Marco John Lewis

Curriculum Vitae

✉ *mlewis@lmf.cnrs.fr*
marco-lewis.github.io
marco-lewis
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Research Interests

Fields Quantum computing, software verification, algorithmic complexity, logic

A researcher interested in understanding the interplay between quantum computing and formal verification techniques; particularly in automated verification techniques and how to adapt them to ensure the correctness of quantum hardware and software.

Education

2024-Present **Postdoctoral Researcher**, *INRIA*, QuaCS.

2020-2024 **PhD: Automated Verification Techniques for Quantum Computers**, *Newcastle University*, Supervisors: Paolo Zuliani and Sadegh Soudjani.

2016–2020 **MEng Mathematics and Computer Science**, *University of Bristol.*
First Class Honours (US GPA = 3.88)
Modules: Quantum Information Theory, Quantum Computing, Types and Lambda Calculus, Advanced Algorithms, Language Engineering.

Research Outputs

Publications

2024 **Automated Verification of Silq Quantum Programs using SMT Solvers**, *Marco Lewis, Paolo Zuliani, Sadegh Soudjani*, In 2024 IEEE International Conference on Quantum Software (QSW), Shenzhen, China, 2024, pp. 125-134.
DOI:10.1109/QSW62656.2024.00027

T-Count Optimising Genetic Algorithm for State Preparation, *Andrew Wright, Marco Lewis, Sadegh Soudjani, Paolo Zuliani*, In 2024 IEEE International Conference on Quantum Software (QSW), Shenzhen, China, 2024, pp. 58-68.
DOI:10.1109/QSW62656.2024.00020

Formal Verification of Quantum Programs: Theory, Tools and Challenges, *Marco Lewis, Sadegh Soudjani, Paolo Zuliani*, ACM Transactions on Quantum Computing 5, 1, Article 1 (March 2024), 35 pages.
DOI:10.1145/3624483

2023 **Verification of Quantum Systems Using Barrier Certificates**, *Marco Lewis, Paolo Zuliani, Sadegh Soudjani.*, In: Jansen, N., Tribastone, M. (eds) Quantitative Evaluation of Systems. QEST 2023. Lecture Notes in Computer Science, vol 14287. Springer, Cham.
DOI:10.1007/978-3-031-43835-6_24

Pre-prints

2025 **High-level quantum algorithm using Silq**, *Viktorija Bezganovic, Marco Lewis, Sadegh Soudjani, Paolo Zuliani*, arXiv preprint, arXiv:2409.10231.

2024 **Verification of Quantum Circuits through Discrete-Time Barrier Certificates**, *Marco Lewis, Sadegh Soudjani, Paolo Zuliani*, arXiv preprint, arXiv:2408.07591.

2022 **Matrix Representation of Arbitrarily Controlled Quantum Gates**, *Marco Lewis, Sadegh Soudjani, Paolo Zuliani*, arXiv preprint, arXiv:2205.02525.

Software Artifacts & Code

2023 **SilVer: Silq Verification**, *Python, D language.*
Zenodo DOI: 10.5281/zenodo.11395797

Verification of Quantum Systems Using Barrier Certificates, *Python.*
GitHub repository: marco-lewis/quantum-barrier-certificates

Masters Dissertation

Title *Quantum Transport and Random Matrix Theory*

Supervisor Prof. Francesco Mezzadri

Description Gained an introduction to quantum chaos and knowledge of modelling quantum dots using random matrix theory. Investigated statistical properties in a non-ideal setting, which awarded a First-class mark (80%).

Bachelor Dissertation

Title *Learning to Securely Generate Keys*

Supervisor Dr. Miranda Mowbray

Description Studied how a neural network could be implemented in a cryptographic scheme. Gained experience in scientific writing, literature reading and time management, achieving a First-class mark (74%).

Experience

Service

2025 **QEST+FORMATS 2025**, *Artifact Reviewer.*

2024 **TACAS 2025**, *Artifact Reviewer.*

CAV 2024, *Artifact Reviewer.*

2023 **TACAS 2024**, *Artifact Reviewer.*

2021 **FoSSaCS 2022**, *Reviewer.*

ATVA 2021, *Reviewer.*

Organisational

2023-2024 **AMBER Talks Organiser**, *School of Computing*, Newcastle University.

2023-2024 **HyCoDeV Meeting Organiser**, *School of Computing*, Newcastle University.

2022-2023 **SAgE Faculty PGR Conference Committee Member**, *Faculty of Science, Agriculture & Engineering*, Newcastle University.

2021-2023 **PhD Course Representative, Chair of Student Staff Committee**, *School of Computing*, Newcastle University.

Teaching and Supervising

2023-2024 **Assistant Supervisor**, *School of Computing*, Newcastle University.
Supervising undergraduate students for dissertation project and follow up research (see *T-count Optimising Genetic Algorithm for State-preparation (TOGAS)* and *High-level quantum algorithm using Silq* in Research Outputs).

2021-2023 **Demonstrator (Teaching Assistant)**, *School of Computing*, Newcastle University.

2023/24 Fault Tolerant and Cyber-Physical Systems

2022/23 Major Project and Dissertation in Computer Science
Group Project in Data Science
Introduction to Quantum Computing
Data Management and Exploratory Data Analysis
Computing Foundations of Data Science

2021/22 Group Project in Data Science
Big Data Analytics
Data Management and Exploratory Data Analysis
Computing Foundations of Data Science

2020/21 Group Project in Data Science
Big Data Analytics

2020 **Introduction to Learning and Teaching in Higher Education**, *Newcastle University*.

Miscellaneous

2021-2022 **Team Captain**, *Newcastle University Karate Club*, Newcastle University.

2019-2020 **Society President**, *Combat Karate*, University of Bristol.

2018 **Software Intern (Summer)**, *Ghyston*, Bristol.

2007-Present **Martial Artist**.
Okinawan Gojo-ryu Karate (18 years), Shotokan Karate (2 years), Muay Thai (2 years), Vovinam (3 months)

Research Skills

- Autonomous worker
- Fast learner and adaptable to new systems
- Problem solving
- Time management

Computer skills

Primary PYTHON, LaTeX

Skilled Microsoft Office

Basic C, C#, D language, Docker, Haskell, Linux