FUYUAN LYU

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SUMMARY

I'm currently a Ph.D. candidate at McGill University & MILA, fortunate to be advised by *Prof Jin L.C. Guo* and *Prof Xue Liu*. My research topics mainly lie in three aspects:

[1] **Automated Feature Engineering & Data-centric AI**, where I mainly work on fundamental and practical ML problems such as representation learning [c1, c2], feature selection[c3, c4], feature fusion [c7], label correlation [c5] and their application in real world scenarios.
[2] **AI4Fintech**, where I work with Tencent FiT on industrial-inspired research such as fund allocation [w1] and recommendation [c9].
[3] **LLM Evaluation**, which explore the LLM evaluation problem [c6, c8] from various aspects.

Before joining McGill, I got my bachelor's degree in Computer Science with *Zhiyuan Honour Degree in Engineering* from Shanghai Jiao Tong University(SJTU). I was advised by *Prof Li Jiang* for my thesis and worked with *Prof Xiaokang Yang*. I also had a great time at Nanyang Technological University(NTU), researching with *Prof Weichen Liu*.

EDUCATION

- PhD, Computer Science, McGill University, 2019-2025 (core GPA 3.81/4.00)
- BEng, Computer Science, Shanghai Jiao Tong University, 2015-2019, (core GPA 90.97/100)
- Zhiyuan Honor Degree for BEng, Shanghai Jiao Tong University, 2015-2019

SELECTED PUBLICATIONS

* denotes (co-)first authors, † denotes (co-)corresponding authors.

Conference:

[c12] Ziqiang Cui, Yunpeng Weng, Xing Tang, **Fuyuan Lyu**, Dugang Liu, Xiuqiang He and Chen Ma, "CoLaKG: Comprehending Knowledge Graphs with Large Language Models for Recommender Systems", *In Proceedings of The 48th International ACM SIGIR Conference on Research and Development in Information Retrieval* (**SIGIR 2025**)

[c11] Xing Tang*, Yunpeng Weng*, **Fuyuan Lyu***, Dugang Liu, and Xiuqiang He, "A Predict-Then-Optimize Customer Allocation Framework for Online Fund Recommendation", *In Proceedings of The 30th International Conference on Database Systems for Advanced Applications* (**DASFAA 2025**)

[c10] Qiyuan Zhang, Yufei Wang, Tiezheng Yu, Yuxin Jiang, Chuhan Wu, Liangyou Li, Yasheng Wang, Xin Jiang, Lifeng Shang, Ruiming Tang, **Fuyuan Lyu**, and Chen Ma, "RevisEval: Improving LLM-as-a-Judge via Response-Adapted References", *In Proceedings of The Thirteenth International Conference on Learning Representations* (**ICLR 2025**)

[c9] Dugang Liu, Chaohua Yang, Yuwen Fu, Xing Tang, Gongfu Li, **Fuyuan Lyu**, Xiuqiang He, and Zhong Ming, "Scenario Shared Instance Modeling for Click-through Rate Prediction", *In Proceedings of The 31st ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD 2025**)

[c8] Kexin Zhang*, **Fuyuan Lyu***, Xing Tang, Dugang Liu, Chen Ma, Kaize Ding, Xiuqiang He, and Xue Liu, "Fusion Matters: Learning Fusion in Deep Click-through Rate Prediction Models", *In Proceedings of the 18th International Conference on Web Search and Data Mining* (**WSDM 2025**)

[c7] Qiyuan Zhang, **Fuyuan Lyu**†, Xue Liu, Chen Ma†, "Collaborative Performance Prediction for Large Language Models", *In Proceedings of the 2024 Conference on Empirical Methods in Natural Language Processing* (**EMNLP 2024**)

[c6] Xing Tang*, Qiao Yang*, **Fuyuan Lyu***, Dugang Liu, Xiuqiang He, "Touch the Core: Exploring Task Dependence Among Hybrid Targets for Recommendation", *In Proceedings of the 18th ACM Conference on Recommender Systems* (**Recsys 2024**)

[c5] **Fuyuan Lyu**, Xing Tang, Dugang Liu, Chen Ma, Weilong Luo, Xiuqiang He, Xue Liu, "Towards Hybrid-grained Feature Interaction Selection for Deep Sparse Network", *In Proceedings of the 37th Conference on Neural Information Processing Systems* (**NeurIPS 2023**)

[c4] Dugang Liu, Xing Tang, Han Gao, **Fuyuan Lyu**, Xiuqiang He, "Explicit Feature Interaction-aware Uplift Network for Online Marketing", *In Proceedings of The 29th ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (**KDD 2023**)

