

JIAN LI

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Associate Professor · Institute of Information Engineering, CAS



CAREER

Institute of Information Engineering, CAS , Associate Professor	2023.10 - Present
Microsoft Research Asia , NLC Group, Visiting Scholar	2024.04 - 2024.06
Institute of Information Engineering, CAS , Tenure-track Assistant Professor	2020.09 - 2023.10

EDUCATION

University of Chinese Academy of Sciences (UCAS) , Cyber Security, <i>Ph.D.</i>	2015.09 - 2020.06
Northeastern University , Software Engineering (International class), <i>Bachelor</i>	2011.09 - 2015.06

RESEARCH INTERESTS

My research focuses on foundational machine learning theory, particularly the generalization theory of large-scale methods. Addressing the lag in foundational theory compared to empirical algorithms in large-scale machine learning, I aim to uncover the underlying principles and narrow the gap between theory and practical algorithms. Ultimately, I strive to guide large-scale algorithm design for a balance between computational efficiency and generalization performance. Specific interests include:

- **Fundamental Research on Large Language Models:** Delving into the foundational theory of large language models, explaining unique capabilities like scaling laws, context learning, and complex reasoning. Improving model architecture for computational efficiency and performance and researching the next generation of efficient language models with reduced parameters.
- **Generalization Theory of Deep Neural Networks:** Exploring connections between neural networks and kernel methods, studying generalization in non-stationary spectral kernel networks, refining current neural network models, and using random matrix theory to understand phenomena in deep networks.
- **Optimal Generalization Guarantees for Large-Scale ML:** Investigating optimal generalization guarantees, relaxing assumptions, and enhancing large-scale algorithms, including federated learning, distributed learning, and random features.

PUBLICATIONS (🔗 [GOOGLE SCHOLAR PROFILE](#))

* Contact author,

Representative Papers

- [A Survey on Model Compression for Large Language Models.](#)
Xunyu Zhu, **Jian Li***, Yong Liu, Can Ma, Weiping Wang.
Transactions of the Association for Computational Linguistics (**TACL**), 2024, Accepted. **CCF-B Journal**.
- [Optimal Rates for Agnostic Distributed Learning.](#)
Jian Li, Yong Liu, Weiping Wang.
IEEE Transactions On Information Theory (**TIT**), 2023. **CCF-A Journal**.
- [Optimal Convergence Rates for Distributed Nyström Approximation.](#)
Jian Li, Yong Liu, Weiping Wang.

- Journal of Machine Learning Research (**JMLR**), 2023. **CCF-A Journal**.
- [Convolutional Spectral Kernel Learning with Generalization Guarantees](#).
Jian Li, Yong Liu, Weiping Wang.
Artificial Intelligence (**AI**), 2022. **CCF-A Journal**.
 - [Optimal Convergence Rates for Agnostic Nyström Kernel Learning](#).
Jian Li, Yong Liu, Weiping Wang.
International Conference on Machine Learning (**ICML**), 2023. **CCF-A Conference**.
 - [Multi-Class Learning: From Theory to Algorithm](#).
Jian Li, Yong Liu, Rong Yin, Hua Zhang, Lizhong Ding, Weiping Wang.
Advances in Neural Information Processing Systems (**NeurIPS**), 2018. **CCF-A Conference**.
 - [Federated learning for non-iid data: From theory to algorithm](#). 🏆 **Best Student Paper Award** (1/92)
Bojian Wei, **Jian Li**^{*}, Yong Liu, Weiping Wang.
Pacific Rim International Conference on Artificial Intelligence (**PRICAI**), 2021. **CCF-C Conference**.

Journal Papers

1. [Optimal Rates for Agnostic Distributed Learning](#).
Jian Li, Yong Liu, Weiping Wang.
IEEE Transactions On Information Theory (**TIT**), 2023. **CCF-A Journal**.
2. [Optimal Convergence Rates for Distributed Nyström Approximation](#).
Jian Li, Yong Liu, Weiping Wang.
Journal of Machine Learning Research (**JMLR**), 2023. **CCF-A Journal**.
3. [Convolutional Spectral Kernel Learning with Generalization Guarantees](#).
Jian Li, Yong Liu, Weiping Wang.
Artificial Intelligence (**AI**), 2022. **CCF-A Journal**.
4. [Optimal Convergence for Agnostic Kernel Learning With Random Features](#).
Jian Li, Yong Liu, Weiping Wang.
IEEE Transactions on Neural Networks and Learning Systems (**TNNLS**), 2023. **CCF-B Journal**.
5. [Semi-supervised vector-valued learning: Improved bounds and algorithms](#).
Jian Li, Yong Liu, Weiping Wang.
Pattern Recognition (**PR**), 2023. **CCF-B Journal**.
6. [A Survey on Model Compression for Large Language Models](#).
Xunyu Zhu, **Jian Li**^{*}, Yong Liu, Can Ma, Weiping Wang.
Transactions of the Association for Computational Linguistics (**TACL**), 2024, Accepted. **CCF-B Journal**.
7. [Improving Differentiable Architecture Search via Self-distillation](#).
Xunyu Zhu, **Jian Li**^{*}, Yong Liu, Weiping Wang.
Neural Networks, 2023. **CCF-B Journal**.
8. [Non-IID Federated Learning with Sharper Risk Bound](#).
Bojian Wei, **Jian Li**^{*}, Yong Liu, Weiping Wang.
IEEE Transactions on Neural Networks and Learning Systems (**TNNLS**), 2022. **CCF-B Journal**.

