Gabriel Schamberg

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Education

PhD Electrical Engineering August 2019
Electrical and Computer Engineering Department, University of California, San Diego (UCSD)

MS Electrical Engineering June 2016
Electrical and Computer Engineering Department, UCSD

BS Computer Engineering June 2012
Computer Science and Engineering Department, UCSD

Research

Postdoctoral Fellow October 2019 – Present
Picower Institute for Learning and Memory, Neuroscience Statistics Research Laboratory, MIT

- built statistical state-space models for tracking a subject's level of unconsciousness from human electroencephalogram recordings
- developed a reinforcement learning paradigm for automatic titration of anesthetic drugs during anesthesia

Graduate Student Researcher December 2014 – August 2019
Neural Interaction Lab, UCSD

- proposed novel approaches for measuring and estimating causal influence using information theory
- created a novel framework for estimating latent time series with non-Markov priors

Undergraduate Student Researcher January 2012 – June 2012
San Diego Supercomputer Center, UCSD

- assisted in data collection for design of the "10×10 processor" by running performance benchmarks on an array of different GPUs

Teaching

Co-Instructor, Statistics for Neuroscience Research (9.073) Spring 2021 *(In preparation)*
Brain and Cognitive Science Department, MIT

- **Details:** graduate-level; 3 hrs/week; 13 weeks
- **Roles:** preparing/delivering lectures (50%); creating HW
- **Topics:** random variables; estimation; statistical testing; spectral analysis; state-space modeling

Co-Instructor, Topics in Neural Signal Processing (9.272) Spring 2020
Brain and Cognitive Science Department, MIT

- **Details:** 19 students (12 enrolled/7 listeners); graduate-level seminar series; 3 hrs/week; 13 weeks
- **Roles:** inviting/organizing guest lectures; advising final projects
- **Topics:** statistical modeling; physiologic control; neural imaging; Granger causality

Instructor, Fundamentals of Engineering Applications (ENG 10) Summer 2018
Jacobs School of Engineering, UCSD

- **Details:** 30 students; undergraduate-level; 6 hrs/week; 5 weeks
- **Roles:** developing curriculum; preparing/delivering lectures; creating labs; advising projects
- **Topics:** engineering math fundamentals; Python programming; Arduino-based project; 3D printing

Instructor, Introduction to Engineering III (ENG 3) Spring 2016
Jacobs School of Engineering, UCSD

- **Details:** 7 students; undergraduate-level, 2 hrs/week; 10 weeks

- **Roles:** developing curriculum; preparing/delivering lectures; creating HW/labs/quizzes
- **Topics:** engineering design process; design challenges; Arduino programming

Instructor, Introduction to Engineering II (ENG 2) Winter 2015
Jacobs School of Engineering, UCSD

- **Details:** 18 students; undergraduate-level, 2 hrs/week; 10 weeks
- **Roles:** developing curriculum; preparing/delivering lectures; creating HW/labs/quizzes
- **Topics:** mathematical programming with Python; multivariable calculus; differential equations

Instructor, Introduction to Engineering I (ENG 1) Fall 2015
Jacobs School of Engineering, UCSD

- **Details:** 31 students; undergraduate-level, 2 hrs/week; 10 weeks
- **Roles:** developing curriculum; preparing/delivering lectures; creating HW/labs/quizzes
- **Topics:** mathematical programming with Python; trigonometry; calculus

Industry Experience

Analytics Research Intern June 2017 – September 2017
CoreLogic

- built a convolutional neural network for identifying homes with solar panels from satellite images
- conducted detailed performance analyses and visualizations of mortgage fraud detection model

Software Developer May 2014 – July 2014
Ziva Corporation

- wrote automated start-up and failure check routines for software defined radios

Software Developer October 2012 – April 2014
NKI Engineering

- developed software for testing conformance of encryption routers
- designed a software defined radio system for simultaneously monitoring and recording multiple channels with a single receiver

Software Developer (Part-time) June 2011 – December 2011
Teradata

- created automated tests for database management software

Publications

In Review

- J. H. Abel*, M. A. Badgeley*, B. Meschede-Krasa, **G. Schamberg**, I. C. Garwood, K. Lecamwasam, S. Chakravarty, D. W. Zhou, M. Keating, P. L. Purdon, and E. N. Brown, "Machine Learning of EEG Spectra Classifies Unconscious States During Propofol-Induced Anesthesia."
- A. Shanker, J. H. Abel, P. Mathur, E. Work, **G. Schamberg**, A. Sharkey, R. Bose, V. Rangasamy, V. Senthilnathan, E. N. Brown, and B. Subramaniam, "Perioperative Multimodal General Anesthesia Focusing on Specific CNS Targets in Patients Undergoing Cardiac Surgeries: The PATHFINDER Study."

