Weizhe Chen

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Education

University of Southern California   *Los Angeles, USA*
PHD IN COMPUTER SCIENCE   *August 2021 - Present*

- Advised by Prof. Sven Koenig and Prof. Bistra Dilkina.
- My research interest lies in the intersection of optimization and machine learning, especially in multi-agent systems and computational sustainability. Specifically, I work on using learning heuristics used in optimization algorithms, and using technologies that is previously used in combinatorial optimization in multi-agent reinforcement learning.

Shanghai Jiao Tong University   *Shanghai, China*
HONORS BACHELOR OF COMPUTER SCIENCE   *Sep 2017 - June 2021*

- Member of ACM class in SJTU, which is an elite CS program for 5 % talented student. Advised by Prof. Weinan Zhang and Prof. Yong Yu.
- Research interest in machine learning, reinforcement learning, multi-agent reinforcement learning, game theory, AI for social good.

Working Experience

Palo Alto Research Center   *Palo Alto, USA*
RESEARCH INTERN   *Jun. 2022 - Aug. 2022*

Publications

Discovering Symbolic Policy for Building Control System Using Reinforcement Learning   *IFAC WC 2023*

- Soo Kyung Kim*, Chihyeon Song*, **Weizhe Chen***, Jinkyoo Park, Saman Mostafavi.

Landscape Optimization for Prescribed Burns in Wildfire Mitigation Planning (pdf)   *COMPASS-22*

- **Weizhe Chen**, Eshwar Parasad Sivaramakrishnan, Bistra Dilkina.

Temporal Induced Self-Play for Stochastic Bayesian Games (pdf)   *IJCAI-21*

- **Weizhe Chen***, Zihan Zhou*, Yi Wu, Fei Fang.

Data-Driven Multimodal Patrol Planning for Anti-poaching (pdf)   *IAAI-2021*

- **Weizhe Chen**, Weinan Zhang, Duo Liu, Weiping Liu, Xiaojun Shi, Fei Fang.

When to Follow the Tip: Security Games with Strategic Informants (pdf)   *IJCAI-PRICAI 2020*

- Weiran Shen, **Weizhe Chen**, Taoan Huang, Rohit Singh, Fei Fang.

Bi-level Actor-Critic for Multi-agent Coordination (pdf)   *AAAI 2020 Oral*

- Haifeng Zhang, **Weizhe Chen**, Zeren Huang, Minne Li, Yaodong Yang, Weinan Zhang, Jun Wang.

Working Paper and Preprints

Efficient Multi-agent Reinforcement Learning via Large Neighborhood Search (pdf)

- **Weizhe Chen**, Sven Koenig, Bistra Dilkina.

No Panacea in Planning: Algorithm Selection for Suboptimal MAPF

- **Weizhe Chen***, Zhihan Wang*, Jiaoyang Li, Sven Koenig, Bistra Dilkina.

Research Experience

Reinforcement Learning for HVAC Control

RESEARCH INTERNSHIP PROJECT DURING INTERNSHIP AT PARC.

- Paper accepted by 22nd IFAC World Congress (IFAC WC 2023).

Algorithm Selection for Sub-Optimal Solvers for Multi-agent Path Finding

ADVISED BY PROF. SVEN KOENIG (USC) AND PROF. BISTRA DILKINA (USC)

- Proposed to use modern computer vision models to learn in Multi-agent path finding area.
- Analyzed how different learning tasks should be used for different selection objectives.
- Paper accepted by AAAI-23 MAPF workshop, and also under review.

Adaptive Window Size for Window Based Lifelong Multi-agent Path Finding in Warehouses

ADVISED BY PROF. SVEN KOENIG (USC)

- Proposed to use machine learning to do adaptive window size for window based search algorithm for lifelong multi-agent path finding.
- Changed the previous algorithm for better fit with this project
- Prepared the dataset for the setting.
- Implemented the algorithm and conducted the experiments.

Landscape Optimization for Prescribed Burns in Wildfire Mitigation Planning

ADVISED BY PROF. BISTRA DILKINA (USC)

- Formed the problem into a multi-objective optimization problem.
- Introduced fairness and diverse distribution constraint for real-world deployment.
- Compared different multi-objective optimization algorithm with different formulation.

