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Qingfeng Lan

Curriculum Vitae

Research Interest
Enhancing large language models with reinforcement learning (RL).
Improving RL efficiency by reducing forgetting and maintaining plasticity.
Understanding the inner workings of deep neural networks.

Education

20.09 - Present Doctor of Philosophy in Computing Science, **University of Alberta**, Canada.
Supervisor A. Rupam Mahmood

18.09 - 20.08 Master of Science in Computing Science, **University of Alberta**, Canada.
Thesis Predictive Representation Learning for Language Modeling. [Link]
Supervisor Alona Fyshe

14.09 - 18.07 Bachelor of Engineering in Computer Science and Technology, **University of Chinese Academy of Sciences**, China.
Thesis A Deep Top-K Relevance Matching Model for Ad-hoc Retrieval. [Link]
Advisor Yanyan Lan (thesis advisor), Guojie Li (tutor)

17.10 - 18.03 Visiting Non-Matriculated Programme, **University of Oxford**, England.
Tutor Leslie Ann Goldberg

Publications

*: Equal contribution

Conference and Journal Articles

Nature-2024 **Loss of Plasticity in Deep Continual Learning**.
Shibhansh Dohare, J. Fernando Hernandez-Garcia, **Qingfeng Lan**, Parash Rahman, A. Rupam Mahmood, Richard S. Sutton. *Nature, 2024.* **Article. [Link]**

RLC-2024 **Learning to Optimize for Reinforcement Learning**.
Qingfeng Lan, A. Rupam Mahmood, Shuicheng Yan, Zhongwen Xu. *Reinforcement Learning Conference, 2024.* **Oral. [Link]**

RLC-2024 **More Efficient Randomized Exploration for Reinforcement Learning via Approximate Sampling**.
Haque Ishfaq, Yixin Tan, Yu Yang, **Qingfeng Lan**, Jianfeng Lu, A. Rupam Mahmood, Doina Precup, Pan Xu. *Reinforcement Learning Conference, 2024.* **Oral. [Link]**

RLC-2024 **Weight Clipping for Deep Continual and Reinforcement Learning**.
Mohamed Elsayed, **Qingfeng Lan**, Clare Lyle, A. Rupam Mahmood. *Reinforcement Learning Conference, 2024.* **Oral. [Link]**

ICLR-2024 **Provable and Practical: Efficient Exploration in Reinforcement Learning via Langevin Monte Carlo**.
Haque Ishfaq*, **Qingfeng Lan***, Pan Xu, A. Rupam Mahmood, Doina Precup, Anima Anandkumar, Kamyar Azizzadenesheli. *International Conference on Learning Representations, 2024.* **Poster.** **[Link]**

TMLR-2023 **Memory-efficient Reinforcement Learning with Value-based Knowledge Consolidation**.
Qingfeng Lan, Yangchen Pan, Jun Luo, A. Rupam Mahmood. *Transactions on Machine Learning Research, 2023.* **CoLLAs certification.** **[Link]**

AISTATS-2022 **Model-free Policy Learning with Reward Gradients**.
Qingfeng Lan, Samuele Tosatto, Homayoon Farrahi, A. Rupam Mahmood. *International Conference on Artificial Intelligence and Statistics, 2022.* **Poster.** **[Link]**

ICLR-2020 **Maxmin Q-learning: Controlling the Estimation Bias of Q-learning**.
Qingfeng Lan, Yangchen Pan, Alona Fyshe, Martha White. *International Conference on Learning Representations, 2020.* **Poster.** **[Link]**

CCIR-2018 **A Deep Top-K Relevance Matching Model for Ad-hoc Retrieval**.
Zhou Yang, **Qingfeng Lan**, Jiafeng Guo, Yixing Fan, Xiaofei Zhu, Yanyan Lan and Yue Wang, Xueqi Cheng. *China Conference on Information Retrieval, 2018.* **Best Paper Award Candidate.** **[Link]**

Workshop and Non-Refereed Articles

ICML-2023 **Elephant Neural Networks: Born to Be a Continual Learner**.
Qingfeng Lan, A. Rupam Mahmood. *ICML Workshop on High-dimensional Learning Dynamics, 2023.* **Poster.** **[Link]**

EWRL-2023 **Overcoming Policy Collapse in Deep Reinforcement Learning**.
Shibhansh Dohare, **Qingfeng Lan**, A. Rupam Mahmood. *European Workshop on Reinforcement Learning, 2023.* **Poster.** **[Link]**

arXiv-2021 **Variational Quantum Soft Actor-Critic**.
Qingfeng Lan. *Quantum Computing Course Project, 2021.* **[Link]**

Employment

24.11 - Present Research Intern, **Huawei Noah's Ark Lab**, Edmonton, Canada.
Collaborator Boxing Chen
Project Enhancing large language models with reinforcement learning.

24.06 - 24.10 Research Intern, **Meta Reality Lab**, California, United States.
Collaborator Rohan Chitnis, Alborz Geramifard
Project Improving Next-generation Wearables through Reinforcement Learning. [Link]
- Built a real-time online reinforcement learning training pipeline from scratch.
- Improved the cursor control policy of the wearables with reinforcement learning.

22.07 - 23.01 Research Intern, **Sea AI Lab**, Singapore.
Collaborator Zhongwen Xu, Shuicheng Yan
Project Learning to Optimize for Reinforcement Learning. [Link]
- Applied meta-learning to learn an optimizer for reinforcement learning tasks.

- Proposed the first learned optimizer for reinforcement learning that is stable to train and generalizes to unseen tasks. Paper accepted at RLC 2024.

22.01 - 22.06 Research Intern, **Huawei Noah's Ark Lab**, Edmonton, Canada.

Collaborator Yangchen Pan, Jun Luo

Project Memory-efficient Reinforcement Learning with Value-based Knowledge Consolidation. [Link]

- Demonstrated that catastrophic forgetting exists even in single-task reinforcement learning, resulting in low learning efficiency.
- Reduced the replay buffer size significantly by mitigating forgetting with value-based knowledge consolidation. Paper accepted at TMLR.

17.07 - 18.04 Research Assistant, **Key Laboratory of Network Data Science and Technology, Chinese Academy of Sciences**, Beijing, China.

Collaborator Yixing Fan, Yanyan Lan, Jiafeng Guo

Project A Deep Top-K Relevance Matching Model for Ad-hoc Retrieval. [Link]

- Proposed a deep relevance matching model for ad-hoc retrieval problem by applying the top-k pooling and a term gating network.
- Outperformed SOTA models on two representative benchmark datasets. Paper accepted at CCIR 2018.

Academic Services

Reviewer JMLR 2020, NeurIPS 2022-2024, ICLR 2023-2024, AISTATS 2023, CoLLAs 2023-2024, ICML 2024, RLC 2024, RLC 2024 Workshop Deployable RL.

Open-Source Code

Jaxplorer.
A Jax reinforcement learning framework for exploring new ideas.

Optim4RL.
A Jax framework of learning to optimize for reinforcement learning.

Explorer.
A PyTorch reinforcement learning framework for exploring new ideas.

Gym Games.
A collection of Gymnasium compatible games for reinforcement learning.

Quantum Explorer.
A quantum reinforcement learning framework based on PyTorch and PennyLane.

Loss of Plasticity.
The implementation of continual backpropagation which maintains network plasticity.

Awards & Honors

2023 Alberta Innovates Graduate Student Scholarship, CAD 31,000.
University of Alberta

Computer skills

Language	Python, Matlab, C
Framework	Jax, PyTorch, Tensorflow