Conference Papers

1. [Optimal Convergence Rates for Agnostic Nyström Kernel Learning](#).
Jian Li, Yong Liu, Weiping Wang.
International Conference on Machine Learning (**ICML**), 2023. **CCF-A Conference**.
2. [Multi-Class Learning: From Theory to Algorithm](#).
Jian Li, Yong Liu, Rong Yin, Hua Zhang, Lizhong Ding, Weiping Wang.
Advances in Neural Information Processing Systems (**NeurIPS**), 2018. **CCF-A Conference**.
3. [Federated learning for non-iid data: From theory to algorithm](#). 🏆 **Best Student Paper Award** (1/92)

- Bojian Wei, **Jian Li**^{*}, Yong Liu, Weiping Wang.
Pacific Rim International Conference on Artificial Intelligence (**PRICAI**), 2021. CCF-C Conference.
4. [High-dimensional Analysis for Generalized Nonlinear Regression: From Asymptotics to Algorithm.](#)
Jian Li, Yong Liu, Weiping Wang.
AAAI Conference on Artificial Intelligence (**AAAI**), 2024. CCF-A Conference.
 5. [FedNS: A Fast Sketching Newton-type Algorithm for Federated Learning.](#)
Jian Li, Yong Liu, Weiping Wang.
AAAI Conference on Artificial Intelligence (**AAAI**), 2024. CCF-A Conference.
 6. [Towards Sharp Analysis for Distributed Learning with Random Features.](#)
Jian Li, Yong Liu.
International Joint Conference on Artificial Intelligence (**IJCAI**), 2023. CCF-A Conference.
 7. [Ridgeless Regression with Random Features.](#)
Jian Li, Yong Liu, Yingying Zhang.
International Joint Conference on Artificial Intelligence (**IJCAI**), 2022. CCF-A Conference.
 8. [Automated Spectral Kernel Learning.](#)
Jian Li, Yong Liu, Weiping Wang.
AAAI Conference on Artificial Intelligence (**AAAI**), 2020. CCF-A Conference.
 9. [Multi-Class Learning using Unlabeled Samples: Theory and Algorithm.](#)
Jian Li, Yong Liu, Rong Yin, Weiping Wang.
International Joint Conference on Artificial Intelligence (**IJCAI**), 2019. CCF-A Conference.
 10. [Approximate Manifold Regularization: Scalable Algorithm and Generalization Analysis.](#)
Jian Li, Yong Liu, Rong Yin, Weiping Wang.
International Joint Conference on Artificial Intelligence (**IJCAI**), 2019. CCF-A Conference.
 11. [Efficient Kernel Selection via Spectral Analysis.](#)
Jian Li, Yong Liu, Hailun Lin, Yinliang Yue, Weiping Wang.
International Joint Conference on Artificial Intelligence (**IJCAI**), 2017. CCF-A Conference.
 12. [Non-IID Distributed Learning with Optimal Mixture Weights.](#)
Jian Li, Bojian Wei, Yong Liu, Yingying Zhang.
European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (**ECML-PKDD**), 2022. CCF-B Conference.
 13. [Operation-level Progressive Differentiable Architecture Search.](#)
Xunyu Zhu, **Jian Li**^{*}, Yong Liu, Weiping Wang.
International Conference on Data Mining (**ICDM**), 2021. CCF-B Conference.
 14. [Sharper Utility Bounds for Differentially Private Models: Smooth and Non-smooth.](#)
Yilin Kang, Yong Liu, **Jian Li**, Weiping Wang.
The Conference on Information and Knowledge Management (**CIKM**), 2022. CCF-B Conference.
 15. [Towards Sharper Risk Bounds for Agnostic Multi-Objectives Learning.](#)
Bojian Wei, **Jian Li**^{*}, Yong Liu.
International Joint Conference on Neural Networks (**IJCNN**), 2023. CCF-C Conference.
 16. [Data Heterogeneity Differential Privacy: From Theory to Algorithm.](#)
Yiling Kang, **Jian Li**^{*}, Yong Liu, Weiping Wang.
International Conference on Computational Science (**ICCS**), 2023. IIE-B Conference.

Preprints

1. On the Statistical Optimality of Newton-type Federated Learning with Non-IID Data.
Jian Li, Yong Liu, Weiping Wang.
Submission in IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), CCF-A Journal.
2. Domain Agnostic Learning: Improved Algorithms and Bounds.

Jian Li, Yong Liu, Weiping Wang.

Submission in Journal of Machine Learning Research (JMLR), CCF-A Journal.

3. Small Language Models: Powerful Executors, Limited Thinkers.

Xunyu Zhu, **Jian Li***, Yong Liu, Can Ma, Weiping Wang.

