Yangyang (Annie) Li

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Qualification

- **System Expertise**: STATA, Python, Julia, R, Java, HTML, CSS, JS, MS Office, MySQL, SAP, C, VBA Macro

Education

Massachusetts Institute of Technology Cambridge, MA June 2026

Bachelor of Science in Computer Science, Economics and Data Science & in Business Analytics (6-14, 15-2)

- **Relevant courses:** Communicating with Data; People, Teams, and Organizations Laboratory; Analytics of Operations Management; Research and Communication in Economics; Econometrics; Optimization Methods in Business Analytics; Energy Economics and Policy; Psychology and Economics; Introduction to Machine Learning; Introduction to Computational Thinking and Data Science; Linear Algebra; Real Analysis

Research Experience

DRO-InstructZero: Distributionally Robust Bayesian Optimization for Large Language Models

Sole Researcher 2025.04 – Present Cambridge, MA

- Addressed a core limitation of current LLM prompt-optimization methods—fragility under distribution shift—by formulating prompt learning as a distributionally robust optimization problem
- Rebuilt complete LLM prompt-optimization pipeline using Python and ChatGPT API, integrating both open-source (Vicuna) and black-box (OpenAI) LLMs. Designed and implemented a novel Distributionally Robust Bayesian Optimization (DRO-BO) framework that models worst-case distribution shifts via f-divergence ambiguity sets.
- Authored and tested a new Bayesian optimization algorithm with Gaussian-Process posterior updates, adversarial reweighting, and UCB-based robust acquisition functions. Utilized **NumPy, PyTorch, cvxpy, and evolutionary strategies (CMA-ES)** to optimize posterior search and solve convex robustness objectives on GPU.
- Conducted multi-task experiments on BIG-Bench (formality rewriting, code debugging, translation), achieving +25–30 pp accuracy gains while maintaining > 96 % in-distribution stability.

Adaptive Virtual Model Control with LLM and Lyapunov-Based Reinforcement Learning

First Author 2025.02 – Present Cambridge, MA

- Developed adaptive virtual model control (VMC) integrating LLM reasoning and Lyapunov-based reinforcement learning for robotic arms.
- Implemented stability-guaranteed adaptation with physics-informed control policies in PyTorch and MuJoCo.
- Validated robustness on 7-DoF Panda arm simulations under uncertainty.

When Multimodal Perception Meets Fuzzy Control: LLM-Guided Navigation for a Turtle-Inspired Biomimetic Robot

First Author 2025.01 – Present Cambridge, MA

- Designed an LLM-guided fuzzy-control navigation framework that unifies multimodal perception (RGB imagery + local radar) with **LLM-based high-level semantic reasoning** for autonomous underwater robots.
- Implemented in closed-loop pipeline in **Python, an LLM-based compression module** that transforms raw observations into compact, human-interpretable tokens for real-time robust adaptive locomotion under partial observability.
- Demonstrated **strong zero-shot generalization** and semantics-aware decision-making across unseen reef-like environments, greatly outperforming baseline navigation and coverage strategies under sensing and communication uncertainty.
- Introduced a **lightweight semantic-communication protocol** allowing multiple robots to exchange intent linguistically, improving coordination efficiency and achieving robust OOI-oriented cooperative coverage in GPS-denied settings.

Quantifying Medical Expenditure's Impact on Well-being: Advanced Econometric Analysis on OHIE

Sole Researcher 2024.02 – Present Cambridge, MA

- Performed Instrumental Variable (IV) regression in Oregon Health Insurance Experiment (OHIE)
- Utilized STATA, performed IV regression to isolate causal impact of Medicaid coverage on psychological well-being
- Implemented innovative subgroup analysis to differentiate variations in expenditure impact on happiness

A Robust Classification Method using Hybrid Word Embedding for Early Diagnosis of Alzheimer's Disease

Sole Researcher, Founder, Team Leader 2019.12 – 2021.06 Brookline, MA

- Developed novel **feature engineer**ing approach that combines deep learning algorithms **Doc2Vec + ELMo linguistic embeddings** for early Alzheimer's Disease detection
- Built and fine-tuned a complete ML pipeline in **Python** (feature engineering, hyperparameter tuning, cross validation, etc.).
- Achieved state-of-the-art **91% accuracy and 97% AUC**, outperforming prior NLP benchmarks (88% accuracy), with demonstrated stability across 1000 repeated experiments and random splits.
- Utilized Micro Web Framework FLASK, developed an application with speedy and effective screening service of Alzheimer's Disease using Python, CSS, HTML, and Java

Peer-reviewed Publication & Preprints

ICLR Li, Y. (2026). DRO-InstructZero: Distributionally Robust Bayesian Optimization for Large Language Models. In International Conference on Learning Representations (ICLR 2026), under review.

