Dun Yuan

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Ph.D. Candidate, School of Computer Science, McGill University | Mila – Quebec AI Institute

Research Interests

My research focuses on the design, training, and deployment of intelligent systems for real-world domains, with particular emphasis on:

- **Large Language Models and Post-Training:** reinforcement learning from human feedback, policy optimization, alignment, efficient test-time reasoning, adaptive inference, long-context modeling, and domain-specific fine-tuning.
- **Knowledge-Centric AI:** retrieval-augmented generation, graph-grounded reasoning, provenance-aware question answering, information extraction, knowledge graph construction, and trustworthy evidence-grounded generation for technical corpora.
- **AI for Telecommunications and Systems:** large language models for wireless networks, telecom question answering, digital twins, multi-agent reinforcement learning, edge intelligence, autonomous control, and AI-native optimization for data-center and communication systems.
- **Trustworthy and Distributed AI Systems:** Web3, decentralized systems, cryptographic protocols, secure data infrastructures, and the integration of AI with privacy-aware and distributed computing environments.
- **Machine Learning Foundations and Applications:** supervised learning, representation learning, neural network architectures, optimization, and applying modern AI methods to networking, systems, and interactive environments.

Education

2021.09–Present **Ph.D. in Computer Science, McGill University** — Montreal, Canada
Supervisor: Prof. Xue Liu; Affiliation: Mila – Quebec AI Institute

2025.09–2026.01 **Visiting Student, MBZUAI** — Abu Dhabi, United Arab Emirates
Machine learning research

2020.09–2021.07 **M.Sc. in Computing, Imperial College London** — London, United Kingdom
Focus on machine learning, neural networks, and applied AI systems

2017.09–2018.01 **Exchange Program, Columbia University** — New York, United States
Completed coursework in English, Statistical Inference, and Time Series Analysis

2015.09–2019.06 **Bachelor of Engineering in Automation, Xi'an Jiaotong University** — Xi'an, China
Capstone project on vehicle chassis detection using multi-sensor fusion

Research and Professional Experience

2025.09–Present **Research Intern, Canada AI** — Montreal, Canada
Research mentor: Dr. Di Wu

- Conduct research on digital twins and multi-agent reinforcement learning for autonomous control in

data-center environments.

- Study learning-based decision-making for large-scale cyber-physical systems under real-world operational constraints.
- Explore AI-driven control, coordination, and optimization methods for complex infrastructure systems.

2025.01–Present **Student Researcher, Samsung Research America** Remote

Manager: Dr. Jianzhong (Charlie) Zhang

- Design entity extraction strategies to automatically construct domain-specific knowledge bases for telecommunications data.
- Support scalable knowledge graph creation and structured information extraction for telecom-oriented LLM and RAG systems.
- Contribute to research on AI systems for next-generation telecommunications and technical knowledge intelligence.

2021.11–2024.01 **Research Intern, Samsung AI Center – Montreal** Montreal, Canada

Research on AI systems for wireless networks and XR applications

- Worked on AI methods for 5G/XR applications, edge intelligence, and wireless-network optimization.
- Contributed to projects bridging machine learning, networking systems, and real-world deployment challenges.

2020.03–2020.06 **Research Intern, Xi'an GrapeCity I.T. Inc.** Xi'an, China

Research on browser-based 3D computer graphics

- Developed and optimized 3D web graphics components using WebGL and WebAssembly.
- Explored performance-oriented rendering, browser-side acceleration, and interactive visualization for web-based applications.
- Focused on practical graphics system design for real-time and interactive 3D experiences.

Selected Publications

- **Dun Yuan**, Di Wu, and Xue Liu. "Escaping Policy Contraction: Contraction-Aware PPO (CaPPO) for Stable Language Model Fine-Tuning." *International Conference on Learning Representations (ICLR)*, 2026.
- **Dun Yuan**, Fuyuan Lyu, Ye Yuan, Weixu Zhang, Bowei He, Jiayi Geng, Linfeng Du, Zipeng Sun, Yankai Chen, Changjiang Han, Jikun Kang, Alex Chen, Haolun Wu, and Xue Liu. "Beyond Message Passing: Toward Semantically Aligned Agent Communication." *arXiv preprint arXiv:2604.02369*, 2026.
- **Dun Yuan**, Hao Zhou, Xue Liu, Hao Chen, Yan Xin, and Jianzhong (Charlie) Zhang. "Enhancing Large Language Models (LLMs) for Telecom using Dynamic Knowledge Graphs and Explainable Retrieval-Augmented Generation." *arXiv preprint arXiv:2602.17529*, 2026.
- Hao Zhou, Chengming Hu, **Dun Yuan**, Ye Yuan, Di Wu, Xi Chen, Hina Tabassum, and Xue Liu. "Large Language Models for Wireless Networks: An Overview from the Prompt Engineering Perspective." *IEEE Wireless Communications*, 32(4):98–106, 2025.
- **Dun Yuan**, Hao Zhou, Di Wu, Xue Liu, Hao Chen, Yan Xin, and Jianzhong Charlie Zhang. "Enhancing Large Language Models (LLMs) for Telecommunications using Knowledge Graphs and Retrieval-Augmented Generation." In *IEEE International Conference on Communications Workshops (ICC Workshops)*, pp. 486–491, 2025.
- Hao Zhou, Chengming Hu, **Dun Yuan**, Ye Yuan, Di Wu, Xue Liu, and Jianzhong Charlie Zhang. "Prompting Wireless Networks: Reinforced In-Context Learning for Power Control." In *ICML 2025 Workshop on Machine Learning for Wireless Communication and Networks*, 2025.

