# Jian Li

Male · Beijing, China · Birth: April 1992
(+86) 130-2005-8233 · me@lijian.ac.cn
lijian.ac.cn · Google Scholar · superlj666
Associate Professor · Institute of Information Engineering, CAS

## CAREER

**Institute of Information Engineering, CAS**, Associate Professor 2023.10 - Present
**Institute of Information Engineering, CAS**, Tenure-track Professor 2020.09 - 2023.10

## EDUCATION

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

## Research Interests

To address the challenges faced by large language models, such as high computational resource demands and weak foundational theories, my research is dedicated to exploring the underlying principles of large language models. The goal is to design efficient and interpretable lightweight language models, thereby narrowing the gap between foundational theory and practical algorithms. Specific research interests include, but are not limited to:

- **Lightweight Language Models:** Investigating the underlying principles of scaling guidelines for large language models to guide the design of the next generation of efficient and deployable lightweight language models. This involves technologies such as language model architecture design, model compression, and high-quality instruction fine-tuning.
- **Large Models and Deep Learning Theory:** Delving into the unique phenomena of large language models, such as scaling guidelines, contextual learning abilities, complex reasoning capabilities, and the underlying principles of benign overfitting and the double descent phenomenon in deep learning.
- **Generalization Theories of Large-Scale Machine Learning Methods:** Researching the generalization theory of large-scale machine learning methods and using the results from generalization theory to enhance large-scale algorithms. This includes studying various methods like federated learning, distributed learning, random features, Nyström methods, sketching methods, and more.

## Publications (👉 Google Scholar Profile)

* Contact author, ★ Notable publications

### Journal Papers

★ Optimal Convergence Rates for Distributed Nyström Approximation.
**Jian Li**, Yong Liu, Weiping Wang.
Journal of Machine Learning Research (**JMLR**), 2023. **CCF-A**.

- 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**.
- Semi-supervised vector-valued learning: Improved bounds and algorithms.
**Jian Li**, Yong Liu, Weiping Wang.
Pattern Recognition (**PR**), 2023. **CCF-B**.

- Improving Differentiable Architecture Search via Self-distillation.
  Xunyu Zhu, **Jian Li***, Yong Liu, Weiping Wang.
  **Neural Networks**, 2023. **CCF-B**.
- ★ Convolutional Spectral Kernel Learning with Generalization Guarantees.
  **Jian Li**, Yong Liu, Weiping Wang.
  Artificial Intelligence (**AI**), 2022. **CCF-A**.
- 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**.

Conference Papers

- High-dimensional analysis for Generalized Nonlinear Regression: From Asymptotics to Algorithm.
  **Jian Li**, Yong Liu, Weiping Wang.
  To appear in AAAI Conference on Artificial Intelligence (**AAAI**), 2024. **CCF-A**.
- FedNS: A Fast Sketching Newton-type Algorithm for Federated Learning.
  **Jian Li**, Yong Liu, Weiping Wang.
  To appear in AAAI Conference on Artificial Intelligence (**AAAI**), 2024. **CCF-A**.
- ★ Optimal Convergence Rates for Agnostic Nyström Kernel Learning.
  **Jian Li**, Yong Liu, Weiping Wang.
  International Conference on Machine Learning (**ICML**), 2023. **CCF-A**.
- Towards Sharp Analysis for Distributed Learning with Random Features.
  **Jian Li**, Yong Liu.
  International Joint Conference on Artificial Intelligence (**IJCAI**), 2023. **CCF-A**.
- 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**.
- Data Heterogeneity Differential Privacy: From Theory to Algorithm.
  Yiling Kang, **Jian Li***, Yong Liu, Weiping Wang.
  International Conference on Computational Science (**ICCS**), 2023.
- Ridgeless Regression with Random Features.
  **Jian Li**, Yong Liu, Yingying Zhang.
  International Joint Conference on Artificial Intelligence (**IJCAI**), 2022. **CCF-A**.
- 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**.
- 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**.
- ★ Federated learning for non-iid data: From theory to algorithm. 🏆 **Best student paper award.**
  Bojian Wei, **Jian Li***, Yong Liu, Weiping Wang.
  Pacific Rim International Conference on Artificial Intelligence (**PRICAI**), 2021. **CCF-C**.
- Operation-level Progressive Differentiable Architecture Search.
  Xunyu Zhu, **Jian Li***, Yong Liu, Weiping Wang.
  International Conference on Data Mining (**ICDM**), 2021. **CCF-B**.
- Automated Spectral Kernel Learning.
  **Jian Li**, Yong Liu, Weiping Wang.
  AAAI Conference on Artificial Intelligence (**AAAI**), 2020. **CCF-A**.

- 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**.
- 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**.
- ★ 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**.
- 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**.

Submitted Papers

- ★ Optimal Rates for Agnostic Distributed Learning. **Second-round review.**
  **Jian Li**, Yong Liu, Weiping Wang.
  Submission in IEEE Transactions On Information Theory (TIT), CCF-A Journal.
- ★ On the Statistical Optimality of Newton-type Federated Learning with Non-IID Data.
  **Jian Li**, Yong Liu, Weiping Wang.
  Submission in Journal of Machine Learning Research (JMLR), CCF-A Journal.
- Domain Agnostic Learning: Improved Algorithms and Bounds.
  **Jian Li**, Yong Liu, Weiping Wang.
  Submission in IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), CCF-A Journal.
- ★ A Survey on Model Compression for Large Language Models. arXiv:2308.07633.
  Xunyu Zhu, **Jian Li***, Yong Liu, Can Ma, Weiping Wang.
  Submission in Transactions of the Association for Computational Linguistics (TACL), CCF-B Journal.
- ★ 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.

## 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 Heterogenous 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 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

**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

## 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. In submission: 2 $\times$ TACL

**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

| | |
|---|---|
| PRICAI 2021 best student paper award | 2021 |
| Outstanding Graduate of Institute of Information Engineering, CAS | 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 |
| Presidential Scholarship of Institute of Information Engineering, CAS | 2018 |

## Academic Service

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