

Brian Neal

Curriculum Vitae

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EDUCATION

San Francisco State University

M.A., Mathematics, Expected May 2022

Thesis: *An adaptive multivariate kernel-based test for association with multiple quantitative traits in high-dimensional data*

Advisor: Tao He

University of California at Santa Cruz

B.A., Economics with honors, June 2010

Summa cum laude

AWARDS AND HONORS

- Travel award from the San Francisco Bay Area chapter of the American Statistical Association to present at the Joint Statistical Meetings, August 2021 (competitive)

PUBLICATIONS AND PREPRINTS

- B. Neal and T. He. “An adaptive multivariate kernel-based test for association with multiple quantitative traits in high-dimensional data.” *Genetic Epidemiology* (not yet submitted).

RESEARCH EXPERIENCE

- B. Neal and T. He. *An adaptive multivariate kernel-based test for association with multiple quantitative traits in high-dimensional data*. (M.A. thesis, in progress)
 - Developed a high-dimensional, kernel-based nonparametric test of association with a multivariate quantitative response, applicable to genetic association studies
 - Adapted methods for feature selection and kernel selection to the multivariate-response case and incorporated both in an adaptive, permutation-based test
 - Developed methods to reduce random variation in the P -value of the adaptive test
 - Implemented the test in an open-source R package, written in R and C++ for computational speed (source version at github.com/brianpatrickneal/AMKAT)
 - Designed simulation studies in R to evaluate empirical size/power and methods for feature selection, kernel selection and P -value variance reduction

- Wrote portable code for the simulation study (for transparency and replicability), available at github.com/brianpatrickneal/AMKAT_simstudy
- (In progress) Applied the test to genetic and neuroimaging data from Alzheimer's disease research; performed cleaning of genetic data and mapping of genetic variants to gene-level and pathway-level sets using PLINK, Python and R

RELEVANT WORK AND TEACHING EXPERIENCE

- **Graduate Teaching Associate**, San Francisco State University, 2017 – 2020

Instructor of record for over 300 students across 10 course sections totaling 22 semester units. Duties included lecturing; designing and planning course curriculum and content; grading; holding office hours; facilitating group work for class sizes ranging from under 20 to over 40. Instructor for the following courses:

- Math 122 (Mathematics for Statistical Quantitative Reasoning), 2018-2020
- Math 123 (Mathematics for Elementary Statistics), 2018-2020
- Math 60 (Entry Level Math), 2017-2018

- **Instructional Student Assistant**, San Francisco State University, 2018 – present

Grader for the following courses:

- Math 748 (Theory and Applications of Statistical and Machine Learning), Fall 2021
- Math 442 (Probability Models), Fall 2019, 2020, 2021
- Math 440 (Probability and Statistics I), 2018-present (6 sections)
- Math 448 (Introduction to Statistical Learning and Data Mining), Spring 2020, 2021
- Math 324 (Probability and Statistics with Computing), 2019-2021 (4 sections)

TECHNICAL SKILLS

- **Programming Languages**

- R
- C++
- Python

- **Software Development**

- R packages with C/C++ routines
- Git/GitHub
- Unit testing
- R Documentation files and vignettes

- **Markup Languages**

- L^AT_EX
- Sweave
- R Markdown

- **Other Software/Skills**

- C++ Armadillo
- Parallel computing in R
- Apache Spark
- Databricks

CONFERENCE PRESENTATIONS

- *An adaptive multivariate kernel-based test for association with multiple quantitative traits in high-dimensional data.* Presented at the Joint Statistical Meetings, August 2021

PROFESSIONAL DEVELOPMENT

- *Empowering the Statistician with Spark, Machine Learning and Deep Learning.* ASA traveling short course. Online, October 9-10 2021

RELEVANT COURSES AND STUDIES

Independent Study

Measure-theoretic probability, large sample theory, reproducing kernel Hilbert spaces

Coursework

Abstract Analysis, Abstract Linear Algebra, Statistical Learning and Data Mining, Mathematical Probability and Statistics, Probability Models, Optimization, Complex Analysis, Real Analysis, Abstract Algebra, Mathematical Proofs

REFERENCES

- Tao He, San Francisco State University, hetao@sfsu.edu
(*Thesis advisor; Probability, Statistics, Statistical Learning and Computing; Grading*)
- Chun-Kit Lai, San Francisco State University, cklai@sfsu.edu
(*Analysis*)
- Serkan Hosten, San Francisco State University, serkan@sfsu.edu
(*Linear Algebra; Teaching*)
- Alexandra Piriyatinska, San Francisco State University, alpiryat@sfsu.edu
(*Probability; Grading*)
- Mohammad Kafai, San Francisco State University, kafai@sfsu.edu
(*Mathematical Statistics*)