

# Lioba Heimbach

PHD STUDENT · ETH ZURICH

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## Research Interests

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My research centers around blockchain protocols with a focus on decentralized finance (DeFi). In particular, I strive towards enabling an accessible, decentralized, fair, and efficient blockchain and DeFi ecosystem. It is my belief that to improve on current system, a deep understanding of today's landscape is required. Blockchain data transparency gives us the unique opportunity to do so. Thus, I perform measurement studies and analytical evaluations of blockchain and DeFi protocols aimed at enhancing the understanding of the current landscape and the behavior of its participants. Building on these insights, I work on proposing new protocols to tackle the identified problems and vulnerabilities.

## Education

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### Ph.D. Student

Zurich, Switzerland

ETH ZURICH

Feb 2021 - present

- Supervised by Roger Wattenhofer at the Distributed Computing Group.
- Teaching role includes supervision of student projects, (head) teaching assistant in lectures offered by our group, and conducting, writing, and grading of exams.
- Scientific staff representative in the department and member of a student panel for a faculty hiring committee.

### M.Sc. in Electrical Engineering and Information Technology

Zurich, Switzerland

ETH ZURICH

Sep 2018 - Sep 2020

- Graduated with honors and awarded an ETH medal for exceptional M.Sc. thesis.
- Exchange semester at the Chinese University of Hong Kong.
- Organization of Electrical Engineering for ETH Students (EE4ETH). EE4ETH is a student-initiated and led project to produce short video tutorials explaining the core concepts of mandatory courses in the Bachelor program.
- Student representative in the department and member of a faculty hiring committee.

### B.Sc. in Electrical Engineering and Information Technology

Zurich, Switzerland

ETH ZURICH

Sep 2016 - Jan 2020

- Student representative in the department.

## Professional Experience

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### Senior Associate

Basel, Switzerland

BANK FOR INTERNATIONAL SETTLEMENTS

Feb 2023 - May 2023

- PhD Fellowship Programme at Monetary and Economic Department.
- Worked on measuring and determining the drivers of leverage in decentralized finance.

## Publications

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### PRE-PRINTS

#### The Potential of Self-Regulation for Front-Running Prevention on Decentralized Exchanges

Lioba Heimbach, Eric Schertenleib and Roger Wattenhofer

*Non-archival: 22nd Workshop on the Economics of Information Security (WEIS), July 2023.*

*Best talk award at WEIS.*

#### Ethereum Proof-of-Stake Consensus Layer: Participation and Decentralization

Dominic Grandjean, Lioba Heimbach and Roger Wattenhofer

#### DeFi Leverage

Lioba Heimbach and Wenqian Huang

PEER-REVIEWED

**A Fair and Resilient Decentralized Clock Network for Transaction Ordering**

Andrei Constantinescu, Diana Ghinea, Lioba Heimbach, Zilin Wang and Roger Wattenhofer  
Forthcoming in 27th International Conference on Principles of Distributed Systems (OPODIS), Tokyo, Japan, December 2023.

**Ethereum's Proposer-Builder Separation: Promises and Realities**

Lioba Heimbach, Lucianna Kiffer, Christof Ferreira Torres and Roger Wattenhofer  
In 2023 ACM Internet Measurement Conference (IMC), Montreal, QC, Canada, October 2023.

**DeFi Lending During The Merge**

Lioba Heimbach, Eric Schertenleib and Roger Wattenhofer  
In 5th Conference on Advances in Financial Technologies (AFT), Princeton, NJ, USA, October 2023.

**Base Fee Manipulation In Ethereum's EIP-1559 Transaction Fee Mechanism**

Sarah Azouvi, Guy Goren, Lioba Heimbach and Alexander Hicks  
In 37th International Symposium on Distributed Computing (DISC), L'Aquila, Italy, October 2023.

**FnF-BFT: A BFT Protocol with Provable Performance Under Attack**

Zeta Avarikioti, Lioba Heimbach, Roland Schmid, Laurent Vanbever, Roger Wattenhofer and Patrick Wintermeyer  
In 30th International Colloquium on Structural Information and Communication Complexity (SIROCCO), Alcalá de Henares, Spain, June 2023.

**Short Squeeze in DeFi Lending Market: Decentralization in Jeopardy?**

Lioba Heimbach, Eric Schertenleib and Roger Wattenhofer  
In 3rd Workshop on Decentralized Finance (DeFi), Bol, Brač, Croatia, May 2023.

**DeFi and NFTs Hinder Blockchain Scalability**

Lioba Heimbach, Quentin Kniep, Yann Vonlanthen and Roger Wattenhofer  
In 27th Financial Cryptography and Data Security (FC), Bol, Brač, Croatia, May 2023.

