

Xiangru Jian

David R. Cheriton School of Computer Science
University of Waterloo
Waterloo, Canada

E-mail: xiangru.jian@uwaterloo.ca
Website: Xiangru Jian
Google Scholar: Xiangru Jian

EDUCATION

- **University of Waterloo, Ph.D. in Computer Science.** Waterloo, Canada
Supervised by Prof. Tamer Özsu. Focus on VLM/LLM agents and multimodal data management. Sept. 2022 – Present
- **City University of Hong Kong, M.Sc in Data Science.** Hong Kong SAR, China
Supervised by Prof. Yu Yang. Focus on data mining and graph learning. Aug. 2020 – Sept. 2021
- **Tongji University, B.Eng.** Shanghai, China
Major in Civil Engineering and minor in Mathematics. Sept. 2014 – July. 2019

WORK EXPERIENCE

- **ServiceNow Research, Visiting Researcher (Internship)** Montreal, Canada
Focus on multimodal learning and GUI understanding. April. 2024 – May. 2025
- **Hong Kong Institute of Data Science at CityU, Research Assistant** Hong Kong SAR, China
Focus on order prediction for industrial partners, such as Alibaba and HKTV Mall. July. 2021 – June. 2022
- **City University of Hong Kong, Research Assistant** Hong Kong SAR, China
Focus on the landscape of DNNs. June. 2021 – Aug. 2021

RESEARCH AREAS

- **LLM and Multimodality:** Multimodal Reasoning; GUI Agents; Document Understanding; Natural Language Interface for Databases; Multi-agent System; Cross-modal Retrieval.
- **Machine Learning:** Graph Learning; Optimization; Set Learning and Generation.

SELECTED PUBLICATIONS (*CO-FIRST AUTHOR, ✉CORRESPONDING AUTHOR, †PROJECT LEAD)

- **VLM/LLM** **Graph** Hao Xu*, ✉Xiangru Jian*†, et al. GraphOmni: A Comprehensive and Extendable Benchmark Framework for Large Language Models on Graph-theoretic Tasks. (Accepted by **ICLR 2026**, [Paper Link](#), [Project Site](#))
- **Agent** **Multimodal** Aarash Feizi, Shravan Nayak, Xiangru Jian, et al. Grounding Computer Use Agents on Human Demonstrations. (Accepted by **ICLR 2026**, [Paper Link](#), [Project Site](#))
- **Data Management** **Multimodal** ✉Xiangru Jian*†, Wei Pang*, Zhengyuan Dong*, Chao Zhang*, M. Tamer Özsu. LazyVLM: Neuro-Symbolic Approach to Video Analytics. Accepted by **ICDE 2026**. ([Paper Link](#))
- **Graph** Xiangru Jian*, Xinjian Zhao*, Wei Pang*, Chaolong Ying, Yimu Wang, Yaoyao Xu, Tianshu Yu. Rethinking Spectral Augmentation for Contrast-based Graph Self-Supervised Learning. **TMLR**, 2025. ([Paper Link](#))
- **Agent** **Multimodal** ✉Shravan Nayak*, ✉Xiangru Jian* et al. UI-Vision: A Desktop-centric GUI Benchmark for Visual Perception and Interaction. **ICML 2025**. ([Paper Link](#), [Project Site](#))
- **Agent** **Multimodal** Wei Pang*, Kevin Qinghong Lin*, Xiangru Jian*, Xi He, Philip Torr. Paper2Poster: Towards Multimodal Poster Automation from Scientific Papers. Accepted by **NeurIPS 2025**. **Oral** at MAS Workshop at **ICML 2025**. ([Paper Link](#), [Project Site](#), 2.8k stars on [GitHub](#))
- **VLM/LLM** **Multimodal** Xiangru Jian*†, ... , Yoshua Bengio, ... , et al. BigDocs: An Open Dataset for Training Multimodal Models on Document and Code Tasks. **ICLR**, 2025. ([Paper Link](#), [Project Site](#))

