

Colin Dietrich

Physics Engineer

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personal website



Profile

Recent dual master's graduate in Engineering Physics with two years of lab experience as a research assistant focused on advanced quantum optical systems. Skilled in experimental quantum optics and programming, with a focus on advancing quantum technology. Browse some of my projects on [my website](#).

Education

Research MS in Engineering Physics *Polytechnique Montreal* **Montreal, CA** 2022-2024

GPA : 4.0/4.0

Coursework : Quantum Optics, Quantum Information, Ultrafast Photonics, A.I.: methods and algorithms, Quantum Field Theory (McGill University).

Research : Full time dedicated to a supervised research project, consisting in developing a bright source of entangled photons.

MS in Engineering Physics *École Polytechnique de Bruxelles* **Brussels, BE** 2021-2024

Honors : Summa Cum Laude

Coursework : Quantum Mechanics II, Laser Physics, Numerical Methods, Plasma Physics, Digital Electronics, Nuclear Physics.

BS in Engineering Physics *École Polytechnique de Bruxelles* **Brussels, BE** 2018-2021

Honors : Magna Cum Laude

Coursework : Quantum and Statistical Physics, Linear Algebra, Quantum Mechanics I, Semiconductor Physics.

Work And Associative Experience

Student Research Assistant *(Polytechnique Montreal)* **Montreal, CA** 2023 - 2024

- Worked as a Student Research Assistant at the Laboratoire des Fibres Optiques under the supervision of Stéphane Virally, focusing on developing high-purity entangled photon sources.
- Conducted research on "band-conditioned states," (Virally et al.) exotic quantum light states with potential for metrology, involving the generation of entangled photon pairs, phase-space measurements, and intensity-based post-selection to produce Wigner functions with negative regions.
- Designed and automated advanced optical experiments, including SHG-FROG, prism compressors, balanced homodyne detection, and RIN characterization, contributing to significant progress in the experimental realization of these states.

Laboratory Instructor and Teaching Assistant *(Polytechnique Montreal)* **Montreal, CA** 2023 - 2024

- Led teams and evaluated initial concept projects in physical engineering (PHS1903), including pulse oximeters, infrared thermometers, wireless energy transfer systems, and laser sensing.
- Served as an evaluator for Statistical Physics (PHS2111) and Biophotonics courses (GBM8802).

Development Cooperation Project *(Codepo, CAMESKIN)* **Kinshasa, RDC** 2021 - 2022

- Led a development cooperation project in partnership with Camsekin and École Polytechnique de Bruxelles, addressing unreliable power grids in the Democratic Republic of Congo by designing a solar energy monitoring system.
- Designed and implemented a Kalman filter-based model for accurate battery life tracking and an MQTT-based remote monitoring app for real-time solar panel and battery performance visualization.
- Utilized an Arduino DUE microcontroller and Python scripts to integrate solar panel output with local weather data predictions, enhancing system adaptability for rural setups.
- Successfully deployed the system in Kinshasa to ensure continuous operation of a solar-powered, refrigerated medical storage facility.

Projects

1st Place at Quantum Hackathon

Montreal, CA 2024

(Pasqal – CMC Virtual Hackaton)

- Won the 2024 Pasqal-CMC hackathon by optimizing 5G antenna placement using a hybrid classical-quantum approach.
- Combined simulated annealing with Pasqal's Pulser library to solve Maximum Weighted Independent Set (MWIS) problems using Neutral Atom Quantum Computing (NAQC).
- Explored Variational Quantum Annealing Algorithm (VQAA) for fine-tuned optimization, showcasing potential for scaling to complex network scenarios.

Python Library for Crystal Optimization

Montreal, CA 2023

(7th Montreal Photonics Networking Event)

- Presented research on the inverse design of nonlinear materials at the 7th Montreal Photonics Networking Event.
- Developed and released an open-source library using a genetic algorithm to optimize second-order nonlinear crystals for enhanced SPDC-based entangled photon generation.

Low-Noise Ultrafast Fiber Laser

Montreal, CA 2023

(Polytechnique Montreal)

- Developed an ultrafast Erbium-doped fiber laser system tailored for quantum optics applications, delivering ultralow-noise, high peak power pulses.
- Built and optimized a passive mode-locked master oscillator amplified by an Erbium-doped fiber amplifier (EDFA).
- Achieved 139 fs pulse durations with ~ 4 nJ energy and characterized an integrated Relative Intensity Noise (RIN) of 0.081%.

Ray-tracing Simulations for 5G Networks

Brussels, CA 2021

(École Polytechnique de Bruxelles)

- Developed C++ ray-tracing software to analyze electromagnetic wave propagation and map 5G indoor small cell base station coverage areas.
- Simulated power reception, bit rate distribution, and optimized transmitter placement using a genetic algorithm.

Solver for Two-Dimensional Poisson Equation

Brussels, CA 2020

(École Polytechnique de Bruxelles)

- Developed a C program to solve the 2D Poisson equation using an iterative Multi-Grid method, optimizing performance with a relaxation parameter and Multi-Grid preconditioning.
- Enhanced solver efficiency by integrating the PRIMME solver and employing UMFPACK for coarse-grid computations.

Skills

- **Programmation:** Python, C, C++, Java, Swift, HTML, CSS, Javascript, LaTeX, MATLAB.
- **Python Libraries:** Numpy, Scipy, Matplotlib, Pandas, PySerial, PyVISA, Qiskit, Pulser.
- **Software:** Github, PowerPoint, Excel, word, Adobe PhotoShop, Inkscape, Mathematica.
- **Language:** Native in French, professional skills in Dutch (obtaining the CNaVT, allowing higher education in Dutch) and English.
- **Soft Skills:** Presentation, Planning, Organized, Creative Problem-Solving, Teamwork, Active Listening, Adaptability, Analytical Thinking.

Hobbies

- **Running / Trail:** Passionate about running, particularly trail running and outdoor endurance events. Completed several marathons and recently finished my first 80km trail.
- **Music:** Guitar and piano.
- **Tennis:** Competitively ranked at C15.2 in Belgium.
- **Backpacking:** Enjoy exploring new places, meeting people, and experiencing different cultures through travel.