

# Alexander Petersen, Ph.D.

---

Department of Statistics and Applied Probability  
University of California  
Santa Barbara, CA 93106

Email: [petersen@pstat.ucsb.edu](mailto:petersen@pstat.ucsb.edu)

---

## EDUCATION

### **University of California at Davis**, Davis, CA

Graduate GPA: 4.0

*Major:* Statistics (Ph.D. and M.S.), 2016

Advisor: Hans-Georg Müller

Dissertation: “Transformation methods for density functions and covariance matrices in functional data analysis”

### **Arizona State University**, Tempe, AZ

GPA: 4.0

B.S. Mathematics, summa cum laude, December 2010

Years attended: 2008–2010

### **Brigham Young University**, Provo, UT

GPA: 3.98

Years attended: 2004–2005 and 2007–2008

## RESEARCH INTERESTS

Nonparametric Statistics, Functional Data Analysis, Object-Oriented Data Analysis, Graphical Models, Functional Brain Connectivity

## PROFESSIONAL EXPERIENCE

### **Assistant Professor**

July 2016 – present

Department of Statistics and Applied Probability  
University of California Santa Barbara

*Courses Taught:*

**Undegraduate:** Regression Analysis (PSTAT 126), Advanced Statistical Models (PSTAT 127)

**Graduate:** Functional Data Analysis (PSTAT 262FR), Statistical Theory (PSTAT 207ABC), Bootstrap and Resampling Methods (PSTAT 227)

### **Graduate Student Researcher**

Sep. 2012 – June 2016

Department of Statistics  
University of California Davis

### **Associate Instructor**

Sep. 2013 – Dec. 2013, Sep. 2014 – Dec. 2014

Department of Statistics  
University of California Davis

*Courses Taught:* Applied Statistics for Biological Sciences (STA 100)

### **Teaching Assistant**

Aug. 2012 – Dec. 2012, April 2013 – June 2013

Department of Statistics  
University of California Davis

*Courses:* Applied Statistics for Biological Sciences (STA 100), Regression Analysis (STA 108) and Mathematical Statistics (STA 231A, graduate course)

## PUBLISHED/ACCEPTED

1. Petersen, A., Müller, H. G., and Deoni, S. Fréchet estimation of time-varying covariance matrices from sparse data, with application to the regional co-evolution of myelination in the developing brain, *to appear in Annals of Applied Statistics*
2. Petersen, A. and Müller, H. G. Wasserstein covariance for multiple random densities, *to appear in Biometrika*
3. Oikonomou, A., Salazar, P., Zhang, Y., Petersen, A., Dmytriw, A., Paul, N., and Nguyen, E. Histogram-based models on non-thin section chest CT predict invasiveness of primary lung adenocarcinoma subsolid nodules, *to appear in Scientific Reports Nature*
4. Petersen, A., Chen, C. and Müller, H. G. (2019). Quantifying and visualizing intra-regional connectivity in resting-state fMRI with correlation densities, *Brain Connectivity*, 9(1), 37–47.
5. Petersen, A. and Müller, H. G. (2019). Fréchet regression for random objects with Euclidean predictors, *Annals of Statistics*, 47(2), 691–719.
6. Petersen, A. (2017). Book Review: Theoretical Foundations of Functional Data Analysis, with an Introduction to Linear Operators, *Journal of the American Statistical Association*, 112(517), 463–464.
7. Petersen, A., Zhao, J., Carmichael, O. and Müller, H. G. (2016). Quantifying individual brain connectivity with functional principal components for networks, *Brain Connectivity*, 6(7), 540–547.
8. Chen, K., Zhang, X., Petersen, A., and Müller, H. G. (2017). Quantifying infinite-dimensional data: Functional data analysis in action, *Statistics in Biosciences*, 9(2), 582–604.
9. Petersen, A. and Müller, H. G. (2016). Functional data analysis for density functions by transformation to a Hilbert space, *Annals of Statistics*, 44(1), 183–218.
10. Petersen, A. and Müller, H. G. (2016) Fréchet integration and adaptive metric selection for interpretable covariances of multivariate functional data, *Biometrika*, 103(1), 103–120.
11. Müller, H. and Petersen, A. Density estimation including examples, *Wiley StatsRef: Statistics Reference Online*, New Jersey: Wiley, 2014.
12. Fewell, J.H., Armbruster, D., Ingraham, Petersen, A. and Waters, J. (2012). Basketball teams as strategic networks, *PloS one*, 7(11), e47445.
13. Petersen, A. , Gelb, A. and Eubank, R. (2012). Hypothesis testing for Fourier based edge detection methods, *Journal of Scientific Computing*, 51(3), 608–630.

