Adrián Garza Zapata

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Education

- **MSc Photonics - Erasmus Mundus Joint Master iPSRS** — France / Finland
  Université Jean Monnet & University of Eastern Finland — *September 2024 - September 2026 (Expected)*
  Concentration: *Photonics and Machine Learning*

- **Bachelor in Engineering Physics** — Monterrey, México
  Tecnológico de Monterrey — *August 2020 - June 2024*
  Concentration: *Photonics and Quantum Technologies*

Experience

- **Summer Research Intern - Functional Materials and Surfaces Group** — Saint-Étienne, France
  Laboratoire Hubert Curien — *June 2025 - September 2025*
  Printed image inscription by laser processing in collaboration with TOPPAN Security.
  - Developed a Python clustering framework for metasurface color reproduction, implemented hierarchical clustering with a custom color difference and laser parameter proximity metric.
  - Improved clustering performance with an average 20% increase in color space volume and reduced cluster element disconnectivity to 10%, enabling more accurate and reproducible color mapping via the laser process while also reducing computing cost.
  - Created a dashboard using the Dash framework to integrate all the clustering modules alongside interactive data visualizations, emphasized visualization speed by applying vectorization and parallel computing concepts.
  - Documented algorithms and visualization methods using Git for version control. Held weekly meeting with key stakeholders of the project to present new findings.

- **Research Assistant - Photonics and Optics Group** — Monterrey, México
  Tecnológico de Monterrey - ITESM — *August 2023 - December 2023*
  Design of a photon pair source for Optical Coherence Tomography based on SFWM.
  - Trained in nonlinear optics and waveguide design in collaboration with CICESE researchers
  - Designed and evaluated waveguide geometries for photon-pair sources applied to Optical Coherence Tomography (OCT) using Lumerical MODE/FDTD solvers.
  - Automated dispersion and phase-matching analysis in MATLAB, optimizing photon-pair bandwidth for improved imaging resolution.

Optical Laboratory and Programming Projects

- **Laser Parameter Optimization for Metasurface Processing**: Simulated noise in a laser process to quantify impact on color reproduction, created a Machine Learning pipeline with Python to optimize parameter selection and reduce experimental noise in metasurface sample processing.
- **Nd YAG Characterization**: Built and aligned an Nd:YAG laser experiment for optical characterization. Optimized SHG alignment, captured spiking and mode profiles, and performed quantitative analysis using oscilloscope data and Python.
- **Design of a 3D Optical Scanner**: Experimentally tested different interferometry setups (Michelson, Mach-Zehnder, Gates) to develop an optical scanner based on phase-shift and phase-demodulation techniques. Used MATLAB to implement an error correction algorithm.
- **Structured Light**: Used a HeNe laser alongside a phase mask to experimentally recreate addifractional vector beams. Recorded intensity profile with a CCD and used MATLAB to analyze local and global polarization states.
- **Optical System Design & Ray Tracing**: Designed optical systems, such as telescopes and cameras, using OpticStudio (Zemax), focusing on aberration correction and system optimization based on physical constraints.

Skills Summary

- **Programming**: **(Advanced)** Python & MATLAB **(Intermediate)** Julia **(Basic)** R
- **Languages**: Spanish: **(Native)**, English: **(C1 TOEFL iBT)**, French: **Basic**
- **Simulation, Libraries & Tools**: Lumerical, OpticStudio, Pandas, Numpy, SKLearn, Pytorch, OpenCV, Git, Plotly, Dash
- **Laboratory Skills**: Optical Alignment, Interferometry, Laser Manipulation, Structured Light and Polarization Optics
- **Notable coursework**: Optical Engineering & Optical Design, Laser Processing & Laser Characterization, Signal and Image Processing, Deep Learning, Fourier Optics & Digital Holography.