**Exploring Price Accuracy on Uniswap V3 in Times of Distress**

Lioba Heimbach, Eric Schertenleib and Roger Wattenhofer  
In 2nd ACM Workshop on Decentralized Finance and Security (DeFi), Los Angeles, California, USA, November 2022.

**Risks and Returns of Uniswap V3 Liquidity Providers**

Lioba Heimbach, Eric Schertenleib and Roger Wattenhofer  
In 4th ACM Conference on Advances in Financial Technologies (AFT), Cambridge, Massachusetts, USA, September 2022.

**SoK: Preventing Transaction Reordering Manipulations in Decentralized Finance**

Lioba Heimbach and Roger Wattenhofer  
In 4th ACM Conference on Advances in Financial Technologies (AFT), Cambridge, Massachusetts, USA, September 2022.  
*Non-archival: SNB-CIF Conference on Cryptoassets and Financial Innovation, May 2023.*

**Eliminating Sandwich Attacks with the Help of Game Theory**

Lioba Heimbach, Eric Schertenleib and Roger Wattenhofer  
In ACM Asia Conference on Computer and Communications Security (ASIA CCS), Nagasaki, Japan, June 2022.

**An Empirical Study of Market Inefficiencies in Uniswap and SushiSwap**

Jan Arvid Berg, Robin Fritsch, Lioba Heimbach and Roger Wattenhofer  
In 2nd Workshop on Decentralized Finance (DeFi), Grenada, May 2022.

**Behavior of Liquidity Providers in Decentralized Exchanges**

Lioba Heimbach, Ye Wang and Roger Wattenhofer  
In 2021 Crypto Valley Conference on Blockchain Technology (CVCBT), Rotkreuz, Switzerland, October 2021.

**PIBES - A Competing-Flow-Aware Protocol for Real-Time Video Applications**

Lioba Heimbach, Lingfeng Guo, Rudolf KH Ngan and Jack YB Lee  
In IEEE Open Journal of the Communications Society, August 2020.

**Ride the Lightning: The Game Theory of Payment Channels**

Zeta Avarikioti, Lioba Heimbach, Yuyi Wang and Roger Wattenhofer  
In 24th Financial Cryptography and Data Security (FC), Kota Kinabalu, Sabah, Malaysia, February 2020.

## Awards, Fellowships, & Grants

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- 2023 **Best Talk Award**, 22nd Workshop on the Economics of Information Security (WEIS)  
**Research Grant**, Institute for Quantitative Research Europe (Inquire Europe) 10,000 €
- 2022 **ETH Medal for Exceptional M.Sc. Thesis**, ETH Zurich
- 2019 **Mobility Scholarship**, ETH Zurich  
**The Rector's Impulse Fund**, ETH Zurich 24,600 CHF

## Invited Talks

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- 2023 **Front-running in DeFi and Possible Solutions**, ETH-NUS FinsureTech Conference  
**Turmoil in DeFi Lending Markets**, DeFOx (Seminar of the Decentralised Finance Research Group at Oxford University)  
**Front-running in DeFi and Possible Solutions**, Complexity Science Hub Vienna
- 2022 **Eliminating Sandwich Attacks with the Help of Game Theory**, Protocol Labs Research Seminar  
**SoK: Preventing Transaction Reordering Manipulations in Decentralized Finance**, Schloss Dagstuhl seminar 22421: Security of Decentralized Financial Technologies
- 2021 **Behavior of Liquidity Providers in DEXes**, Morgan Stanley Quant Research Colloquium

## Teaching Experience

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- 2021 - present **Computational Thinking**, Head Teaching Assistant
- 2021 - present **Principles of Distributed Computing**, Teaching Assistant
- 2023 - present **Distributed Systems**, Teaching Assistant
- 2018 - 2019 **Numerical Methods**, Teaching Assistant
- 2018 **Discrete Mathematics**, Teaching Assistant
- 2017 **Linear Algebra**, Teaching Assistant

## Mentoring

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During my Ph.D. studies, I had the privilege to (co-)supervise 20 student projects (Bachelor's, semester, and Master's theses). Some of these have led to peer-reviewed publications. I keep a full list of projects supervised on my website.

## Professional Services

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- 2023 **PC Member**: DeFi@CCS  
**External Reviewer**: DISC, PODC
- 2022 **External Reviewer**: FC, AFT, WWW, OSDI, MobiCom  
**Invited Reviewer**: IEEE/ACM Transactions on Networking
- 2021 **External Reviewer**: FC, AFT, WWW