

Colin Blake

PhD researcher in quantum computing

MOCQUA, Inria / Université de Lorraine, LORIA - Nancy, France

colin.blake@inria.fr | colin-blake.eu

Research

Equational theories for quantum circuits: qudits, controlled operations, phase-affine fragments, normal forms and rewriting methods for compilation.

Education

PhD in Computer Science Oct 2024-present
Université de Lorraine, MOCQUA (Inria / LORIA). Expected completion: 2027.
Thesis: *Reasoning with and Optimising Quantum Circuits.*
Supervisors: Simon Perdrix and Miriam Backens.

Master Parisien de Recherche en Informatique (MPRI) 2022-2024
M2: ENS Paris-Saclay, 2023-2024, *Mention Bien.*
M1: Université Paris-Saclay, 2022-2023.

Magistère d'Informatique 2021-2024
Université Paris-Saclay. University diploma alongside the L3-M2 pathway.

Licence Double Diplôme, Mathematics and Computer Science 2019-2022
Université Paris-Saclay. *Mention Très Bien.*

Publications

A Complete Equational Presentation of Qudit Circuits via Polycontrolled PROPs.
Colin Blake. MFCS 2026, LIPIcs 386, 6:1-6:18. **Best Student Paper Award.**
doi:10.4230/LIPIcs.MFCS.2026.6

Simpler Presentations for Many Fragments of Quantum Circuits.
Colin Blake. FSCD 2026, LIPIcs 378, 6:1-6:20.
doi:10.4230/LIPIcs.FSCD.2026.6

Preprint

Completeness for Prime-Dimensional Phase-Affine Circuits.
Colin Blake. 2026. arXiv:2603.06466.

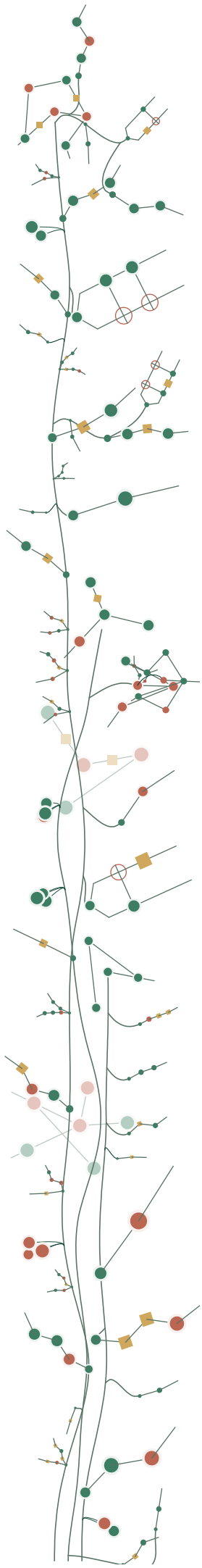
Research internships

M2 - Inria MOCQUA, Nancy Mar-Jul 2024
Equational theories of qudit circuits. Supervisor: Simon Perdrix.

M1 - Inria QuaCS, Orsay Mar-Jul 2023
ZX-calculus fragments with partial transpose. Supervisor: Renaud Vilmart.

L3 - LMF QuaCS, Orsay May-Jul 2022
Typed quantum-circuit compilation and ZX-calculus pattern matching.
Supervisor: Kostia Chardonnet.

For the ornament, see https://github.com/kevinraymond/florilegium



Awards and scholarships

2026 - France Excellence Quantum scholarship for a research visit to the University of Amsterdam.

2026 - Best Student Paper Award, MFCS, for the paper on polycontrolled PROPs.

2025 - First Jury Prize, Scientific Game Jam Nancy, with the team behind *Les Chevaliers du Quantique.*

2022-2023 - Labex DigiCosme Excellence Scholarship, M1 MPRI.

Teaching

Tutorial instructor - Mines Nancy 2026-2027
Tutorials and practical classes since September 2026: Algorithms and Complexity; Python for Engineers.

Practical-class instructor - Université de Lorraine Sep 2025-Aug 2026
Java software project (24 h); Introduction to Artificial Intelligence (22 h); Introduction to Algorithms (18 h).

Practical-class instructor - Université de Lorraine Feb-Aug 2025
Java software project (24 h); Introduction to Artificial Intelligence (12 h).

Supervised practical classes and projects, contributed to AI project design, and assessed assigned student groups.

Invited talks and selected presentations

MFCS 2026, Paris, 27 August 2026; **QPL 2026**, Amsterdam, 17 August 2026; **FSCD 2026**, Lisbon, 23 July 2026: presentations of the papers listed above.

Invited seminar, Marne-la-Vallée, 26 November 2025: *Quantum computing and ZX-calculus.*

Science outreach

Les Chevaliers du Quantique (2025). Designed the original circuit-simplification game and the mechanics of its team-developed video-game adaptation.

Fête de la Science, Nancy, 10-11 October 2025: public quantum-circuit workshops using the game.

Cap sur le numérique à Bercy, Paris, 8 December 2025: quantum research and research careers.

Research software

minimality-auto (Python). Command-line search for invariants separating an equation from the other axioms of a quantum-circuit theory.

Languages

French: native. English: full professional proficiency.
Spanish: professional working proficiency.