Xiangyu Liu

B.S. in Computer Science - Shanghai Jiao Tong University - Shanghai, China

✉ liuxiangyu999@sjtu.edu.cn

Education

Shanghai Jiao Tong University   **Shanghai, China**
B.S. in Computer Science   *Sep.2017 – Jun.2021*

- GPA:92.23/100(4.03/4.3) Ranking:2/153
- Zhiyuan Honors Program of Engineering (an elite program for top 5% talented students)
- Advisors: Prof. Weinan Zhang and Prof. Yong Yu
- Highlighted Courses to My Research: Probability and Statistics(100/100, A+), Linear Algebra(98/100, A+), Introduction to Computation(100/100, A+), Thinking and Approach of Programming(95/100, A+), Mathematical Analysis(H)(95/100, A+), Mathematical Foundation of Computer Science(96/100, A+), Computer System Architecture(97/100, A+)

University of California, Berkeley   **Berkeley, CA**
Exchange Student   *Jan.2020 – Present*

Research Interests

My research interests lie in the general area of machine learning, particularly in deep learning, reinforcement learning and machine learning system, as well as their applications in sequential decision making and multi-agent systems.

Research Experience

Empathetic Reasoning in Multi-Agent Reinforcement Learning   **SJTU, Shanghai**
Guide: Prof. Weinan Zhang, Prof. Yong Yu, Apex Lab, SJTU   *Jun.2019 – Sep.2019*

- We introduce the concept of empathy to symmetric Markov games where agents are able to reason the evaluations and behaviours of other agents through their own models. Considering the mutual reasoning between agents, the impact of empathy could be recursive. We propose a Q learning method with multi-level empathetic reasoning for both competitive and cooperative environments.
- Our experiments demonstrate that empathetic reasoning improves the performance of standard Q-learners. In cooperative environment, we can achieve the optimal solutions with the fastest speed. In competitive environment, empathetic Q learners can easily defeat learners with only local rewards or only global rewards.

Credit Assignment for Cooperative Multi-Agent Reinforcement Learning   **SJTU, Shanghai**
Guide: Prof. Weinan Zhang, Prof. Yong Yu, Apex Lab, SJTU   *Sep.2019 – Now*

- We propose a novel framework to solve credit assignment problems in the cooperative multi-agent reinforcement learning. We assume the team reward can be decomposed into a set of individual rewards and learn corresponding Action-Dependent Value (ADV). The learned ADV can be leveraged to compute the state-action value and further the advantage function which serves as the critic to guide the actor under the normal actor-critic algorithm framework.

Awards and Competitions

- **A-class Scholarship for Excellent Academic Performance** (Top 1% in SJTU), SJTU.   2018
- **National Scholarship** (Top 0.2% in China and Top 3 in CSD), Ministry of Education of P.R.China. 2018&2019
- **1st Prize in Chinese Mathematics Competitions** (Top 1 in SJTU), Chinese Mathematical Society. 2018
- **Zhiyuan Honor Scholarship** (Top 5% in SJTU), SJTU.   2018&2019

Selected Projects

Characterizing Internet Hosts Using Deep Learning *2019*

Guide: Prof. Yichao Chen

- We implement a system to characterize Internet hosts using deep learning, leveraging Internet scan data to produce numerical and lightweight representations of hosts. To do so, we first extract binary tags from semi-structured texts then use the variational autoencoder (VAE) to construct low-dimensional embeddings of our high-dimensional binary representations which do not rely on specific applications. This universality makes the embeddings broadly applicable to a variety of learning tasks whereby they can be used as input features. We present two such examples, detecting and predicting malicious hosts, and unmasking hidden host attributes.
- Comparing the trained models in their performance, speed, and robustness. We show that our embeddings reports competitive performance compared with binary representations and can achieve high accuracy for these learning tasks, while drastically reducing memory and computational requirements for large-scale analysis.

Diabetic Retinopathy Detection *2019*

Guide: Prof. Bin Sheng

- We propose a brand new framework, binocular twin neural network architecture combined with region detection and extraction. We use common CNN models to extract features ,and then combine features of the left eye and right eye.
- We further introduce the prior knowledge that only early lesions, symptomatic microangiomas often appear around the macular area of the unique structure of the fundus into deep neural networks, concurrently train CNNs to extract the macular disc area to augment features for classifications.

Computer Skills

- Programming Languages: Python, MATLAB, C/C++, Java, LaTeX
- Deep Learning Framework: TensorFlow, PyTorch