Gengrui Zhang

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🏠 https://gengruizhang.github.io

RESEARCH INTERESTS

Gengrui Zhang is a PhD candidate in the Department of Electrical & Computer Engineering at the University of Toronto. His research focuses on distributed systems, especially consensus algorithms and fault tolerance. He aims to develop architectures and algorithms that target high performance, fortify security, generalize better, and uncover the structure underlying a problem. He is especially interested in developing consensus algorithms binding efficiency and robustness under various fault-tolerant models and applying theoretical problems to real-world applications. Towards these objectives, he is also broadly interested in questions related to consistency models, blockchain systems, distributed file systems, cloud databases, P2P systems, and CRDTs.

EDUCATION

University of Toronto — Toronto, ON, Canada
Ph.D. Candidate, Electrical & Computer Engineering — 2019 - present
Dissertation: *"Reputation-based Consensus Algorithms: Binding Efficiency and Robustness"*
Advisor: Prof. Hans-Arno Jacobsen (*IEEE Fellow*)

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

Hunan University (Talent Program) — Changsha, HN, China
Bachelor of Applied Science, Computer Science — 2011 - 2015
Thesis: *"Design and Implementation of GraphX Algorithms using Apache Spark"*
Advisor: Prof. Ken-Li Li

FELLOWSHIPS & AWARDS

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:

- **Gengrui Zhang**, Fei Pan, Sofia Tijanic, and Hans-Arno Jacobsen. Prestige BFT: A Reputation-based Byzantine Fault-tolerant Consensus Algorithm. (*Under review*)

- **Gengrui Zhang**, Yunhao Mao, Shashank Motepalli, and Hans-Arno Jacobsen. V-Guard: A High Performance Consensus Protocol for V2X Permissioned Blockchains. (*Under review*)

- **Gengrui Zhang** and Hans-Arno Jacobsen. Escape to Precaution against Leader Failures. *In 2022 IEEE 42nd International Conference on Distributed Computing Systems, 2022.* (**ICDCS'22**) (*Acceptance rate:* 19.9%)

- **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.* (**Middleware'21**) (*Acceptance rate:* 25.9%)

- 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* (*Author names in alphabetical order except the first author*)

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

▷ Journal Articles:

- **Gengrui Zhang** and Hans-Arno Jacobsen. Prosecutor+: An Efficient BFT Consensus Algorithm with Behavior-aware Penalization and Proactive Recovery. (*Under review*)

- **Gengrui Zhang**, Fei Pan, Michael Dang'ana, Yunhao Mao, Shashank Motepalli, Shiquan Zhang, and Hans-Arno Jacobsen. Reaching Consensus in the Byzantine Empire: A Comprehensive Review of BFT Consensus Algorithms. *arXiv preprint arXiv:2204.03181, 2022* (*Under review*)

- 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*

PATENT

- **Gengrui Zhang**, Hans-Arno Jacobsen, and Sheng Sun. Invention disclosure submission. 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 Comparsions between Permissionless and Permissioned Blockchains"

- SIAT-CAS, Shenzhen, China, 2017.11

TEACHING EXPERIENCE

▷ **Graduate level courses:**

- **ECE1770 Trends in Middleware: Blockchain Technology (*Winter*)**   2022
  Head TA, University of Toronto

- **ECE1762 Algorithms and Data Structures (*Winter*)**   2020 - 2021
  TA, University of Toronto

▷ **Undergrad level courses:**

- **ECE419 Distributed Systems (*Winter*)**   2019 - 2022
  Head TA, University of Toronto

- **ECE345 Algorithms and Data Structures (*Fall*)**   2020 - 2021
  TA, University of Toronto

- **ECE244 Programming Fundamentals (*Fall*)**   2019 - 2021
  TA, University of Toronto

- **CSC263 Data Structures and Analysis (*Winter*)**   2021
  TA, University of Toronto

SUPERVISION

Co-supervised design projects (4th-year capstone):

- AI-Enabled Traffic Camera Feed Transcription   2021
  Students: Andrew Lau, Chunqiu (Steven) Xia, Robert Dermarkar

- Consensus Protocol Visualization Engine   2020
  Github: https://github.com/ConsensusVisualization/protocols
  Students: Robert Fairley, Yannan (Walter) Lin, Abhishek Patil, and Daniel Hu

- Consensus Protocol Visualization Engine   2020
  Students: Jinzhuo (Sarah) Tang, Xian (Shirley) Zhou, Yichen Wang, Yuchen Wang

REVIEW AND SERVICE

Conferences:

- ACM/IFIP International Middleware Conference (Middleware)   2019 - 2022

- International Conference on Distributed Computing Systems (ICDCS)   2019

- IEEE International Conference on Blockchain (IEEE Blockchain)   2019

Journals:

- Journal of Parallel and Distributed Computing (JDBC)   2018

INDUSTRY EXPERIENCE

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