Jordan A. Awan
awan@psu.edu
(570) 441-3573

RESEARCH INTERESTS

Formal Privacy
Theoretical and applied problems in Differential Privacy; Statistical Inference under formal privacy

Statistics
Functional Data Analysis; Nonparametric Statistics;

Analysis of Physiological Signals
Acoustic Analyses; Pitch Estimation

EDUCATION

Penn State University, University Park PA — **Fall 2016-present**
Doctor of Philosophy, Statistics
Advisors: Aleksandra Slavković and Matthew Reimherr
GPA: 4.0

Brandeis University, Waltham MA — **Fall 2014-Spring 2016**
Master of Arts, Mathematics
Advisor: Olivier Bernardi
GPA: 3.898

Clarion University of Pennsylvania, Clarion PA — **Fall 2011-Spring 2014**
Bachelor of Science, Mathematics
Minors: Computer Science, Honors
GPA: 4.0

PROFESSIONAL CAREER

Harvard University, Center for Research on Computation and Society (CRCS), Cambridge MA — **Summer 2018**
Visiting Graduate Student
Advisor: Salil Vadhan

Penn State University, Department of Statistics, University Park PA — **Summer 2017-present**
Research Assistant
Advisor: Aleksandra Slavković

Lafayette College, Department of Mathematics, Easton PA — **Summer 2013**
REU participant
Advisor: Liz McMahon

HONORS & AWARDS

PSU Statistics 50th Anniversary Best Poster Award — **Spring 2018**

August and Ruth Homeyer Graduate Fellowship — **Fall 2017-Spring 2018**

Best Performance on Applied Qualifying Exam, PSU Statistics — **Summer 2017**

Stephen B. Brumbach Distinguished Graduate Fellowship — **Fall 2016-Spring 2017**

GAANN Fellowship **Fall 2014-Summer 2016**

MAA Outstanding Student Poster Award **Winter 2014**

France-Allison Presentation Award **Fall 2013**

MAA Outstanding Student Presentation Award **Summer 2013**

Board of Governors Academic Tuition Scholarship **Fall 2011-Spring 2014**

REFEREED PUBLICATIONS

Reimherr, M., **Awan, J.**. "KNG: The K-Norm Gradient Mechanism." arXiv:1905.09436. Submitted.

Reimherr, M., **Awan, J.**. "Elliptical Perturbations for Differential Privacy." arXiv:1905.09420. Submitted.

Awan, J., Slavkovi'c, A. "Differentially Private Inference for Binomial Data." arXiv:1904.00459. Submitted.

Awan, J., Slavković, A. "Structure and Sensitivity in Differential Privacy: Comparing K-Norm Mechanisms." arXiv:1801.09236. Under Revision.

Awan, J., Bernardi, O. (2019) "Tutte Polynomials for Directed Graphs." Journal of Combinatorial Theory, Series B. arXiv:1610.01839. Accepted.

Awan, J., Kenney, A., Reimherr, M., Slavković A. (2019) "Benefits and Pitfalls of the Exponential Mechanism with Applications to Hilbert Spaces and Functional PCA." Proceedings of the 36th International Conference on International Conference on Machine Learning. arXiv:1901.10864. Accepted.

Awan, J., Slavković, A. (2018) "Differentially Private Uniformly Most Powerful Tests for Binomial Data." Advances in Neural Information Processing Systems 31, 4208–4218.

Awan, S., **Awan, J.**. (2018) "A Two-Stage Cepstral Analysis Procedure for the Classification of Rough Voices." Journal of Voice.

Gaskill, C., **Awan, J.**, Watts, C., Awan, S. (2016) "Acoustic and Perceptual Classification of Within-sample Normal, Intermittently Dysphonic, and Consistently Dysphonic Voice Types." Journal of Voice, Volume 31, Issue 2, 218-228.

