Renhao Zhang

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EDUCATION

Harvard University Cambridge, MA, USA
Program: Cross-Registration; Major: Computer Science 09/2023 – 12/2023
Advanced Course: Inverse Problems in Reinforcement Learning-with healthcare applications

Brown University Providence, RI, USA
Degree: M.S.; Major: Electrical and Computer Engineering; GPA: 3.8/4.0 08/2022 – 05/2024
Advanced Courses: Computer Graphics, Coordinated Mobile Robotics, Reiterating AI
Teaching Assistant: Introduction to Robotics; Scientific Programming of C++
Research Assistant: BVC (Brown Visual Computing), IRL (Intelligent Robot Lab)

Dalian University of Technology Dalian, Liaoning, China
Degree: B.S.; Major: Electronic Information Engineering; GPA: 3.82/4.0 09/2018 – 06/2022
Admitted to the Electronic Information Innovative and Experimental Class (Top 1%)
Advanced Courses: Machine Learning, Digital Image Processing, Network Security, Data structure
Teaching Assistant: Computer Vision
Research Assistant: Wireless Communication Lab, HCI (Human-Computer Interaction)

Technique Skills

Programming: C, C++, Python, Verilog HDL, Assembly Language, Matlab
Frameworks: PyTorch, Tensorflow2, JAX, OpenGL, OpenCV, Django, ROS
Research Area: Reinforcement Learning, Computer Graphics, Computer Vision, Deep Learning

PUBLICATIONS

R. Zhang, H. Fu, Y. Miao, G. Konidaris, "Model-based Reinforcement Learning for Parameterized Action Spaces", submitted to The Forty-first International Conference on Machine Learning, 2024.
R. Zhang, X. Li, and N. Zhao, "When DSA Meets SWIPT: A Joint Power Allocation and Time Splitting Scheme Based on Multi-Agent Deep Reinforcement Learning," in IEEE Transactions on Vehicular Technology, 2022, doi: 10.1109/TVT.2022.3213243.
Li, D. †, Shi, Z. †, Zhang, H. †, **Zhang R.** *, †, "Domain adaptation in nuclei semantic segmentation", Proc. SPIE 12155, International Conference on Computer Vision, Application, and Design (CVAD 2021), 1215512 (20 December 2021); https://doi.org/10.1117/12.2626575
Liu, S., Zhang, A. †, Li, Y. †, Zhou, J., Xu, L., Dong, Z., & **Zhang, R.** Temporal Segmentation of Fine-grained Semantic action: A Motion-Centered Figure Skating Dataset. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 35, No. 3, pp. 2163-2171)., 2021-05-18
Li, X., Dong, Y., Zhang, Y., Sun, H., **Zhang, R.,** Ding, H., DDQN-Based Cost-Efficient Skipping Based Sensing Scheme for Cognitive Radio Transmissions, CN112367131A,2021-02-12

RESEARCH EXPERIENCE

Recovering Skills in ICU domains with Hierarchical Inverse Reinforcement Learning. 09/2023-12/2023
Supervisor: Prof. Finale Doshi-Velez, Harvard University
- Proposed a learning-based approach to recover hierarchical policies in the ICU dataset
- Used Option-GAIL framework to train higher and lower level policies from expert's demonstration
- Interpreted how the learned skills would help patients recover from hazardous states

Solve Parameterized Action MDP with Model-based RL approach 03/2023-02/2024
Supervisor: Prof. George Konidaris, Brown University
- Designed a novel model-based RL method to solve parameterized action MDP
- Developed a customed dynamic model and CEM optimizer to take both discrete action and continuous action into consideration
- Outperformed the current SOTA algorithms on several parameterized action space domains
- Proved a theoretical bound for convergence

Infer Shape Program with gradual edits 02/2023-NOW
Supervisor: Prof. Daniel Ritchie, Brown University

- Proposed an algorithm to infer programs from 2D, 3D, and vector shapes of different domain languages
- Designed a diffusion model that can gradually edit the program, instead of directly outputting the final result from scratch
- Developed a pipeline to do self-training on corrupted sequences
- Achieved a higher accuracy on more complex domains than the current one-shot methods

Domain Adaptation in Nuclei Semantic Segmentation 06/2021-08/2021

Role: team leader

- Designed and implemented Fourier Domain Adaptation to palliate the shortage of unlabelled datasets
- Experimented on both IoU and Excepted Calibration Error for better evaluation of the biomedical problem
- Utilized Pytorch deep learning framework to build a U-net network for the semantic segmentation of cell nuclei with domain adaptation to increase accuracy by 5%

Hybrid DSA and SWIPT with D2D Underlying System: A MADDPG Approach 01/2021-10/2021

Supervisor: Prof. Xuanheng Li, Dalian University of Technology

- Proposed a novel framework to combine Dynamic Spectrum Access (DSA) and Simultaneous Wireless Information and Power Transfer (SWIPT) together
- Applied Multi-Agent Deep Deterministic Policy Gradient (MADDPG) for optimization to ensure that the secondary users cannot interfere with the primary users and always have enough energy to work
- Compared MADDPG with DDPG, the performance is 10% superior
- Will add a recurrent neural network to the input to improve the MADDPG network

Temporal Segmentation of Fine-grained Semantic Action 04/2020-02/2021

Supervisor: Prof. Shenglan Liu, Dalian University of Technology

- Developed a figure skating dataset focusing on motion-centered temporal action segmentation whereas researchers mainly studied task-centered TAS previously
- Showed the necessity of this dataset as the existing SOTA methods are difficult to achieve excellent results on this dataset

DDQN-based Sensing Scheme for Cognitive Radio Transmissions 10/2019-04/2020

Supervisor: Prof. Xuanheng Li, Dalian University of Technology

- Designed a novel scheme to reduce the power consumption of secondary users when sensing the spectrums of primary users by skipping certain time slots
- Compared the performance among different reinforcement learning models like Q-learning, PPO, DQN, Actor-Critic, and DDPG, confirmed DDQN for its faster converging speed and more energy-saving
- Implemented the DDQN algorithm to reduce the power consumption of spectrum sensing by 20%

WORK EXPERIENCE

Research intern, AI-Lab, **Dalian Hi-Think Computer Co.** 04/2022-06/2022

Project: Japanese Script Recognition; Defect Detection; Deep Learning Framework Migration

- Improved CRNN and Cascade RCNN efficiency to detect Japanese Script
- Applied object detection deep learning model and edge detection to do the defect detection on flooring
- Migrated SOTA CV algorithms developed on PyTorch and Tensorflow to the MindSpore framework

Algorithm Engineer intern**, Panasonic Software Development Centre Dalian Co., Ltd** 06/2021-07/2021

Project: Time and Attendance System based on face recognition

- Researched the face recognition algorithm and designed the position detection of the face for each frame, increasing the recognition rate by 10 times to reach 30fps
- Designed web page with Django and constructed database with MySQL

HONORS AND AWARDS

Outstanding Graduates	06/2022
Second Prize, China Computer Design Competition	05/2020
Honorable Prize, COMAP's Mathematical Contest in Modelling	02/2020
Scholarship for Academic Excellence	09/2019

EXTRACURRICULAR ACTIVITIES

- Good at swimming, playing tennis, table tennis, volleyball and billiards