **Courses:** Distributed Systems, Intro to Deep Learning (PhD), Intro to Machine Learning (PhD), Web Development, Linear Algebra, Probability, Statistical Inference, Mathematical Finance, Discrete Math, Multivariate Calculus
- **Skills:** Java, Python, C, C++, SQL, JavaScript, HTML, CSS, Pandas, PyTorch, Jupyter, Git, AWS, Docker, MongoDB, Shell
- **Awards:** Dean's List (High Honors), International Economics Olympiad Global Finalist (National Top 3)

EXPERIENCE

High-Speed Object Manipulation with NeRF - Robotics Institute, CMU   *May 2023 – Present*
Research Assistant with Prof. Jeffrey Ichnowski

- Designed a Panoptic Studio with 24 time-synchronous cameras to generate training dataset with COLMAP
- Wrote Python scripts to configure BlenderCloth and generate compatible JSON files to automate experiment process
- Implemented new features for ParticleNeRF, including depth image scaling, automated OBB finding, and real-time particle tracking in Python and C++, significantly improved rendering results with a mean square error of 0.18 on particle trajectories

Socrates: An Intelligent Tutoring Bot with GPT-4 - CS Department, CMU   *Mar 2023 – Present*
Research Assistant with Prof. Umut Acar

- Prompt-tuned GPT-4 model through OpenAI API with data from past semesters to answer student questions interactively
- Invented a iterative-prefix algorithm to segment post threads to standardize data for consistent prompt format
- Constructed a chat-bot tutor backend in Python, including chain of thoughts and self-verification prompt tuning, embedding space search through vector database, and quality check for adversarial injection, improving system safety and user experience

Deep Survival Analysis for Bankruptcy Prediction - Auton Lab, CMU   *Jan 2023 – May 2023*
Undergraduate Researcher with Dr. Chirag Nagpal

- Researched on firm bankruptcy prediction using time-to-event analysis with neural networks based on corporate data
- Proposed 2 definitions of event indicator to deal with data censorship and conducted data pre-processing and augmentation
- Designed training and evaluation pipeline with PyTorch and Scikit-Learn and conducted parallel grid search for hyper-parameter tuning on auton survival models, increasing prediction accuracy by over 5.8% than baseline models

Parallel and Sequential Data Structures and Algorithms (15-210) - CMU   *Dec 2022 – Present*
Teaching Assistant

- Led recitations and office hours for 200+ students on advanced algorithm design & functional programming in SML and C++

Human-Computer Interaction Institute, CMU   *Sep 2022 – Dec 2022*
Software Developer

- Designed data visualization schemes for evaluations of machine learning model for non-technical users
- Implemented an interactive evaluation visualization web interface in HTML, CSS, JavaScript, and Vega-Lite

PROJECTS

Distributed Search Engine | Java :

- Developed a large scale text search engine, supporting retrieval models including Boolean retrieval, BM25, Indri, and LeToR
- Implemented result diversification, query expansion, and a SVM classifier, improving search result by 12% more relevant overall

Concurrent Web Proxy | C++ :

- Built a fully functional web proxy that can accept, parse, and forward HTTP requests to servers and fetch content back to clients
- Used POSIX library to handle requests concurrently through multi-threading and a dynamic cache to boost HTTP request by 60%

MyTorch© | Python :

- Wrote my own deep learning library in pure NumPy with out-of-the-box usability, inspired by PyTorch
- Supports the creation of MLP, CNN, RNN with gated recurrent units, and LSTM, with autodiff for efficient backpropagation

Speech Recognition Neural Network | Python :

- Constructed a LSTM-based model with LAS architecture for transcription of raw Mel Frequency Cepstral Coefficients audio
- Adapted multi-head attention, Gumbel-noise reparametrization, and Locked Dropout to optimize Levenshtein distance below 7