Yourui Shao

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Hello! I'm Yourui.

I have a background in applicational machine learning, full-stack software engineering, and math. Currently, I'm broadly interested in AI algorithm development (foundational models, inference-time scaling, multimodality) and the computational side of brain-computer interfaces, but I enjoy solving problems of all sorts, and I *love* debugging.

Education

California Institute of Technology, B.S. in Computer Science, minor in Neurobiology *Exp. Grad.* 06/29

- Courses: Learning Systems, Programming Methods, Software Design in C, Research in Computing and Mathematical Sciences, Introduction to Robotics, Linear Algebra, Multivariable Calculus, Differential Equations, Molecular Biology, Cell Biology, Introduction to Computation and Neural Systems

Experience

Research Intern @ San Jose State University | Python, NLP, Statistical Analysis Aug 2024 – Aug 2025

- Worked with Prof. Andreopoulos to develop low-cost word embeddings generation methods as alternative to neural networks. Iteratively improved algorithms via analyzing underlying mathematical and NLP techniques.
- Developed and programmed methods for combining bit array word encodings and neighborhood frequency values to mathematically represent relationships in word occurrences via iterating over toy corpus.

Brain-Inspired Computing @ COSMOS, University of California, Los Angeles Jul 2024 – Aug 2024

- Completed college-level summer program investigating parallels between neurological pathways for vision and behavior and mathematical algorithms behind artificial neural networks such as MLPs, CNNs, GANs, and Deep RL.
- Deconstructed and rewrote traditional models (ex: AlexNet), mastering PyTorch and neural network layer design.

Projects

Relay @ HackPrinceton 2025 | Python, LangChain, FastAPI, TypeScript, React Nov 2025

- In 20 hours, built functioning full-stack, multi-agent AI web application to look up and cite, write articles, and notify users on state legislative activity using RAG system capable of self-updating via live scraping congressional sites.
- Developed conversational agent with custom source retrieval tooling and adaptive to user interest and reading level.

Reinforcement Learning for *Fish* | Python, PyTorch Jan 2025 – May 2025

- Senior research project. Reinforcement learning model for multiplayer, team-based card game *Fish*.
- Built and optimized custom modular two-part (1) LSTM hand prediction and (2) Q-learning decision-making neural networks in PyTorch generalizing beyond card, suit, and player order. Designed model from studying human gameplay.
- Programmed custom state-action converter, data parser, and reward functions selected via testing.
- Self-collected and parsed real-world gameplay data. Programmed custom multiplayer self-play gameplay pipeline to generate simulated data for exploration and training across many iterations.

AMC Problems Trainer, problemstrainer.app | Python, Flask, JavaScript, Jinja, MySQL Feb 2023 – Oct 2024

- Fine-tuned DistilBERT on webscraped, hand-labeled American Mathematics Competitions (AMC) problems with TeX vocabulary additions to increase equation literacy, for multi-label problem classification at 94% accuracy.
- Developed algorithm for practice-based adaptive problem recommendation system implemented via Flask, Jinja, and MySQL in SQLAlchemy. Paper presented at IEEE BigDataService.

Acceptify AI @ University of California, Los Angeles | Python, PyTorch, Sklearn Jul 2024 – Aug 2024

- Developed combined Random Forest model and neural network handwritten in PyTorch to predict post-secondary education outcomes, testing model and feature combinations to achieve 85-92% accuracy. Analyzed feature importance via PCA and Gini to identify impactful factors. Paper presented at IEEE FMLDS.
- Data collected via scraping 4,000+ online Reddit post content and dilating to 21,000+ datapoints.
- In novel approach, extracted categorical and numerical features from text data with LLMs for use in deep learning.

Publications

Predicting College Admission Results with Machine Learning on Unstructured Online Data, 2024 IEEE FMLDS

An Accurate Classification and Recommendation Method of Competitive Math Problems, 2024 IEEE BigDataService

Skills

- **Languages & Tools**: Python, Google ADK, LangChain, CrewAI, FastAPI, Flask, PyTorch, TensorFlow, Numpy, Pandas, JavaScript, TypeScript, React, NodeJS, Vercel SDK, HTML/CSS, SQL (Postgres, MySQL), git, Docker
- **Concepts:** Natural Language Processing, Transformers, Reinforcement Learning, Deep Learning, AI Agent Systems, Feature Engineering, Statistical Analysis, REST APIs, Embedded Systems, Full Stack, Databases