[c3] **Fuyuan Lyu***, Xing Tang*, Dugang Liu, Chen Liang, Xiuqiang He, Xue Liu, "Optimizing Feature Set for Click-through Rate Prediction", *In Proceedings of The Web Conference 2023* (**WWW 2023**)

[c2] **Fuyuan Lyu***, Xing Tang*, Hong Zhu, Huifeng Guo, Yingxue Zhang, Ruiming Tang, Xue Liu, "OptEmbed: Learning Optimal Embedding Table for Click-through Rate Prediction", *In Proceedings of the 31st ACM International Conference on Information and Knowledge* (**CIKM 2022**)

[c1] **Fuyuan Lyu***, Xing Tang*, Huifeng Guo, Ruiming Tang, Xiuqiang He, Rui Zhang, Xue Liu, "Memorize, Factorize, or be Naïve: Learning Optimal Feature Interaction Methods for CTR Prediction", *In Proceedings of the 38th IEEE International Conference on Data Engineering* (**ICDE 2022**)

Journal:

[j1] Haolun Wu, Yansen Zhang, Chen Ma, **Fuyuan Lyu**, Bowei He, Bhaskar Mitra, Xue Liu, "Result Diversification in Search and Recommendation: A Survey", *IEEE Transactions on Knowledge and Data Engineering (2024)*

Workshop:

[w1] **Fuyuan Lyu**, Linfeng Du, Yunpeng Weng, Qiufang Ying, Zhiyan Xu, Wen Zou, Haolun Wu, Xiuqiang He, Xing Tang, "Timing is important: Risk-aware Fund Allocation based on Time-Series Forecasting", *ICLR 2025 Workshop on Advances in Financial AI: Opportunities, Innovations and Responsible AI*

Preprint:

[p3] Qiyuan Zhang*, **Fuyuan Lyu***, Zexu Sun, Lei Wang, Weixu Zhang, Zhihan Guo, Yufei Wang, Irwin King, Xue Liu, Chen Ma, "What, How, Where, and How Well? A Survey on Test-Time Scaling in Large Language Models", *arxiv 2503.24235*

[p2] **Fuyuan Lyu**, Xing Tang, Dugang Liu, Haolun Wu, Chen Ma, Xiuqiang He, Xue Liu, "Feature Representation Learning for Click-through Rate Prediction: A Review and New Perspectives", *arxiv 2302.02241*

[p1] Yuecai Zhu, **Fuyuan Lyu**, Chengming Hu, Xi Chen, Xue Liu, "Encoder-Decoder Architecture for Supervised Dynamic Graph Learning: A Survey", *arxiv 2203.10480*

RESEARCH EXPERIENCE

McGill University & MILA **Sep 2019 to now**

Research Assistant *Advisor: Prof. Jin L.C. Guo & Prof. Xue Liu*

- OptFusion: This paper investigates the fusion mechanism in the CTR model. Specifically, we found that the embedding layer is the juicy part of the model. In order to perform well, a model does not need to be heavy but needs to be densely connected to the embedding layer. The paper is accepted in WSDM 2025.
- OptNum: This paper studies the numerical modeling in tabular prediction tasks. The paper is under-submission.
- SpecB-FNO: We analyze the Fourier Neural Operator(FNO) from the spectral perspective and propose SpecB-FNO to alleviate the Fourier-parameterization bias. The paper is under-submission.
- OptFeature: Propose to select feature interaction at different granularity in deep sparse networks. The paper is accepted in NeurIPS 2023.
- OptFS: Jointly consider the influence of selecting feature and feature interaction in CTR Prediction and propose an automated method to select. The paper is accepted in WWW 2023. It has been utilized on the Tencent FiT platform with millions of annual revenue increases.

RBC Borealis **Jan 2025 to now**

Research Intern *Advisor: Dr. Melissa Mozifian & Dr. Ankit Vani & Dr. Edward Smith*

- RL4ExplainableTS: Utilizing Reinforcement Learning for explainable time series forecasting. This project is under work.

City University of Hong Kong **Mar 2024 to Sep 2024**

Research Assistant *Advisor: Prof. Chen Ma*

- CPP4LLM-Eval: We propose a Collaborative Performance Prediction framework for LLM Evaluation. This project revisits the scaling law from the collaborative perspective. This paper is accepted by EMNLP 2024.
- RevisEval: This project aims to better utilize the LLM's generative ability instead of its discriminative ability in LLM-as-a-Judge. Specifically, the quality of an answer is not directly determined by asking LLM to give it a score. Instead, it is measured as the distance between the original answer and the answer revised by LLM. This paper is accepted by ICLR 2025.

