Sean Aubin | Systems Design

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Education

Academic Qualifications

- **University of Waterloo**
  MASc (Hons) Systems Design Engineering *Started Sept. 2015*
  Cumulative Average: 93.00
- **University of Waterloo**
  Electrical Engineering, Honours, Co-op Program, with Distinction *Sept. 2010 – Apr. 2015*
  Cumulative Average: 82.42

Awards

- ***Alexander Graham Bell CGS - Master's*** $17500 (2018)
- ***President's Graduate Scholarship*** $5000 (2018)
- ***Alexander Graham Bell CGS - Master's*** $17500 - Declined (2017)
- ***President's Graduate Scholarship*** $5000 - Declined (2017)
- ***CogSci Conference: Computational Modeling Prize in Applied Cognition*** $1000 (2016)
- ***CogSci Conference: Student Travel Award*** $500 (2016)
- ***Ontario Graduate Scholarship*** $15000 (2016)
- ***President's Graduate Scholarship*** $5000 (2016)
- ***University of Waterloo Graduate Scholarship*** $5000 (2016)
- ***NSERC Undergraduate Research Award*** $4500 (2015)
- ***Dean's Honour List*** Spring 2014
- ***ECE457A: Cooperative and Adaptive Algorithms*** Best project at poster session
- ***University of Waterloo Merit Award*** $1000 (2010)

Publications

Aubin, S., Voelker A., and Eliasmith C., Improving with Practice: A Neural Model of Mathematical Development. *Topics in Cognitive Science, 2016*.

Aubin, S., Voelker A., and Eliasmith C., Improving with Practice: A Neural Model of Mathematical Development. *38th Annual Conference of the Cognitive Science Society, 2016*.

Sharma, S., **Aubin S.**, and Eliasmith C., Large-scale Cognitive Model Design Using the Nengo Neural Simulator. *Biologically Inspired Cognitive Architectures, 2016*.

Research Experience

Masters Thesis (Ongoing): *Neurally Modeling Improving with Practice*

Humans improve at tasks with practice. I have published a model of mathematical cognition demonstrating this skill using the Nengo neural simulator. This model replicated behaviour, but I am now researching how to match neural data. Once complete, the model will show the novel benefits of merging cognitive neuroscience and large-scale biological modeling. Specifically, how cognitive neuroscience data can constrain biological models, which in turn give mechanistic explanations (answering not just "how" but "why") of human behaviour.

Undergraduate Research Assistant: *Visualization of Neural Simulation Data*

While converting D. Rasmussen's Hierarchical Reinforcement Learning from Nengo 1.4 to Nengo 2.0, dynamic visualization of the state-changes happening in the model were needed. Created a web-based visualizer using D3.js and JavaScript laying the foundation for the present Nengo GUI (`github.com/nengo/nengo_gui`). Analyzed state-space exploration patterns of neural reinforcement learning model in response to different noise patterns being injected into the basal ganglia.

Industry Experience

Honda Research Institute Japan — **Randy Gomez, PhD**
Graduate Research Intern — *Nov.–June. 2017*

- Applied theoretical Deep Learning concepts to solve a difficult problem.
- Built Kinect joint de-noising and emotion detection neural networks using Keras and TensorFlow.

Honda Research Institute Japan — **Kazuhiro Nakadai, PhD**
Undergraduate Research Intern — *May–Dec. 2013*

- Built a multi-modal human-computer system under a strict deadline using Kinects, a microphone array, HARK and other technologies.
- Created a spoken language understanding module that converted text derived from speech into a machine-understandable command using natural language processing.
- Used ROS, Kinect and C++ to create a gaze detection and user recognition system.

Extracurricular Activities

Teaching Experience

- ***ENGL108H: Guest Lecturer*** Gave lecture on the metaphors, levels of abstraction and mechanistic explanations for the brain.
- ***Python Workshop for Beginners 2016, 2017*** Organized and taught a three-day Python programming workshop to students who have never programmed before. Obtained $500 grants from Women in Computer Science and the Python Software Foundation. `uwpyb.github.io`
- ***Software Carpentry*** Organized and taught the Git component of a two-day Software Carpentry workshop, intended to help researchers save time with better programming skills.
- ***Nengo Summer School 2015, 2016*** Assisted post-docs and PhDs in constructing a model of the Wisconsin Card Sorting Task, Motor Sequencing and Classical Conditioning using Nengo over a period of two weeks.
- ***First-Year Circuits and Programming Tutor*** Tutored drop-in sessions for first-year engineering students learning to solve analog circuits, as well as C++ and Matlab programming.
- ***Learning Night*** Co-organizer and occasional presenter of periodic event where attendees make 15 minute casual and informative presentations, ranging from "How to Build a Brain" to "Intro to K-pop Choreography". For more information see `learningnight.com`.

Other Activities

- ***Kavli Summer School and Futures Symposium 2016*** Participant of two week long summer school focused on brain circuits and stress in cognitive neuroscience. Hosted informal Nengo workshop. Attended weekend seminar on alternatives to synaptic memory storage. Suggested a Nengo-based alternative.
- ***cogsci.stackexchange.com*** Avid participant on the question/answer site. Frequently answer/ask questions about theoretical neuroscience and cognitive modeling. Also regularly carry out moderation duties, such as closing off-topic questions and helping users clarify their queries.