A Study on Automatic Curriculum Learning for Multi-agent Reinforcement Learning

ADVISED BY PROF. YING WEN (SJTU), PROF. WEINAN ZHANG(SJTU), PROF. YONG YU(SJTU)

- Undergraduate Thesis.
- Proposed a pair of population-based re-ranking based algorithms for unsupervised environment design for reinforcement learning.
- Use experiments to show that our methods can help improve the training efficiency.

Approximated Temporal-Induced Neural Self-Play for Stochastic Bayesian Games

ADVISED BY PROF. FEI FANG (CARNEGIE MELLON UNIVERSITY), PROF. YI WU (TSINGHUA UNIVERSITY)

- Proposed a temporal-induced reinforcement learning based algorithm to approximate perfect Bayesian Nash equilibriums (PBNEs) in stochastic Bayesian game with one-sided incomplete information and finite horizon.
- Generalized our algorithm to a general temporal-induction paradigm that can be combined with other game-solving techniques, e.g., counterfactual regret minimization.
- Used experiments to show that our method can lead to strategy profiles that are close to PBNEs in general-sum games and is more scalable than current methods which is typically mathematical programming.

When to Follow the Tip: Security Games with Strategic Informants

ADVISED BY PROF. FEI FANG (CARNEGIE MELLON UNIVERSITY)

- This project is about introduced a new player – a strategic informant, who can observe and report upcoming attacks – to the defender-attacker security game setting, and analyze the strategy in this setting.
- Implemented the algorithms and conducted all the experiments.

Data-Driven Multimodal Patrol Planning for Anti-poaching

ADVISED BY PROF. FEI FANG (CARNEGIE MELLON UNIVERSITY)

- Showed that by analyzing satellite images and using historical patrol data, we are able to use modern machine learning methods to predict the poaching threat in a very good way.
- Proposed a novel mixed-integer linear programming-based approach to optimize multimodal patrol routes for a mix of driving and foot patrols.
- Prediction deployed in Jilin Huangnihe National Nature Reserve in Northeast China in December 2019, the rangers got much better result than historical record. And Prepared to deploy in more areas in 2020.

Bi-level Actor-Critic for Multi-agent Coordination

ADVISED BY PROF. WEINAN ZHANG (SHANGHAI JIAO TONG UNIVERSITY), PROF. JUN WANG (UNIVERSITY COLLEGE LONDON)

- Proposed to consider Stackelberg equilibrium as a potential better convergence result than Nash equilibrium in terms of Pareto superiority.
- Formally defined the problem of solving Stackelberg equilibrium as 'Bi-level reinforcement learning' (Bi-RL) problem and proposed an algorithm called 'Bi-level Actor Critic' (Bi-AC) to solve the Bi-RL problem.
- Did a converge analysis of our Bi-AC algorithm that showed our algorithm can converge under some specific assumptions.
- Showed that the proposed Bi-AC algorithm successfully converged to the Stackelberg equilibria in matrix games and find a asymmetric solution in a highway merge environment.

Honors and Awards

USC Viterbi Graduate Fellowship   *2021*

Team Member of Programming Contest Team Quasar
- Silver medal, 15th place in 'The 2018 CCPC final'.
- Gold medal, 2nd place in 'The 2018 ICPC Asia Nakhon Pathom Regional Contest'.
- Gold medal, 12th place in '2018 ICPC China Qingdao Provincial Programming Contest'.
- Gold medal, 4th place in '2018 CCPC Guilin Provincial Programming Contest'.

Team Member of Programming Contest Team Blazar
- Gold medal, 6th place in '2017 CCPC QinHuangDao Regional Contest'.
- Silver medal, 5th place in '2017 ACM-ICPC Asia-Manila Regional Contest'.

Teaching Experience

College Programming Contest Team of Shanghai Jiao Tong University
STUDENT CO-COACH   *Spring, Fall 2019*

Machine Learning course (CS420) in Shanghai Jiao Tong University
TEACHING ASSISTANT   *Spring 2020*

Skills

Language   C++, Python
Software   Pytorch, Tensorflow, HuggingFace, Latex, Gurobi, Dask, QGIS, ENVI