

# Ekaterina Smirnova -- Résumé

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## Education

**2014-2016 Postdoctoral Training** University of Wyoming, Laramie, WY

Mentor: *Snehalata Huzurbazar*

**2010-2014 PhD in Statistics** The University of Texas at Dallas, Richardson, TX

Dissertation: *Large Cross-Covariance Matrix Estimation with Applications to fMRI Data*

Advisor: *Sam Efromovich*

**2008-2010 MS in Mathematics, concentration in Statistics** Texas Tech University, Lubbock, TX

Master's Thesis: *Covariance Matrix for Jet Reconstruction*

Advisors: *Martin Clyde (Statistics) and Igor Volubouev (Physics)*

**2005-2007 BA in German (major), Mathematics (minor)** North Central College, Naperville, IL

Honors: *Summa Cum Laude*

## Employment History

**Aug 2016 - current** University of Montana, Missoula, MT  
*Assistant Professor / Department of Mathematical Sciences*

- Multiple collaborative projects with US Forestry service, Johns Hopkins University (JHU), NC State, Virginia Commonwealth University (VCU), and Centers for Disease Control (CDC)
- Lung cancer biomarker discovery in patients exhaled breath (PI Ciprian Crainiceanu, JHU)
- Normalization and filtering methods for 16S microbiome data analysis (with VCU and CDC)
- Associations between wearable devices activity data and health outcomes (with JHU)
- Analysis of functional longitudinal data (with JHU and NC State)

**Aug 2014 - 2016** University of Wyoming, Laramie, WY  
*Postdoctoral Research Associate / Department of Statistics*

- Vaginal Microbiome Project in collaboration with VCU to study impact of vaginal microbiome on women's health and pregnancy outcome
- Ordination and visualization methods for large-p small-n data, distance based methods for group differences testing (PERMANOVA)
- Methods for detecting differentially abundant species (genes)
- Base-calling methods in next generation sequencing performance evaluation

**May 2014** - Aviall, the Boeing Company, Dallas, TX

**Aug 2014** *Information Delivery Intern*

- Dynamical analysis and visualization of large data sets
- Air fleet retirement analysis and predictive modeling with ANOVA and time series techniques
- R, SQL and Spotfire for data manipulation, analysis and visualization

**Aug 2010** - The University of Texas at Dallas, Richardson, TX

**Aug 2014** *Teaching Associate*

- Functional MRI data analysis
- Signal processing and denoising methods using wavelets
- Large (large-p, small-n) cross-covariance matrix estimation for functional data
- Using R and SAS software for analysis

**June 2013** - SABRE Holdings, Southlake, TX

**Aug 2013** *Statistics Intern*

- Airline revenue management
- Hierarchical regression models with heteroscedastic noise
- Work with SAS -- proc UNIVARIATE, MIXED, REG, LOGISTIC, GLM

**Aug 2008** - Texas Tech University, Lubbock, TX

**Aug 2010** *Teaching Assistant*

- Spatial models to jet reconstruction in high energy physics experiments

**Aug 2007** - Michigan State University, East Lansing, MI

**June 2008** *Teaching Assistant*

- Teaching introductory level German language

## Publications

1. Leroux, A., Di, J., **Smirnova, E.**, McGuffey, E., Cao, Q., Bayatmokhtari, E., Tabacu, L., Zipunnikov, V., Urbanek, J. K., and Crainiceanu, C. "Organizing and analyzing the activity data in NHANES", under review, 2017.
2. **Smirnova, E.**, Khormali, O., Egan, J. M. "Functional analysis of spatial aggregations regions of Jeffrey pine beetle-attack within the Lake Tahoe Basin", under review, 2017.
3. Grimes, M., Gaiser, J., Cook, W., Hall, B., Rikova, K., **Smirnova, E.**, Clark, N., Lachmann, A., Hornbeck, P., Ma'ayan, A., and Comb, M. "Using protein phosphorylation, acetylation, and methylation to outline lung cancer signaling networks", under review, 2017.
4. Thomas, J., Lutes, L., **Smirnova, E.**, Das, B., Huzurbazar, S., Aldrich, L., Kepler, M. "Creation of lifestyle health-related self-concept (lifestyle-HRSC) questionnaire", under review, 2017.
5. **Smirnova E.**, Huzurbazar S., and Jafari F. "PERFect: permutation filtration of microbiome data", under review, 2017.

