

# Gonzalo E. Mena

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## Current position

Data Science Initiative Postdoctoral Fellow • **Harvard University**

## Areas of specialization

Statistics • Machine Learning • Data Science • Computational Biology

## Education

2014-2018	PhD. in Statistics, <b>Columbia University</b> Advisor: Liam Paninski. Committee: David Blei, John Cunningham, Andrew Gelman, John Paisley.
2012-2014	M.A. Statistics, <b>Columbia University</b>
2007-2011	Mathematical Engineer Certificate, <b>University of Chile</b> .
2005-2007	Bs. Engineering, <b>University of Chile</b> .

## Employment and Research Experience

Summer 2018	Postdoctoral Fellow <b>Mortimer Zuckerman Mind Brain Behavior Institute and Grossman Center for the Statistics of Mind, Columbia University.</b>
Summer 2017	Software Engineer (Research) Intern, <b>Google Brain</b> . Cambridge, MA. Host: Jasper Snoek.
2014 - Present	Collaborator, <a href="#">Stanford Artificial Retina Project</a> led by E.J. Chichilnisky.
2010 - 2011	Project Engineer, <b>Center for Mathematical Modeling, University of Chile</b>
2010-2011	Research Assistant. <b>CIAE, University of Chile</b>
Summer 2008	Research intern. <b>University of California, San Diego</b> . Host: Rafael Nuñez

## Publications

### PREPRINTS

- 2019 Yemini, E., Lin, A., Nejatbakhsh, A., Varol, E., Sun, R. **Mena, G.**, Samuel, D.T. Paninski, L. Venkatachalam, V. Oliver, H. NeuroPAL: A Neuronal Polychromatic Atlas of Landmarks for Whole-Brain Imaging in *C.elegans*. [Submitted to Cell](#).

### JOURNAL ARTICLES

- 2017 **Mena, G.**, Grosberg, L., Hottowy, P., Litke, A., Cunningham, J., Chichilnisky E.J. & Paninski, L. Electrical Stimulus Artifact Cancellation and Neural Spike Detection on Large Multi-Electrode Arrays. [PLOS Computational Biology](#) 13: e1005842, 2017
- 2014 **Mena, G.** & Paninski, L. On Quadrature Methods for Refractory Point Process Likelihoods, [Neural Computation](#), Vol. 26, No. 12, 2790-2797, 2014

### PEER REVIEWED CONFERENCE PAPERS

- 2019 **Mena, G** and Niles-Weed, J. Statistical Bounds for Entropic Optimal Transport: Sample Complexity and the Central Limit Theorem. [To appear, 33rd Conference on Neural Information Processing Systems \(NeurIPS\)](#)
- 2019 Shah, N., Madugula, S., Grosberg, L., **Mena, G.**, Tandon, P., Hottowy, P., Sher, Alexander., Litke, A., Mitra, Subhasish, and Chichilnisky, E.J. Optimization of Electrical Stimulation for a High-Fidelity Artificial Retina. Nishal P. Shah, Sasidhar. 9th [International IEEE/EMBS Conference on Neural Engineering \(NER\)](#), 714-718
- 2018 **Mena, G.**, Belanger, D., Linderman, S., Snoek, J. Learning Latent Permutations with Gumbel-Sinkhorn Networks. the Sixth International Conference on Learning Representations, [arXiv](#).
- 2018 Linderman, S.\*, **Mena, G.\***, Cooper, H., Paninski, L., Cunningham, J. Reparameterizing the Birkhoff Polytope for Variational Permutation Inference. Artificial Intelligence and Statistics (AISTATS) [arXiv](#).

