Sungho Hong

Group Leader in Computational Neuroscience

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Education and Academic Positions

Dec 2012 – presently	**Okinawa Institute of Science and Technology** Group Leader in Computational Neuroscience Unit.	Okinawa, Japan
Sep 2007 – Nov 2012	**Okinawa Institute of Science and Technology** Researcher in Computational Neuroscience Unit. Advisor: Erik De Schutter	Okinawa, Japan
Aug 2004 – Aug 2007	**University of Washington** Senior Fellow in Physiology and Biophysics Department. Advisor: Adrienne L. Fairhall	Seattle, WA
Aug 2004	**University of Pennsylvania** PhD in Physics - Theoretical High Energy Physics. Advisor: Matthew J. Strassler	Philadelphia, PA
Aug 1999	**Korea Advanced Institute of Science and Technology** MSc in Physics - Elementary Particle Physics. Advisor: Kiwoon Choi	Daejon, Korea
Feb 1995	**Korea Advanced Institute of Science and Technology** BSc in Physics	Daejon, Korea

Other Experience

1995 – 1996	Private in Korean Army (mandatory service).

Honors

2012	OCNS Travel Award
2008, 2012	Invited tutor for Okinawa Computational Neuroscience Course.
2012 - 2013	Reviewer for Computational Neuroscience Meeting presentations.
2004 – presently	Reviewer for Journal of Physics A, Physical Review Letters, Neural Computation, and PLOS Computational Biology.

Research Interests and Experiences

My current research interests are studying how biophysical mechanisms at the cellular and network level impact neural information processing via computational modeling and developing the methods of analyzing experimental data to construct those models.

Impact of cellular mechanisms in neural information processing   *2004 - presently*
  - In Dr. Erik De Schutter's lab, I have been studying how intrinsic cellular properties can control the information processing scheme both at the single neuron and the network level (collaboration with Dr. Steven Prescott in University of Pittsburgh).
  - With Haroon Anwar, I built the detailed physiological model of the active dendrites in the cerebellar Purkinje neuron focusing the Ca^{2+}-related dynamics.
  - In collaboration with Dr. Toru Takumi (Hiroshima University/RIKEN), I have been studying the cellular/network mechanism of the suprachiasmatic nucleus in encoding circadian information.
  - In Dr. Adrienne Fairhall's lab, I studied statistical modeling of neural coding applied to single neurons and its biophysical interpretation, focusing on the neuronal mechanisms for processing information adaptively to the context of the input.

Development of neural data analysis   *2009 - presently*
  - I have been developing the methods to analyze the gene expression imaging data from the suprachiasmatic nucleus, including a variant of the multiscale spectral clustering algorithm that identified the clustered substructures. The codes are available at http://github.com/JihwanMyung/ImagingAnalysis.
  - I developed a Compressive Sensing-based method to efficiently estimate phase response curves from limited experimental data. The codes are available at http://github.com/shhong/csprc.

Theoretical high energy physics   *2000 - 2004*
  - I worked on the string theory-based analysis on the strongly bound state to model nucleons/hadrons. Particularly, I computed their form factors and couplings, which led to novel proposals to some longstanding puzzles in nuclear physics such as the ρ-meson universality problem.

Teaching Experiences

Jun 2008, Jun 2012	I tutored graduate students participating in the Okinawa Computational Neuroscience Course about computational modeling of neural systems.
Jul 2000	As a lab instructor of the Penn Summer Science Academy 2000, I helped the high school students carry out basic Physics experiments and understand the underlying concepts.
1999 - 2001	As a Teaching Assistant in Physics and Astronomy Dept., University of Pennsylvania, I taught the experimental sections of the introductory Physics courses.
1996	I taught the problem solving classes for General Physics I/II as a Teaching Assistant in Dept. of Physics, KAIST

Publications and Presentations

Please find the attached **list of publications and presentations**.

References

Erik De Schutter
Computational Neuroscience Unit
Okinawa Institute of Science and Technology
1919-1 Tancha, Onna-son
Okinawa 904-0495, Japan
Email: erik@oist.jp

Adrienne L. Fairhall
Physiology and Biophysics Department
University of Washington
Seattle, WA 98195-7290, USA
Email: fairhall@u.washington.edu

Steven A. Prescott
Department of Physiology
University of Toronto
555 University Ave
Toronto, ON, M5G 1X8, Canada
Email: steve.prescott@utoronto.ca

Publications

Journal publications

Ratté, S., **Hong, S.**, De Schutter, E., and Prescott, S.A. (2013) Impact of neuronal properties on network coding: Roles of spike initiation dynamics and robust synchrony transfer. Neuron *78*, 758-72.

Hong, S., Robberechts, Q., and De Schutter, E. (2012c). Efficient estimation of Phase Response Curves via Compressive Sensing. J. Neurophysiol., *208*, 2069–81.

Myung, J., **Hong, S.**, Hatanaka, F., Nakajima, Y., De Schutter, E., and Takumi, T. (2012b). Period coding of *Bmal1* oscillators in the suprachiasmatic nucleus. J. Neurosci. *32*, 8900–18.

Hong, S., Ratté, S., Prescott, S.A., and De Schutter, E. (2012a). Single neuron firing properties impact correlation-based population coding. J. Neurosci. *32*, 1413–28.

Anwar, H., **Hong, S.**, and De Schutter, E. (2010). Controlling Ca^{2+}-Activated K^+ channels with models of Ca^{2+} buffering in Purkinje cells. Cerebellum, 1–13 (online first).

Hong, S., and De Schutter, E. (2008c). Purkinje neurons: What is the signal for complex spikes? Curr. Biol. *18*, R969–R971.