## SUBMITTED

Petersen, A. Liu, X. and Divani, A. Wasserstein  $F$ -tests and confidence bands for the Fréchet regression of density response curves

Kokoszka, P., Miao, H., Petersen, A., and Shang, H.L. Forecasting of density functions with an application to cross-sectional and intraday returns

Jafari M., Salazar P., Di Napoli M., Ziai W., Mayer S., Petersen A., Bershada E., Damani R., and Divani, A. Automated, Segmented, Multiparameter Hematoma Image Analysis for Predicting Outcome after Intracerebral Hemorrhage

Divani, A., Liu, X., Di Napoli, M., Lattanzi, S., Ziai, W., James, M.L., Saver, J., Jafari, M., Hemphill, J.C., Vespa, P., Mayer, S., and Petersen, A. Blood pressure variability within the first 24 hours after admission predicts poor in-hospital outcome in spontaneous intracerebral hemorrhage

## IN PREPARATION

Zapata, J., Oh, S.-Y., and Petersen, A. Functional Graphical Models for Partially Separable Gaussian Processes

Cisneros, P., Oh, S.-Y., and Petersen, A. A Distributionally Robust Representation of the Graphical Lasso

## FUNDING

NSF DMS-1811888: *Statistical Modelling of Multivariate Functional and Distributional Data*, Principal Investigator, July 2018 – June 2021

Regents' Junior Faculty Fellowship, UC Santa Barbara, Summer 2018

## PRESENTATIONS

### INVITED TALKS

*Fréchet Regression and Wasserstein Covariance for Random Density Data*, Computational and Methodological Statistics, University of Pisa, Pisa, IT, Dec. 2018

*Wasserstein Regression and Covariance for Random Densities*, Statistics Department Seminar, Brigham Young University, Provo, UT, Oct. 2018

*FPCA, Regression, and Covariance for Random Densities*, Statistics Department Seminar, Colorado State University, Ft. Collins, CO, Sep. 2018

*Fréchet Regression and Wasserstein Covariance for Random Density Data*, IMS Annual Meeting, Vilnius, LT, July 2018

*Fréchet Estimation of Time-Varying Covariance Matrices From Sparse Data, With Application to the Regional Co-Evolution of Myelination in the Developing Brain*, IISA Conference, University of Florida, Gainesville, FL, May 2018

*Fréchet Estimation of Time-Varying Covariance Matrices From Sparse Data, With Application to the Regional Co-Evolution of Myelination in the Developing Brain*, Computational and Methodological Statistics, University of London, London, UK, Dec. 2017

*Fréchet Regression for Random Objects with Euclidean Predictors*, EcoSta 2017, Hong Kong, June 2017

*FPCA, Regression and Covariance for Random Densities*, Geometry, Statistics and Data Analysis, Davis, CA May 2017

*Fréchet integration and adaptive metric selection for covariance objects in functional data*, Computational and Methodological Statistics, Seville, Spain Dec. 2016

*Quantifying Functional Connectivity with Data-Adaptive Covariance Matrices for Multivariate Functional Data*, Joint Statistical Meeting, Chicago, IL, July 2016

*Representation of Samples of Density Functions and Regression for Random Objects*, Department of Statistics, University of Illinois Urbana-Champaign, Champaign, IL, Feb. 2016

