Eric Crawford

PhD Candidate in Machine Learning

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Education

Candidate for PhD, Computer Science   *Montreal, Quebec, Canada*

McGill University / Mila   *2014-Aug 2021*

- Cumulative GPA: 4.0/4.0
- Member of Reasoning and Learning Lab

Master of Mathematics, Computer Science   *Waterloo, Ontario, Canada*

University of Waterloo   *2012-2014*

- Cumulative GPA: 91.80%
- Member of Computational Neuroscience Research Group

Bachelor of Mathematics, Honors Computer Science, Co-op, CogSci Option   *Waterloo, Ontario, Canada*

University of Waterloo   *2007-2012*

- Cumulative GPA: 88.07%
- Dean's Honors List with Distinction

Publications

Conference / Journal Articles

- **Crawford, E.**, and Pineau, J. (2020). Exploiting Spatial Invariance for Scalable Unsupervised Object Tracking. *AAAI*.

- **Crawford, E.**, and Pineau, J. (2019). Spatially Invariant Unsupervised Object Detection with Convolutional Neural Networks. *AAAI*.

- Dong, Y, Shen, Y., **Crawford, E.**, van Hoof, H., and Cheung, J.C.K. (2018). BanditSum: Extractive Summarization as a Contextual Bandit. *EMNLP*.

- Kroger, B., **Crawford, E.**, Bekolay, T., and Eliasmith, C. (2016). Modeling interactions between speech production and perception: speech error detection at semantic and phonological levels and the inner speech loop. *Frontiers in Computational Neuroscience*.

- **Crawford, E.**, Gingerich, M., and Eliasmith, C. (2015). Biologically plausible, human-scale knowledge representation. *Cognitive science*.

- **Crawford, E.**, Gingerich, M., and Eliasmith, C. (2013). Biologically plausible, human-scale knowledge representation. *Conference of the Cognitive Science Society*.

Workshops and Preprints

- **Crawford, E.**, and Pineau, J. (2020). Learning 3D Object-Oriented World Models from Unlabeled Videos. *ICML Workshop on Object-Oriented Learning.* **Outstanding Paper Award.**

- **Crawford, E.**, and Pineau, J. (2019). Spatially Invariant, Label-free Object Detection. *NeurIPS Workshop on Perception as Generative Reasoning.* **Spotlight.**

- Venkattaramanujam, S., **Crawford, E.**, Doan, T., and Precup, D. (2019). Self-supervised Learning of Distance Functions for Goal-Conditioned Reinforcement Learning. *arXiv preprint arXiv:1907.02998.*

- **Crawford, E.**, and Pineau, J. (2018). Spatially Invariant Attend, Infer, Repeat. *NeurIPS Workshop on Modeling the Physical World.*

- **Crawford, E.**, Rabusseau, G. and Pineau, J. (2017). Sequential Coordination of Deep Models for Learning Visual Arithmetic. *arXiv preprint arXiv:1809.04988.*

- Voelker, A., **Crawford, E.**, and Eliasmith, C. (2014). Learning large-scale heteroassociative memories in spiking neurons. *Unconventional Computation and Natural Computation.*

THESES

- **Crawford, E.** (2021). Learning Object-Oriented Models of the Visual World. PhD Thesis, McGill University. (Undergoing final corrections).

- **Crawford, E.** (2015). Biologically plausible, human-scale knowledge representation. Master of Mathematics Thesis, University of Waterloo.

SOFTWARE

- **Crawford, E.** (2013-2015). MPI backend for the Nengo neural simulator. *https://github.com/nengo/nengo-mpi*.

- **Crawford, E.** (2010-2015). Contributions to Nengo neural simulator core library. *https://github.com/nengo/nengo*.

Experience

Computer Vision Intern *Vancouver, BC, Canada*

UNITY TECHNOLOGIES *May 2021-Aug 2021*

- Performed large-scale experiments aimed at finding opportunities for training instance segmentation networks on simulated data.
- Developed techniques for training Mask-RCNN on simulated data, aiming to reduce the number of hand-labeled examples required.
- Implemented robust and scalable infrastructure for managing large numbers of simultaneous training jobs using Google Cloud Platform.

Machine Learning Consultant *San Francisco, California, USA*

PERSONA IDENTITIES INC. *2019*

- Developed cloud-based deep learning capabilities for document verification using TensorFlow and Google Cloud Platform.
- Designed and implemented deep computer vision solutions enabling new forms of document verification.
- Performed extensive model selection and hyperparameter tuning to find the optimal balance between inference speed, precision and recall.

Teaching Assistant *Montreal, Quebec, Canada*

SCHOOL OF COMPUTER SCIENCE, MCGILL UNIVERSITY *2014-2016*

- Implemented game-playing platform for AI course project, ran tournament involving hundreds of submitted agents.
- Held office hours, marked papers, gave tutorials.

Teaching Assistant *Waterloo, Ontario, Canada*

DEPARTMENT OF COMPUTER SCIENCE, UNIVERSITY OF WATERLOO *2012-2014*

- Held office hours, marked papers, gave tutorials.

Lead Developer *Waterloo, Ontario, Canada*

COMPUTATIONAL NEUROSCIENCE RESEARCH GROUP, UNIVERSITY OF WATERLOO *2010-2014*

- Designed and implemented CUDA and MPI backends for the Nengo neural simulation package.
- Reduced network simulation times by several orders of magnitude using high-performance clusters, allowing networks containing hundreds of thousands of neurons to be simulated in real-time.

Research Assistant *Philadelphia, Pennsylvania, USA*

DEPARTMENT OF OTORHINOLARYNGOLOGY, UNIVERSITY OF PENNSYLVANIA *2011*

- Implemented computational methods for identifying neural receptive fields based on neurophysiological data.

Developer *Waterloo, Ontario, Canada*

ACRONYM SOFTWARE *2009*

- Implemented UI features for wood and masonry engineering software in C++ and C#.

Awards & Scholarships

Alexander Graham Bell Canada Graduate Scholarship - Doctoral - $70,000 – NSERC	*09/2016-08/2018*
David R. Cheriton Graduate Scholarship - $20,000 – University of Waterloo	*09/2012-08/2014*
Alexander Graham Bell Canada Graduate Scholarship - Masters - $17,000 – NSERC	*09/2012-08/2013*
President's Graduate Scholarship - $10,000 – University of Waterloo	*09/2012-08/2013*
Ontario Graduate Scholarship - $15,000 (Declined) - Gov. of Ontario	*09/2012-08/2013*
Computational Neuroscience Summer Program - $4,000 – University of Pennsylvania	*05/2011-07/2011*
Undergraduate Student Research Award - $4,500 – NSERC	*01/2011-04/2011*
Undergraduate Student Research Award - $4,500 – NSERC	*01/2010-04/2010*
Industrial Undergraduate Student Research Award - $4,500 – NSERC	*09/2008-12/2008*
President's Scholarship - $2,000 – University of Waterloo	*09/2007-12/2007*

Skills

- Object Detection and Instance Segmentation with Deep Neural Networks

- Training Deep Neural Networks on Simulated Data

- Unsupervised Object Detection and Tracking

- Variational Autoencoders

- PyTorch & TensorFlow

- OpenCV

- Google Cloud Platform

- Linux, Git, CUDA, MPI

- Languages: Python, C/C++, Java, Scheme, LaTeX