- Hao Zhou, Chengming Hu, Ye Yuan, Yufei Cui, Yili Jin, Can Chen, Haolun Wu, **Dun Yuan**, Li Jiang, Di Wu, Xue Liu, Charlie Zhang, Xianbin Wang, and Jiangchuan Liu. "Large Language Model (LLM) for Telecommunications: A Comprehensive Survey on Principles, Key Techniques, and Opportunities." *IEEE Communications Surveys & Tutorials*, 27(3):1955–1993, 2025.
- Hao Zhou, Chengming Hu, **Dun Yuan**, Ye Yuan, Di Wu, Xue Liu, Zhu Han, and Jianzhong Zhang. "Generative AI as a Service in 6G Edge-Cloud: Generation Task Offloading by In-Context Learning." *IEEE Wireless Communications Letters*, 14(3):711–715, 2025.
- Hao Zhou, Chengming Hu, **Dun Yuan**, Ye Yuan, Di Wu, Xue Liu, and Charlie Zhang. "Large Language Model (LLM)-Enabled In-Context Learning for Wireless Network Optimization: A Case Study of Power Control." *arXiv preprint arXiv:2408.00214*, 2024.
- Zonglun Li, Shuhao Zheng, Junliang Luo, Ziyue Xin, **Dun Yuan**, Shang Gao, Sichao Yang, Bin Xiao, and Xue Liu. "PoUDR: Proof of Unified Data Retrieval in Decentralized Storage Networks." *IACR Cryptology ePrint Archive*, 2024.
- **Dun Yuan**, Ekram Hossain, Di Wu, Xue Liu, and Gregory Dudek. "Realizing XR Applications Using 5G-Based 3D Holographic Communication and Mobile Edge Computing." *arXiv preprint arXiv:2310.03908*, 2023.
- **Dun Yuan**, Yujin Nam, Amal Feriani, Abhisek Konar, Di Wu, Seowoo Jang, Xue Liu, and Gregory Dudek. "Mixed-Variable PSO with Fairness on Multi-Objective Field Data Replication in Wireless Networks." In *IEEE International Conference on Communications (ICC)*, pp. 3720–3725, 2023.
- **Dun Yuan** and L. Liu. "Design and Implementation of Vehicle Chassis Detection System Based on Multi-Sensor Fusion Technology." In *2019 4th International Conference on Electromechanical Control Technology and Transportation (ICECTT)*, pp. 113–116, 2019.

Full publication list available on Google Scholar.

Invited Talks

- "Reinforcement Learning and Web3," invited talk at Northwest University, Xi'an, China; invited by Prof. Ju Wang.

Awards and Honors

- Graduate Excellence Award, McGill University, 2022–2026
- Second Prize, Robocon Contest, 2016–2017
- First Prize, China Undergraduate Mathematical Contest in Modeling, 2016

Skills

Programming: Python, C/C++, C#, Java, JavaScript, TypeScript, WebGL, WebAssembly, LaTeX
ML and AI: PyTorch, LLM fine-tuning, RLHF, reinforcement learning, multi-agent RL, retrieval-augmented generation, knowledge graphs, information extraction
Systems and Research: Linux, Docker, Git, distributed training, evaluation pipelines, data processing, technical prototyping, empirical ML research, technical writing
Languages: English, Mandarin Chinese

Extracurricular Activities

- **Competitive strategy gaming:** Big fan of strategy games including *Age of Empires* and the *Civilization* series (*Civilization V–VII*). Recognized as a semi-professional *Civilization VI* player with international recognition, participation in the Civilization World Cup for five seasons, and an online fan base of over 10,000.
- **Game development:** Started learning game development in middle school through self-directed study, and later led groups of friends to participate in indie game jams.