PERSONAL INFORMATION

Name: Yu-Ren Liu (刘驭壬) Gender: Male Birthdate: April 8, 1996

Institution: Department of Computer Science and Technology, Nanjing University, China

Position: Ph.D. candidate

Supervisor: Yang Yu (NJU) Co-supervisor: Kun Zhang (CMU & MBZUAI)

Email: liuyr@lamda.nju.edu.cn Personal Web: http://www.lamda.nju.edu.cn/liuyr/

Phone number: (+86) 13852295166

Research Interest: Reinforcement Learning, Causal Representation Learning.

Expected graduation time: December 2024.

EDUCATION

- **2021.9~present**
  Ph.D. candidate: Department of Computer Science and Technology, Nanjing University
- **2022.5~2023.5**
  Research assistant: Machine Learning Department, MBZUAI, UAE (One-year joint-supervision Ph.D. program, supported by CSC Funding 国家留学基金委资助公派联合培养博士)
- **2018.9~2021.9**
  Ph.D. student: Department of Computer Science and Technology, Nanjing University
- **2014.9~2018.6**
  B.Sc. degree: Computer Science and Technology, Kuang Yaming Honors School (Recommend enrollment without requiring college entrance examination 保送生), Nanjing University, China. (Elite Plan, Rank: 5/ 33 in CS major)

RESEARH EXPERIENCE

Causal Reinforcement Learning. 2021.9 – present

Causal reinforcement learning is an area of research that combines ideas from causal inference and reinforcement learning to improve decision-making in sequential environments. Along this line, I am focused on learning causal representations for reinforcement learning. In the work of "Learning World Models with Identifiable Factorization", we propose a novel method to learn world models with disentangled latent process. Our work extends the theoretical results in previous work to enable block-wise identifiability of four categories of latent variables in general nonlinear case. Our method achieves the state-of-the-art performance in variants of the DeepMind Control Suite and RoboDesk with noisy distractors. Currently, we are exploring to learn and utilize causal representations in nonstationary/heterogenous environments with the change of reward function, observation function, or transition dynamics.

Derivative-free Optimization. 2018.9 – 2021.6

Derivative-free optimization (DFO) is a class of optimization methods that aim to find the minimum or maximum of a function without using explicit derivatives. In the work of "Asynchronous Classification-Based Optimization", we propose to accelerate the classification-based optimization method based on asynchronous parallelization. We show in experiments that our method can achieve almost linear speedup while preserving good solution quality. In the work of "ZOOpt: Toolbox for derivative-free optimization", we opensource a toolbox that implements a series of classification-based optimization methods and pareto optimization methods. In the work of "COVID-19 Asymptomatic Infection Estimation", we design a fine-grained infectious disease transmission simulator, where the parameters for setting the simulator are learned based on derivative-free optimization methods.

CODE

Github: https://github.com/AlexLiuyuren?tab=repositories

- ZOOpt: I am the core developer of the open-source python package ZOOpt, which provides efficient derivative-free solvers and is designed easy to use. ZOOpt toolbox particularly focuses on optimization problems in machine learning, addressing high- dimensional, noisy, and large-scale problems.

PUBLICATION LIST

Conference Paper

- **Yu-Ren Liu**, Biwei Huang, Zhengmao Zhu, Honglong Tian, Mingming Gong, Yang Yu, Kun Zhang. Learning World Models with Identifiable Factorization. In: Advances in Neural Information Processing Systems 36 (NeurIPS23), New Orleans, Louisiana, 2023. (PDF)
- Zheng-Mao Zhu, Shengyi Jiang, **Yu-Ren Liu**, Yang Yu, Kun Zhang. Invariant Action Effect Model for Reinforcement Learning. In: Proceedings of the 36th AAAI Conference on Artificial Intelligence (AAAI22), Vancouver, Canada, 2022. (PDF)
- **Yu-Ren Liu,** Yi-Qi Hu, Hong Qian, Yang Yu. Asynchronous Classification-Based Optimization. In: Proceedings of the 1st International Conference on Distributed Artificial Intelligence (DAI19), Beijing, China, 2019. (PDF)