Awan, S., **Awan, J.** (2013) "The Effect of Gender on Measures of Electroglottographic Contact Quotient." Journal of Voice, Volume 27, Issue 4, 433-440.

NON-REFEREED PUBLICATIONS

Awan, S., **Awan, J.**, Watts, C., S. Gaskill, C. (2017). "Response to Aichinger and Kubin Re: Letter to the Editor Acoustic and Perceptual Classification of Within-Sample Normal, Intermittently Dysphonic, and Consistently Dysphonic Voice Types." Journal of Voice . 10.1016/j.jvoice.2017.06.001.

RESEARCH PROJECTS

Robust Methods for Differential Privacy **Fall 2018-present**

Investigated the use of robust techniques with objective perturbation and exponential mechanism to improve finite sample performance of differential privacy. Joint work with Roberto Molinari.

The K-Norm Gradient Mechanism **Spring 2019-Summer 2019**

Developed an application of the exponential mechanism to ensure optimal statistical convergence properties. Joint work with Matthew Reimherr.

Differentially Privacy Inference for Difference of Population Means **Summer 2018**

Developed differentially privacy hypothesis tests to test the difference of population means. Joint work with Salil Vadhan.

Elliptical Distributions in Hilbert Spaces **Summer 2019-Summer 2019**

Studied when two measures in an elliptical family are equivalent. Proved properties of when families of distributions satisfy differential privacy. Joint work with Matthew Reimherr.

Analysis of Exponential Mechanism with FPCA **Fall 2017-Spring 2019**

Analyzed asymptotic performance of the exponential mechanism. Extended exponential mechanism to Hilbert spaces, and applied to the problem of producing functional principal components. Joint work with Ana Kenney, Matthew Reimherr, and Aleksandra Slavković.

Vortex Whistles for Low-Cost Spirometry **Spring 2015-present**

Designed a device that produces a frequency proportional to the flow entering, and developed a pr9ogram in Java to track the pitch and compute an estimate of the volume of air which passed through the device. Joint work with Shaheen Awan.

Differentially Privacy Inference of Binomial Data **Spring 2018-Spring 2019**

Derived uniformly most powerful tests for binomial data within the framework of Differential Privacy (DP). Joint work with Aleksandra Slavković.

Comparing K-Norm Mechanisms in Differential Privacy **Summer 2017-Spring 2018**

Developed a formal comparison of K-Norm Mechanisms in DP and derived the optimal K-Norm Mechanism as a function of the statistic of interest. Extended the Functional and Objective Perturbation Mechanisms to allow for arbitrary K-Norm Mechanisms, and applied these mechanisms to Linear and Logistic Regressions. Joint work with Aleksandra Slavković.

Tutte-like Polynomial for Digraphs and Oriented Matroids **Summer 2015-Summer 2016**

Developed extensions of the Tutte Polynomial for digraphs and oriented matroids; Discovered and proved properties of the polynomial as well as connections to other graph invariants. Joint work with Olivier Bernardi.

Classifying Normal, Consistently, & Intermittently Dysphonic Voices **Summer 2014-Spring 2016**

Developed a program in Java which implements measures to differentiate between normal, consistently, and intermittently dysphonic voices; Joint work with Shaheen Awan.

REU on Finite Geometry in SET® **Summer 2013**

Studied caps in $AG(4,3)$, using geometric, combinatorial, and computer proofs; Programmed in C# and Mathematica to perform computer searches. Joint work with Claire Frechette, Liz McMahon, and Yumi Li.

Effects of Gender on Measures of Electroglottographic Contact Quotient **Spring 2012-Fall 2012**

Produced a program written in Scilab to measure attributes of voice via Electroglottographic waves, analyzed data, co-authored an article which is published in the Journal of Voice. Worked under Dr. Shaheen Awan at Bloomsburg University.

