Alberto Ruiz-Biestro

BSc Engineering Physics – Photonics & Quantum Systems, Nano & Microstructures RG

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GitHub / Projects

Education

Monterrey Institute of Technology **Aug 2020 – Jun 2024**

B.S. Engineering Physics (expected) **Current GPA**: 3.8 (Percent Grade: 95.95/100)

TOEFL iBT Score: 108 (contact me for a .PDF copy) CEFR equivalence: C1

Publications

1. **Alberto Ruiz-Biestro** and J. C. Gutierrez-Vega. *Solutions of the Lippmann-Schwinger equation for mesoscopic confocal parabolic billiards*. Dec 2023. arXiv:2312.07396 (under Review at Phys. Rev. E.)

Skills

- **Strong numerical background**: proficient in Julia, MATLAB, and Python. Skilled in Mathematica, COMSOL, and Bash. Working knowledge of HTML and CSS.
  - **Quantum Software**: TKET (pytket), Qiskit.
- **Experimental**: Experience in optical metrology, optical equipment (HeNe lasers, waveplates and polarizers, holography, etc.). Arduino and microcontrollers.

Awards

- **Best Team Project**, *ICTP – Quantinuum Quantum Hackathon* **Apr 2023**
- **Academic Merit Scholarship recipient**, *Monterrey Institute of Technology (ITESM)* **Aug 2020**

Research Experience

Monterrey Institute of Technology, Photonics and Mathematical Optics Group **Sep 2023 – present**
Advisors: Julio C. Gutierrez-Vega

- Implemented a Boundary Integral Method for solving the Lippmann-Schwinger (scattering) Equation.
- Implementation of meshes for discretization and parallel optimization techniques.
- Advanced theoretical methods and mathematical formulations for analytic results.
- Gave a poster presentation at the Mexican Optics & Photonics Meeting..... **Nov 2023**

International Centre for Theoretical Physics & Quantinuum **Apr 2023**
Advisor: Nathan Fitzpatrick (*Quantinuum*)

- Generated ground and excited state curves using a Quantum Krylov-subspace method along a reaction coordinate for an H_2 molecular Hamiltonian.
- Development of hybrid quantum-classical algorithms with TKET and the InQuanto quantum chemistry platform.
- Collaborated with graduate students from diverse backgrounds. Our team received the *Best Team Project* award, along with second place.
- Attended lectures on Quantum Adiabatic Computation, Quantum Error Correction, Quantum Chemistry, and ZX calculus.

Monterrey Institute of Technology, Physics Dept. **Aug 2021 – Sep 2022**
Advisors: Dr. Antonio Ortiz-Ambriz Dr. Gerardo Fox Dr. Servando López

- Numerical simulation of the *Nonlinear Schrodinger Equation* through *pseudo-spectral method* (split-step Fourier) and numerical solutions of Boundary Value Problems (shooting method, finite differences, etc.).
- Developed audio-identification algorithm in order to identify an audio recording from a microphone (FFT and signal-processing methods).
- Analyzed the travelling-salesman-problem through simulated annealing; simulated the dynamics and critical points of the Lenz-Ising model.
- Developed *Genetic algorithms* and *Neural Networks* (see my website).

Leadership

- Undergraduate **Quantum Computing Club** co-founder and VP ..... **Aug 2022 – Dec 2023**
  - Founded the group with the intent of teaching areas of quantum mechanics and quantum computing to interested students that may not have had similar classes. Organized seminars, including one with Dr. Benjamín Perez-García on the implementation of Deutsch's algorithm with linear optics, as well as a variety of courses that gave undergraduate students tools to program and analyze quantum algorithms.
  - Active participation in the organization of my institution's first **quantum hackathon**. Helped with dissemination and spreading the invitation to external faculty and students.
  - Co and teaching of workshops in colaboration with the *Physics Student Society* (AEF in Spanish) from Nuevo-Leon's Autonomous University (UANL).
  - Organization, planning, and direction of quantum computing bootcamps, offering intensive courses to students from ITESM as well as from other universities. Our outreach has grown beyond the state of Nuevo León.
- Given talks and short courses on Julia, Python, LaTeX ..... **Aug 2022 – Sep 2023**
- **SPIE** Student Chapter President and **OSA** member ..... **Jan – Nov 2023**
  - Provided sponsorship opportunities for the **International Physics Symposium**.
- Virtual poster presentation **2021**
  - Presented a Raman spectrometer design for biosignature detection in a rover for the National Space Activity Congress (CONACES), organized by the Mexican Space Agency.

Teaching Experience

- **Course assistant for Mathematical Methods for Physics** ..... **Aug – Dec 2023**
  - Graded homework and exams; held weekly advisory sessions.
- **Course assistant for Modern Electrodynamics** ..... **Aug 2022 – Jun 2023**
  - Graded homework and exams; held weekly advisory sessions.
- **Mathematics course tutor**, *Instituto Bilingüe Victoria*
  - Taught math to a group of 20 kids from secondary school ..... **Jan - May 2020**

Activities and Interests

Social Services — Teaching at low income communities in Mexico.

Sports — Former state rugby player (long ago).
Enjoy hiking, biking, avid bouldering and rock climbing, and the outdoors.

Music — I play the piano since secondary-school, enjoy making music in my free time.