Journal Publications

- **G. Schamberg**, W. Chapman, S. Xie, and T. P. Coleman, "Direct and Indirect Effects: An Information Theoretic Approach," *Entropy*, Volume 22, Issue 8, August 2020
- **G. Schamberg** and T. P. Coleman, "Measuring Sample Path Causal Influences with Relative Entropy," *IEEE Transactions on Information Theory*, Volume 66, Issue 5, October 2019
- A. Allegra, A. Gharibans, **G. Schamberg**, D. Kunkel, and T. P. Coleman, "Bayesian Inverse Methods for Spatiotemporal Characterization of Gastric Electrical Activity from Cutaneous Multi-Electrode Recording," *PLoS One*, Volume 14, Issue 10, October 2019

- **G. Schamberg**, D. Ba, and T. P. Coleman, "A Modularized Efficient Framework for Non-Markov Time Series Estimation," *IEEE Transactions on Signal Processing*, Volume 66, Issue 12, June 2018.

Conference Proceedings

- **G. Schamberg***, S. Chakravarty*, T. Baum, and E. N. Brown, "Inferring neural dynamics during burst-suppression using a neurophysiology-inspired switching state-space model," *IEEE Asilomar Conference on Signals, Systems, and Computers*, November 2020 (To appear).
- W. De Faria, **G. Schamberg**, and E. N. Brown, "Classifying EEG of Propofol-Induced Unconsciousness in the Presence of Burst Suppression," *IEEE MIT Undergraduate Research Technology Conference*, October 2020.
- **G. Schamberg***, M. A. Badgeley*, and E. N. Brown, "Controlling Level of Unconsciousness by Titrating Propofol with Deep Reinforcement Learning," *International Conference on Artificial Intelligence in Medicine*, August 2020 **(Best Paper Award)**.
- **G. Schamberg** and T. P. Coleman, "On the Bias of Directed Information Estimators," *IEEE International Symposium on Information Theory*, July 2019.
- **G. Schamberg** and T. P. Coleman, "Quantifying Context-Dependent Causal Influences," *NeurIPS Workshop on Causal Learning*, December 2018.
- **G. Schamberg** and T. P. Coleman, "A Sample Path Measure of Causal Influence," *IEEE International Symposium on Information Theory*, June 2018.
- **G. Schamberg**, M. Wagner, D. Ba, and T. P. Coleman, "Efficient Low-Rank Spectrotemporal Decomposition using ADMM," *IEEE Statistical Signal Processing Workshop*, June 2016.

Thesis

- "Information Theoretic Measures and Estimators of Specific Causal Influences," *University of California, San Diego*, August 2019.

Invited Talks

Royal College of Anaesthetists Winter Symposium	December 2020
Information, Signals, and Systems Seminar, *Harvard*	March 2019
Neuroscience Statistics Research Laboratory Seminar, *MIT*	March 2019
CRISP Lab Seminar, *Harvard*	March 2017

Conference Talks

IEEE Asilomar Conference on Signals, Systems, and Computers	November 2020
International Conference on Artificial Intelligence in Medicine	August 2020
IEEE International Symposium on Information Theory	July 2019
Information Theory and Applications Workshop	February 2019
IEEE International Symposium on Information Theory	July 2018

Grants and Awards

Picower Postdoctoral Fellowship October 2019 – Present

Picower Institute for Learning and Memory

- **Summary:** research proposal based award to support pursuit of an independent research agenda
- **Project:** developing control signals for closed loop anesthesia delivery systems

Innovative Research Grant Award July 2018

Kavli Institute for Brain & Mind

- **Summary:** $50,000 awarded for proposed innovative research studying brain organization (with four co-investigators)
- **Project:** rhythmic coordination – a mechanism for efficient processing of information from multiple sources

Honorable Mention, Graduate Research Fellowship Program April 2015
National Science Foundation

- **Summary:** awarded to top ∼30% of applicants
- **Project:** statistical phase estimation for quantifying neural mechanisms underlying cognition

Jacobs Fellowship September 2014 – September 2017
Jacobs School of Engineering, UCSD

- **Summary:** three years of fully funded graduate studies awarded to top applicants among all engineering PhD programs

Gordon Scholar September 2009
Gordon Center for Engineering Leadership, UCSD

- **Summary:** a program aimed to train engineering students to be leaders through symposiums, workshops, challenge projects, and additional required coursework

Academic Involvement

Guest Editor, *Entropy* Special Issue on "Information Flow in Neural Systems"	November 2020
Reviewer, *IEEE Transactions on Neural Networks and Learning Systems*	October 2020
Reviewer, *IEEE Transactions on Signal Processing*	January, March 2020
Reviewer, *IEEE International Symposium on Information Theory*	February 2020
Reviewer, *IEEE Transactions on Information Theory*	December 2019
Reviewer, *Knowledge Based Systems*	December 2018, June 2019
Session Co-Chair, *Information Theory and Applications Workshop*	February 2017