ICASSP Li, Y., Xu, J., Chen, Y., Xie, G., & Zhang, S. (2026). Never Too Rigid to Reach: Adaptive Virtual Model Control with LLM and Lyapunov-Based Reinforcement Learning. In IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2026), under review.

TMC Li, Y., Xu, J., Zhang, W., Zhang, H., Xie, G., Tang, J., Zhang, S., & Li, Yi. (2026). When Multimodal Perception Meets Fuzzy Control: Toward LLM-Guided Navigation for a Turtle-Inspired Biomimetic Robot. In IEEE Transactions on Mobile Computing (TMC 2026), under review.

GLOBEHEAL Li, Y. (2024). The Impact of Medicaid Coverage on Mental Health, Why Insurance Makes People Happier in OHIE: by Spending Less or by Spending More? In Proceedings of the 8th Global Public Health Conference (GLOBEHEAL 2025), Vol. 8, Issue 1, pp. 17–29. The International Institute of Knowledge Management (TIIKM). ISBN 978-624-5746-57-6. DOI: https://doi.org/10.17501/26138417.2025.8102

ACAI Li, Y. 2020. Early Diagnosis of Alzheimer's Disease Using Hybrid Word Embedding and Linguistic Characteristics. In 2020 3rd International Conference on Algorithms, Computing and Artificial Intelligence (ACAI 2020). Association for Computing Machinery, New York, NY, USA, Article 65, 1–7. DOI: https://doi.org/10.1145/3446132.3446197

ICA Li, Y. (2020). Business Plan for Autonomous Delivery Robot. Intelligent Control and Automation, 11(02), 33 - 46. doi: 10.4236/ ica.2020.112004.

IEEE Y. Li, "Research Direction of Smart Home Real-time Monitoring," 2020 International Conference on Computer Engineering and Intelligent Control (ICCEIC), 2020, pp. 220-232, doi: 10.1109/ICCEIC51584.2020.00051.

Professional Experience

Academy of Aspire Intelligence at Boston Institute of Education (Nonprofit) *Research Analyst* 2021.09 – Present Cambridge, MA

- Conducted advanced econometric research with a focus on instrumental variable (IV) strategies to derive robust causal inferences in health economics, policy-relevant insights on financial risk protection and psychosocial well-being
- Collaborated on multidisciplinary teams to translate quantitative findings into practical recommendations for healthcare policy interventions for underserved populations
- Received full sponsorship for PhD studies (USD 64,000/year for four years) from the Academy of Aspire Intelligence—awarded in recognition of transformative contributions to contemporary academic discourse on social welfare and public policy.

Massachusetts Institute of Technology 6.C01 Modeling with Machine Learning *Lab Assistant* 2025.01 – 2025.5 Cambridge, MA

- Grading assignments/exams and co-develop grading guidelines,
- Teach office hours, mentoring fellow undergraduates on lab experiments and research in machine learning modeling
- Collaborate with TAs and faculty on curriculum and collect student feedback

Boston Consulting Group (BCG) 2023 Advance Program *Attendee* 2023.02 – 2023.03 Cambridge, MA

- Attended an exclusive invite only BCG conference aimed at sophomore women in college to pursue a career in consulting
- Leveraged various consulting frameworks and tools such as SWOT analysis, Porter's Five Forces analysis, market sizing, and competitive benchmarking to conduct in-depth research and analysis
- Worked collaboratively with cross-functional teams to present findings and recommendations to clients

DEI (Diversity, Equity, & Inclusion) *Coordinator of Sorority Delta Phi Epsilon* 2021.09 – 2023.09 Cambridge, MA

- Organized DEI Workshop and invited MIT SPXCE, Social Justice & Cross Cultural Engagement Intercultural Center as guest speaker
- Led Fundraising Event (Krispy Kreme Donut Fundraising) and raised over $1,500 for DEI fund and sorority financial aid

Autonomous Delivery Robot Service Team *Leader* 2019.02 – 2021.06 Brookline, MA

- Designed and assembled autonomous Delivery Robots with dynamic movement and remote control
- Provided Robot Delivery Service during pandemic, such as picking up prescription and groceries for over 10,000 elders

Honors & Awards

Bain Cup Case Competition 2022.01
Achieved Finalist in prestigious Bain Cup consulting case analysis competition held by Bain & Company, Inc.

Regeneron Science Talent Search (STS) 2021.01
Named as Top Science Talent Search Scholar on 1/7/2021, received $2000 award and another $2000 for high school STEM fund

Google Code Jam Coding Competition 2020.06
Ranked 270th in Round 3 as one of the top 1,000 amongst 30,221 contestants (> age 16)

71st Annual Massachusetts Science & Engineering Fair (MSEF) 2020.05
2nd Place Award out of ~1400 research projects submitted, the sole researcher of my project

Future Business Leaders of America (FBLA) China 2020.02
2nd Place Nationwide by I-Connect Living business plan out of 261 teams