Pengyue Zhu
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EDUCATION

Boston University, Boston, MA **2019.09 – 2025.08**
Ph.D. in Economics
Field of interest: Macroeconomics, Econometrics, Machine Learning

Renmin University of China, Beijing, China **2015.09 – 2019.06**
BS degree, double major: Mathematics and Finance GPA: 3.82/4

SKILLS

Programming & Tools: Python (PyTorch, Scikit-learn, NumPy, Pandas), SQL, R, Julia, Spark, Git, Linux
Machine Learning: Random Forest, XGBoost, SVM, K-Means, Transformers, LoRA, Recommender Systems, VLMs
Data Science & Analytics: A/B Testing, Causal Inference, Bayesian Methods, MCMC, Time Series
Big Data & Deployment: FastAPI, Gradio, FAISS, AWS, Docker

WORK AND RESEARCH EXPERIENCE

Graduate Researcher - Causal Inference & Quantitative Modeling, *Boston University* **2021.09 – 2025.05**
• Segmented U.S. households using K-Means clustering on the 2022 Survey of Consumer Finances (SCF) to uncover patterns in asset allocation behavior, integrating key demographic features such as age, income, and net worth
• Applied causal inference methods (DiD) to quantify the impact of Quantitative Easing (QE) on portfolio composition
• Built and calibrated a Heterogeneous Agent New Keynesian (HANK) model using Simulated Method of Moments (SMM) to simulate macro-financial responses to QE shocks
• Performed large-scale data analysis in Python (Pandas, NumPy, StatsModels) to evaluate dynamic redistribution effects, revealing a 6% amplification in short-run QE impact and a 2% dampening in the long run

Research Assistant - Vision-Language Models, *Boston University* **2024.09 – present**
• Contributed to the SITE benchmark by designing spatial reasoning tasks and datasets that evaluate vision-language models (VLMs) on scale, orientation, and visualization challenges
• Fine-tuned transformer-based vision-language models using LoRA and contrastive loss, achieving a 12% improvement in spatial question answering accuracy on multi-modal benchmarks
• Developed standardized data preprocessing pipelines, task-specific input formats, and evaluation protocols to enable systematic comparison of pre-trained VLMs (e.g., BLIP, GIT) on spatial reasoning tasks

PROJECT EXPERIENCE

Multi-modal Product Recommendation System with Large Language Model **2024.12 - 2025.02**
• Developed an end-to-end multi-modal recommendation system by adapting LLaVA to encode product images and descriptions into a shared latent space using contrastive learning
• Engineered a scalable, low-latency retrieval pipeline using FAISS and FastAPI, enabling real-time recommendations over 1M+ product embeddings with sub-100ms response time
• Simulated user interaction sessions and conducted offline A/B testing to evaluate recommendation quality, achieving 92% average precision and a 10% reduction in irrelevant results
• Logged experiments with MLflow and performed ablation studies on similarity functions and fine-tuning strategies to improve model generalization across modalities
• Containerized the system with Docker to enable reproducible, production-ready deployment

Dialogue Summarization with Large Language Model **2024.09 - 2024.12**
• Fine-tuned LLaMA-2 on multi-domain dialogue datasets using supervised learning, enhancing summary coherence and generalization across varied conversational contexts
• Applied Low-Rank Adaptation (LoRA) to improve inference efficiency, reducing compute cost by 35%
• Achieved ROUGE-L: 45.2 and BLEU: 37.8, demonstrating strong performance in abstraction and factual alignment
• Deployed an interactive Gradio-based demo with real-time inference, and integrated FastAPI for scalable, GPU-accelerated production deployment with reduced latency
• Conducted error analysis to reduce hallucinations and domain-specific failures

SELECTED HONORS AND AWARDS

Dean's Fellowship, Boston University **2019 - 2025**
National Scholarship (top 0.2% nationwide), the Ministry of Education, P.R. China **2018**
Academic Perfection Recognition, UC Davis **2018**
President Scholarship, Renmin University of China **2017**