

KANIUAR BACHO

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EDUCATION

PhD Quantum Cryptography

University of Edinburgh

2025 - 2027

United Kingdom

- My research focuses on constructing quantum cryptographic protocols, including blind remote state preparation, proofs of quantumness, classical verification of quantum computation, and related tasks.
Advisors: Alexandru Cojocaru & Tomoyuki Morimae
- Awarded full funding for my PhD studies by the University of Edinburgh's School of Informatics

M.Sc. IT Security

Ruhr University Bochum

2022 - 2024

Germany

- GPA: 98%/100% (excellent)
Valedictorian — 5 out of 95 successful graduations from 2021 to 2024 achieved $\geq 95\%$ (excellent)
- **Master's Thesis:** Compiling Nonlocal Games without Quantum Homomorphic Encryption (grade 100%)
Advisors: Michael Walter & Giulio Malavolta
- Selected Coursework:
 - ◊ Discrete Mathematics
 - ◊ Information Theory
 - ◊ Introduction to Cryptography I, II
 - ◊ Cryptography
 - ◊ Cryptographic Protocols
 - ◊ Zero-Knowledge Proof Systems
 - ◊ Post-Quantum Cryptanalysis
 - ◊ Quantum Cryptography
 - ◊ Quantum Information & Computation
 - ◊ Quantum Algorithms
 - ◊ Quantum Circuits
- Awarded full funding for my master's studies by the German Academic Scholarship Foundation

B.Sc. Mathematics

University of Bonn

2017 - 2021

Germany

- GPA: 1.3/1.0 (very good)
- **Bachelor's Thesis:** Classification of Representations of $GL_2(\mathbb{F}_{p^n})$ (grade 1.1)
Advisors: Johannes Anschütz & Peter Scholze
- Selected Coursework:
 - ◊ Linear Algebra I, II
 - ◊ Group, Ring, and Galois Theory
 - ◊ Commutative Algebra
 - ◊ Representation Theory of Lie Algebras
 - ◊ Representation Theory of Groups
 - ◊ Algebraic Number Theory
 - ◊ Algorithmic Mathematics I, II
 - ◊ Probability Theory
 - ◊ Markov Chains & Stochastic Algorithms
 - ◊ Analysis I, II, III
 - ◊ Complex Analysis
 - ◊ Geometry and Topology
- Awarded full funding for my bachelor's studies by the German Academic Scholarship Foundation

PUBLICATIONS

Humanity's Last Exam [arXiv]

2025

- Contributed mathematical problems that current LLMs can't solve, establishing a new benchmark to test AI limits

Compiled Nonlocal Games from any Trapdoor Claw-Free Function [ePrint]

2024

Kaniuar Bacho, Alexander Kulpe, Giulio Malavolta, Simon Schmidt, Michael Walter

- CRYPTO 2025
- QIP 2025 (Poster Presentation)

TALKS

Slides of my talks are available at kaniuarbacho.github.io

Compiled Nonlocal Games from any Trapdoor Claw-Free Function

- CRYPTO 2025 (Aug 2025)
- Kyoto University Quantum Cryptography Workshop (Oct 2025)

Compiling Nonlocal Games without Quantum Homomorphic Encryption

- Defense of my Master's Thesis at the Ruhr University Bochum (Dec 2024)

Quantum Error Correction

- Quantum Technologies Academy in Bavaria, Germany (Aug 2024)

Quantum Random Walks

- Quantum Algorithms Seminar at Ruhr University Bochum (Jul 2023)

Quantum Key Distribution

- Department-wide presentation at the company TÜV Information Technology (Oct 2022)

Quadratic Forms over \mathbb{Q}_p

- Algebraic Number Theory Seminar at the University of Bonn (Nov 2020)

Classification of Representations of $GL_2(\mathbb{F}_{p^n})$

- Defense of my Bachelor's Thesis at the University of Bonn (Sep 2020)

