Zonglin Lyu

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EDUCATION

Columbia University, New York, NY — Enrolled: Sept 2021 — Dec 2022
M.S. in Operations Research — Overall GPA: 3.64 — MS level GPA 4.09

University of California San Diego, La Jolla, CA — Enrolled: Sept 2017 — June 2020
B.S. in Applied Mathematics — Overall GPA: 3.81 — Major GPA 3.95

RESEARCH INTERESTS

- Artificial Intelligence
- Computer Vision
- Deep Learning
- Multi-modal Learning
- Multi-agent Collaboration in Computer Vision

PUBLICATION

*: equal in contribution
†: corresponding author

1. Multiagent Multitraversal Multimodal Self-Driving: The MARS Dataset. (Submitted, pdf is coming soon)
2. Zonglin Lyu*, Yiming Li*, Mingxuan Lu, Chao Chen, Michael Milford, and Chen Feng†. "Collaborative Visual Place Recognition." (2023).pdf
3. Xuande Feng*, Zonglin Lyu*,†. "How Features Benefit: Parallel Series Embedding for Multivariate Time Series Forecasting with Transformer." In 2022 IEEE 34th International Conference on Tools with Artificial Intelligence (ICTAI) (Oral presentation). pdf

RESEARCH EXPERIENCE

AI4CE Lab — New York University, NY
Advisor: Chen Feng — Jan 2023 - present

- Conduct a literature review on Test Time Training, Visual Place Recognition, Point Cloud Prediction
- Formulate the first framework for Collaborative Visual Place Recognition and develop an effective and robust algorithm that balances noise and extra information that collaborators provide. Multi-agent collaboration achieves at most a 50% reduction in error rate than single-agent. The paper was submitted to ICRA 2024.
- Propose methods for future improvements and extensions for Collaborative VPR.
- Benchmark a large-scale outdoor dataset. The paper is coming soon.
- Design a method to take advantage of languages in VPR.
- Implemented with PyTorch. Codebase can be found here.

Transformer in Multivariate Time Series Prediction — Columbia University, NY
Self-desgined research — March 2022 - July 2022

- Conduct literature reviews on time series prediction based on Neural Networks.
- Propose Parallel Series Embedding method applied in transformer-based models to predict time series, achieving notable improvements (at most 50% reduction in RMSE) over the baseline. The paper was accepted to ICTAI 2022.
- Implemented with PyTorch. Codebase can be found here.

PROJECT EXPERIENCE

SE-(3) Equivariant Performer — Columbia University, NY
Advisor: Krzysztof Choromanski — Oct 2022 - Dec 2022

- Conduct literature reviews on equivariant neural networks for point clouds.
- Prove that SE3 equivariance is compatible with Performer (linear transformer).
- Design a novel model based on SE(3)-Transformer, making it compatible to performer. The model achieves a 10% performance increase and 2x speedup over the baseline, and the performer variant archives a 5% performance improvement and more than 20% memory efficiency.
- Implemented with PyTorch. Codebase can be found here.

Supervising OCR models with LLMs — Columbia University, NY
Advisor: Peter N. Belhumeur — Oct 2022 - Dec 2022

- Conduct literature reviews on Language Models, OCR Models, and Diffusion Models.

- Design a method to supervise an OCR Model with LLMs. Try to use the output distribution of LLMs to provide knowledge of language to the OCR models.
- Train a Character-level Bert. With this model, there is a small improvement over the baseline.
- Implemented with PyTorch. Codebase can be found here and here.

Statistical Inference & Random Optimization Columbia University, NY
Advisor: Henry Lam Sept 2021 - Oct 2022

- Construct an algorithm to implement cheap bootstrap efficiently. Apply this to Neural Network Model, Queuing system, Computer Network Model, and Integer Programming.
- Construct algorithms to solve the random optimization problem for different methods. Visualize and analyze the optimality gap of each method.
- Implemented with Python, Matlab, and R.

SKILLS

- **Relevant Coursework:** Mathematics of Deep Learning (A+), Practical Deep Learning & System Performance (A+), Machine Learning & High Dimensional Data Mining, Simulation (A+), Python, Reinforcement Learning (audit), Deep Learning for Computer Vision (audit), Machine Learning, Intro to C, Intro to Java, Probability, Statistics, Stochastic Processes, Optimization, Numerical Analysis, Linear Algebra, Mathematical Analysis
- **Online Courses:** Analysis of Algorithm, Data Structure
- **Programming and Software** Python (Pytorch, Numpy, Pandas, matplotlib, etc), Java, C, C++, SQL, R, MATLAB, LaTeX.