Boshen Zhang

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RESEARCH INTERESTS

I am interested in Artificial Intelligence, particularly in the development of decision-making agents capable of adaptive, rapid, and robust operations within cooperative environments. My objective is to develop decision-making methodologies with applications in robotics. The following key areas currently shape my research endeavors:

- Multi-Agent Systems
- Robot Learning
- Human Robot Interaction
- Foundation Models

EDUCATION

University of Southern California, GPA: 3.60/4.0 Jun 2023 - Dec 2024
Master of Science, Computer Science
Coursework: Robot Learning, Robotics, Autonomous Decision-Making, Computational Human-Robot Interaction, Algorithm Analysis, Machine Learning, Linear Programming and Extensions

Virginia Tech, GPA: 3.60/4.0 Aug 2018 - Dec 2022
Bachelor of Science, Computer Science & Applied Mathematics

RESEARCH EXPERIENCE

Interactive and Collaborative Autonomous Robotics Lab (ICAROS) Los Angeles, CA
University of Southern California Dec 2023 - Present
Research Assistant | Advisor: ***Stefanos Nikolaidis***

- Investigating diverse human behavior emulation with LLM-aided Quality Diversity (QD) optimization approach in multi-agent collaborative system.
- Developed LLM-based agent framework enabling agents' communication and collaboration in real time.
- Created an advanced multi-agent Steakhouse environment for agents and human interaction.
- Integrated SGLang with QD experiment framework on High-Performing Computing (HPC) platform, reducing experiment batch inference latency
- Investigating LLM embedding mutation strategy with CMA-ME on poetry evaluation domain.

Computational Human-Robot Interaction Course Project Los Angeles, CA
University of Southern California Jan 2024 - Present
Research Lead | Advisor: ***Stefanos Nikolaidis***

- Enhanced agent real time adaptability to human behavior by utilizing LLMs for lower-level planning and benchmarking agent adaptability in proposed reactive scenarios.
- Finetuned llama3-8B model using LoRA based on trajectory from existing PPO algorithm and human experts
- Distillated Llama3-1B model with knowledge from GPT-4o to achieve lower latency and higher team fluency for proposed framework.
- Conducted user study and data analysis for different interaction styles between human and LLM powered agents and measured user satisfaction, perceived agent intelligence, and task efficiency under different teaming styles.

Prof Hooshangi's Research Group
Research Assistant | Advisor: ***Sara Hooshangi*** *Aug* 2022 -Dec 2022

- Processed and lemmatized over 750 open-ended responses utilizing Natural Language Toolkit (NLTK), then leveraged Pandas to organize and analyze student feedback and identified recurring themes.
- Analyzed student responses using sentiment analysis, examined emotional insights and visualized sentiment patterns.

PUBLICATIONS

Boshen Zhang*, Shipeng Liu*, Zhehui Huang. 2024. Benchmark Real-time Adaptation and Communication Capabilities of Embodied Agent in Collaborative Scenario. In the Workshop on Planning in the Era of Large Language Models at the AAAI 2025(LM4Plan @ AAAI2025). Posted at https://arxiv.org/abs/2412.00435

Shipeng Liu, FNU Shrutika, **Boshen Zhang**, Zhehui Huang, Feifei Qian. 2024. Effect of Adaptive Communication Support on Human-AI Collaboration. *arXiv preprint arXiv:2412.06808* (under review)

** Denotes equal contribution*

PRESENTATIONS

Southern California Robotics Symposium. 2024. (Oral) Riverside, CA
Benchmarking Reactive Human-AI Collaboration Powered by Foundation Models

COMPUTER SKILLS

Languages: Python, Java, JavaScript, C, Swift, MATLAB, Mathematica, Bash, LaTeX
Libraries: PyTorch, NumPy, Matplotlib, Pandas, Hugging Face
Other: ROS, Linux, PyBullet, SLURM, Robosuite

AWARDS & ACHIEVEMENTS

- Overall 2nd place for VTHacks IX Hackathon (387 participants) 2022
- IISE DAIS Mobile/Web App Competition Finalist 2022
- IISE Annual Conference & Expo, 4th place in final presentation 2022

ACADEMIC PROJECTS

Steakhouse-AI Feb - May 2024
Multi-agent Reinforcement learning testbed built on Overcooked environment
- Added 5 medium level actions and 4 unique dishes on top of Overcooked testbed.
- Developed an interactive game interface using Pygame for human-agent gameplay and communication

Fetch Arm Manipulation Jan 2024
Scripts for Fetch robot objects manipulation in iGibson simulated environment.
- Implemented Inverse Kinematics for precise robot configurations in response to target positions
- Implemented RRT algorithms to manipulate objects while avoiding collisions

Semantic Search Mar 2022
Chrome extension enabling search contents in form of synonyms, images, and videos. Alternative for Ctrl + F
- Achieved ~90% search accuracy by building a Chrome extension for synonyms and image recognition and highlighting features with JavaScript.
- Developed website object detection framework using YOLO and launched with google cloud

WORK EXPERIENCE

Prof. Weijun Xie's Research Group Blacksburg, VA
Software Engineer Aug 2021 - May 2022
- Implemented a website with JavaScript, Express.js, jQuery, Bootstrap, specifically designed to manipulate and showcase behavior of a drunk driver linear model built in Pyomo
- Processed asynchronous HTTP requests using Ajax and maintained/analyzed user data with MySQL, enabling data analysis for 500+ users.

Share App Remote
Full Stack Developer Intern Jun 2021- Aug 2021
- Developed and integrated a user system with APIs, facilitating database access and processing diverse client requests and Migrated dataset from MongoDB to DynamoDB

LANGUAGE

Chinese (Native), English (Full-professional), Japanese (Elementary)