- Graph Multimodal Xinjian Zhao*, Wei Pang*, Zhongkai Xue*, **Xiangru Jian***, et al. The Underappreciated Power of Vision Models for Graph Structural Understanding. **NeurIPS** 2025. ([Paper Link](#))
- Retrieval Multimodal Graph **Xiangru Jian** and Yimu Wang. InvGC: Robust Cross-Modal Retrieval by Inverse Graph Convolution. Findings of **EMNLP** 2023. ([Paper Link](#))
- Retrieval Multimodal Yimu Wang, **Xiangru Jian** and Xue Bo. Balance Act: Mitigating Hubness in Cross-Modal Retrieval with Query and Gallery Banks. **EMNLP** 2023. ([Oral](#), [Paper Link](#))
- Optimization Keke Wu, **Xiangru Jian**, Rui Du, Jingrun Chen and Xiang Zhou. Understanding Loss Landscapes of Neural Network Models in Solving Partial Differential Equations. **IEEE BigData** 2023. ([Oral](#), [Paper Link](#))
- Optimization Qixin Zhang, Zengde Deng, **Xiangru Jian**, Zaiyi Chen, Haoyuan Hu and Yu Yang. Communication-Efficient Decentralized Online Continuous DR-Submodular Maximization. **CIKM** 2023. ([Paper Link](#))
- Graph Lyuyi Zhu, Qixin Zhang, **Xiangru Jian**, Yu Yang. Graph convolutional network for traffic incidents duration classification. Engineering Applications of Artificial Intelligence, Volume 151. ([Paper Link](#))
- Graph Lyuyi Zhu, Qixin Zhang, **Xiangru Jian**, Yu Yang, Lishuai Li. Spatio-temporal Traffic Accidents Detection via Graph-based Generative Adversarial Network. Engineering Applications of Artificial Intelligence, Volume 165. ([Paper Link](#))

SELECTED PREPRINTS (*CO-FIRST AUTHOR, ✉CORRESPONDING AUTHOR, [†]PROJECT LEAD)

- Data Management Agent **Xiangru Jian**, Zhengyuan Dong, M. Tamer Özsu. InteracSPARQL: an Interactive System for SPARQL Query Refinement Using Natural Language Explanations. ([Preprint](#), [Paper Link](#))
- Data Management Optimization Yu Yin*, **Xiangru Jian***, Haoxiang Liu, Wei Gong, Yu Yang. A Pattern-based Subset Choice Model. ([Preprint](#), Under review at [ESWA](#))
- VLM/LLM Multimodal Tianyu Zhang, Suyuchen Wang, Chao Wang, Juan Rodriguez, Ahmed Masry, **Xiangru Jian**, Yoshua Bengio, Perouz Taslakian. SCOPE: Selective Cross-modal Orchestration of Visual Perception Experts. ([Preprint](#), [Paper Link](#))

SELECTED RESEARCH PROJECTS

- **Research Intern at ServiceNow Research** Montreal, Canada
GUI Agents and Multimodal Reasoning April 2024 – May 2025
 - **UI-Vision: A Desktop-centric GUI Benchmark for Visual Perception and Interaction**
 Developed an open-source benchmark for evaluating autonomous GUI agents in desktop environments. Designed and curated a richly annotated dataset spanning 83 software applications to assess visual perception, layout grounding, and action prediction. (ICML 2025, [Paper Link](#), [Project Site](#))
 - **GroundCUA: A High-Quality Dataset for Grounding Computer-Use Agents**
 Worked on the development of a large-scale instruction-tuning dataset for desktop UI localization, comprising 3M+ expert annotations across 80+ desktop applications. Trained state-of-the-art grounding models (GroundNext-3B and GroundNext-7B) using a two-stage recipe combining SFT and lightweight RL, achieving top performance on five grounding benchmarks, including OSWorld-G, UI-Vision, and ScreenSpot-Pro. (ICLR 2026, [Paper](#), [Project Site](#))
 - **BigDocs: An Open Dataset for Training Multi-Modal Models on Document and Code Tasks**
 Co-led the effort of BigDocs—a 7.5-million sample, license-permissive dataset for multimodal document understanding. The dataset supports tasks such as document parsing and long-format code generation (e.g., Screenshot2HTML and Table2LaTeX), advancing research in structured output and document reasoning. (ICLR 2025, [Paper Link](#), [Project Site](#))