*Representation of Samples of Density Functions and Regression for Random Objects*, Department of Statistics, University of Florida, Gainesville, FL, Jan. 2016

*Representation of Samples of Density Functions and Regression for Random Objects*, Department of Statistics, Florida State University, Tallahassee, FL, Jan. 2016

*Representation of Samples of Density Functions and Regression for Random Objects*, School of Mathematical & Statistical Sciences, Arizona State University, Tempe, AZ, Jan. 2016

*Representation of Samples of Density Functions and Regression for Random Objects*, Department of Statistics and Applied Probability, University of California, Santa Barbara, CA, Jan. 2016

*Fréchet Regression for Random Objects*, Computational and Methodological Statistics, University of London, London, UK, Dec. 2015

*Representation of Samples of Density Functions and Regression for Random Objects*, Department of Statistics, Brigham Young University, Provo, UT, Nov. 2015

*Edge Detection from Noisy Fourier Data*, Computational Mathematics Seminar, School of Mathematical & Statistical Sciences, Arizona State University, Tempe, AZ, Oct. 2010

*Jump Discontinuity Detection with Noisy Fourier Data*, SIAM Annual Meeting, Pittsburgh, PA, July 2010

#### CONTRIBUTED TALKS

*Fréchet Estimation of Time-Varying Covariance Matrices From Sparse Data, With Application to the Regional Co-Evolution of Myelination in the Developing Brain*, Joint Statistical Meeting, Vancouver, British Columbia, Canada, July 2018

*Wasserstein Covariance for the Functional Data Analysis of Multivariate Densities*, Joint Statistical Meeting, Baltimore, MD, Aug. 2017

*Functional data analysis for density functions by transformation to a Hilbert space*, ICSA/Graybill Conference, Colorado State University, Ft. Collins, CO, June 2015

*Detecting Jump Discontinuities Given Noisy Fourier Data*, SIAM Conference on Imaging Science, Chicago, IL, April 2010

#### POSTERS

*Quantifying connectivity and brain networks in resting state fMRI with functional data analysis*, Alzheimer's Disease Center Research Symposium, Sacramento, CA, Nov. 2014

*Interpretable covariances and partial correlations for multivariate functional data with adaptive metrics*, Joint Statistical Meeting, Boston, MA, Aug. 2014

#### PROFESSIONAL SERVICE

##### REFEREE:

Biometrika

Annals of Statistics

Journal of the American Statistical Association

Journal of the Royal Statistical Society, Series B

Biometrics

Journal of Machine Learning Research

Computational Statistics and Data Analysis

Journal of Computational and Graphical Statistics

Electronic Journal of Statistics

Journal of Nonparametric Statistics

SIAM Journal on Mathematics of Data Science  
Statistics and Its Interface  
Journal of Applied Statistics

#### HONORS AND AWARDS

Regents' Junior Faculty Fellowship, UC Santa Barbara, 2018  
Outstanding Graduate Research Award, UC Davis, 2015  
Summer Graduate Student Researcher Award, UC Davis, 2013 and 2015  
Julius Blum Award, awarded to the highest performing Ph.D. student from the first, second or third years, UC Davis, 2013  
UC Davis Graduate Scholars Fellowship, 2011  
Dean's List, Arizona State University, all semesters of attendance.  
Full-Tuition Academic Scholarship, Brigham Young University 2004–2005 and 2007–2008 academic years.  
Dean's List, Brigham Young University, all semesters of attendance.

#### SPECIAL SKILLS

*Computing Skills:* Matlab, R, and L<sup>A</sup>T<sub>E</sub>X. In Matlab, I have extensive experience with neuroimaging packages such as SPM, REST, Brain Connectivity Toolbox and Graph-Theoretical Analysis Toolbox. I have also contributed to the development of PACE 2.17, a Matlab package for functional data analysis (PACE download), and an R package for analyzing samples of density function entitled 'fdadensity' (download from Github).

*Foreign Language:* Spanish - proficient in speaking, reading and writing. Two years of study followed by residency in Santiago, Chile, from July 2005 to May 2007.