Alexander Murph

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Please see my website for further information about my research and a comprehensive selection of my teaching materials, including recordings of my lectures.

Education

May 2023 — **University of NC at Chapel Hill**, Chapel Hill, NC
Doctor of Philosophy in Statistics & Operations Research
- Dissertation Advisor: Jan Hannig
- Qualifying exams in Theoretical & Applied Statistics and Probability

May 2018 — **Bucknell University**, Lewisburg, PA
Bachelor of Science in Mathematics
Bachelor of Arts in Computer Science
Minor in Women's & Gender Studies
- Thesis: "Comparing Sequences of Finite States with Non-Uniform Time Intervals"
- Advisors: Asst. Prof. Abby Flynt, Assoc. Prof. Brian King

Research and Work Experience

Aug 2021 – Present — Mayo Clinic Kern Center Internship

I am developing a dynamic system to detect changes in the underlying distribution of the Mayo Clinic's data. This detection system is of major use for any model that Mayo develops; if there is a major change in the data, this can be an early warning for major drops in performance of models in production. This internship demanded extensive knowledge of cluster computing methods, advanced knowledge of Bayesian model development, and constant self-motivation as an often-solo researcher.

Aug 2020 – Present — Research in Fiducial Inference on Manifolds

I am broadly interested in the intersection between classical Geometry and modern Statistics. My current project explores this intersection by developing a Generalized Fiducial Distribution (GFD) on constrained parameter spaces. Specifically, I am interested in the case where the parameter space can be expressed as a differentiable level set. The general form of the GFD developed by *Hannig et. al 2016* can be naturally constrained to a such space. This "constrained GFD" inherits many desirable asymptotic qualities from the original GFD, and has shown promising results on simulated data.

Aug 2019 – Present — Research in Gaussian Graphical Models (GGMs)

An overarching aim of my research is to bring what has come to be known as the EAS methodology for model selection to GGMs, which will introduce a creative new means for covariance selection for GGMs. I am also involved in a modern applied project that uses GGMs, and have a strong interest in modern computation methods to fit GGMs.

Publications

- Murph, A., Storlie, C. Bayesian Changepoint Detection for Mixed Data with Missing Values, Early Draft.
- Murph, A., Hannig, J., & Williams, J. Generalized Fiducial Inference on Differentiable Manifolds, Late Draft.
- Murph, A., Hannig, J., & Williams, J. Examples in Fiducial Inference, Submitted to Chapman & Hall Handbook on BFF inference.

- Faden, E., Mitchell, A., Murph, A., Myers, T., & Ryan, N. (2021). Mr. Hulot's Invisible Gorilla: Jacques Tati and Inattentional Blindness, *Projections*, Accepted Oct 5, 2020.
- Murph, A., Flynt, A., & King, B.R. (2021). Comparing finite sequences of discrete events with non-uniform time intervals, *Sequential Analysis*.

Teaching & Course Development Experience

Fall 2020 | Data Science for COVID-19
Course Instructor
Created a course covering how a data scientist might approach the problems that arise in a global catastrophe like the COVID-19 pandemic. We had speakers from South Korea, England, and South Africa, as well as local scholars from the US. This international roster of speakers mirrored what was a fully international classroom; we had over 100 students hailing from 12 countries taking the class in 12 different timezones.

Summer 2020 | Introduction to Data Analysis
Course Instructor
Designed and taught an introductory statistics course. Focused on making the difficult and sudden transition to remote learning as painless as possible for my students, while still demanding diligence and genuine mastery of the material.

Spring 2020 | Machine Learning
Teaching Assistant
Assisted a graduate-level Machine Learning class with Dr. Andrew Nobel. I wrote all computing assignments for this class using the R programming language.

Community Involvment

Nov 2019 – Present | AYA Cancer Advising Board
Coordinator
I created a board of fellow young adult cancer survivors to oversee the development of a transfusion space specifically for Adolescent and Young Adults (AYAs) at the UNC Cancer Center. We continue to advise the UNC Cancer Center on multiple projects and grant proposals.

June 2020 – Present | DataOPS Outreach Team
Treasurer
I am an active member of my department's recent diversity initiative to provide fun, accessible data education to underrepresented high-school students.

Talks and Presentations

Mar 2017 | AMIA 2017 Joint Summits on Translational Science, San Francisco
Poster Presenter
Poster entitled Machine Learning and Statistical Techniques to Predict Sepsis: Unifying Previous Work. Summarized the BGRI's findings to professionals in the field of Medical Informatics. Conference provided valuable exposure to numerous presentations by leaders in the field.

Nov 2016 | EPaDel Mathematics Conference, Villanova University
Student Speaker
Talk entitled Sepsis Safari: Predictive Data Analysis on Wild Data. Covered topics on training and testing predictive models, and gave a brief overview of my research under the BGRI.

Scholarships

Aug. 2021	SAMSI RA Fellowship NSF funding to allow me to focus entirely on research for Fall 2021.
Aug. 2014	Bucknell Mathematics Scholarship ($ 40,000) The Bucknell Mathematics Scholars Program recognizes a very limited number applicants with strong potential to excel as students of mathematics. Under this program, I have organized three mathematics related social events a semester to facilitate social time between faculty and students.
Aug. 2014	Cancer for College ($ 5,000) Non-profit organization that grants scholarships to cancer survivors wanting to obtain an undergraduate degree

Computer Skills

Basic:	HTML, Photoshop
Intermediate:	SAS, Java, Julia, Linux
Advanced:	R, C/C++, STAN, Python, Matlab, Mathematica, Git, LaTeX, Cluster Computing

Honors

Eagle Scout
Honors Societies: Phi Beta Kappa, Pi Mu Epsilon, Omnicron Delta Kappa, Mortar Board
Bucknell Awards: Residential Colleges 'Golden Pair', Bucknell Class Award of Excellence '18, Bucknell Mathematics Award