- **Graduate Research Assistant at University of Waterloo** Waterloo, Canada
Sept 2022 – Present
Multimodal Data Management, Cross-Modal Retrieval and Graph Learning
 - **Paper2Poster: Towards Multimodal Poster Automation from Scientific Papers**
Proposed and developed Paper2Poster, the first benchmark and metric suite for academic poster generation, and PosterAgent, a visual-in-the-loop multi-agent pipeline. The system transforms research papers into editable posters, outperforms GPT-4o, and was accepted for Oral at the MAS Workshop ICML 2025 and later NeurIPS 2025. (NeurIPS 2025, [Paper Link](#), [Project Site](#)).
 - **GraphOmni: Benchmarking LLMs on Graph-Theoretic Reasoning**
Developed GraphOmni, a comprehensive and extensible evaluation framework that systematically benchmarks LLMs on graph reasoning tasks by varying graph types, serialization formats, and prompt schemes. Introduced an RL-based selector to dynamically choose optimal serialization–prompt combinations, yielding significant accuracy gains. (ICLR 2026, [Paper Link](#), [Project Site](#))
 - **Robust Cross-Modal Retrieval**
 1. Formulated the representation degeneration problem in cross-modal retrieval and proposed InvGC, the first post-processing solution. (EMNLP 2023, [Paper Link](#))
 2. Developed DBNORM, a unified framework mitigating hubness by reducing similarity between hubs and queries. (EMNLP 2023, [Paper Link](#))
 3. Further proposed DREAM, a relevance-based augmentation framework using language and visual generative models, significantly improving video-text retrieval. (NAACL 2025, [Paper Link](#))
 - **Graph Self-Supervised Learning**
Conducted empirical studies revealing that simple edge perturbations (edge dropping and adding) offer comparable or superior performance to complex spectral augmentations in graph self-supervised learning, significantly reducing computational costs. Provided theoretical analysis supporting these findings and challenging conventional assumptions in spectral augmentation methods. (TMLR 2025, [Paper Link](#))
 - **Application of Foundation Models on Data Management** (Supervised by Prof. Tamer Özsu)
Proposed a datalog-like logic form that unifies various graph query languages (e.g., SPARQL) as an intermediate language for natural language interfaces to graph databases. Designed a pipeline for open-vocabulary video query across multi-frame systems, leveraging scene graph generation and a streaming graph OLAP architecture. (In submission, [Paper Link](#))
- **Graduate Research Assistant at City University of Hong Kong** Hong Kong SAR, China
Sept 2020 – Sept 2022
Data Mining and Optimization in E-commerce and Deep Learning
 - **Submodular Maximization** (Supervised by Prof. Yu Yang)
Developed one-shot decentralized algorithms (Mono-DMFW and DOBGA) that reduce per-round communications and gradient evaluations from $T^{3/2}$ to 1, achieving $(1 - 1/e)$ -approximation with $O(T^{4/5})$ and $O(\sqrt{T})$ -regret bounds, respectively. (CIKM 2023, [Paper Link](#))
 - **Landscape of DNN** (Supervised by Prof. Xiang Zhou)
Introduced the *Roughness Index* to quantitatively analyze the loss landscape of deep neural networks, revealing novel insights into optimization dynamics. (IEEE BigData 2023, [Paper Link](#))

PROFESSIONAL SERVICES

- Reviewer for: ICLR; ICML; ACL ARR; TMLR, TKDD; TBD; ACI Material Science Journal.
- External Reviewer for: VLDB 2023, 2024; SIGMOD 2024; CIKM 2022, 2023; SIGIR 2022; KDD 2022.

SELECTED HONORS AND AWARDS

- Graduated with distinction, ranking 1st in the master’s program.. City University of Hong Kong.
- Outstanding Graduate of Tongji University (Highest Honor, Top 5%), 2019.
- National Scholarship (Top 2%), 2015.