Martin A Spacek

Contact Information

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Research Interests

Computational neuroscience, neural assemblies, spike timing and reliability, distributed systems.

How do neurons in a highly connected network interact, and how do the interactions influence brain function? How does the brain encode and process sensory information at the timescale of neuronal spikes, both in single neurons and across populations? How does it solve difficult computational problems, such as object binding and pattern recognition?

Education

University of British Columbia, Vancouver, BC, Canada **September 2003 - present**

PhD candidate in Neuroscience, expected completion Fall 2013
Thesis: "Spike correlations and network states in high density neural populations in V1"
Supervisor: Nicholas V Swindale

University of Alberta, Edmonton, AB, Canada **September 1996 - May 2001**

BSc Engineering Physics
Thesis research project: PCR on a chip

Academic Experience

University of British Columbia, Vancouver, BC, Canada

PhD Graduate Student **May 2004 - present**

Perform *in-vivo* multiple-unit extracellular electrophysiology with silicon electrodes in anesthetized rat and cat in visual cortex. Design experiments, perform all surgical procedures, collect and analyze neuronal spike data.

Develop three major software projects: dimstim (visual stimulation), spyke (neuronal spike sorting), and neuropy (spike and LFP data analysis).

MSc Graduate Student **September 2003 - April 2004**

Courses in: cellular and systems neuroscience; computational neuroscience; mathematics of biological pattern formation; neuroanatomy; animal care and lab safety.

Research Assistant **February 2002 - August 2003**

Collect multiple single unit spike data from cat visual cortex with silicon electrodes. Characterize electrodes, including site impedances, noise, and crosstalk. Test and characterize data acquistion system.

Investigate issues related to multichannel spike sorting: noise cleaning, interpolation of raw data, spike detection and clustering.

Publications

Swindale NV, Spacek MA (2013) Spike sorting for polytrodes: a divide and conquer approach. *Frontiers in Systems Neuroscience (submitted).*

Spacek MA, Blanche TJ and Swindale NV (2009) Python for large-scale electrophysiology. *Frontiers in Neuroinformatics* 2:9.

Spacek MA, Swindale NV (2009) Python in neuroscience. *Neuromorphic Engineer* 10.2417/1200907.1682.

Blanche TJ, Spacek MA, Hetke J, Swindale NV (2005) Polytrodes: high-density silicon electrode arrays for large-scale multiunit recording. *Journal of Neurophysiology* 93:2987-3000.

Spacek MA, Brown KB, Ma Y, Robinson AM, Lawson RPW, Allegretto W (1999) CMOS cantilever microstructures as thin film deposition monitors. *Canadian Conference on Electrical and Computer Engineering (CCECE)*, 1648-1651.

Abstracts

Swindale NV, Spacek MA (2012) Response variability in cat visual cortex. *Soc Neurosci Abstr* 42:571.23.

Spacek MA, Swindale NV (2012) Local pairwise correlations and network states in cat primary visual cortex. *Canadian Association of Neuroscience (CAN)* 3-D-66.

Spacek MA, Blanche TJ, Seamans JK, Swindale NV (2007) Accounting for network states in cortex: are (local) pairwise correlations sufficient? *Soc Neurosci Abstr* 37:790.1.

Spacek MA, Blanche TJ, Swindale NV (2006) Heterogenous firing rate dependencies in simultaneously recorded neural populations in cat area 17. *Cosyne*, #235.

Spacek MA, Blanche TJ, Douglas RM, Swindale NV (2003) Signal processing and spike detection methods for high-density silicon electrode arrays. *Soc Neurosci Abstr* 23:429.20.

Blanche TJ, Hetherington PA, Rennie CJ, Spacek MA, Swindale NV (2003) Model-based 3D cortical neuron localization and classification with silicon electrode arrays. *Soc Neurosci Abstr* 23:429.19.

Talks

"Local pairwise correlations and network states in cat primary visual cortex." Society for Neuroscience 2011 meeting, November 15, 2013, Washington, DC. 41:536.06.

"Accounting for network states in cortex: are pairwise correlations sufficient?" Computational Neuroscience (CNS) 2007 workshop, July 12, 2007, Toronto, Canada.

"Large scale simultaneous recording of neurons in primary visual cortex." Ophthalmology Research Day, April 21, 2006, UBC, Vancouver, Canada.

Intensive Courses

Collaborative Research in Computational Neuroscience (CRCNS) summer course - Mining and modeling of neuroscience data. July 11-22, 2011, UC Berkeley, San Francisco, CA.

Okinawa Computational Neuroscience Course - Bayesian Brain: Probabilistic Approaches to Neural Coding and Learning. November 9-19, 2004, Okinawa, Japan.

Teaching

University of British Columbia, Vancouver, BC, Canada

Problem Based Learning (PBL) tutor **August 2008 - October 2008**

Guide small groups (7–8) of 2nd year medical students through PBL case studies.

Awards & Scholarships

PhD Tuition Award, University of British Columbia, 2004-2008.

Research Assistantship, Graduate Program in Neuroscience, University of British Columbia, 2008.

NSERC Undergraduate Student Research Award, Carleton University, Ottawa, 2000.

Dean's Research Award, Faculty of Engineering, University of Alberta, 1998.

Service

KidStart mentoring program, Vancouver, BC, Canada

Volunteer mentor **July 2004 - October 2012**

Spend one-on-one time with an at-risk youth, via activities and outings.

Languages

Python, MatLab, C, LaTeX.

English, Czech, French, some German and Spanish.