

TOGZHAN BARAKBAYEVA

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Summary

I'm a PhD candidate in the Computer Science and Engineering department at the Hong Kong University of Science and Technology (HKUST). My research is led and supervised by Prof. Amir Goharshady and I'm proudly part of the ALPACAS research group. I'm also fortunate to be co-supervised by Prof. Dimitris Papadopoulos.

My research focuses on developing secure, efficient and trustless blockchain-based protocols, and solving optimization problems in blockchain. During my PhD, I worked on a wide range of interesting projects, and my favourite ones were about optimizing miner revenue. In my work, I combine ideas and use concepts from applied cryptography, algorithms, software engineering and game theory.

My background in academia and industry has provided me with a strong foundation to work on challenging tasks on blockchain.

Education

Hong Kong University of Science and Technology

Doctor of Philosophy in Computer Science and Engineering

Sep 2022 - Present

Hong Kong

- Became a member of a group supervised by *Amir Goharshady* through an interview process with a success rate of **1.7%**.
- Awarded a Hong Kong PhD Fellowship Scheme (HKPFS) scholarship with a funding of US\$184,100.

Nazarbayev University

Bachelor of Science in Computer Science. Minor in Math.

Aug 2018 - Jun 2022

Astana, Kazakhstan

- Graduated with "Cum Laude" honours with cGPA: **3.74/4.00**.
- Placed 9th out of 138 students of the Computer Science class of 2022 (**top 7%** of class).

Publications

- J. Ballweg, T. Barakbayeva, Z. Cai, A.K. Goharshady. **LockFee: Refundable Transaction Admission via Time-Locked Collateral**. IEEE International Conference on Decentralized Applications and Infrastructures, *DAPPS 2026* (a.r. 12.28%).
- T. Barakbayeva, S. Farokhnia, A.K. Goharshady, S. Novozhilov. **Boosting Gas Revenues of Ethereum Miners**. IEEE/ACM International Conference on Software Engineering, *ICSE 2026* (a.r. 19.77%).
- T. Barakbayeva, Z. Cai, A.K. Goharshady, K. Keyoor. **Smart Contracts for Trustless Sampling of Correlated Equilibria**. International Joint Conference on Artificial Intelligence, *IJCAI 2025* (a.r. 19.3%).
- T. Barakbayeva, S. Farokhnia, A.K. Goharshady, P. Li, Z. Lin. **Improved Gas Optimization of Smart Contracts**. International Conference on Fundamentals of Software Engineering, *FSEN 2025*.
- T. Barakbayeva, S. Farokhnia, A.K. Goharshady, M. Gufler, S. Novozhilov. **Pixiu: Optimal Block Production Revenues on Cardano**. IEEE International Conference on Blockchain, *Blockchain 2024* (a.r. 18.89%).
- V.P. Abidha, T. Barakbayeva, Z. Cai, A.K. Goharshady. **Gas-Efficient Decentralized Random Beacons**. IEEE International Conference on Blockchain and Cryptocurrency, *ICBC 2024* (a.r. 19.34%).
- T. Barakbayeva, Z. Cai, A.K. Goharshady. **SRNG: An Efficient Decentralized Approach for Secret Random Number Generation**. IEEE International Conference on Blockchain and Cryptocurrency, *ICBC 2024* (a.r. 19.34%).

Work Experience

University of Oxford, St Catherine's College

Visiting Scholar

May 2026

Oxford, United Kingdom

- Extended programmable blockchain protocols to enable parallel execution of smart contracts.

Nethermind

Research Intern

Jun 2024 - Aug 2024

London, United Kingdom (remote)

- Performed experimental evaluations of Nova and Mova folding schemes [paper][code].
- Explored BLS signature schemes and protocols with private senders.

Nazarbayev University

Research Assistant

Jan 2021 - Jan 2022

Astana, Kazakhstan

- Implemented the addition of Inception blocks into the evolutionary algorithm AE-CNN for image classification tasks [paper][code].

GroveFlow

Software Engineering Intern

Jun 2020 - Aug 2020

San Francisco, USA (remote)

- Integrated the COVID dashboard backend for displaying trends and growth rates at the county and state levels, as well as performing CSV parsing and data processing. Dashboard reached 100,000+ views.

- Developed the frontend of a web-chart generation application, which creates graphs based on user input.

Ethereum Foundation

Jun 2020 - Oct 2020

Summer Intern

Remote

- Developed a staking application to deposit and withdraw funds on the Ethereum blockchain as part of the open-source project scaffold-eth. Wrote a full tutorial on setting up the smart contract and interacting with the frontend.
- Implemented an input component to convert between bytes32 and string.
- Implemented a commitment scheme and added a frontend for the application.
- Developed a collectors leaderboard page and recent color history at nifty.in.

Method Pro

Jun 2019 - Aug 2019

Software Engineering Intern

Almaty, Kazakhstan

- Developed a full-stack admin app to display data statistics. Integrated data science approaches.
- Implemented an algorithm for text processing of comments, by removing stopwords and punctuation, performing lemmatization. Extracted relevant nouns, displaying them on a t-SNE plot.

Teaching

1. Instructor, **Modern Consensus Mechanisms**. ALPACAS research group, Hong Kong University of Science and Technology, Spring 2026.
2. Teaching assistant, **COMP 1029P: Python Programming Bridging Course**. Hong Kong University of Science and Technology, Fall 2025.
3. Teaching assistant, **COMP 1029V: Excel VBA Programming Bridging Course**. Hong Kong University of Science and Technology, Fall 2025.
4. Teaching assistant, **COMP1021: Introduction to Computer Science**. Hong Kong University of Science and Technology, Spring 2025.
5. Teaching assistant, **COMP 1029J: Java Programming Bridging Course**. Hong Kong University of Science and Technology, Spring 2024.
6. Teaching assistant, **COMP 4901W: Introduction to Blockchain, Cryptocurrencies, and Smart Contracts**. Hong Kong University of Science and Technology, Spring 2023.

Activities

MARBLE 2026, Program Committee Member. Sep 16 – Sep 18, 2026.

Aarhus University, Prof. Andreas Pavlogiannis, Research visitor. Aarhus, Denmark, Aug 23 – Aug 25, 2024.

IEEE International Conference on Blockchain, IEEE Blockchain 2024, Presenter. Copenhagen, Denmark, Aug 19 – Aug 22, 2024.

IEEE International Conference on Blockchain and Cryptocurrency, ICBC 2024, Presenter. Trinity College Dublin, Dublin, Ireland, May 27 – May 31, 2024.

CIMPA Research School on Graph Structure and Complex Network Analysis, Program participant. Nesin Mathematics Village in Şirince, Izmir, Turkey, Jun 4 – Jun 16, 2023.

C3: Consensus, Concurrency & Cryptography Workshop, Program participant. National University of Singapore, Singapore (remote), Dec 12 – Dec 14, 2022.

Supervision

Research intern supervision

Jun 2023 - Jan 2024

Hong Kong University of Science and Technology

- Supervised a research intern, Karaneh Keyoor, and co-authored the resulting publication: "Smart Contracts for Trustless Sampling of Correlated Equilibria".

Grants & Awards

1. **HKPFS Conference Travel Allowance**, 2026
2. **Ethereum Foundation Research Grant**, 2024
3. **HKPFS Conference Travel Allowance**, 2024
4. **Research Travel Grant**, 2024
5. **HKPFS Conference Travel Allowance**, 2023
6. **Hong Kong PhD Fellowship Scheme**, 2022-2026