### PEER REVIEWED CONFERENCE EXTENDED ABSTRACTS AND WORKSHOP PAPERS

- 2019 Electrical recording and stimulation of RGCs in the macaque raphe at cellular resolution. Gogliettino, A. Madugula, S., Fan, V.H., **Mena, G**, Hottowy, P. Dabrowski, W. Sher, A., Litke, A.M., Paninski, L and Chichilnisky, E.J. The Eye and The Chip.
- 2019 Temporal dithering of epiretinal stimulation to optimize artificial vision. N.P. Shah, N, Madugula, S, Grosberg L, **Mena G.**, Hottowy P, Dabrowski, W. Sher, A, Litke A, . Mitra, S, Chichilnisky, E.J. The Eye and The Chip
- 2017 **Mena, G.**, Belanger, D., Muñoz, G., Snoek, J. Sinkhorn Networks: [Using Optimal Transport Techniques to Learn Permutations](#). NIPS Workshop in Optimal Transport & Machine Learning. **Selected for Spotlight presentation.**, 2017
- 2017 **Mena, G.\***, Linderman\*, S., Belanger, D., Snoek, J., Paninski, L., Cunningham, J. [Toward Bayesian permutation inference for identifying neurons in C. elegans](#). NIPS Workshop on Worm's Neural Information Processing, 2017.
- 2017 Madugula, S.\*, **Mena, G.\***, et al. [Large-scale analysis of patterned epiretinal stimulation for prosthesis design](#). The Eye and the Chip, 2017
- 2017 Shah, N., Madugula, S., Grosberg, L., **Mena, G.** et al. Greedy dictionary-based stimulation for optimization of epiretinal prosthesis. The Eye and the Chip, 2017.
- 2017 **Mena, G.**, Grosberg, L., Madugula, S., Hottowy, P., Litke, A., Cunningham, J., Chichilnisky E.J. & Paninski, L. [Large-scale spike sorting for the analysis of electrical stimulation and a first application](#). COSYNE, 2017

- 2015 **Mena, G.**, Grosberg, L. , Kellison-Linn, F. , Chichilnisky E.J. & Paninski, L. [Large-scale Multi-Electrode Array Spike Sorting Algorithm Introducing Concurrent Recording and Stimulation](#). NIPS Workshop on Statistical Methods for Understanding Neural Systems, 2015.

#### THESES

- 2018 **Mena, G.** Statistical Machine Learning methods for the Large Scale Analysis of Neural Data.  
2011 **Mena, G.** Reflected Stochastic Differential Equations Applied to the Modeling of some Neurobiological Processes Underlying Cognitive Phenomena (Spanish), B.S. Thesis . [Academic Repository of University of Chile](#), 2011

#### OTHER CONFERENCE PRESENTATION

- 2018 **Mena, G.**, Belanger, D., Linderman, S., Snoek, J. Learning Latent Permutations with Gumbel-Sinkhorn Networks. ICLR, 2018. 12th Annual Machine Learning Symposium, New York Academy of Sciences. Linderman, S.\* , **Mena, G.\***, Cooper, H., Paninski, L., Cunningham, J. Reparameterizing the Birkhoff Polytope for Variational Permutation Inference. BAFI, 2018  
2011 **Mena, G.**, Dartnell, P., Araya, R. A Computational Mechanism for Learning in Decision Making Through Changes in Cortico-Caudate Synaptic Strength. Chilean Society for Neuroscience Symposium. Santa Cruz, Chile , 2011  
2011 Gomez, M., **Mena, G.**, Araya, R., Dartnell, P. Individual Differences in Inhibitory Control and Fraction Learning. IMBES Conference 2011. San Diego, CA, USA.

## Honors, Awards and Fellowships

- 2019 NeurIPS Spotlight talk, "Statistical Bounds for Entropic Optimal Transport: Sample Complexity and the Central Limit Theorem." With J. Niles-Weed  
2018-2020 Harvard Data Science Initiative Postdoctoral Fellow.  
2018 ICLR Presenter Travel Award.  
2017 COSYNE Presenter Travel Award  
2016 Minghui Yu Teaching Assistant Award, Columbia University  
2012 Dean's Fellowship GSAS, Columbia University. Full funding of the Ph.D.  
2011 Fulbright Scholarship for PhD Studies in the US.  
2005-2009 Outstanding Student (top 5%). University of Chile.  
2004 Highest Score, PSU Mathematics (admission test for Chilean universities).  
2004 Honorable Mention. XVI Chilean Mathematics Olympiad.  
2004 First Place. Mathematics. *Olympiads of Knowledge*. University of Santiago

## Invited Talks

- 2019 *On The Unreasonably Effectiveness of Sinkhorn Algorithm*.  
Harvard Data Science Initiative Lunch.  
2019 *Probabilistic Neural Identity Inference in C.elegans*.  
CMM Symposium on Data Science for Frontier Astronomy, Biology, Medicine and Climate. Puerto Varas, Chile.  
2019 *On Worms, Matchings, and Entropic Optimal Transport*.  
Harvard Natural Language Processing Group Meeting, Harvard University.  
2018 *Methods for the Large-Scale Analysis of Neural Data*.  
CRISP Group Meeting, Harvard University.  
2018 *Statistical Machine Learning Methods for the Analysis of Neural Data*.

