Runzhe (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, Real Analysis, Discrete Math, Multivariate Calculus

Skills: Java, Python, C, C++, SQL, JavaScript, React, HTML, CSS, Pandas, PyTorch, Git, AWS, Docker, MongoDB

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*

Researcher Assistant with Prof. Jeffrey Ichnowski (paper under review at CoRL 2023)

- Built up a Panoptic Studio with 25 time-synchronous cameras to generate training dataset with COLMAP
- Configured BlenderCloth to generate synthetic data and wrote Python scripts to generate JSON configuration files compatible with ParticleNeRF, which greatly automated the whole baseline model experiment process
- Implemented new features to existing codebase, including depth image scaling, automated object OBB finding, and real-time particle tracking in Python and C++, and significantly improved the visual rendering results

Socrates: An Intelligent Teaching System with LLMs - CS Department, CMU *Mar 2023 – Present*

Researcher Assistant with Prof. Umut Acar (NSF funded)

- Fine-tuned GPT-4 model through OpenAI API to answer students' question automatically in real time
- Collected 1000+ pieces of tuning data from past semesters and proposed iterative-prefix algorithm to standardize the data for consistent prompting format and higher quality of answers from the model
- Constructed a question-answer system with tutor-verifier mechanism in Python for word embedding generation, quality check, and adversarial attack prevention to enhance system safety and improve user experience
- Deployed the model on a learning platform and collected feedback from an algorithm class at CMU for further updates

Deep Survival Analysis for Bankruptcy Prediction - Auton Lab, CMU *Jan 2023 – May 2023*

Undergraduate Researcher with Dr. Chirag Nagpal

- Researched on firm bankruptcy prediction within given time horizon with neural networks based on corporate data
- Proposed 2 different implementations of bankruptcy indicator to deal with censored data and conducted data pre-processing on over 80k data points from Compustat/CRSP Merged Database for time-to-event analysis
- Designed training and evaluation pipeline, experimented with various survival models against baseline models and conducted parallel grid search for hyper-parameter tuning, increasing prediction accuracy by over 5.8%

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

Human-Computer Interaction Institue - CMU *Sep 2022 – Dec 2022*

Software Developer

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

Projects

Distributed Text Search Engine *(Java, Lucene)* **:** A large-scale search engine supporting probabilistic retrieval, query expansion, diversification, with SVM-based ranking algorithm that improves searching result 12% more relevant

Attention-based Speech Recognition System *(PyTorch, Pandas)* **:** A deep learning model capable of translating audio into English words, with multi-head attention, Gumbel-noise reparametrization, and Locked Dropout optimization

MyTorch© *(Python, NumPy)* **:** A custom deep learning library in pure NumPy, inspired by PyTorch, supporting the creation of MLP, CNN, RNN with gated recurrent units, and LSTM, with autodiff for efficient backpropagation

Concurrent Web Proxy *(C Language)* **:** A fully functional web proxy that can handle multiple HTTP requests to end servers and fetch relevant content back to clients concurrently with dynamic caching to speed up the process by over 60%

Dynamic Memory Allocator *(C Language)* **:** An efficient memory allocator using segregated lists, supporting malloc, free, calloc and realloc functions, with a memory utilization rate higher than the standard library implementations