6. Jean, S., Huang, B., Brooks, J. P., Edwards, D. J., **Smirnova, E.**, Huzurbazar, S., Fettweis, J. M., Serrano, M. G., Sheth, N. U., Strauss, J. F. III, Jefferson, K. K., and Buck, G. A. "Multi-omic profiles discriminate characteristics of the vaginal environment in early pregnancy", under review, 2017.
7. **Smirnova, E.**, Ivanescu, A., Bai, J., and Crainiceanu, C. "A practical guide to big data," to appear in *Statistics and Probability Letters*, 2018.
8. Brooks, J. P., Chen, G., Diao, L., Edwards, D., Fettweis, J. M., Huzurbazar, S., Rakitin, A., Satten, G. A., **Smirnova, E.**, Waks, Z., Wright, M. L., Yanover, C., Zhou, Y.-H. "Changes in vaginal community state types reflect major shifts in the microbiome", *Microbial Ecology in Health & Disease*, 28(1), 2017.
9. Cacho A., **Smirnova E.**, Huzurbazar S., and Cui X. "A Comparison of base-calling algorithms for Illumina sequencing technology", *Briefings in Bioinformatics*, 17(5), pp. 786-795, 2016.
10. Efromovich S., and **Smirnova E.** "Statistical analysis of large cross-covariance and cross-correlation matrices produced by fMRI images," *J Biom Biostat*, 5(2), pp 1 - 8, 2014.
11. Efromovich S., and **Smirnova E.** "Wavelet estimation: minimax theory and application", *Sri Lankan Journal of Applied Statistics*, 5(4), pp. 17 - 32, 2014.

## Grants

- pending**      A Clinical Assessment of Virtual Reality Cognitive Rehabilitation in Subjects Suffering From Neurotrauma  
*Role: Co-Investigator*  
 PI: Thomas Rau, PhD (VirtualMind, CSO). Co-PI: Bill Rosen, MD (independent medical practitioner)  
 Funding agency: DOD; total \$1.59 million for 18 months.
- 2017**            Development of Statistical Tools for Microbiome Data Analysis  
*Role: Principal-Investigator*  
 University of Montana, University Research Grant Program; total \$4,475.
- 2016-2017**      NanoSpectrometer Biomarker Discovery and Confirmation Study  
*Role: Principal-Investigator*  
 Johns Hopkins University Subaward; total \$43,520 (University of Montana).
- 2015**            Visualizing and Modeling Vaginal Microbiome Data for Improved Understanding of BV  
*Role: Co-Investigator*  
 PI: Snehalata Huzurbazar (University of Wyoming), Co-PI: Laura Bond (Boise State Univ)  
 Mountain West Clinical and Translational Research Infrastructure Network; pilot grant funded under NIH 1U54GM104944-01A1; \$18,319 (University of Wyoming); total \$22,000.

## Conference and Workshop Presentations

1. *PERFect: permutation filtration of microbiome data.*  
 -- CMStatistics, London, UK, December 2017.
2. *Adjusting for Overdispersion in Microbiome Data Analysis.*  
 -- Joint Statistical Meetings (JSM), Baltimore, MD, August 2017.
3. *Microbiome Normalization Methods: Effect on Ordination Analysis.*  
 -- 7th International Workshop on the Perspectives on High-Dimensional Data Analysis, Guanajuato, Mexico, 2017  
 -- ENAR, Washington, DC, March 2017  
 -- Joint Statistical Meetings (JSM), Chicago, IL, August 2016.

