Cyrus Omar

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Academic Experience

Carnegie Mellon University

PhD in progress, Neural Computation, *expected* 2013.
GPA: 4.00/4.00

University of Illinois at Urbana-Champaign

BS, Computer Science, 2008.
BS, Molecular & Cellular Biology, 2008.
GPA: 3.99/4.00

RESEARCH ASSISTANT
Beckman Brain-Machine Interface Group,
Profs. Todd Coleman and Timothy Bretl,
December, 2006–August, 2008

RESEARCH ASSISTANT
Knowledge Representation & Reasoning Group
Prof. Eyal Amir and Dr. Tsvi Achler,
May 2007–July, 2008

Research

Fields of Interest

THEORETICAL NEUROBIOLOGY spiking network dynamics, oscillations & synchrony, sensory systems physiology, synaptic plasticity, perceptual inference

SOFTWARE ENGINEERING high-performance and scientific computing, programming language design and implementation, developer tools

REHABILITATITVE TECHNOLOGIES brain-machine interfaces, communication prosthetics

Peer-Reviewed Publications

J. W. Middleton, C. Omar, B. Doiron & D. J. Simons. *Correlated activity is stimulus-modulated in a feedforward inhibitory circuit*. In review, Nature Neuroscience, 2010.

C. Omar, A. Akce, M. Johnson, T. Brelt, R. Ma, E. Maclin, M. McCormick & T. P. Coleman. *A feedback information-theoretic approach to the design of brain-computer interfaces*. To appear, International Journal of Human-Computer Interaction (IJHCI), 2010.

C. Omar, M. Johnson, T. W. Bretl & T. P. Coleman. *Policies for neural prosthetic control: initial experiments with a text interface*. 2008 American Control Conference (ACC)

T. Achler, C. Omar & E. Amir. *Shedding the weights: more with less*. 2008 International Joint Conference on Neural Networks (IJCNN). Hong Kong.

Invited Talks (speaker)*

C. Omar*. *Opening up new avenues for studying neural circuit dynamics using Python and CUDA*. Supercomputing 2009. Portland, OR.

C. Omar, M. Johnson, T. W. Bretl, and T. P. Coleman*, *Using feedback information theory for closed-loop neural control in brain-machine interfaces*, special session on "Methods of Information Theory in Computational Neuroscience", 2008 Computational Neuroscience Meeting (CNS), July 2008. Portland, OR.

C. Omar, M. Johnson, T. W. Bretl, T. P. Coleman*, *Querying the user properly for high-performance brain- machine interfaces: recursive estimation, control, and feedback information-theoretic perspectives*, Invited Session on "Revamping Signal Processing for Neuroscience: Challenges in Brain Machine Interface Technology", 2008 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP). Las Vegas, NV.

Posters

C. Omar. `cl.oquence`*: Embedding an annotation-free statically-typed language targeting OpenCL into Python*, SciDAC 2010. Chattanooga, TN.

C. Omar. `atomic-hedgehog`*: A Python-based orchestration framework for OpenCL-accelerated simulation and data analysis, with applications to neurobiology*, 2010 DOE CSGF Annual Conference. Washington, DC.

A Akce, R Ma, M McCormick, M Johnson, C Omar, E Maclin, T Bretl, T Coleman, *Feedback Information-Theoretic Paradigms for Designing Brain-Machine Interfaces*, 2010 BCI Meeting. Asilomar, CA.

C Omar, J W Middleton, D J Simons, B Doiron, *Excitatory-Inhibitory Correlations Result From Competing Correlating and Anti-Correlating Forces*, 2010 Computational and Systems Neuroscience (CoSyNe) Annual Meeting. Salt Lake City, UT.

C. Omar, J. W. Middleton, D. J. Simons & B. Doiron, *State-dependent correlation between excitatory and inhibitory firing is explained by opposing correlating input with anti-correlating neural interactions*, Society for Neuroscience Annual Meeting, 2009. Chicago, IL.

J. W. Middleton, C. Omar, B. Doiron, & D. J. Simons. *Excitatory and inhibitory neural activity in layer 2/3 of whisker somatosensory cortex exhibits positive spontaneous correlations on long timescales and whisker-evoked decorrelation on short timescales*, Society for Neuroscience Annual Meeting, 2009. Chicago, IL.

Scientific Software

`ahh`, a Python package containing useful tools for high-performance scientific computing, including

- `cl`, a superset of the OpenCL runtime which reduces the tedium of OpenCL programming
- `cl.oquence`, a superset of the OpenCL programming language with a Python-like syntax, type inference and compile-time higher-order functions.
- `cl.ements`, a collection of high-performance OpenCL-based analysis functions
- `cl.egans`, an OpenCL-based simulation framework, focusing on spiking neural networks.

Honors, Awards, & Fellowships

- DOE Computational Science Graduate Fellowship (2008-present)
- NSF Graduate Research Fellowship (2008-present, deferred)
- Duncan H. Lawrie Leadership Award (2008)
- UIUC Bronze Tablet Inductee (2008)
- Member, Phi Beta Kappa (2008)
- Member, Tau Beta Pi (2008)
- Jeffrey P. Blahut Scholarship (2007)
- Judge's Prize, Computing Habitat Competition (2007)
- Franz Hohn and J. P. Nash Scholarship for scientific computing (2006)

Last updated: June 13, 2010