Jesse Murray

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Education

2021 - 25 **PhD in Computational Biology**, *University of Oxford*, United Kingdom.
Within the SABS R^3 Centre for Doctoral Training. | Focusing on systems approaches to biomedical science, specifically the design of robust and reusable computational models and research software for large biomedical data sets. | Fully funded by the EPSRC (UK Research and Innovation).

2020 - 21 **Master of Science in Statistical Science**, *University of Oxford*, United Kingdom.
Twelve month degree. | Nine months of coursework: Statistical Machine Learning, Bayes Methods, Foundations of Statistical Inference, Applied Statistics *(linear & generalized linear models)*, Computational Statistics, Statistical Programming, Stochastic Models in Mathematical Genetics, Advanced Topics in Statistical Machine Learning. | Three month dissertation: Bayesian proteomics co-supervised by Oliver Crook and Charlotte Deane.

2016 - 20 **Bachelor of Science in Physics**, *Drew University*, Madison, New Jersey.
Summa Cum Laude - GPA 4.000/4.000 | Minor in Mathematics. | Additional coursework: Statistics, Modeling and Simulation, Molecular and Cellular Biology, Biochemistry, Organic Chemistry I & II, Biological Psychology. | GRE - Jan. 2020 - 169/170 Quantitative, 165/170 Verbal, 5/6 Analytical Writing.

2015 - 16 **Cello Program**, *The Juilliard School*, New York, New York.
Attended at a competitive music conservatory before changing career paths.

Research Experience

June 2020 - **Astrobiology Statistics Research**, *NASA Ames Research Center - Biospheric Science Branch*, Mountain View, California, Diana Gentry.
Project: Statistical Classification of Biosignature Information. | Current outcome: First author of a conference poster. | Investigating how multiple life-detection measurements can be algorithmically combined into a robust biogenic or abiogenic classification of a sample. | Modeling element composition, isotope fractionation, and spectral data with statistical machine learning classification algorithms. | Discovered that combinations of chemical biosignatures can make accurate classifications and potentially improve the instrumentation protocols of life-detection missions. | Expanding the project to include spectral data through collaboration with postdoc Sunanda Sharma. | Continuing the research from a paid full-time summer internship.

Dec. 2019 - **Independent Statistics Research**.
Project: Normal linear Markov model with applications to polygenic inheritance. | Current outcome: First author of a conference paper. | Extending the normal linear model into a Markov process with a normally distributed initial state. | Important properties of the model are derived: the conditional distribution of any ancestor or descendant's score, exponential functions for the convergence to the population distribution, a reversible stationary distribution. | Introduction of a novel measure of mobility and information loss, visualizations through probability kernels that make predictions over any number of generations. | Verified against two separate datasets of human height.

May 2019 - June 2020 **Eye-Tracking Research**, *Drew University*, Minjoon Kouh.
Project: Gaze sequences reveal how people gradually arrive at a solution to a word puzzle (anagram) | Current outcome: First author of a conference poster. | Designed and ran an original eye-tracking experiment of 29 participants. | Formed and led a small research team of undergraduate students and high school volunteers. | Structured and analyzed raw eye-tracking coordinate-time-series data (90 million rows). | Obtained new results about how the beginnings and ends of solution words are significantly more informative than their middles. | All 2020 phase II experiments (spring and fall) unfortunately had to be cancelled due to the pandemic, delaying publication efforts.

Summer 2017 **Atmospheric Chemistry Research**, *Drew University*, Ryan Hinrichs.
Adsorption rates of Pinene onto dust and sand samples under varying temperatures and relative humidities. | Skills and technologies used: Infrared spectroscopy, Gaussian, IGOR Pro.

2017 - **Independent Research Projects**, *Displayed on jessebmurray.github.io*.
Completed about a half-dozen small research projects that apply computational simulation, data analysis, or mathematical modeling to real-world situations. | Some examples include: Machine Learning to predict COVID-19 cases within counties from US census data, Modeling the growth of non-decomposed waste in US landfills, Exploring a proposed musical tuning algorithm.

Conferences

July 2021 **Normal linear Markov model with applications to polygenic inheritance**, *Statistics 2021 Canada, 6th Canadian Conference in Applied Statistics*, Paper publication, First author.
Contributed Paper Session 1. | Meeting of the Institute of Mathematical Statistics | Currently under review for selection to be published in the Springer Conference Proceedings.

Dec. 2020 **Algorithmic detection of elemental biosignatures**, *American Geophysical Union Fall Meeting*, Poster publication, First author.
Planetary Sciences session: *Getting the Most Out of Data in Astrobiology: Overcoming the Too Little, Too Rare, and Too Different*.

Mar. 2020 **Gaze sequences reveal how people gradually arrive at a solution to a word puzzle (anagram)**, *Brain and Behavior Conference - University of Scranton*, Poster publication, First author.
Undergraduate neuroscience conference.

Skills

Computational Expertise: Python (Scikit-learn, PyTorch, NumPy, SciPy, Pandas, Matplotlib, Seaborn), R, Excel. | Fluency: Git, Linux, MATLAB, Octave. | Some experience: Mathematica, C, C++, Java, Julia.

Mathematical Statistics, Probability, Machine Learning, Linear Algebra, Calculus, Differential Equations.

Scientific Molecular and Cellular Biology, Biochemistry, Organic Chemistry, Mathematical Physics, Mechanics, Optics, Electronics, Electricity and Magnetism.

Presentation LaTeX, Jupyter Notebook, Markdown, HTML, Powerpoint, Microsoft Word.

Teaching Experience

2017 - 20 **University Tutor**, *Center for Academic Excellence*, Drew University.
Physics I & II, Calculus I, II, & III, Pre-Calculus, Statistics, Astronomy, Biology, Chemistry, Organic Chemistry | 5 - 6 hours per week. | Leader of *Quant Camp*, a program for students to show up and receive help on any quantitative problems across the range of coursework.

July 2020 **Research and Teaching Assistant**, *New Jersey Governor's School in the Sciences*.
Project: Implementing machine learning with iRobot hardware for human detection. | Graded and tutored students in *Special Relativity*. | Full-time paid position. | Made a time-travel simulator spreadsheet, which calculated effects of special relativity and put them into real-life terms.

Additional and volunteer experience

Oct. 2020 - **Graduate Common Room Committee Member**, *University of Oxford*, Christ Church college.
Elected photographer & social media officer in Michaelmas term. | Created and ran a LinkedIn group for graduate students and alumni.

2019 **President**, *Math Club*, Drew University.
Revamped the undergraduate club. | Initiated weekly meetings to solve problems and present projects. | Launched a professor-talk-series for quantitative professors to give fun academic talks, 25+ attendance.

Jan. 2019 - **Science contributor**, *Wikipedia*.
Hundreds of contributions to science and mathematics. | Received a Wikipedia award for contributions. | Interviewed and featured in the Mashable article: "The guardians of Wikipedia's climate page".

Fall 2018 **Volunteer internship**, *Morristown Medical Center, Emergency Department*.
Assisted medical staff with patient intake and evaluation. | Total of 50 hours over the semester.

Awards, Scholarships, and Societies

Awards Marshall C. Harrington Prize in Physics and Astronomy (outstanding research project) - 2020 | Arnold S. Boxer Memorial Prize in Physics - 2019 | John F. Ollom Prize in Physics - 2017

Scholarships EPSRC PhD scholarship - 2021 | Weddell Family Scholarship - 2018 | Dean's Scholarship - 2016

Societies Pi Mu Epsilon - 2020 | Sigma Pi Sigma - 2019 | Phi Beta Kappa - 2018