

# Eric Crawford

PHD CANDIDATE IN MACHINE LEARNING  
McGill University, Montreal, Quebec, Canada

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## Education

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### Candidate for PhD, Computer Science

MCGILL UNIVERSITY / MILA

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

Montreal, Quebec, Canada

2014-Aug 2021

### Master of Mathematics, Computer Science

UNIVERSITY OF WATERLOO

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

Waterloo, Ontario, Canada

2012-2014

### Bachelor of Mathematics, Honors Computer Science, Co-op, CogSci Option

UNIVERSITY OF WATERLOO

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

Waterloo, Ontario, Canada

2007-2012

## Publications

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### 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

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### Computer Vision Intern

Vancouver, BC, Canada

UNITY TECHNOLOGIES

2021

- Performed large-scale experiments with Detectron2, aimed at finding opportunities for weakly-supervised learning for instance segmentation.
- Developed algorithms and techniques for training Mask-RCNN networks on simulated data generated by the Unity game engine, with the goal of reducing the number of hand-labeled examples required to reach a given level of performance.
- Implemented 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

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**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**

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- 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