Daniel N. Hill

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Education

Computational Neuroscience, PhD, 2009
University of California, San Diego

Electrical and Computer Engineering, MS, 2008
Specialization in Intelligent Systems, Robotics, and Control.
Univiersity of California, San Diego

Summer course in Neuroinformatics, 2006
Marine Biology Laboratory, Woods Hole, MA

Computer Science, BS, 2002
Concentration in Artificial Intelligence.
Rochester Institute of Technology

Research Positions

Machine Learning Scientist, 2015-present
Amazon, Palo Alto, CA

Senior Data Scientist, 2013-2015
Integral Ad Science, New York, NY

Led "Causal Impact" project to estimate the ROI of digital ad campaigns using observational analysis when A/B tests are unavailable. Collaborated with Prof. Foster Provost of NYU and Prof. Alan Hubbard of Berkeley.

Post-doctoral Researcher, 2010-2012
Technical University of Munich, Germany
Advisor: Prof. Arthur Konnerth

Performed high-speed calcium imaging in vivo to understand information processing within the dendrites of L5 cortical neurons. Collaborated with Nobel laureate Bert Sakmann.

Scientific Software Developer, 2006-2009
Chronux Project
Project lead: Prof. Partha Mitra at Cold Spring Harbor Laboratory

Open-source, community-driven, NIH-sponsored software project. I developed software to perform spike sorting, a signal detection and data clustering problem encountered in systems neuroscience.

Doctoral Student, 2003-2009
UCSD Neurophysics Lab, San Diego, CA
Advisor: Prof. David Kleinfeld

Recorded and analyzed multi-channel electrophysiological and videographic data sets to investigate control of the whisker system by primary motor cortex.

Built a biomechanical simulator of the whisking apparatus based on my data.

Developed a MATLAB toolbox called UltraMegaSort2000 which is used for analyzing electrophysiological data by dozens of research labs worldwide.

Research Assistant, 2001-2002
Los Alamos National Laboratory, New Mexico
Advisor: Dr. Garrett Kenyon
Coded neural network model of retina to test hypothesis about Benham's Top illusion.

Research Assistant, 2001
Los Alamos National Laboratory, New Mexico
Advisor: Dr. Bill Hlavacek
Implemented and parallelized clustering algorithms that I applied to DNA sequences, genome expression patterns, and lightning classification.

Teaching Experience

Neuroinformatics Summer Course, Lecturer 2008-2012
Marine Biology Laboratory, Woods Hole, MA

Graduate Biophysics Laboratory, T.A. 2004-2008
University of California, San Diego, CA

Fellowships

NRSA, National Institutes of Health, 2006-2008

IGERT, National Science Foundation, 2002-2005

Patents

Hill DN, Tsemekhman K. Methods, systems, and media for identifying automatically refreshed advertisements. U.S. Patent Application 14/329,514, filed August 2014. Patent Pending.

Papers

Hill DN, Moakler R, Hubbard AE, Tsemekhman V, Provost F, Tsemekhman K. Measuring causal impact of online actions via natural experiments: application to display advertising. Submitted. (2015)

Hill DN, Varga Z, Jia H, Sakmann B, Konnerth A. Multibranch activity in basal and tuft dendrites during firing of layer 5 cortical neurons in vivo. PNAS. 110(33):13618-13623 (2013)

Grienberger C, Rochefort NL, Adelsberger H, Henning HA, **Hill DN**, Reichwald J, Staufenbiel M, Konnerth A. Staged decline of neuronal function in vivo in an animal model of Alzheimer's disease. Nat Commun. 3:774. (2012)

Hill DN, Curtis J, Moore JD, Kleinfeld D. Primary motor cortex reports efferent control of vibrissa position on multiple timescales. Neuron. 72(2):344-56 (2011).

Rochefort NL, Narushima M, Grienberger C, Marandi N, **Hill DN**, Konnerth A. Develop-

ment of direction selectivity in mouse cortical neurons. Neuron. 71(3):425-32 (2011).

Hill DN, Mehta SB, Kleinfeld D. Quality metrics to accompany spike sorting of extracellular signals. J. Neurosci. 31:8699-8705 (2011)

Wolfe J, **Hill DN**, Pahlavan S, Drew PJ, Kleinfeld D, Feldman DE. Texture coding in the rat whisker system: slip-stick versus differential encoding. PLoS Biology. 6(8):1661-1677 (2008).

Hill DN, Bermejo R, Zeigler HP, Kleinfeld D. Biomechanics of the vibrissa motor plant in rat: Rhythmic whisking consists of triphasic neuromuscular activity. J Neurosci. 28(13):3438-55 (2008).

Kenyon GT, **Hill D**, Theiler J, George JS, Marshak DW. A theory of the Benham top based on center-surround interactions in the parvocellular pathway. Neural Networks. 17: 773-786 (2004).

Eads D, **Hill D**, Davis S, Perkins S, Ma J, Porter R, Theiler J. Zeus: Genetic algorithms and support vector machines for time series classification. Proc. SPIE. 4787:74-85 (2002).

Book Chapter

Hill DN, Kleinfeld D, Mehta SB. Spike Sorting. In Observed Brain Dynamics by P. P.Mitra and H. Bokil, Oxford Press. (2007)

Conference Talks

Using negative controls to validate and repair a natural online experiment. Conference on Digital Experimentation at MIT, Boston, MA (2014).

How single are my units? Quality metrics in spike sorting. Validation of Automatic Spike-Sorting Methods workshop, Ski, Norway (2011)

The cortical representation of muscle activation in the control of whisking. Barrels XXI, Baltimore, MD (2008)

Triphasic neuromuscular control of whisking. Functional Organization of Barrel Cortex Networks. Alicante, Spain (2008)

Biomechanics, behavior, and encoding in the rat vibrissa system. COSYNE, Park City, UT (2007)

Biomechanics of whisking: whisking consists of 3 phases of muscle activity. Barrels XIX, Atlanta, GA (2006)

Electromyography and kinematics of whisking: a preliminary analysis. Barrels XVII, San Diego, CA (2004)