Erik C. Johnson

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Education

University of Illinois Urbana-Champaign, IL
Doctor of Philosophy, *Electrical Engineering*, 2016 *Advisor*: Douglas L. Jones
Thesis: Minimum-Error, Energy-Constrained Source Coding by Sensory Neurons
Master of Science, Electrical Engineering, 2013 *Advisor*: Douglas L. Jones
Thesis: Recovery of Sparse Signals and Parameter Perturbations from Parametrized Signal Models
Bachelor of Science, *Electrical Engineering,* 2008 *Minor*: Physics

Research Experience

Sprite Robotics (Champaign, IL) Aug 2016-Present
Research Engineer- Developing models of motion and online learning techniques for mobile wheeled robots in the home environment. Investigating receding horizon stochastic control techniques for robot motion control. Studying the integration of sensor data to enable aggressive and reliable robot maneuvers.
University of Illinois at Urbana-Champaign (Urbana, IL) Aug 2011-Aug 2016
Research Assistant (Douglas L. Jones, advisor)- Processing electrophysiological data to study neural encoding in the rat vibrissal (whisker) system, developing novel sparse recovery algorithms, and studying optimal neural encoding.
University of Texas, San Antonio (San Antonio, TX) Summer 2012
Visiting Researcher (Rama Ratnam, supervisor)- Implemented new calibration and audio stimulation system for auditory physiology work. Assisted with invasive electrophysiological recordings from the inferior colliculus. Funded by the Burroughs Wellcome Fund Collaborative Travel Grant.
University of Illinois at Urbana-Champaign (Urbana, IL) Aug 2009-July 2011
Graduate Fellow, NSF Neuroengineering IGERT (Douglas L. Jones, advisor)- Developed novel signal processing and spike-sorting algorithms for electrophysiological data recorded from microelectrode arrays.
University of Illinois at Urbana-Champaign (Urbana, IL) Aug 2008-May 2009
Research Assistant (Michael C. Loui, advisor)- Assessed the effectiveness of the peer-led team learning pedagogy in Introduction to Electrical and Computer Engineering.
National Center for Supercomputing Applications (Urbana, IL) May 2008-Jan. 2009
Automated Learning Group, Graduate Research Intern (Loretta Auvil, supervisor)- Developed software for SEASR/Meandre, a data-driven flow execution engine, and conducted data-mining research projects
Argonne National Laboratory (Argonne, IL) Summer 2005, Summer 2006
Undergraduate Guest Research Intern (Stuart Martin, supervisor)- Created software to process and display usage statistics for the Globus Toolkit distributed computing project.

Theses

- Johnson, E. C. Minimum-Error, Energy-Constrained Source Coding by Sensory Neurons. Ph.D. thesis, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, August 2016.
- Johnson, E. C. Recovery of Sparse Signals and Parameter Perturbations from Parameterized Signal Models. M. sc. thesis, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, May 2013.

Publications

Journal Papers

- Kaloti A. S., Johnson E. C., Bresee C. S., Naufel S. N., Perich M. G., Jones D. L., and Hartmann M. J. Z. Representation of stimulus speed and direction in vibrissal-sensitive

regions of the trigeminal nuclei: a comparison of single unit and population responses. *PLoS ONE* 11(7):e0158399 (2016)

- Johnson E. C., Jones, D. L., Ratnam, R. A Minimum-Error, Energy-Constrained Neural Code is an Instantaneous Rate Code. *Journal of Computational Neuroscience,* 40.2 (2016): 193-206.
- Johnson E. C., Robbins, B. A., Loui, M. C. What Do Students Experience as Peer Leaders of Learning Teams? *Advances in Engineering Education* 4.4 (2015).
- Jones D. L., Johnson E. C., Ratnam R. A stimulus-dependent spike threshold is an optimal neural coder. *Frontiers in Computational Neuroscience* 9:61 (2015).
- Loui, M. C., Robbins, B. A., Johnson, E. C., Venkatesan, N. Assessment of Peer-led Team Learning in an Engineering Course for Freshmen. *International Journal of Engineering Education* Volume 29:6 (2013).

Conference Papers (Peer Reviewed)

- Johnson E. C., Jones D. L., Ratnam R. Minimum squared-error, energy-constrained encoding by adaptive threshold models of neurons. In *Proc. of IEEE ISIT, 2015,* pp. 1337–1341
- Johnson, E. C., Norton, J. S., Jun, D. M., Bretl, T., Jones, D. L. Sequential Selection of Window Length for Improved SSVEP-Based BCI Classification. *Engineering in Medicine and Biology Society (EMBC), 2013 35th Annual International Conference of the IEEE.,* pp. 7060-7063.
- Johnson, E. C., Jones, D. L. Joint Recovery of Sparse Signals and Parameter Perturbations with Parameterized Measurement Models. In *Acoustics, Speech and Signal Processing (ICASSP), 2013 IEEE International Conference on* (pp. 5900-5904). IEEE.
- Johnson, E. C. and Loui, M. C. 2009. Work in progress - how do students benefit as peer leaders of learning teams? In *Proceedings of the 39th IEEE international Conference on Frontiers in Education Conference* (San Antonio, Texas, USA, October 18 - 21, 2009), 645-646.
- Johnson, E. C. and Wah, E. 2008. Data Visualization and Analysis of CIC Graduate Student TeraGrid Resource Usage. In *Proceedings of the 2008 Fourth IEEE international Conference on Escience* (December 07 - 12, 2008), 354-355.
- Wah, E., Johnson E. C., Auvil, L., Thakkar, U., Hwu, W., Kirk, D., Dunning, T., Glotzer, S. Visualization and Analysis of GPU Summer School Applicants and Participants. In *Proceedings of the 2008 Fourth IEEE international Conference on Escience* (December 07 - 12, 2008), 362-363.