4. *Network Connectivity Based Filtering of Microbiome Data.*  
 -- 6th International Workshop on the Perspectives on High-Dimensional Data Analysis, Fields Institute, Toronto, CA, May 2016  
 -- 6th International Human Microbiome Consortium, Houston, TX, November 2016.
5. *Microbiome Data Normalization Methods.*  
 -- CO/WY ASA Chapter Meeting, Boulder, CO, April 2016
6. *Understanding Bacterial Vaginosis: Analysis of 16S rRNA Vaginal Taxa Composition.*  
 -- Second Annual Mountain West CTR-IN Meeting, Las Vegas, NV, June 2015  
 -- Bioinformatics: Discovering Patterns in Human Microbiome Data Workshop, SAMSI, Durham, NC, March 2015.
7. *Visualization of Multidimensional Data with Different Structures.*  
 -- Workshop on Visualization for Big Data: Strategies and Principles, Fields Institute, Toronto, CA, February 2015.
8. *Wavelet based voxel-wise methods for resting state inter hemispheric connectivity estimation.*  
 -- CO/WY ASA Chapter Meeting, Aurora, CO, October 2014.  
 -- Ordered Data Analysis, Models in Health Research Methods: An International Conference in Honor of H.N. Nagaraja for his 60th Birthday, Dallas, TX, March 2014.
9. *Wavelet Estimation: Minimax Theory and Application.*  
 -- Joint Statistical Meetings (JSM), Boston, MA, August 2014.
10. *Large Covariance Matrix Estimation for Functional Data.*  
 -- Conference of Texas Statisticians (COTS), The University of Texas at Dallas, Richardson, TX, March 2014. Winner of the first place in the doctorate poster session.
11. *New Statistical Methods for fMRI Data Analysis.*  
 -- Conference of Texas Statisticians (COTS), Rice University, Houston, TX, March 2013  
 -- UT Metroplex Day, The University of Texas at Arlington, Arlington, TX, February 2012

## Invited Presentations

1. *Challenges in Microbiome Data Analysis: Filtering, Normalization and Dimension Reduction Techniques.* Johns Hopkins University, Wearables and Implantables Technology (WIT) group, Baltimore, MD, September 2016.
2. *Matrix decomposition with positivity constraint: Applications to clustering and dimensionality reduction.* Canada Excellence Research Chair in Data Science for Real-Time Decision-Making seminar, GERAD, Montreal, CA, August 2016.
3. *Explanatory Data Analysis Methods in Duality Diagrams Framework.* Colorado School of Public Health, Aurora, Co, April 2016.

## Awards

- *Betty and Gifford Johnson Graduate Scholarship.* The University of Texas at Dallas, Richardson, TX, May 2014.
- *UTD PhD Small Grants Program.* The University of Texas at Dallas, Richardson, TX, April 2014.
- *First Place in the Doctorate Poster Session.* Conference of Texas Statisticians (COTS), The University of Texas at Dallas, Richardson, TX, March 2014.
- *International Student Scholarship.* North Central College Award, North Central College, Naperville, IL, 2005-2007.

## Service

- Scientific Committee member for the International Environmetrics Society (TIES) conference, 2018 meeting
- Vice President of Montana ASA chapter and organizer of 2017 meeting in Missoula, MT
- Organizer of an invited session for the 10th International Conference on Computational and Methodological Statistics (CMStatistics), London, UK
- Participated in a year-long Pacific Northwest Circle of Success: Mentoring Opportunities in STEM program, which was funded through NSF to increase the number of American Indian/Alaska Native students who complete STEM graduate programs.
- Reviewer for Computational Statistics and Data Analysis, Methodology and Computing in Applied Probability, Microbiome, Frontiers, and Plos journals
- Undergraduate statistics program advisor
- Co - organizer of Rocky Mountain Mathematics Consortium (RMMC)  
RMMC is a 2 week Summer Workshop co - organized with Victor Ginting and Farhad Jafari, Department of Mathematics, University of Wyoming.

## Classes Taught

- Topics in Statistics: Mixed models for functional longitudinal data analysis (STAT 544 UM)
- Theory of probability and statistics (STAT 421/422 UM)
- Pre - Calculus (MATH 2312 UT Dallas)
- Trigonometry (MATH 1321 Texas Tech)
- Contemporary mathematics (MATH 1300 Texas Tech)
- Theory of Linear Models (STAT 545 UM)
- Business Calculus (MATH 1331 Texas Tech)
- Statistical methods (MATH 2300 Texas Tech)

## Software Engineering Skills

### Programming Languages

*R*

*SAS*

*MATLAB*

*Familiarity with SQL, shell scripts*

### Platforms

*Linux*

*Macintosh*

*Windows*