Oliver A. Orejola

Tulane University 6823 St. Charles Avenue (973)-897-7512
oorejola@tulane.edu New Orleans, LA 70118 oorejola.github.io

Research Interests & Technical Skills

High-dimensional Probability & Statistics, Time Series Analysis, Random Matrix Theory, Deep Learning, Machine Learning, python, jupyter notebooks, TensorFlow, SQL, R, R-markdown, GitHub, LaTeX

Education

Tulane University, New Orleans, LA *Expected:* May 2024
Ph.D. Mathematics, Advisor: Gustavo Didier Ph.D.

University of Colorado Boulder, Boulder, CO May 2016
B.A. Mathematics, *Magna Cum Laude*, Advisor: Elizabeth Gillaspy Ph.D.
B.A. Physics

Research Experience

Tulane University, New Orleans, LA Aug. 2019 - Present
Graduate Student Researcher
Investigated high-dimensional time series and the empirical eigenvalue distributions of their corresponding sample covariance matrices. Developed a statistical test for detection of unimodal self-similarity in a high-dimensional setting. Proved completeness of games in which coalitions can engage in concealed operations.

Colorado School of Mines, Golden, CO May 2016 - Aug. 2016
Summer Student Researcher
Simulated Adiabatic Quantum computation for multiple NP-Hard problems.

University of Colorado Boulder, Boulder, CO May 2015 - May 2016
Undergraduate Student Researcher
Proved Cohomologous 2-cocycles defined on a k-graph are also Homotopic.

Papers

"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. (in preparation) (2023)
"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)*
"Cohomologous 2-cocycles are Homotopic 2-cocycles: k-graphs and C^*-algebras" (2016) *Undergraduate Honors Theses*

Projects

"Political Wikipedia Edit trends: Indicators for important events" Intro Data Science Fall 2022
Scraped Wikipedia web page data. Implemented random forests for anomaly detection on Wikipedia edit history. Examined temporal relationship between edit anomalies and important events.

"Neural Nets for PDE's: Parameter to Solution map" Deep Learning Spring 2022
Used TensorFlow to train a model which solves a PDE given the PDE's parameters as inputs.
Utilized PINNs (Physics Informed Neural Network) methodology.

"Predicting Horse Races" Data Analysis Fall 2021
Implemented binomial and multinomial logistic linear models to predict Horse Races.

"TicTacToe: DNN Trained using a Genetic Algorithm" Machine Learning Spring 2019
Utilized genetic algorithms to optimize a Neural Network's TicTacToe performance.

Professional Experience and Teaching

Tulane University, New Orleans, LA

Instructor, Statistics for Scientists — Fall 2021, Fall 2023 - Present

Teaching Assistant — Fall 2018 - Spring 2023

Summer Teaching Assistant, Explorations in Experimental Math — Summer 2022

Willis Towers Watson, Denver, CO

Benefits Analyst — Oct. 2016 - July 2018

Reviewed bank check ledger and automated pension calculations.
Streamlined manual pension calculations for deployment.

PhET Interactive Simulations, Boulder, CO

Quality Assurance Consultant — Oct. 2013 - Feb. 2016

Tested simulations for physical correctness, usability, and user accessibility on different platforms.

Talks/ Posters/ Presentations

Graduate Student Colloquium, Tulane University

An Introduction to Spectral Clustering — Apr. 2023

On the Empirical Spectral Distribution of Large Wavelet Random Matrices — Nov. 2022

On the Empirical Spectral Distribution for Random Matrices with Independent Rows — Oct. 2021

A simple proof of Bell's Inequalities — Nov. 2019

REMRSEC REU Poster, Colorado School of Mines

Simulation and Analysis of the Knapsack Problem in Adiabatic Quantum Computation — Aug. 2016

Thesis Defense, UC Boulder

Cohomologous 2-cocycles are Homotopic 2-cocycles: k-graphs and C^*-algebras — Apr. 2016

MAA Mathfest Presentation, Washington D.C

C^*-algebras from k-Graphs and 2-Cocycles — Aug. 2015

Workshops

Harmonic and Multifractal Analyses: from Mathematics to Quantitative Neuroscience — July 2023
CRM, Université de Montréal

50th Probability Summer School Saint-Flour — July 2022
CNRS, Université Clermont Auvergne

Awards

Academic Awards

Magna Cum Laude Mathematics Honors Thesis, UC Boulder — May 2016

Dean's List, UC Boulder — Aug. 2013 - May 2016

Research Awards

Summer Research Funding, Tulane University — May 2019, May 2020, May 2021, May 2022 & May 2023

Outstanding Presentation Award, Mathematical Association of America (MAA) MathFest — Aug. 2015

Professional and Academic Conference Endowment (PACE) Award, UC Boulder — Aug. 2015

Service & Leadership

SIAM Tulane Student Chapter *Vice President* — Aug. 2020 - June 2022

Graduate Studies Student Association *Mathematics Department Representative* — Jan. 2019 - July 2022