Hong, S., Lundstrom, B.N., and Fairhall, A.L. (2008b). Intrinsic gain modulation and adaptive neural coding. PLOS Comput. Biol. *4*, e1000119.

Lundstrom, B.N., **Hong, S.**, Higgs, M.H., and Fairhall, A.L. (2008a). Two computational regimes of a single-compartment neuron separated by a planar boundary in conductance space. Neural Comput. *20*, 1239–60.

Hong, S., Agüera y Arcas, B., and Fairhall, A.L. (2007). Single neuron computation: from dynamical system to feature detector. Neural Comput. *19*, 3133–72.

Hong, S., Yoon, S., and Strassler, M.J. (2006b). On the couplings of vector mesons in AdS/QCD. J. High Energy Phys. *04*, 003.

Hong, S., Yoon, S., and Strassler, M.J. (2006a). Adjoint Trapping: A new phenomenon at strong 't Hooft coupling. J. High Energy Phys. *03*, 012.

Erlich, J., **Hong, S.**, and Unsal, M. (2004). Matrix models, monopoles and modified moduli. J. High. Energy Phys. *09*, 024.

Hong, S., Yoon, S., and Strassler, M.J. (2004a). Quarkonium from the fifth dimension. J. High Energy Phys. *04*, 046.

Conference proceedings/abstracts and other publications

Hong, S., Negrello, M., Junker, M. A., Thier, P., and De Schutter, E. (2013). Saccade angle modulates correlation between the local field potential and cerebellar Purkinje neuron activity, BMC Neuroscience *14(Suppl 1)*, 91.

Hong, S. and De Schutter, E. (2011). Efficient estimation of Phase Response Curves via Compressive Sensing. BMC Neuroscience *12(Suppl 1)*, 61.

Negrello, M., **Hong, S.**, and De Schutter, E. (2010a). What was the Purkinje doing while the monkey slept? BMC Neuroscience *11(Suppl 1)*, 9.

Anwar, H., **Hong, S.**, and De Schutter, E. (2010b). Generating dendritic Ca^{2+} spikes with different models of Ca^{2+} buffering in cerebellar Purkinje cells. BMC Neuroscience *11(Suppl 1)*, 154.

Anwar, H., **Hong, S.**, and De Schutter, E. (2009a). Modeling the excitability of the cerebellar Purkinje cell with detailed calcium dynamics. BMC Neuroscience *10(Suppl 1)*, 34.

Hong, S., and De Schutter, E. (2009b). Rich single neuron computation implies a rich structure in noise correlation and population coding. BMC Neuroscience *10(Suppl 1)*, 05.

Hong, S., and De Schutter, E. (2008b). Correlation susceptibility and single neuron computation. BMC Neuroscience *9(Suppl 1)*, 141.

Hong, S. (2004). Hadron Form Factors and Interactions: Comparing AdS/CFT and QCD. University of Pennsylvania Thesis (Philadelphia: University of Pennsylvania).

Presentations

Talks in Conferences and Workshops

Jul 2012	OCNS Conference - "60 Years of the Hodgkin-Huxley Model"	Cambridge, UK
May 2012	RIKEN Brain Sci. Inst. Workshop - "Circuit Function of the Brain"	Wako, Japan
Dec 2011	APCTP-KAIST Young Computational Neuroscientist Workshop	Daejon, Korea
Jul 2009	Computational Neuroscience Meeting 2009	Berlin, Germany

Invited Talks

Aug 2013	Blue Brain Project, EPFL	Lausanne, Switzerland
	Department of Neuroscience, Erasmus MC	Rotterdam, Netherlands
Oct 2009	Department of Physics, Kyoto University	Kyoto, Japan
	Graduate School of Biomedical Sciences, Hiroshima University	Hiroshima, Japan
Mar 2008	Department of Neurobiology, Yale School of Medicine	New Haven, CT
Jun 2007	Center for Brain Science, Harvard University	Cambridge, MA
Jun 2006	Department of Bio and Brain Engineering, KAIST	Daejon, Korea
Oct 2003	Physics Department, University of Washington	Seattle, WA

Posters

2013	Computational Neuroscience Meeting (CNS) 2013	Paris, France
	Title: *Saccade angle modulates correlation between the local field potential and cerebellar Purkinje neuron activity*	
	Computational and Systems Neuroscience (COSYNE) 2013	Salt Lake City, UT
	Title: *Behavior-modulated correlation of cerebellar Purkinje neuron and network activity*	
2011	Society for Neuroscience Meeting (SfN) 2011	Washington, DC
	Title: *Single neuron properties impact correlation-based population coding*	
	CNS 2011	Stockholm, Sweden
	Title: *Efficient estimation of Phase Response Curves via Compressive Sensing*	
2010	SfN 2010	San Diege, CA
	Title: *Computational modeling of cerebellar Purkinje neurons with complex and reduced morphologies*	
	CNS 2010	San Antonio, TX
	Title: *Generating dendritic Ca2+ spikes with different models of Ca2+ buffering in cerebellar Purkinje cells*	

2009	CNS 2009	Berlin, Germany
	Title: *Modeling cerebellar Purkinje cell with detailed calcium dynamics*	
2008	CNS 2008	Portland, OR
	Title: *Correlation in a Common Input Model and Single Neuron Computation*	
2008	COSYNE 2008	Salt Lake City, UT
	Title: *Network Analysis of EEG Coherence in Autism Spectrum Disorder*	
2007	COSYNE 2007	Salt Lake City, UT
	Title: *Intrinsic Basis of Gain Modulation and Adaptive Neural Coding*	
2006	COSYNE 2006	Salt Lake City, UT
	Title: *Single Neuron Computation: from Dynamical System to Feature Detector*	