Journal Paper

- **Yu-Ren Liu,** Yi-Qi Hu, Hong Qian, Yang Yu, and Chao Qian. ZOOpt: Toolbox for derivative-free optimization. In: **Science China Information Science**. (PDF)

Manuscripts

- Zhengmao Zhu, **Yu-Ren Liu**, Honglong Tian, Yang Yu, Kun Zhang. Beware of Instantaneous Dependence in Reinforcement Learning. (Submitted to AAAI 24) (PDF)
- Jing-Cheng Pang, Tian Xu, Shengyi Jiang, **Yu-Ren Liu** , Yang Yu. Reinforcement Learning With Sparse-Executing Actions via Sparsity Regularization. (Submitted to TNNLS) (PDF)
- Yang Yu, **Yu-Ren Liu**, Fan-Ming Luo*, Wei Wei Tu, De-Chuan Zhang, Guo Yu, Zhi-Hua Zhou. COVID-19 Asymptomatic Infection Estimation. (PDF)

INTERNSHIP

- 2023.7~present: Meituan (美团)
  Machine Learning Engineer
  My work is trying to identify causal latent variables influencing transitions in rewarded order delivery scenario. This can assist delivery service providers in deducing present situations from observed decision trajectories, ultimately leading to improved policy optimization. Our method has already demonstrated a substantial advantage over baseline models in terms of both the identifiability of the latent variables and transition prediction accuracy. I am currently preparing for an online A/B test to further validate its effectiveness.
- 2018.3~2018.7: Meridian Global Inc - YRTech (子午投资-跃然科技)
  Quantitative Researcher
  My work centered on the automated identification of effective factors within the Chinese A-share market. Throughout this internship, I transformed the factor search problem to a derivative-free optimization problem and then developed a distributed optimization system using the Julia programming language to automate the searching process.

REWARDS & HONORS

- The 7th 'Internet+' University Student Innovation and Entrepreneurship Competition: Teacher-Student Collaboration Group National Silver Award, 2021.
- Postgraduate Elite Scholarship (top 10%), Nanjing University, 2019
- First-Class Academic Scholarship (top 20%), Nanjing University, 2018, 2019, 2020
- Undergraduate Elite Scholarship, Nanjing University, 2015, 2016, 2017
- Second-Class People's Scholarship, Nanjing University, 2015
- Citi Cup Innovation and Application Contest Top 20 in China, Xian, 2016

TEACHING ASSISTANT

- Introduction to Artificial intelligence (with Prof. Yang Yu; for undergraduate students), Fall, 2019
- Introduction to Machine Learning (with Prof. Zhi-hua Zhou, Prof. De-Chuan Zhan and Prof. Han-Jia Ye; for undergraduate students), Spring, 2020

CERTIFICATE

- Feburaray, 2021: I passed the CFA exam level 1 at first attempt with 8 As and 2 Bs [performance].
- November, 2020: I passed the FRM exam part 1 at first attempt with excellent grades in all four subjects [performance].
- August, 2019: I completed the courses at the Machine Learning Summer School held in Skoltech, Moscow, Russia [certificate].

SKILL STACK:

Rich research experience in the fields of reinforcement learning and causal discovery.
Solid foundations in mathematics, statistics, machine learning, and deep learning.
Excellent coding skill: Python, Pytorch

- Deep understanding of algorithm engineering and GPU cluster acceleration.
- Proficient in cloud containerization (Docker).
- Capable of quickly reproducing frameworks from newest deep learning literature.

MINOR

Finance
I have passed the CFA exam level 1 and FRM exam part 1 at first attempt. I have systematically learned the courses on Economics, Portfolio Management, Equity Investment, Fixed Income, Derivatives andAlternative Investments.

LANGUAGES

Mandarin: Native language
English: Fluent speaking, advanced listening, reading and writing