Representation Theory of Lie Algebras

- Lie Algebras Seminar at the University of Bonn (May 2020)

Random Walks on the Symmetric Group

- Markov Chains and Stochastic Algorithms Seminar at the University of Bonn (Jul 2018)

SERVICE

I have served as a subreviewer for the following conferences: TQC 2025, ASIACRYPT 2025, EUROCRYPT 2026

WORK EXPERIENCE

Quantum Cryptography Researcher

Jan 2025 - Dec 2027

Quantum Software Lab

Quantum Technologies Intern

Sep 2022

TÜV Information Technology

- Consulted institutes with the quantum technologies team on securing their Quantum Key Distribution (QKD) infrastructure; investigated implementation-level vulnerabilities and proposed mitigations to reduce exploitation risk.
- Introduced and familiarized researchers from other divisions with the emerging realm of QKD devices.

Teaching Assistant

Ruhr University Bochum & University of Bonn

- Conducted weekly problem-solving sessions, corrected homework, and created and graded exams:
 - ◊ Quantum Information and Computation (Winter 2023/2024)
 - ◊ Cryptographic Protocols (Summer 2023)
 - ◊ Analysis II (Summer 2019): professor and my students graded my teaching with a 1.0/1.0

Volunteer Mentor for Freshmen

Oct 2019 - Sep 2020

University of Bonn

- Mentored freshmen by providing tips on how to learn, think, and solve problems, and answered all kinds of questions

Visiting Researcher

Sep 2018

Max Planck Institute for Mathematics in Bonn

- Collaborated with two other national winners of the federal mathematics competition to falsify a conjecture in algebraic topology by constructing an explicit counterexample

PROJECTS

IMC Trading Prosperity 3 Competition

2025

- Collaborated in a team of three to deploy trading strategies and identify patterns across virtual assets in a realistic simulated market, using Python (OOP, Pandas, NumPy). Implemented Market Making, Mispricing and Market Taking, Synthetic Arbitrage, Mean Reversion, Predictive Modelling, and Portfolio Optimization; optimized decision-making by anticipating and modeling competitors' strategies (Top 3% of 12,000+ teams globally).

Machine Learning for Trading

2023

- Developed machine learning-based forecasting trading strategies using real financial data in Python (Yahoo Finance, Pandas, NumPy), as part of a course by Prof. Dr. Tucker Balch, Managing Director at J.P. Morgan AI Research.

SKILLS

Programming Languages	Python, C++, HTML/CSS, Git, Z Shell, Machine Learning for Trading
	English (fluent), German (native), Kurmanji (native)

HONORS & AWARDS

Best Graduate Award

2024

- 500€ sponsored by secida AG

Best Master's Thesis in the Computer Science Faculty Award

2024

- 500€ sponsored by the Computer Science Faculty of Ruhr University Bochum

German Academic Scholarship Foundation

- Germany's largest, oldest and most prestigious scholarship foundation
- Awarded full funding for my bachelor's and master's studies (Top 0.5% students in Germany)

International Olympiad in Cryptography

2023

- Silver Medalist — ranked 3rd in the University Students category (Top 3 out of 200 competitors)
- 2 out of 8 of my solutions were selected as the best solutions

Federal Mathematics Competition [my write-ups]

2016 - 2017

- Most prestigious mathematical competition in Germany, alongside the Mathematical Olympiad
- Two-time national winner 2016 & 2017 (Top 10 out of 1,500 competitors)
- Interviewed on the German TV show WDR and the radio

German Mathematical Olympiad

2010 - 2016

- Several first prizes in the first three rounds (from 4th to 11th grade)
- Team member representing the German state NRW for the finals in 2016 (Top 200 out of 200,000 competitors)

Mathematical Kangaroo

2016

- First Prize (Top 0.35% out of 10,500 competitors in the 11th grade in Germany)

Vice Boxing Champion of North Rhine-Westphalia Germany

2015