Gengrui (Edward) Zhang

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EMPLOYMENT

Concordia University — Montreal, QC, Canada
Assistant Professor, Electrical & Computer Engineering — 2024 - present

RESEARCH INTERESTS

My primary research goal is to develop high-performance, highly scalable, and highly available distributed systems. By integrating theoretical foundations with real-world imperatives, my research addresses the nuanced challenges that arise in practical applications, including, but not limited to, consensus algorithms, consistency models, transactions, coordination, synchronization, resource allocation, and fault tolerance. By tackling fundamental challenges, my work supports various distributed applications, including distributed machine learning, blockchains, cloud computing, and data management.

EDUCATION

University of Toronto — Toronto, ON, Canada
Doctor of Philosophy, Electrical & Computer Engineering — 2019 - 2024
Dissertation: *"Efficient and Scalable Consensus Algorithms"*
Advisor: Hans-Arno Jacobsen (*IEEE Fellow*)

University of Chinese Academy of Sciences — Beijing, China
Master of Engineering, Computer Science — 2015 - 2018
Thesis: *"Digital Content Protection Using Blockchain Technologies"*
Advisor: Cheng-Zhong Xu (*IEEE Fellow*)

Hunan University — Changsha, HN, China
Bachelor of Engineering, Computer Science — 2011 - 2015
Thesis: *"Design and Implementation of GraphX Algorithms using Apache Spark"*
Talent Program (Li-Da Talent Program for Computer Science)

INDUSTRY EXPERIENCE

Tencent Technology Co. Ltd — Shenzhen, GD, China
Software Engineer, Platform & Content Group (PCG) — 2018

FELLOWSHIPS & AWARDS

Doctoral Completion Award, University of Toronto — 2023

ECE Student Fellowship, University of Toronto — 2019 - 2022

Research Fellowship, University of Toronto — 2019 - 2022

Outstanding Student, University of Chinese Academy of Sciences — 2017

University Individual Scholarship, Hunan University — 2012 - 2014

Best Paper Award

- The 13th International Conference on Green, Pervasive and Cloud Computing — 2018

Prize of Excellence, Asia SuperComputer Challenge 2014

Proud Team Award, Asia SuperComputer Challenge 2013

PUBLICATIONS

▷ Conference Papers:

C1 **Gengrui Zhang**, Shiquan Zhang, Michail Bachras, Hans-Arno Jacobsen. Cabinet: Dynamically Weighted Consensus Made Fast. (*Under review*)

C2 **Gengrui Zhang**, Yunhao Mao, Shashank Motepalli, Shiquan Zhang, and Hans-Arno Jacobsen. V-Guard: An Efficient Permissioned Blockchain for Achieving Consensus under Dynamic Memberships in V2X Networks. *arXiv preprint arXiv:2301.06210, 2023.* (*Under review*)

C3 **Gengrui Zhang**, Fei Pan, Sofia Tijanic, and Hans-Arno Jacobsen. PrestigeBFT: Revolutionizing View Changes in BFT Consensus Algorithms with Reputation Mechanisms. *In 2024 IEEE 40th International Conference on Data Engineering (ICDE). IEEE, 2024.* **(ICDE'24)**

C4 Yuqiu Zhang, Tongkun Zhang, **Gengrui Zhang**, and Hans-Arno Jacobsen. Lifting the Fog of Uncertainties: Dynamic Resource Orchestration for the Containerized Cloud. *In Proceedings of the 13th ACM Symposium on Cloud Computing, 2023.* **(Acceptance rate:** 28.5%**, SoCC'23)**

C5 **Gengrui Zhang** and Hans-Arno Jacobsen. Escape to Precaution against Leader Failures. *In 2022 IEEE 42nd International Conference on Distributed Computing Systems, 2022.* **(Acceptance rate:** 19.7%**, ICDCS'22)**

C6 **Gengrui Zhang**. Binding Efficiency and Robustness for Blockchains using Reputation-based Byzantine Fault-Tolerant Consensus Algorithms. *In Proceedings of the 23rd International Middleware Conference, 2022.* (Short Paper) **(Middleware'22)**

C7 **Gengrui Zhang** and Hans-Arno Jacobsen. Prosecutor: An Efficient BFT Consensus Algorithm with Behavior-aware Penalization against Byzantine Attacks. *In Proceedings of the 22nd International Middleware Conference, 2021.* **(Acceptance rate:** 25.9%**, Middleware'21)**

