

# OLIVER OREJOLA

+1 (973) 897-7512 ♦ New York, NY

[oorejola@gmail.com](mailto:oorejola@gmail.com) ♦ [linkedin.com/in/oliver-orejola](https://www.linkedin.com/in/oliver-orejola) ♦ [oorejola.github.io](https://oorejola.github.io)

## EDUCATION

**Ph.D Mathematics**, Tulane University 2024

Thesis: Essays on random matrix theory and applications

Relevant Coursework: Deep Learning, Data Science, Natural Language Processing, and Stochastic Processes

**B.A Physics and Mathematics**, University of Colorado Boulder 2016

Thesis: Cohomologous 2-cocycles are Homotopic 2-cocycles: k-graphs and  $C^*$ -algebras *Magna Cum Laude*

## SKILLS

**Technical Skills** Python, R, SQL, GIT, Pandas, Docker, Scikit-learn, Numpy, LangChain, TensorFlow  
RAG methods, Machine Learning, Data Analysis, Statistics, Linear Algebra, Algorithms

**Soft Skills** Leadership, Collaboration, Communication, Teamwork, Mentoring

## PUBLICATIONS

“On the empirical spectral distribution of large wavelet random matrices based on mixed-Gaussian fractional measurements in moderately high dimensions” with Didier, G., Wendt, H. and Abry, P. (submitted: currently on arXiv)

“Identifying high-dimensional self-similarity based on spectral clustering applied to large wavelet random matrices” with Didier, G., Wendt, H. and Abry, P. (2024) 32nd European Signal Processing Conference (EUSIPCO)

“Bootstrap based test for the unimodality of estimated Hurst exponents. Performance assessment in high-dimensional analysis setting” with Lucas, C.G. Didier, G., Wendt, H. and Abry, P. (2023) 29th Francophone Colloquium Signal and Image Processing (GRETSI)

“Shhh! The Logic of Clandestine Operations” with Naumov, P. (2023) 32nd International Joint Conference on Artificial Intelligence (IJCAI)

“Hurst multimodality detection based on large wavelet random matrices” with Didier, G., Wendt, H. and Abry, P. (2022) 30th European Signal Processing Conference (EUSIPCO)

## PROJECTS

**agenticRAG-app** 2024

- Engineered GUI for Agentic Retrieval Augmented Generation (ARAG) enabling multi-document Q&A, summarization, and analysis.
- Architected document-specific agents and a top-level Chain of Thought (CoT) agent to facilitate comprehensive user interactions across large document corpora.

**Cointegration and Causality: Statistical Analysis of Apple’s Supply Chain** 2023

- Conducted statistical analysis on Apple’s stock price relationship with major suppliers using cointegration and Granger causality tests.
- Identified statistically significant cointegration and predictive relationships between Apple’s stock and eight key suppliers across specific time periods.

**Political Wikipedia Edit trends: Indicators for important events** 2022

- Analyzed Wikipedia edit trends for US political figures using web scraping, EDA, and Isolation Forests to detect event indicators.

**Neural Nets for PDE’s: Parameter to Solution map** 2021

- Engineered deep learning models using TensorFlow to solve partial differential equations (PDEs) with Physics Informed Neural Networks (PINNs).

## EXPERIENCE

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### Graduate Student Researcher

Tulane University

Aug 2019 - May 2024

*New Orleans, LA*

- Formulated novel statistical tests and machine learning algorithms for signal processing yielding 3 publications.
- Implemented augmented spectral clustering method to identify 13 cointegrated signals among high dimensional Federal Reserve economic data.
- Pioneered and proved new results within the intersection of wavelet analysis, random matrix theory and time series analysis yielding 2 publications.
- Devised model for a formal semantics of clandestine operations with results published in IJCAI.

### Instructor

Tulane University

Aug 2021 - May 2024

*New Orleans, LA*

- Developed a data structures and machine learning Python course for more than 20 grad students.
- Instructed multiple statistics classes with 90% of students reporting strong growth of their statistical literacy.

### Teaching Assistant

Tulane University

Aug 2018 - May 2021

*New Orleans, LA*

- Facilitated recitation learning for a variety of mathematics courses, leading discussion sections, grading assignments, and providing one-on-one student support for classes of 50-100 students.  
Courses: applied math, introduction to statistics, mathematical statistics, probability theory, linear algebra

### Benefits Analyst

Willis Towers Watson

Oct 2016 - Jul 2018

*Denver, CO*

- Improved calculation and legal document review processes for pension deployment by implementing tiered coordinated review decreasing SLA breaches by 20%.

### Summer Researcher

Colorado School of Mines

May 2016 - Aug 2016

*Golden, CO*

- Reduced adiabatic quantum computation simulation inefficiency for NP-Hard problems by 50%.

### Senior Quality Assurance Analyst

PhET Interactive Simulations

Oct 2013 - Feb 2016

*Boulder, CO*

- Streamlined standardized quality assurance testing procedures improving team testing efficiency by 80%.