RESEARCH PRESENTATIONS

Proceedings of the 36th International Conference on International Conference on Machine Learning, Long Beach CA, Speaker **Summer 2019**

Analysis of the Exponential Mechanism with Applications to Hilbert Spaces and Functional PCA

2019 Joint Statistical Meetings, Denver CO, Speaker **Summer 2019**

Analysis of the Exponential Mechanism with Applications to Hilbert Spaces and Functional PCA

Simons Institute for the Theory of Computing, Berkeley, CA, Speaker **April 2019**

Differentially private UMP hypothesis tests for bernouilli data

Computational & Methodological Statistics Meeting in Pisa, Italy, Speaker **December 2018**

Differentially private UMP hypothesis tests for bernouilli data

Computational & Methodological Statistics Meeting in Pisa, Italy, Co-author **December 2018**

Analysis of the Exponential Mechanism with Applications to Hilbert Spaces and Functional PCA

American Speech & Hearing Association Annual Convention, Boston, Co-author **November 2018**

A Two-Stage Cepstral Analysis Procedure for the Classification of Rough Voices

2018 Joint Statistical Meetings, Vancouver British Columbia, Speaker **July 2018**

Optimizing finite sample performance under differential privacy

47th Annual Care of the Professional Voice: Voice Foundation Symposium Philadelphia, PA, Co-Author **June 2018**

Presentation on low-cost aerodynamic measures using a vortex whistle

47th Annual Care of the Professional Voice: Voice Foundation Symposium, Philadelphia, PA, Co-Author **June 2018**

Workshop on the use of a vortex whistle for measures of respiratory capacity and control

Statistical Society of Canada Annual Meeting, McGill University, Montreal Quebec, Speaker **June 2018**

Optimizing finite sample performance under differential privacy

Mathematical Foundations of Data Privacy, Banff International Research Station (BIRS), Banff CA, Speaker **May 2018**

Structure and Sensitivity in DP: Comparing K-Norm Mechanisms

Stochastic Modeling and Computational Statistics Seminar, Penn State University, Speaker **February 2018**

Structure and Sensitivity in DP: Comparing K-Norm Mechanisms

Algorithmic Challenges in Protecting Privacy for Biomedical Data, Institute of Pure and Applied Mathematics (IPAM), UCLA, CA, Co-author **January 2018**

Structure and Sensitivity in DP: Optimal K-Norm Mechanisms

Northeast Big Data Hub Workshop on Overcoming Barriers to Data Sharing including Privacy and Fairness at DIMACS, NJ, Co-author **October 2017**

Structure and Sensitivity in DP: Comparing K-Norm Mechanisms

The Fall Voice Conference in Scottsdale, AZ, Co-author **October 2016**

Acoustic and perceptual classification of within-sample normal, intermittently dysphonic, and consistently dysphonic voice types

MIT Combinatorics Seminar, Speaker **April 2016**

Tutte polynomials for directed graphs and oriented matroids

Brandeis Graduate Student Seminar, Speaker **April 2016**

Tutte polynomials for directed graphs and oriented matroids

Brandeis Combinatorics Seminar, Speaker **January 2016**

Tutte polynomials for directed graphs and oriented matroids

American Speech & Hearing Convention in Denver Colorado, Co-author **Fall 2015**
Differentiating normal, consistently, and intermittently dysphonic voices

Brandeis Mathematics Graduate Student Seminar, Speaker **Fall 2014**
REU results on maximal caps and substructures in $AG(4,3)$

Pi Mu Epsilon Conference at Youngstown State University, Speaker **Spring 2014**
REU results on maximal caps and substructures in $AG(4,3)$

Joint Math Meetings in Baltimore Maryland, Speaker **Winter 2014**
REU results on maximal caps and substructures in $AG(4,3)$

Clarion University Honors Presentations, Speaker **Fall 2013**
Results on demicaps in $AG(4,3)$

Mathfest Conference in Hartford Connecticut, Speaker **Summer 2013**
REU results on maximal caps and substructures in $AG(4,3)$