Conference Presentations

- Bresee, C. S., Bush, N. E., Kaloti, A. S., Johnson, E. C., Naufel, S. N., Perich, M. G., Jones, D. L., Hartmann, M. J. Z. Evidence for tuning to stimulus directionality in the responses of neurons with multi-whisker receptive fields in spinal trigeminal nucleus interpolaris. Program No. 706.16/S17. 2015 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2015. Online.
- Johnson, E. C., Jones, D. L., Ratnam, R. An optimal neural encoding model predicts anti-correlated spike-trains in the p-type afferents of a weakly electric fish. Program No. 90.09/AA17. 2015 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2015. Online.
- Johnson, E. C., Jones, D. L., Ratnam, R. A Minimum-Error, Energy-Constrained Neural Encoder Predicts an Instantaneous Spike-Rate code. BMC Neuroscience 2015, 16(Suppl 1):P201
- Johnson, E. C., Jones, D. L., Ratnam, R. Encoding of sensory signals by an energy-constrained neural source encoding mechanism. Program No. 372.18/VV82. 2014

Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2014. Online.

- Maduram, A., Johnson, E. C., Catanho, M., Rubakhin, S., Jones, D. L., Gillete, R., Sweedler, J. Morphological and electrophysiological parameters of spatially complex networks of peripheral sensory neurons formed in microfluidic devices. Program No. 520.27. 2011 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2011. Online.
- Vega Leonel, J. C. M., Catanho, M. J., Quinn, C. J., Johnson, E. C., Jones, D. L., Coleman, T. P., Leckband, D. E., Kong, H. Electrophysiological and neuronal localization techniques for cultured aplysia neurons. Program No. 873.12. 2011 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2011. Online.

Related Work Experience

Northrop Grumman (Rolling Meadows, IL) Summer 2009
DSP Algorithm Development Intern- Algorithm development for electronic countermeasures and electronic warfare simulation.

Northrop Grumman (Rolling Meadows, IL) Summer 2007
Systems Engineering Intern- Developed requirements for the B-52 Electronic warfare upgrade project.

Teaching Experience

Graduate Teaching Assistant, Computer Systems and Programming
Spring 2015, Fall 2015, Spring 2016, University of Illinois

Graduate Teaching Assistant, Introduction to Electrical and Computer Engineering
Fall 2008, Spring 2009, University of Illinois

Graduate Teaching Assistant, Digital Signal Processing Summer School
June-July 2008, Ho Chi Minh City Technical University, Vietnam

Volunteer Teaching Assistant, Introduction to Electrical and Computer Engineering
Spring 2008, University of Illinois

Extracurricular Activities and Outreach

- *Student Coordinator for Graduate College Focal Point Grant (Interactions Design and Engineering of Adaptive Systems) 2013-2014*- Co-wrote proposal and served on executive committee with two other students and two faculty. The grant brought together engineers, designers, and cognitive scientists to develop novel BCI and HCI projects.
- *Student Coordinator for Graduate College Focal Point Grant (International, Collaborative Experience in Neuroengineering) 2011-2012*- Co-wrote proposal with and served on executive committee with two other students and two faculty. The grant included monthly seminars, a symposium, and web meetings. The goal was to foster new collaborations with neuroengineering communities around the world and encourage students to apply for international collaborative research opportunities.
- *Student Planning Committee for Neuroengineering Symposium*, 2010-2011- Planned and executed first ever Neuroengineering Symposium at the Beckman Institute along with three other students. Events included poster session, invited speakers, laboratory tours, and demonstrations.
- *Neuroengineering Student Association*- Founding president, 2011-2015. Organized seminars and social events for neuroengineering students to complement Symposia. Helped secure University funding for yearly symposia. Worked to recruit interested undergraduate students and transition organization to being an undergraduate-led group.

- *Undergraduate Project Mentor*- Mentored three undergraduates in diverse areas including quantitative assessment methods and human-computer interaction. With fellow Graduate Students Jamie Norton and David Jun, mentored three ECE senior design teams.
- *Brain Awareness Day and Engineering Open House Demonstrations*- 2010 presented and demo noise vocoder for cochlear implants, 2011 demonstrated computer vision techniques and discussed visual system, 2011 Fun with Audiovisual processing, 2013 presented adventures in hearing demonstration at Brain awareness day (real time spectrogram and spatial audio)
- *IEEE Multitouch Computer Screen*- Project Leader/Founder- Project founded to allow freshman students to work on a large technical project. The project won the 1st Place award for returning exhibits at the 2009 Engineering Open House.
- *Fencing Illini*- Men's epee fencer and Epee Captain, 2010-2011. Youth Foil Coach, Fall 2009, Spring 2010, Fall 2010, Fall 2014, Spring 2015, Fall 2015, Spring 2016. Substitute Youth Foil Coach, Spring 2011-Summer 2013.

Recognitions

- Graduate College Focal Point Grant Recipient, 2011, 2013
- Burroughs Wellcome Fund Collaborative Travel Grant Recipient, 2012
- NSF Neuroengineering IGERT Fellow, 2009-2011
- Chancellor's Scholar, UIUC, 2005, 2006, 2007, 2008
- Timothy N. Trick Leadership Award for founding IEEE Multitouch Screen Project, 2008
- E.C. Jordan Award in the area of Communications and Control, 2008
- Bronze Tablet Award- Highest University graduation honor for undergraduates, 2008
- Windy City Chapter, Association of Old Crows Scholarship, 2007, 2008
- Robert Byrd Scholarship (Robert C. Byrd Honors Program) 2005, 2006, 2007, 2008