Jichen Li

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Research Interest

My research focuses on addressing endogenous security problems in blockchain protocols by **analyzing economic vulnerabilities** and **designing incentive-compatible, cryptographically secure, and operationally efficient solutions**. To achieve this, I have developed computational techniques and tools for targeted scenario analysis, modeling, and protocol design, including: (1) A dynamic protocol analysis framework integrating algorithmic game theory, Markov decision processes, and reinforcement learning. (2) A protocol implementation methodology combining mechanism design, algorithmic optimization, and cryptographic primitives.

In my work, I reconstruct protocol execution scenarios to model miners' and participants' utility functions and strategic spaces, analyze behavioral interactions, and design new mechanisms that satisfy target conditions. By bridging theory and practice, I validate conclusions through simulations and code implementations. My research outcomes have been adopted by Cryptape's Nervos blockchain and China's ChainMaker to enhance ecosystem security and consensus protocols.

Educations

Peking University, Department of Computer Science Sept. 2020 – Present

- Supervisors: Xiaotie Deng
- Research Area: Blockchain and Algorithmic Game Theory

Peking University, Electronics Engineering and Computer Science Engineering Sept. 2016 – Jul. 2020

- B.Sc. in Compuer Science
- Thesis: *Game Theory Based Blockchain Sharding Protocol*
- Advisor: Xiaotie Deng

Intership

Zhongguancun Laboratory Jan. 2024 – Present

- Visiting Student
- Project: Blockchain Consensus

Hong Kong Polytechnic University, Department of Computing Jan. 2023 – May 2023

- Research Assistant
- Host: Bin Xiao

Publications

Decentralized Funding of Public Goods in Blockchain System: Leveraging Expert Advice 2024

- **Jichen Li**, Yukun Cheng, Wenhan Huang, Mengqian Zhang, Jiarui Fan, Xiaotie Deng, Jie Zhang
- IEEE Trans. Cloud Comput. 12(2): 725-736 (2024)

n-MVTL Attack: Optimal Transaction Reordering Attack on DeFi 2023

- Jianhuan Wang, **Jichen Li**, Zecheng Li, Xiaotie Deng, Bin Xiao
- ESORICS 2023

A Provable Softmax Reputation-Based Protocol for Permissioned Blockchains 2023

- Hongyin Chen, Zhaohua Chen, Yukun Cheng, Xiaotie Deng, Wenhan Huang, **Jichen Li**, et al.
- IEEE Trans. Cloud Comput. 11(1): 1065-1077 (2023)

An Efficient and Robust Committee Structure for Sharding Blockchain 2023

- Mengqian Zhang, **Jichen Li**,Zhaohua Chen,Hongyin Chen,Xiaotie Deng
- IEEE Trans. Cloud Comput. 11(3): 2562-2574 (2023)

Altruism, Collectivism and Egalitarianism: On a Variety of Prosocial Behaviors in Binary Networked Public Goods Games 2023

- **Jichen Li**,Xiaotie Deng,Yukun Cheng,Yuqi Pan,Xuanzhi Xia,Zongjun Yang,Jan Xie
- AAMAS 2023: 609-624

MEV Makes Everyone Happy under Greedy Sequencing Rule 2023

- Yuhao Li*,Mengqian Zhang*,**Jichen Li***,Xiaotie Deng
- DeFi@CCS 2023: 9-15

Funding Public Goods with Expert Advice in Blockchain System 2022

- **Jichen Li**,Yukun Cheng,Wenhan Huang,Mengqian Zhang,Jiarui Fan,Xiaotie Deng,Jan Xie
- ICDCS 2022: 180-190

Insightful Mining Equilibria 2022

- Mengqian Zhang, Yuhao Li, **Jichen Li**
- WINE 2022: 21-37

CycLedger: A Scalable and Secure Parallel Protocol for Distributed Ledger via Sharding 2020

- Mengqian Zhang,**Jichen Li**,Zhaohua Chen,Hongyin Chen,Xiaotie Deng
- IPDPS 2020: 358-367

Working Papers

Survey on Strategic Mining in Blockchain: A Reinforcement Learning Approach

- **Jichen Li**,Lijia Xie*,Hanting Huang,Bo ZHou, Binfeng Song, Wanying Zeng, Xiaotie Deng, Xiao Zhang

Sealed-bid Auctions on Blockchain with Timed Commitment Outsourcing

- **Jichen Li***,Yuanchen Tang*,Jing Chen,Xiaotie Deng

Multi-Block Withholding Attacks on Ethereum 2.0: An MDP Approach with Reinforcement Learning

- Wanying Zeng,Binfeng Song,Bo Zhou,**Jichen Li***,Lijia Xie,Xiaotie Deng

Composition of Authenticated Byzantine Agreement with Man-in-middle Attack

- **Jichen Li***,Xuanzhi Xia,Jing Chen,Xiaotie Deng

Networked Public Goods Games with Prosocialism

- **Jichen Li***,Yukun Cheng,Xiaotie Deng

Honors and Awards

- Excellent Paper Award of CMTGA, 2023
- Best Student Paper Award of CSIAM, 2023
- Excellent Student of CFCS, Peking University, 2023
- Excellent Doctoral Student in Theoretical Computing, CCF, 2024

Services

Conference Reviewer

AFT 2024, WINE 2024, FOCS 2024, ICDCS 2023

Conference Organization

- CSIAM Blockchain Technology and Application Forum 2023-2024(Student Track Chair)
- IJTCS 2024(Track chair)
- CACC 2024 Algorithm Ability Competition(Question Setter)

Student's Work

Counselor of Peking University Undergraduate Class Sept. 2020 – Jul. 2022

Monitor of Peking University CSCF PhD Class Sept. 2020 – Sept. 2022