JIALU GAO

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RESEARCH INTERESTS

Real Robot Learning, Imitation Learning, Multi-task Learning, Diffusion Models, Representation Learning, Generalization

EDUCATION

CARNEGIE MELLON UNIVERSITY Aug 2023 – Aug 2025(expected)
Master's in Robotics

TSINGHUA UNIVERSITY Sep 2019 – Jun 2023
Bachelor of Computer Science and Technology

- **Computer Science Courses:** Object-oriented Programming, Data Structure and Algorithm, Operation System, Compiler, Computer Network Security Technology, Assembly Language Programming, Introduction to Artificial Intelligence, Introduction to Machine Learning, Pattern Recognition, Computer Architecture.
- **Math Courses:** Calculus A, Discrete Mathematics, Advanced Linear Algebra, Complex Functions, Statistical Computing and Software, Probability and Statistics, Introduction to Bayesian Statistics, Introduction to Casual Inference, Statistical Inference.

PUBLICATION

Can Pre-Trained Text-to-Image Models Generate Visual Goals for Reinforcement Learning?

Jialu Gao*, *Kaizhe Hu**, *Guowei Xu, Huazhe Xu*
Submitted to The Conference on Neural Information Processing Systems 2023, under review

A Dual Representation Framework for Robot Learning with Human Guidance

*Ruohan Zhang, Dhruva Bansal, Yilun Hao, Ayano Hiranaka, **Jialu Gao**, Chen Wang, Roberto Martín-Martín, Li Fei-Fei, Jiajun Wu.*
The 6th Conference on Robot Learning (CoRL) 2022

The Origin of CBRAM With High Linearity, On/Off Ratio, and State Number for Neuromorphic Computing

*Yanming Liu, **Jialu Gao**, Fan Wu, He Tian, Tian-Ling Ren.*
IEEE Transactions on Electron Devices, 2021.

ACADEMIC EXPERIENCES

Robot Learning with Text-to-Image Models *Tsinghua IIIS* Oct 2022 – Jun 2022

- Explore the possibility of utilizing the knowledge embedded in pre-trained text2image diffusion models to provide visual guidance for robot learning, without any expert demonstrations or human-designed reward functions.
- Propose a pipeline using image editing techniques to generate visual goals for example-based visual RL.
- Experiments in simulation and real-world validates the effectiveness of the proposed method.

Efficient Robot Learning Under Human Guidance *Stanford SVL* May 2022 – Oct 2022

- Under the guidance of Ruohan Zhang, Fei-Fei Li and Jiajun Wu, explore sample-efficient framework for robot learning under human guidance, using preference learning and evaluative feedback.
- Create a Dual Representation Framework using scene-graph as high-level abstract representation to facilitate efficient query selection schemes for sample-efficient preference learning algorithms.
- Design and run experiments both in simulation and real-world settings, validating the effectiveness of our framework.
- The paper "*A Dual Representation Framework for Robot Learning with Human Guidance*" is accepted at CoRL 2022.

Concurrent Imitation Learning *Stanford CogAI* Mar 2022 – Jun 2022

- Under the guidance of Ruohan Zhang, Huazhe Xu and Jiajun Wu, propose a new multi-task learning setting called "Concurrent Multi-task learning", which aims to learn multiple tasks at the same time from a single demonstration where demonstrators perform multiple tasks alternatively.
- Build new environments based on MetaWorld-v2 with keyboard interfaces for user-friendly demonstration collection.
- Propose an EM-based neural network algorithm that treats the problem as a mixture of conditional gaussians, which can successfully learn separated tasks from mixed expert demonstrations without any additional task labels.

Multi-task Imitation Learning *Stanford CogAI* Oct 2021 – Mar 2022

- Under the guidance of Ruohan Zhang, Huazhe Xu and Jiajun Wu, explore how skill discovery using modularization can be used to facilitate better imitation learning with limited expert demonstrations.
- Implement a Soft Modularization network in Imitation Learning settings, which outperforms single-task MLP agents in terms of convergence speed and overall performance.
- Compare and visualize the modularization process, and study the correspondence between task similarity and routing.