Vector Institute. Toronto, Canada.

2018 *Statistical Machine Learning Methods for the Analysis of Neural Data.*  
IBM Research. Yorktown Heights, NY, USA.

2018 *Statistical Machine Learning Methods for the Analysis of Neural Data.*  
IBM. Research. Cambridge. MA, USA.

2018 *Reparameterizing the Birkhoff Polytope for Permutation Variational Inference.*  
Business Analytics in Finance and Industry, Santiago, Chile.

2018 *Optimal Transport and Applications to Data Science.*  
Summer School in Probability and Stochastic Processes. CMM, University of Chile, Santiago, Chile.

2017 *Toward Bayesian Permutation Inference for Identifying Neurons in C. elegans.*  
Neurotheory Seminar. Columbia University, NY, USA.

2017 *Gumbel-Sinkhorn Networks.*  
Google Brain. Cambridge, MA, USA.

2017 *Recent Advances in Artificial Intelligence.*  
Machine Learning Seminar, CMM, University of Chile. Santiago, Chile.

2016 *Model-based Spike Identification With Electrical Stimulation Artifacts.* Symposium on Retinal Prosthesis. Stanford University. CA, USA.

2016 *Gaussian Process for Artifact Cancellation in Neural Recordings.*  
Center for Theoretical Neuroscience, Columbia University, NY, USA.

2016 *How Neuroscience Can Benefit From Machine Learning?.*  
Machine Learning Seminar, CMM, University of Chile, Santiago, Chile.

2016 *Algorithmic Challenges in Retinal prosthesis.*  
Institute for Complex Systems of Valparaiso, Chile.

2015 *Large-scale Multi-Electrode Array Spike Sorting Algorithm Introducing Concurrent Recording and Stimulation.* Computer Science Department, Stanford University, CA, USA.

## Teaching

INSTRUCTOR, COLUMBIA UNIVERSITY

2015 Introduction to Statistics with Calculus (undergraduate level).

TEACHING FELLOW, HARVARD UNIVERSITY

2019 Capstone Research Project Course.

TEACHING ASSISTANT, COLUMBIA UNIVERSITY

2017 Neural Data Analysis (PhD. level)

2017 Computational Statistics (PhD. level).

2016 Probability and Statistic Inference (M.A. level).

2016 Introduction to Statistics (without calculus) (undergrad level). Data Mining (M.A. level).

2015 Introduction to Probability and Statistics (M.A. level).

2015 Data Mining (M.A. level).

2014 Computational Statistics (PhD. level).

2014 Statistical Inference (M.A. level).

2013 Stochastic Processes and Applications (M.A. level).

2013 Probability (M.A. level).

2012 Probability and Statistics (M.A. level).

## TEACHING ASSISTANT, UNIVERSIDAD DE CHILE

2010	Stochastic Calculus (M.Sc. level). Universidad de Chile
2009	Markov Processes (M.Sc. level).
2009	Probability and Statistics (undergrad level).
2008	Linear Algebra (undergrad level).
2008	Multivariate Calculus (undergrad level).
2007	Elementary Algebra (undergrad level).
2007	Elementary and advanced Calculus (undergrad level).
2006	Mathematics Summer School for High School Student.

## Service

2019	Organizer. Computational Statistics Reading Group, Harvard University.
2018	Reviewer, Journal of Information and Inference.
20120	Reviewer, AAAI Conference on Artificial Intelligence.
2018-2020	Reviewer, International Conference in Learning Representations (ICLR).
2018	Reviewer, Symposium on Advances on Approximate Bayesian Inference (AABI).
2018	Reviewer, Journal of Neuroscience Methods.
2018	Reviewer, International Conference on Machine Learning (ICML).
2018-2020	Reviewer, Artificial Intelligence and Statistics (AISTATS).
2016-2019	Reviewer, Neural Information Processing Systems (NIPS).

## Other

### BLOGGING

2017	The Gumbel-Softmax Trick for Inference of Discrete Variables. <b>Columbia Advanced Machine Learning Seminar Blog</b> . <a href="https://casmls.github.io">https://casmls.github.io</a>
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### SKILLS

**Languages:** Spanish (native), English (fluent), French (elementary)

**Programming languages:** Python, Matlab, R, Java

**Other Computational Skills:** Git,  $\LaTeX$

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Last updated: September 22, 2019 •  $\LaTeX$