Tencent, FiT **Jan 2024 to Sep 2024**
Research Intern *Advisor: Dr. Xing Tang & Dr. Xiuqiang He*

- PTOFA: This paper is inspired by a product-line problem: fund recommendation in Tencent, FiT department. Unlike common recommendations, different funds have a strict minimal exposure to users, and the revenue gaps between users are much more significant. This paper is accepted by DASFAA 2025.
- HTLNet: This paper is inspired by a product-line problem: customer revenue estimation under certain investments in Tencent, FiT department. A hybrid-target learning network is proposed as a practical solution. This paper is accepted by Recsys 2024.

Huawei Noah's Ark Lab, Montreal **Nov 2021 to Jun 2023**
Research Intern *Advisor: Yingxue Zhang*

- Towards Automated Negative Sampling for Implicit Recommendation: In this project, we challenge the common belief in the negative sampling community that a "best" negative sampler exists. Instead, we hypothesize that the negative sampler is model&data-dependent and propose an efficient selection algorithm. The paper is under-submission.
- OptEmbed: Study the influence of the size of the embedding table in CTR Prediction. Propose a unified framework to optimize the size of the embedding table and model parameters automatically. The paper is accepted in CIKM 2022.

Huawei Noah's Ark Lab **Mar 2021 to Aug 2021**
Research Intern *Advisor: Dr. Xing Tang & Dr. Ruiming Tang*

- OptInter: Study the influence of modeling methods for feature interaction. Propose a novel deep CTR prediction framework including various modeling methods and a two-stage learning algorithm to select the optimal for each feature interaction automatically. The paper is accepted in ICDE 2022.

Shanghai Jiao Tong University **Feb 2019 to Aug 2019**
Research Assistant *Advisor: Prof. Li Jiang*

- Dual-flow Training Framework to Exploit Structured Sparsity: Support structured sparsity from framework level. Propose a flexible dual-flow mechanism to decouple the non-zero data and the sparse network structure. Integrate the dual-flow mechanism into the deep learning compiler stack built on TVM.

Nanyang Technological University **Aug 2018 to Feb 2019**
Research Assistant *Advisor: Prof. Weichen Liu*

- Cross-filter Compression: Address the conflict between uniform quantization and compact network design when speedup CNN. Explored CNN spatial-adjunct layer property and proposed cross-filter compression method.

Shanghai Jiao Tong University **Jun 2017 to Feb 2018**
Research Assistant *Advisor: Prof. Xiaokang Yang*

- Explored the possibility of more realistic cloth transfer by generating and transferring structure in 3D dimension.
- Designed a specific generative adversarial network to animate cartoon figures.

TEACHING AND MENTORING EXPERIENCE

- Teaching
  - Teaching Assistant for COMP303: *Software Design*, 2020 Winter
- Mentoring:
  - Helen Zhao on Classicial ML, 2025 Winter
  - Dowoo Kim on Uncertainty for Treatment Effect Estimation, 2025 Winter
  - Carlone Scott on Automatic Data Labeling, 2024 Summer & Fall
  - Qiyuan Zhang on LLM Evaluation, 2024 Winter & Summer
  - Kexin Zhang(now RA@UCSD) on Recommender System, 2024 Winter
  - Tim Yang & Tom Yang on LLM-based Feature Selection, 2024 Winter
  - Aasheesh Singh(now MLE@Vector) on Federated Prediction, 2023 Summer & Fall
  - Shaoxiang Qin on Fourier Neural Operator, 2023-2024

SELECTED AWARDS

- National Award for Outstanding Overseas Student (Class A), 2023
- NeurIPS Scholar Award, 2023
- McGill GREAT Award for NeurIPS, 2023
- SIGIR Student Travel Grant for CIKM, 2022
- Grad Excellence Award of McGill University, 2019-2024
- Faculty of Science Graduate Supplement Award, 2022-2024
- Natural Sciences and Engineering Research Council of Canada, 2019-2020 & 2022-2024

- School of Computer Science Grad Stimulus Initiative Award, 2020-2021
- Wolfe Fellowship in Sci & Tech, 2019-2020
- Zhiyuan Honor Degree of Engineering of Shanghai Jiao Tong University(1%), 2019
- Zhiyuan Oversea Research Scholarship (1st class) of Shanghai Jiao Tong University, 2019
- Zhiyuan Outstanding Student Scholarship of Shanghai Jiao Tong University(5%), 2019
- Microsoft Intelligence Award , awarded to 4/438 participants in the 1st HACKxFDU Hackathon, 2016.