C8 James Meijers, Edward Au, Yuxi Cai, Hans-Arno Jacobsen, Shashank Motepalli, Robert Sun, Andreas Veneris, **Gengrui Zhang**, and Shiquan Zhang. Blockchain for V2X: A Taxonomy of Design Use Cases and System Requirements. *In 2021 3rd Conference on Blockchain Research & Applications for Innovative Networks and Services (BRAINS). IEEE, 2021*

C9 **Gengrui Zhang** and Chengzhong Xu. An Efficient Consensus Protocol for Real-time Permissioned Blockchains under non-Byzantine Conditions. *In International Conference on Green, Pervasive, and Cloud Computing. Springer, 2018* **(Best Paper Award)**

▷ Journal Articles:

J1 **Gengrui Zhang**, Fei Pan, Yunhao Mao, Sofia Tijanic, Michael Dangana, Shashank Motepalli, Shiquan Zhang, and Hans-Arno Jacobsen. Reaching Consensus in the Byzantine Empire: A Comprehensive Review of BFT Consensus Algorithms. *ACM Computing Surveys (CSUR)*

J2 James Meijers, Panagiotis Michalopoulos, Shashank Motepalli, **Gengrui Zhang**, Shiquan Zhang, Andreas Veneris, and Hans Arno Jacobsen. Blockchain for V2X: Applications and Architectures. *IEEE Open Journal of Vehicular Technology, 2022*

PATENTS

- **Gengrui Zhang**, Hans-Arno Jacobsen, and Sheng Sun. Method and System for Creating a Distributed Ledger of Verified Vehicle Transactions (Patent Ref: 92014620US01). International Patent. 2022.

- **Gengrui Zhang**, Tongxin Bai, and Chengzhong Xu. A Second-hand Vehicle Transaction Method, Apparatus and System based on Blockchain Technology. CN 106897887 A[P]. 2017.

INVITED TALKS

"Fairness in Byzantine Consensus"

- Macau University, Macau SAR, China, 2021.04

"Scaling Byzantine Consensus"

- Blockchain ACM SACMAT, Toronto, Canada, 2019.06

"Optimizing Consensus Algorithms for Permissioned Blockchains"

- Blockchain Week, Toronto, Canada, 2019.04

"Untangling Blockchain Consensus Protocols from Blockchain 1.0 to 2.0"

- Tencent, Shenzhen, China, 2018.04

"High-level Comparisons between Permissionless and Permissioned Blockchains"

- SIAT-CAS, Shenzhen, China, 2017.11

TEACHING

▷ **Instructors:**

- COEN352 Data Structures & Algorithms, Concordia University, Fall 2024

▷ **Guest Lectures:**

- *"Introduction to Consensus Algorithms"*, ECE419 Distributed Systems, 2023
- *"Paxos and Raft"*, ECE1770 Trends in Middleware: Blockchain Technology, 2022

▷ **Teaching Assistantships:**

- ECE1770 Blockchain Technology, Head TA, University of Toronto, 2021–2022
- ECE419 Distributed Systems, Head TA, University of Toronto, 2019–2023
- ECE345 Algorithms and Data Structures, TA, University of Toronto, 2019–2023
- CSC343 Introduction to Databases, TA, University of Toronto, 2023
- ECE244 Programming Fundamentals, TA, University of Toronto, 2019–2023
- CSC263 Data Structures and Analysis, TA, University of Toronto, 2021

REVIEW AND SERVICE

Conferences:

- PC in IEEE International Conference on Data Engineering (ICDE) 2025
- PC in IEEE International Conference on Decentralized Applications and Infrastructures (DAPPS) 2024
- External reviewer for ACM/IFIP International Middleware Conference (Middleware) 2022
- External reviewer for ACM/IFIP International Middleware Conference (Middleware) 2020
- External reviewer for International Conference on Distributed Computing Systems (ICDCS) 2019
- External reviewer for IEEE International Conference on Blockchain (IEEE Blockchain) 2019

Journals:

- External reviewer for IEEE Transactions on Network and Service Management 2023
- External reviewer for Journal of Parallel and Distributed Computing (JDBC) 2018