

Jiaming Shan

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INTERESTS

My research interest lies in building generally capable embodied agents that continuously explore, plan, and develop new skills in open-ended worlds. In my undergraduate studies, I mainly explored the interaction and collaboration of embodied agents grounded in natural language. In my graduate studies, I seek to explore visual grounding and grounding in broader modality or the real-world as well.

EDUCATION

Shanghai Jiao Tong University

2020/9 – Present

Bachelor of Computer Science

- Member of ACM Honors Class, an elite CS program for top 5% talented students
- GPA (All Core Courses): 3.98/4.3, Ranking: 3/36

PUBLICATIONS

[1] QAS-Bench: Rethinking Quantum Architecture Search and A Benchmark

Authors: Xudong Lu, Kaisen Pan, Ge Yan, **Jiaming Shan**, Wenjie Wu, Junchi Yan.
International Conference on Machine Learning (ICML), 2023.

[2] Building Cooperative Embodied Agents Modularly with Large Language Models

Authors: Hongxin Zhang*, Weihua Du*, **Jiaming Shan**, Qinghong Zhou, Yilun Du, Joshua B. Tenenbaum, Tianmin Shu, Chuang Gan.
International Conference on Learning Representations (ICLR), 2024 (Under Review).

[3] Constrained Human-AI: An Inclusive Embodied AI Assistance Challenge

Authors: Andi Peng*, Weihua Du*, **Jiaming Shan***, Tianmin Shu, Chuang Gan
Conference on Computer Vision and Pattern Recognition (CVPR), 2024 (Conference Submission).

EXPERIENCE

Developing a non-learning generative model by inverting the Redunet network 2022/7 – 2023/2

Advisor: Quanshi Zhang

Shanghai Jiao Tong University

- **Objectives:** Developing a non-learning generative model by inverting the ReduNet, a deep neural network constructed naturally by deriving the gradients of the Maximal Coding Rate Reduction (MCR2) objective. This novel approach, aimed at using datasets to directly compute network parameters, was a precursor to methodologies like those seen in Hinton's later forward-forward model.
- **Contribution:** Build the generative model by implementing the algorithms of the reverse process of ReduNet generation. Incorporating K-means and least squares fitting methods to accomplish an approximate reversible process while enhancing fitting precision and ensuring the quality of generation. Test the generative model in MNIST datasets. Finetune the components for optimal performance.

Proposing Quantum Architecture Search Benchmark [1]

2023/3 – 2023/6

Advisor: Junchi Yan

Shanghai Jiao Tong University

- **Objectives:** Formulated the automatic quantum architecture search (QAS) problem into two tasks: i) arbitrary quantum circuit (QC) regeneration given a target QC; ii) approximating an arbitrary unitary (oracle) and generated a public QAS benchmark which is still missing in literature.
- **Contribution:** Responsible for generating the entire dataset used in the QAS problem and metric selection. Implemented fundamental baseline methods, including Brute Force Search and Simulated Annealing. Involved in writing sections of the manuscript and analyzing performance of baseline methods.

Building Cooperative Embodied Agents Modularly with Large Language Model[2] 2023/2 – 2023/5

Advisor: Chuang Gan

Shanghai Jiao Tong University / Massachusetts Institute of Technology

- **Objectives:** Present a novel framework that utilizes LLMs for multi-agent cooperation by converting the environment description, observation, and the space of possible actions into textual form and injecting it into an LLM's prompt, utilizing its in-context learning ability to derive the best action. Additionally, through this capability, we can enable it to decide whether to use natural language for communication and determine the content of such communication. We then test it in various embodied environments: ThreeDWorld and Virtualhome.
- **Contribution:** Build the environment of Virtualhome. Design and conduct user studies that proves LLM agents can collaborate with humans better than heuristic planning agents. Developed the heuristic planning (HP) baseline incorporating communication templates essential for agent collaboration. Led the creation and validation of experimental results. Designed visual representations for the study.

Enabling Embodied Agents to Help Constraint Agents [3]

2023/8 – 2023/11

Advisor: Chuang Gan

Massachusetts Institute of Technology

- **Objectives:** Introduce a novel AI challenge and benchmark for assisting physically constrained humans. Implementing diverse and realistic simulations of human physical limitations.
- **Contribution:** Conceptualized various constraint agents and helpers, implementing and integrating them into the TDW environment. Leverage the in-context-learning abilities of large language models for the deployment of language agents. Generate the dataset. Contributed to the writing and data visualization of the manuscript.

PROJECTS

Extension of Generalization Error Theorem Project

SJTU ACM Class, Machine Learning (CS3612), 2022

- Investigated and extended the Generalization Error Theorem to accommodate scenarios with infinite hypothesis sets or large finite sets with pronounced continuity.
- Developed enhanced theorem constraints through innovative distance definitions between functions, contributing to more effective application of mathematical theorems in advanced statistical models.

Cycle Detection Network with Hand-Written Parameters and No-Training

SJTU ACM Class, Machine Learning (CS3612), 2022

- Developed a specialized network using manually crafted kernels to emulate Breadth-First Search (BFS) for cycle detection in pixel maps, achieving an accuracy of 100%.

RISC-V CPU Implemented in Verilog RTL

SJTU ACM Class, Computer Architecture (MS108), 2021

- RISC-V cpu with iCache and branch predictor with 2-bit saturating counter.

Compiler for Mx* Language

SJTU ACM Class, Compiler Design and Implementation (MS208), 2022

- A Compiler from Mx* language (which is a C++ & Java like language) to RV32I Assembly. I designed a new IR that use C++ instead of LLVM to implement my self-designed optimizations. The IR can be more flexible because I can change it as the progress proceeded.

HONORS & AWARDS

- 2023 National Scholarship Award
- 2020, 2021, 2022, 2023 Zhiyuan Honorary Scholarship (Top 2% in Shanghai Jiao Tong University)
- 2021 Interdisciplinary Contest In Modeling Honorable Mention
- 2021 Third Prize, National Undergraduate Mathematical Contest in Modeling, Provincial Level
- 2021 Silver Medal, International Physics Competition for University Students

COURSE WORK

- MATH 1205H Linear Algebra(H): 98/100
- CS 1952 Programming Practice: 96/100
- MATH 2701 Probability: 98/100
- CS 3612 Machine Learning: 98/100
- AI 3604 Computer Vision: 100/100
- AI 3607 Deep Learning and Its Applications: 97/100