Submission in Transactions of the Association for Computational Linguistics (TACL), CCF-B Journal.

4. [Improving Small Language Models' Mathematical Reasoning via Mix Thoughts Distillation](#). arXiv:2401.11864.

Xunyu Zhu, **Jian Li***, Yong Liu, Can Ma, Weiping Wang.

Submission in Neural Networks, CCF-B Journal.

5. [Key-Point-Driven Mathematical Reasoning Distillation of Large Language Model](#). arXiv:2407.10167.

Xunyu Zhu, **Jian Li***, Can Ma, Weiping Wang.

Submission in IEEE Transactions on Neural Networks and Learning Systems (TNNLS), CCF-B Journal.

PROJECTS

National Key R&D Program of China (2022YFB3105302.2), ¥1,200,000 2022.12 - 2025.11

Title: Aggregation and Collaborative Techniques for Cross-platforms Heterogeneous Data

- Research on Cross-Platform Data Security Sharing Technology
- Research on Human-Machine Collaboration Annotation Technology Based on Important Tags Discovery
- Research on Heterogeneous Data Fusion Technology Based on Constraints on Different Feature Distributions

National Natural Science Foundation of China (No. 62106257), ¥300,000 2022.01 - 2024.12

Title: Large Scale Structured Prediction with Automated Spectral Kernel Learning

China Postdoctoral Science Foundation (No. 2023T160680), ¥180,000 2023.07 - 2024.03

Special Support, Less than 800 cand per year

Title: Research on Deep Differentiable Gaussian Processes for Structured Prediction

Special Research Assistant Project of CAS, ¥800,000 2020.09 - 2022.09

Title: Large-scale Few-shot Automated Machine Learning

Talent Program Class A of Institute of Information Engineering, CAS 2023.10 - 2026.09

Talent Program Class B of Institute of Information Engineering, CAS 2020.09 - 2023.10

PATENTS

A Large-Scale Ontology Merging Method that Integrates Representation Learning and Divide-and-Conquer Strategy Granted date: April 8, 2022

Hailun Lin, Yong Liu, **Jian Li**, Weiping Wang

Granted number (CN): CN110059194A

A Federated Learning Method and System Based on Attention Mechanism 2023

Jian Li, Jiaoyang Li, Bojian Wei, Yong Liu, Weiping Wang

Application Number (CN): 202311073645.3

A Vertical Domain Large Model Method and System Based on Knowledge Distillation and Prompt Engineering 2023

Jian Li, Jiaoyang Li, Zheng Lin, Yong Liu, Weiping Wang

Application number (CN): 202311073641.5

Neural Network Architecture Search Method, Device, Computer Equipment, and Storage Medium

2020

Jian Li, Yong Liu, Liubin Wang, Yiguo Yang, Juhong Wang

Application Number (CN): 202011567991.3

STUDENTS

Yilin Kang, Ph.D. student, Differential Privacy 2020.09 - 2023.06

Publications: Computers & Security, CIKM 2022, ICCS 2023

Post-graduation: Researcher in Purple Mountain Laboratories

Bojian Wei, Master student, Federated Learning 2020.09 - 2022.06

Publications: PRICAI 2021 (**Best student paper award**), ECML-PKDD 2022, IJCNN 2023, TNNLS

Post-graduation: Management Trainee in Bank of China Head Office

Xunyu Zhu, Ph.D. student, Neural Architecture Search & Compression of LLMs 2020.09 - Present

Publications: ICDM 2021, Neural Networks, TACL. In submissions: TACL, Neural Networks, TNNLS

Boxuan Che, Ph.D. student, Efficient Graph Neural Networks 2022.09 - Present

Xuning Zhang, Master student, Optimization on Federated Learning 2022.09 - Present

Undergraduate Thesis: Research on Federated Learning for Heterogeneous Data.

Excellent Bachelor's Thesis in Wuhan University in 2023.

HONORS AND AWARDS

Microsoft Research Asia StarTrack Scholars Program 2024

Talent Plan Class A of IIE, CAS 2023

PRICAI 2021 best student paper award 2021

Special Research Assistant of Chinese Academy of Sciences 2020

Talent Plan Class B of IIE, CAS 2020

~~AIDU Talents of Baidu Research (Decline)~~ 2020

~~Joint Ph.D. Program with Stanford University (Discontinued due to COVID-19)~~ 2020 - 2021

Outstanding Graduate of Beijing 2020

Outstanding Graduate of University of Chinese Academy of Sciences (UCAS) 2020

National Scholarship for Doctoral student 2019

ZhuLiYueHua Scholarship for Excellent Doctoral Student 2019

Presidential Scholarship of Chinese Academy of Sciences (CAS) 2019

National Scholarship for Doctoral students 2018

ACADEMIC SERVICE

- Guest Editor of Mathematics
- Program committee of Conference: ICML, NeurIPS, ICLR, AAAI, IJCAI, ECAI, etc.
- Reviewers of Journals: TPAMI, JMLR, Pattern Recognition, etc.