Sean Mulherin

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Research Interest

Time Series Analysis, Point Process Analysis, Education, Social Statistics

Education

M.S. Applied Statistics and Data Science, UCLA   2023 - Present

> *Testing for Causal-Clustering in K-12 Student Discipline*

> Advisor: Dr. Rick Schoenberg

M.A.T. Secondary Mathematics, University of North Carolina, Chapel Hill   2020

> Advisor: Dr. Josh Corbat

B.S. Mathematics, North Carolina State University   2019

Professional Experience

Brentwood School   2024 - Present
- Physics Faculty
- Data Science Expository Course
- 9th Grade Academic Advisor

UCLA Department of Statistics and Data Science   2024 - Present
- Student Ambassador
- Reader/Grader

Jackson Hole High School   2021 - 2023
- Math Faculty: Geometry, AP Prep Algebra II, Trigonometry/Precalculus
- Cross Country & Track Coach
- Chess Club Coach

Mountain Academy of Teton Science Schools   2020 - 2021
- Lead Math Faculty: Algebra, Geometry, IB Applications & Interpretations
- Health & Wellness Teacher
- 9-10th Grade Academic Advisor

Carrboro High School   2019 - 2020
- Student-Teacher: Geometry, AP Calculus AB, AP Calculus BC

North Carolina State University Tutorial Center   2016 - 2018
- Math Tutor: Calculus I-III, Foundations of Advanced Mathematics,
    Differential Equations I, Mathematical Probability

Research Experience

UCLA Master's Thesis, *Testing for Causal-Clustering in K-12 Student Discipline*   2024
- The degree to which student misconduct events appear to be governed by causal contagion is investigated. A test recently introduced by McGovern et al. (2024), involving likelihood-ratio tests to compare the fit of a Poisson cluster model to that of a Hawkes model, is applied to daily data from 2016-2023 on disciplinary actions for K-12 students grouped by day, school, and school year. Evidence of causal-clustering appears to vary across grade levels and school years. Of the twelve different school/year combinations examined, seven exhibited statistically significant evidence of causal triggering.

Advanced Studies Institute in Mathematics of Data Science & Machine Learning   2024
- Sponsored by the National Science Foundation, I traveled to Uzbekistan to participate in a two-week workshop focusing on the mathematics of machine learning. Topics covered include model-based clustering, Hawkes point processes, benign overfitting, generalization, double descent, and mirror descent.

University of North Carolina, Chapel Hill Research Project   2020
Assessing Collaboration and Critical Thinking Opportunities in Online Learning at the Secondary Level during the COVID-19 pandemic
- This paper studies the instructional strategies and tools secondary school that teachers used during the COVID-19 quarantine to promote collaboration and critical thinking amongst their students through virtual learning. A sample of the literature about online instructional techniques and critical thinking or collaboration is reviewed. We collected data from 36 secondary instructors by means of online surveys and virtual interviews. Results show a strong positive correlation between teachers who report higher amounts of participation and the assigning of group work.

North Carolina State University, College of Design   2017 - 2018
- As a research assistant, I collected data pertaining to the efficacy of healthy diets on the social, emotional, and academic performance of elementary school students.

Projects

Financial Modeling   2024
- Programmed a web application that provides two tools operating at the confluence of statistics and finance. The first is a forecasting tool that uses the Prophet model to fit and predict the daily adjusted closing price of a specified asset. The second tool is one for portfolio optimization and valuation wherein the user inputs multiple assets and relevant performance

metrics are displayed such as volatility, return, weights, and so on.

Forecasting Selling Price of Houses in the U.S. 2024
- Built an interface for users to input a city and forecast period to observe and explore the forecasted trends and prediction metrics computed by the Prophet model. This model is notorious for its accuracy and flexibility. Housing prices are atypically volatile, so this model does particularly well at producing accurate home price forecasts.

An Artificial Neural Network Approach to Identifying Diabetes Risk Status 2023
- Programmed a neural network from scratch to classify a user's risk of developing type II diabetes after completing a 21 question survey. My model was trained using CDC data and achieves 84% accuracy in its validation-set predictions.

Tracking Global Carbonization 2023
- Conducted a comprehensive statistical analysis of the current state of global carbon dioxide emissions. Data was obtained from the United National Development Program and analyzed using R. Advanced data visualizations were displayed to portray highly interpretable results.

A Classification Analysis on Breast Cancer Tumors 2023
- Built and compared models to classify breast cancer tumors as malignant or benign. Models compared include: linear discriminant analysis, quadratic discriminant analysis, support vector machines, logistic regression, random forests, Naive Bayes, and KNN. The most optimal model used linear discriminant analysis to predict with 97% accuracy on the validation set.

An Ethereum Regression Analysis 2023
- Built and compared various regression models to predict the USD-ETH price in the year 2030. Models include: linear, quadratic, cubic, exponential, and logarithmic regression.

Note: all of my data science projects, academic papers, and lecture notes from my teachings can be found on my online portfolio linked in the header.

Appointments

National Institute of Statistical Sciences GSN Council Member	2023 - Present
UCLA Statistics Graduate Student Association, VP of External Affairs	2023 - Present
UCLA Math and Physical Sciences Council Member	2023 - Present
DataFest Conference Guest Speaker - Introduction to R	2024
DataFest Conference Guest Speaker - Data Cleaning and Wrangling in R	2024
NCAA Division I Cross Country & Track Athlete	2015 - 2019