POSTERS

Proceedings of the 36th International Conference on International Conference on Machine Learning, Long Beach CA **Summer 2019**
Analysis of the Exponential Mechanism with Applications to Hilbert Spaces and Functional PCA

Thirty-second Conference on Neural Information Processing Systems **December 2018**
Differentially Private Uniformly Most Powerful Tests for Binomial Data

Theory and Practice of Differential Privacy in 25th ACM Conference on Computer and Communications Security **October 2018**
Differentially Private Uniformly Most Powerful Tests for Binomial Data

50^{th} Anniversary Conference, Penn State University, Department of Statistics **May 2018**
Optimizing finite sample performance under differential privacy

Rao Prize Conference at Penn State University, PA **May 2017**
Maximum Likelihood Estimation with Differential Privacy

Joint Math Meetings in Baltimore Maryland **Winter 2014**
REU results on maximal caps and substructures in $AG(4,3)$

OTHER PRESENTATIONS

Penn State Statistics Graduate Student Association Workshop, Speaker **Fall 2018**
Introduction to Differential Privacy

Center for Research on Computation and Society, Harvard University, Speaker **Summer 2018**
Introduction to Differential Privacy

Penn State Statistics Graduate Student Association Workshop, Speaker **Fall 2017**
Introduction to Differential Privacy

Penn State DS 300: Privacy and Security for Data Sciences, Speaker **Fall 2017**
Introduction to Differential Privacy

Brandeis Mathematics Graduate Student Seminar, Speaker **Fall 2015**

A proof of the 5 color theorem

Brandeis Combinatorics Seminar, Speaker **Spring 2015**
Topics in matroid representability

Brandeis Mathematics Graduate Student Seminar, Speaker **Spring 2015**
Topics regarding the Tutte polynomial

Pi Mu Epsilon Conference at Youngstown State University, Speaker **Spring 2013**
A solution for the 2013 COMAP MCM problem A

Clarion University High School Mathematics Competition, Speaker **Fall 2012**
Mental math algorithms with proofs and examples

Cumberland Valley Math Modeling Challenge at Shippensburg University, Speaker **Fall 2011**
A model to predict the economic impacts of different voting systems

CONTINUING EDUCATION

Northeast Big Data Hub Workshop on Overcoming Barriers to Data Sharing including Privacy and Fairness at DIMACS, NJ **Fall 2017**
Attended talks on Differential Privacy and Distributed Databases

2017 Joint Statistical Meetings, Baltimore MD **Summer 2017**
Attended talks on Privacy, Functional Data, Simulation based inference

RELEVANT EXPERIENCE

NSF Grant Proposal: Formal Privacy for Complex Data Objects **Fall 2018**
Helped to prepare the main proposal. Provided background on differential privacy and communicated preliminary work on private FPCA and elliptical distributions.

TEACHING EXPERIENCE

Pennsylvania State University Department of Statistics, Instructor **Spring 2019**
Introduction to Probability and Statistics with R

Brandeis University Department of Mathematics, Instructor **Fall 2015, Spring 2016**
Calculus II

Brandeis University Department of Mathematics, Grader **Fall 2014, Spring 2015**
Multivariate Calculus, Linear Algebra

Brandeis University Department of Mathematics, Tutor **Fall 2014, Spring 2015**
Pre-Calculus, Calculus I & II

Clarion University Department of Academic Enrichment, Tutor **Fall 2011-Spring 2014**
Finite Mathematics, Pre-Calculus, Calculus I & II, Linear Algebra

TECHNICAL SKILLS

Programming Languages
Proficient in: R; Latex; Java; C#; MATLAB/Scilab/Octave;
Familiar with: C/C++; Javascript; Mathematica

Operating Systems
Proficient in: Linux; Mac OS X; Windows

Editors/IDEs
Proficient in: Emacs; Rstudio; Eclipse
Familiar with: Visual Studio