Nuno Castanheira

469-407-1782 nvmcastanheira@gmail.com Palo Alto, CA
LinkedIn GitHub Google Scholar

Education

Masters in Applied Physics, Stanford University **Aug 2023 – Expected: April 2025**
Focus: Optical/Laser Systems

B.S. in Physics, University of Texas at Dallas **Aug. 2019 – June. 2023**
GPA: 3.87/4.0, Cum Laude and Major honors *Minor: Nanoscience and Technology*

B.S. in Applied Mathematics, University of Texas at Dallas **Aug. 2020 – June. 2023**
GPA: 3.87/4.0, Cum Laude

Skills

Programming Languages: Python, Julia, MATLAB, C++/C#, Fortran, Wolfram Language (Mathematica)
Packages: NumPy/SciPy/MatPlotLib, PyTorch, scikit-learn, tensorflow, keras, Pandas, Qiskit, Flux, Makie
Technologies/Frameworks: Zemax, git, Jupyter Notebooks, LaTeX, Linux
Methods: Regression (linear, ridge, polynomial, etc.), optimization (global convex methods, gradient descent), stochastic calculus/differential equations, neural networks, finite-difference solvers (ODE and PDE methods).
Laboratory: High-power broadband laser systems and optical components, nonlinear crystal design, ultrahigh vacuum technology, Raman/XPS/ellipsometry
Languages: Full fluency in English, Spanish, and Portuguese.

Experience

Stanford University – Fejer/Mabuchi Group **August 2023 – Present**
Graduate Research Assistant

- Simulated optical waveguide/resonator devices, developed finite difference FED/FDTD solvers for classical waveguiding structures, and developed tensor decomposition code for broadband quantum optics theory.
- Developed theory on nonlinear and quantum optics, working with experimentalists to design quasi-phase matched and dispersion engineered nonlinear devices.

University of Texas at Dallas – Department of Materials Science **Oct. 2022 – Sept. 2023**
Research Software Engineer

- Worked with Linux systems to produce large sets of data from NIST's SESSA application and train an open-source ML algorithm with PyTorch for the purpose of characterizing XPS background scattering.
- Developed prototype ML software for future use as an open-source package in Python.

Cornell University – Center for Material Sciences **June 2021 — August 2022.**
Research Assistant

- Analyzed hybridized optical processes in nonlinear optics for viability in broadband and efficient conversion of ultrafast EM waves in the IR regime.
- Utilized high-powered lasers in a laboratory setting to test multi-step optical simulations.
- Designed a nonlinear crystal to propagate laser pulses for frequency conversion using quasi-phase-matching.
- Developed novel technology (see patents) in use for third-harmonic generation of fundamental optical frequencies.

Publications, Presentations, Awards & Patents

- Stanford EDGE Fellow (2023)
- Stanford Applied Physics 5-year Departmental Award (2023)
- NSF REU Fellow (2021, 2022)
- UTD Academic Excellence Scholar (2019-2023)
- Gelb, L., **Castanheira, N.**, V., Walker, A. (2023). "Thin Film Analysis by XPS: Quantitative Analyses Using Physics-Based and Machine-Learning Approaches". *AVS International Symposium and Exhibition.*
- **Castanheira, N.**, Flemens, N., Moses, J. (2023). "Cascaded third-harmonic generation approaching full efficiency through an unconventional pathway". *SPIE, Photonics West.* (Proceedings and presentation)
- **Castanheira, N.**, Zhang, F. (2023). "Quasiparticle Interference in Trigonally Warped Graphene Systems". *APS March Meeting.*
- **Castanheira, N.**, Flemens, N., Moses, J. (2021). "Novel Solutions for Third Harmonic Generation Using Quasi-Phase Matching". *UTD Computational Science Seminar.*
- (Pending) Castanheira, N., Flemens, N., Moses, J. (Filed 2/2024). "Third-harmonic Frequency Generator and Generation Method" (U.S. Patent No. 00,599,035).
- (Provisional Patent) Castanheira, N., Flemens, N., Moses, J. (1/2023) "Third-harmonic Frequency Generator and Generation Method" (U.S. Provisional Application No. 63,442,413).