Kaniuar Bacho

kaniuar.bacho@gmail.com Kaniuar Bacho Website

Education

PhD Quantum Cryptography 2025 - 2027
University of Edinburgh *United Kingdom*

- Exploring the minimal assumption in quantum cryptography that still ensures a rich family of useful applications.
  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 2022 - 2024
Ruhr University Bochum *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 2017 - 2021
University of Bonn *Germany*

- GPA: 1.3/1.0 (very good)
- Bachelor's Thesis: Classification of Representations of $\mathrm{GL}_2(\mathbb{F}_{p^n})$ (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

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 $\mathrm{GL}_2(\mathbb{F}_{p^n})$
- 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

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

Honors & Awards

Best Graduate Award 2024

- 500€ sponsored by secida AG

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