Alberto Ruiz-Biestro

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

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GitHub

Education

B.S. Engineering Physics (expected) Monterrey Institute of Technology **Aug 2020 – Jun 2024**

Current GPA: 3.8 (Percent Grade: 95.95)

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

Experience

Quantum Hackathon Awardee International Centre for Theoretical Physics & Quantinuum **April 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 using TKET.
- Collaborated with graduate students from various backgrounds. Our team received the *Best Team Project* award.

Undergraduate Research Assistant *ITESM, Photonics and Quantum Systems* **(ongoing)**
Advisors: Julio C. Gutierrez-Vega

- Research focused on efficient implementation of a Boundary Wall Method for Lippmann-Schwinger (scattering) Equation in different geometries.

Undergraduate Research Assistant *ITESM, Physics Department* **2023 –**
Advisors: Flavio F. Contreras

- Charaterization of molecular order and functional properties of wheat samples in order to determine relative crystallinity-degrees.
- Analysis of the Debye Scattering Equation and atomic Pair-Distribution Function (PDF) for structural determination of ferrispinels and Fm-3m symmetries (*ongoing*).
- Experience handling AFM, XRD, UV-VIS, FTIR, Raman Spectrometers, as well as PVD techniques.

Undergraduate Research Experience *ITESM, Physics Department* **2021 – 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).
- Numerical simulation of the travelling-salesman-problem through simulated annealing. Other work includes working with continuous-time Markov processes and the Lenz-Ising model.
- Experience with *Genetic algorithms* and *Neural Networks* (see my website).

Teaching / Leadership

- Undergraduate **Quantum Computing Club** co-founder and VP **2022 –**
  - 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.

- Undergraduate *Mathematical Methods for Physics* course assistant **2023**
- Given talks and short courses on Julia, Python, LaTeX **2022 – 2023**
- **SPIE** Student Chapter President and **OSA** member **2023**
  - Provided sponsorship opportunities for the **International Physics Symposium**.
  - Created webpage for Photonics research group for it to display current research and activities.
- Undergraduate Electrodynamics course assistant **2022 – 2023**
- 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.
- Academic Merit Scholarship recipient from Monterrey Institute of Technology (ITESM) **2020**
- Mathematics course tutor to a group of 20 kids in secondary school **2020**.

Skills

- **Computational** (*alphabetically*): basic C/C++, COMSOL, Git, advanced Julia, LaTeX, Linux shell, Matlab (GA & NN), Object-Oriented-Programming, and advanced Python (incl. Pandas and other libraries). Working knowledge of HTML and CSS.
  - **Quantum Software**: TKET (pytket), Qiskit.
- **Experimental**: Arduino and microcontrollers; Optics laboratory equipment (HeNe lasers, waveplates and polarizers, holography, etc.); XRD and Bruker software; AFM; UV-VIS, FTIR, RAMAN spectrometers, thin-film deposition.
- **Soft Skills**: Research skills, leadership, adaptability, teamwork, attention to detail.

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.

Other activities — Often enjoy playing the piano and making music.