



Lattice-Based Zero Knowledge Proofs

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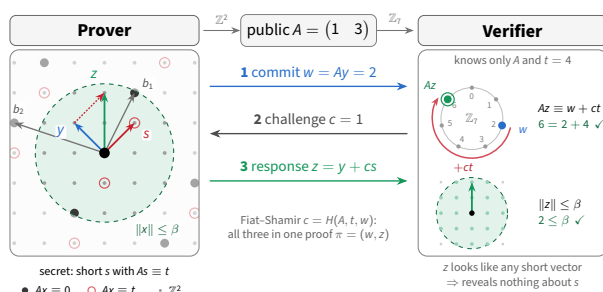
Motivation

Zero-Knowledge proofs are an advanced cryptographic primitive that allows a party to prove with high confidence that they hold a secret witness. Recently there has been increasing interest in making these proof systems post-quantum secure. Lattice-based problems such as SIS and LWE are behind the NIST standardized PQC algorithms such as ML-KEM, ML-DSA, and modern Fully Homomorphic Encryption schemes. There are numerous attempts at building post-quantum proof systems using lattices, but there is no systematic overview and comparison of these schemes.

In this project you will answer the question ‘How well does lattice-based proof systems perform?’. Using lattice-based proof systems in group signatures or verifying non-trivial relations is of interest.

Goals and Tasks

-  Systematically categorize lattice-based proof systems
-  Identify the building blocks
-  Perform a trade-off analysis of lattice-based proof systems
-  Improve upon the existing lattice-based proof systems



An example Lattice Based ZKP interaction

Literature

- > [H. Perez](#)
Lattice-Based ZK Explained
2025
zkv.xyz/lattice-based-zk-explained/
- > [N. K. Nguyen and G. Seiler](#)
Greyhound: Fast Polynomial Commitments from Lattices
2024

Courses & Deliverables

☒ Master Project

Project code
Report
Presentation

– OR –

☒ Master's Thesis

Initial presentation
Project code
Thesis (60+ pages)
Final presentation

Recommended if you're studying

☒ CS ☒ ICE ☒ SEM ☒ MATH

Prerequisites

- > Interest in lattice-based cryptography
- > Programming (C/C++, Python)

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