

ANDREW R. GARCIA, PH.D.

GitHub | LinkedIn | Portfolio

Scientist with experience in Monte Carlo simulations, 3-D graphics, and machine learning searching for an exciting career in a quantitative field.

EDUCATION

University of Florida Doctorate (Ph. D.) Engineering / Chemical	Gainesville, FL 2017 - 2022
University of Florida (UF) Masters (M. Sc.) Engineering / Chemical	Gainesville, FL 2012 - 2015
University of Miami (UM) Bachelors (B. Sc.) Chemistry	Coral Gables, FL 2007 - 2011

SKILLS

Occupational:	Machine Learning (5+ yrs), Deep Learning (3+ yrs), Monte Carlo Simulations (4+ yrs), Computer Vision (3+ yrs), 3-D Computer Graphics (3+ yrs), High Performance Computing (3+ yrs), Cloud Computing (3+ yrs)
Programming Languages:	C++ (2+ yrs), Python (5+ yrs), JavaScript (3+ yrs), LaTeX (2+ yrs), Bash Unix shell (3+ yrs)
Libraries/Frameworks:	CUDA , Git, HTML/CSS, NumPy, Numba, pandas, pathos, SciPy, TensorFlow, Keras, three.js, jQuery.ajax
Tools / Platforms:	DigitalOcean, Linux (Ubuntu), npm, node.js, webpack

EXPERIENCE

University of Florida | Research Assistant - Ph. D. Gainesville, FL | Oct 2017 - May 2022

- Conducted experimental and theoretical work to optimize the crystallization process of MIL-53 metal organic frameworks (MOFs).
- Developed three-dimensional (3-D) kinetic Monte Carlo simulations to model the complex anisotropic nature of crystals.
- Applied artificial intelligence (AI) algorithms to expand the breadth of knowledge on structure-function.
- Developed a framework for cloud parallel task computing with DigitalOcean droplets using clusters of 8-16 vCPUs to solve large sets of Monte Carlo simulations, cutting hypothetical computing work of 24 hours to less than 2 hours.

UF | Teaching Assistant, Computer Model Formulation Gainesville, FL | Jan 2018 - May 2018

- Reviewed the numerical algorithms taught in class to students during my office hours.
- Taught students how to handle different programming elements from Python needed for the course.
- Reviewed several lines of written Python code from the exams of the 75 students in class to assign grades.

UF | Teaching Assistant, Chem. Kinetics and Reactor Design Gainesville, FL | Aug 2017 - Dec 2017

- Derived theoretical expressions of chemical kinetics and held pre-exam reviews for students.
- Taught students how to use spreadsheets to calculate complex heat transfer and chemical reaction properties on reactors.
- Obtained the *Ray Fahien Graduate Teaching Award* from this course with 115 students, who rated me on my performance.

Xerox | Associate Engineer Webster, NY | Jul 2015 - Jul 2017

- Developed new chemical toner formulations and protocols.
- Performed experimental work at the lab and pilot plant scales, as well as machine troubleshooting.
- Optimized process conditions for a toner for a large, multi-departmental project implemented for production with Six Sigma.

University of Florida | Research Assistant - M. Sc. Gainesville, FL | Dec 2012 - Jun 2015

- Adapted a process used to support the submission of a \$45,000 commercialization proposal in June 2014.
- Fulfilled the main goals of the research project, making a significant contribution to the passing of a larger NIH R01 funded (about \$180,000 for the year 2015) project.
- Co-invented a technology highly applicable to the \$1.68 billion dollar market of nerve repair and regeneration.

Thermodynamic and Kinetic Crystal Growth Theory for the Design of Metallic and Molecular Crystals (2-year campus restriction access)

Andrew Garcia, 2022

Ph. D. Dissertation

1. A. Garcia, et al. "Kinetic Monte Carlo Modeling of MIL-53 Metal Organic Framework Crystal Growth" *2021 AIChE Annual Meeting (Oral Presentation)*
2. A. Garcia, et al. "Thermodynamic Modeling of Competing Crystal Species from a MIL-53 Metal Organic Framework (MOF) Reaction" *2021 AIChE Annual Meeting (Oral Presentation)*
3. A. Garcia, et al. "Monte Carlo Simulations of Hydrothermal Metal Organic Framework (MOF) Crystal Growth" *2020 AIChE Annual Meeting (Oral Presentation)*
4. A. Garcia, et al. "Crystallization of MIL-53 Metal Organic Frameworks (MOFs) through Changes in the Hydrothermal Process" *2019 AIChE Annual Meeting (Oral Presentation)*

Synthesis of Dissolvable Magnetic Microspheres for Tissue Scaffold Applications

Andrew Garcia, 2015

M. Sc. Thesis

Relevant literature (as either author or co-author):

1. C. Lacko, et al. "Magnetic particle templating of hydrogels: engineering naturally derived hydrogel scaffolds with 3D aligned microarchitecture for nerve repair" *Journal of neural engineering* (2020)
2. A. Garcia, et al. "Processing-size correlations in the preparation of magnetic alginate microspheres through emulsification and ionic crosslinking" *Colloids and Surfaces A: Physicochemical and Engineering Aspects* (2017)
3. C. Rinaldi, et al. "Magnetically templated tissue engineering scaffolds and methods of making and using the magnetically templated tissue engineering scaffolds" *US Patent US20210178024A1* (2015 - Present)

SELECTED OPEN-SOURCE AS MAIN DEVELOPER

voxelmap | pip install voxelmap | Jupyter notebook

Python

A Python library for making voxel models from NumPy arrays. Features:

- Draws 3-D voxel models from NumPy arrays with custom coloring schemes.
- `map3d` | `voxel-per-pixel` | method: Turns images to 3-D voxel models.
- `ImageMesh` | `3-D Convex Hull` | method: Turns images to 3-D polygon mesh geometries.

materialsML | pip install materialsml

Python

A Machine Learning package for materials informatics. A crafty data analysis complement to the materials database from *The Materials Project*. Features:

- Extracts multiple materials and their found properties from the Materials Project database.
- Uses a built-in neural network to predict material properties from their chemical topology.

powerxrd | pip install powerxrd | Jupyter notebook

Python

A Python library made for the analysis of XRD data. Features:

- Makes automated spectral calculations of crystallite sizes; uses a recursive maxima finder.
- **In progress:** Implement user-friendly *Rietveld refinement* methods to offer simpler crystallographic analysis alternatives to FullProf, MAUD and Profex.

bridge (main) | ponte | pip install ponte

C++, Python

A suite of mini-libraries designed to connect array data between Python and C++ through the use of JSON files. As open-source, the long-term goal is to expand the suite to transcribe arrays to a variety of different languages.

tensorscout | pip install tensorscout

Python

This library explores the concept of globalizing low latency in large array computations from multi-processing computing (parallel CPU tasks) of slices from a sliced array.

streamdice | web

C++, JavaScript

A stream cipher based on the random shuffling of maps to encrypt secret messages. It has also been written in Python and Javascript.

CERTIFICATIONS

- Fundamentals of Accelerated Computing with CUDA Python - **NVIDIA**
- Fundamentals of Deep Learning for Computer Vision - **NVIDIA**

HONORS & AWARDS

- NanoDay 2020 Best Poster in Nano-Chemistry Poster Competition
- NanoFlorida 2020 Honorable Mention in Conference Presentation titled: Monte Carlo Simulations of MOF Crystal Growth
- Ray W. Fahien 2017 UF Graduate Teaching Award