AI algorithms Based on Artificial Synapse *Student Research Training* Mar 2020 -Sep 2020

- Construct the neural network simulation pipeline written in C/C++, which uses CBRAM model as neurons to build a 2-layer MLP model. Our CBRAM model outperforms previous methods by 20% in the MNIST classification task.
- The paper *"The Origin of High Linearity, On/Off Ratio and State Number of CBRAM for Neuromorphic Computing"* is published at IEEE-TED 2021.

WORK EXPERIENCE

Bing Ads, Deep Learning Intern | Microsoft Explore Intern Program Jul 2021 - Sep 2021

- Ad-creative generation: propose a novel Ad-title generation network architecture that cleverly combines BART and CVAE, which can generate Ad-titles from landing-pages in a sequence-to-sequence fashion.
- The proposed network generates Ad-titles that achieve 96% overall high quality labeled by online-users, with significantly improved diversity by 12% of m-bleu score compared to previous methods.

SELECTED PROJECTS

- **MIT Online Learning Program – Machine Learning and Data Science:** Build a CycleGAN model for face-aging effects with a GUI, which can add years to a teenager's photo as well as make an elder's face younger.
- **Pattern Recognition from Limited Data:** Design a contrastive learning strategy for pretraining using 5 pictures, which improves the performance of large models(ViT, MLPMixer, ConvMixer) after fine-tuning by a relative 8%.
- **Spam Email Detection with Machine Learning:** Implement SVM and decision-tree with bagging and adaboost to predict spam email, achieving 80% accuracy.
- **GRE Vocabulary Learner(Qt):** A self-designed app which aids non-native English speakers to memorize GRE vocabulary easier by using the *Ebbinghaus forgetting curve*, as well as authentic contexts selected from GRE tests.
- **Android News App(Android Studio, front-end):** A news app that can run on Android phones, supports random news browsing, keyword and conditional searching, and a user system with history record.
- **Pipeline CPU(Verilog):** A pipeline CPU that implements 29 standard RISCV instructions, and the RISCV-P extension, with dynamic branch prediction, cache and VGA support.

EXTRACURRICULAR ACTIVITIES

- **2022 Tennis Team of Computer Science Department** As one of the three girl players, contribute to our team winning the 4th place in Tsinghua Annual Tennis Tournament in 2022 spring.
- **Female Speaker at Women Think Next 2021, Microsoft China** As a speaker in group A, share my story of a teenage girl finding her passion in Computer Science and continually pursuing it, inspiring many people.
- **Student Association for Science and Technology** Organize the annual Competition of Information Institute and was in charge of pre-competition training and question preparation in the section of Artificial Intelligence.
- **IOS Club of Tsinghua University** Vice President of Software engineering department. In charge of the summer training program of the IOS club of Tsinghua, teaching club members to write Swift code.
- ***KouMing* Educational Platform, co-founder** Co-founded a nonprofit organization that aims to provide high school students with learning tips, time-management, career choices, and one-on-one instruction, which gained over 10,000 subscribers in one month.
- **Rubik's Cube Club of Tsinghua High School, President** Founded the first club of Rubik's cube in Tsinghua High School. Entered the 2016 Asian Rubik's Cube Championship and won the top 20 in female speed-cubing, with the official personal best of 13.68s (for 3by3 Rubik's Cube).

AWARDS

- Sports Excellence Award (10%), Tsinghua University, 2022.
- Volunteer Excellence Award (2%), Tsinghua University, 2021.
- Science and Innovation Award (5%), Tsinghua University, 2021.
- Honorable Mention (15%) in MCM-ICM, 2021.
- Top 10 final speakers at Tsinghua English Speech Competition, 2019.

LANGUAGE SKILLS

English – High proficiency

- TOFEL 113 (R28 L30 S28 W27) GRE 332 (V162 Q170 W3.5)
- CET-4 689/710, CET-SET4 A

PROGRAMMING SKILLS

- **Programming Languages:** C/C++, Python, Java(Android), Swift, R, SQL, Latex, Markdown, Shell, HTML/CSS, MATLAB, Assembly (RISC-V, x86), VHDL/Verilog
- **Developer Tools:** VS Code, PyCharm, Git, Docker, Linux, XCode, Vim, Android Studio, Vivado, Quartus
- **Libraries/Frameworks:** PyTorch, Fairseq, StableDiffusion, Pandas, NumPy, Lucene, Keras, Django, Vue, CUDA, OpenMP, MPI