

Curiosity-driven artificial intelligence researcher and science communicator. Interested in creative, cross-disciplinary solutions to complex problems.

## SKILLS

<b>Tools and Languages</b>	Python (PyTorch, Tensorflow, matplotlib, scikit-learn, pandas), MATLAB, R, SQL, Unix/bash, Git, LaTeX
<b>Quantitative Research</b>	Mathematical modeling, mathematical optimization, neural network architecture design
<b>Communication</b>	Technical writing, data visualization, scientific communication

## RESEARCH & WORK EXPERIENCE

**Montréal Institute for Learning Algorithms (MILA) | Research Scientist** Sep 2019 — Dec 2021

*Continuation of doctoral research exploring memory in reinforcement learning agents*

- Developed research program to explore advantages of forgetting for reinforcement learning agents in dynamic environments
- Created analysis toolkit for large synthetic data sets using Python (pandas). Developed programmatic error detection and data visualization tools (seaborn, matplotlib)
- Organized small peer mentorship groups within larger lab group. Engaged two junior graduate students in weekly meetings to discuss research progress, provide feedback on written and oral presentation materials.

**University of Toronto | Research Associate** Jan 2016 — Aug 2019

*Doctoral research focused on modeling episodic memory for enhanced performance in reinforcement learning agents*

- Developed a 4-year research plan to explore the utility of biologically-inspired memory in reinforcement learning agents
- Designed semi-automated data collection, storage, and analysis pipeline in Python. Managed simulations on high performance computing system (SciNet Niagara cluster) with bash scripting
- Created high-level visualizations of complex module interactions and graphical representations of data trends
- Organized regular meetings with supervisory team to discuss progress on short- and long-term goals.

**Netherlands Institute for Neuroscience | Research Associate** Sep 2018 — Aug 2019

*Generation of theoretically-based computational models informed by experimental results to validate findings*

- Designed simulations to explore effects on mitochondrial motility of inter-neuronal firing patterns at different frequencies
- Contributed to paper writing and comprehensive code documentation for reproducibility of results

**AsapSCIENCE | Writer** Oct 2014 — Feb 2018

*Science communication videos for a general-audience YouTube channel with 10M subscribers*

- Distilled high-level concepts from primary research materials to core intuitions
- Wrote and edited scripts for accessible scientific communication through whiteboard animation videos

## TEACHING EXPERIENCE

**Toronto District School Board | Co-Op Placement Supervisor** Feb 2021 — May 2021

- Designed 8-week research program for high school students to learn fundamental concepts of deep reinforcement learning
- Met twice weekly with mentee to discuss progress, roadblocks, and clarify objectives
- Oversaw written final report summarizing the topics learned over the semester

**IBRO-Simon's Computational Neuroscience Imbizo | Teaching Assistant & Project Supervisor** Jul 2019 — Jan 2020

*Intensive month-long training course bringing international academics to Africa to share expertise*

- Evaluated international student applications and selected a shortlist of promising candidates
- Designed and presented a tutorial and hands-on workshop session on reinforcement learning
- Supervised 6 short-term graduate-level research projects for students interested in machine learning, neural network optimization and reinforcement learning

**University of Toronto | Teaching Assistant** Sep 2013 — Dec 2019

*Teaching in lecture, tutorial, and laboratory settings for undergraduate students in biological sciences*

- Prepared and presented educational materials on topics in biology, mathematics, physiology, neuroscience, and computer science for classes ranging from 25-400 students
- Created, administered, and graded tests to assess student comprehension, provided detailed constructive feedback for improvement
- Designed anonymous feedback form so students could flag where they were falling behind or where instruction could be improved. Found many students wished for additional guidance with scientific writing and presentation skills, subsequently designed teaching materials to address this gap

## EDUCATION

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### University of Toronto

- Doctor of Philosophy, Computational Neuroscience 2021  
*Dissertation: Episodic Control - The Role of Memory in Decision Making*
- Master of Science, Cell & Systems Biology (Neuroscience) 2015
- Honours Bachelor of Science, Mathematics and Neuroscience 2013

## OUTREACH

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- Neural Information Processing Systems (NeurIPS) Workshop on Biological and Artificial Intelligence** | Reviewer 2019 — 2020
- Grad Overflow Workshop** | Series Creator and Organizer 2016 — 2019
  - Organized tutorials and peer mentorship for graduate students on theory and use of computational tools
  - Covered topics such as basics of Python, R, plotly, databasing
- Canada Learning Code** | Ladies Learning Code Technical Mentor 2019
- Harbord Collegiate Institute Coding Team** | Assistant Coach 2019
- Scadding Court Community Centre Youth Science Program** | Mentor 2013 — 2016

## PUBLICATIONS & PRESENTATIONS

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- **Forgetting Enhances Episodic Control with Structured Memories.** (In Progress). [bioRxiv preprint](#).  
*Annik Yalnizyan-Carson, Blake A. Richards.*
- **Activity-Dependent Regulation of Mitochondrial Motility in Developing Cortical Dendrites.** (2021). [eLife](#).  
*Catia A.P. Silva, Annik Yalnizyan-Carson, M. Victoria Fernández Busch, Mike van Zwieten, Matthijs Verhage, Christian Lohmann.*
- **Improving Model-Free Control with Episodic Caching in RL Tasks with Changing Reward Contingencies.**  
*Annik Yalnizyan-Carson, Blake A. Richards.* Poster presentation at Reinforcement Learning & Decision Making Conference 2019
- **Episodic Caching Assists Model-Free Control in RL Tasks with Changing Reward Contingencies.**  
*Annik Yalnizyan-Carson, Blake A. Richards.* Nanosymposium Talk at Society for Neuroscience Meeting 2018
- **Spatiotemporal Changes to Efficacy of the  $K^+Cl^-$  Cotransporter KCC2 in Inhibitory STDP.**  
*Annik Yalnizyan-Carson, Blake A. Richards, Melanie Woodin.* Poster Presentation at Canadian Association for Neuroscience Meeting 2016.
- **Patterned Illumination Systems for Optogenetics in Neuroscience** (2015). [Mightex Whitepaper](#).  
*Annik Yalnizyan-Carson, Blake A. Richards, Dominic Krakowski.*
- **A Dynamic Model of the  $K^+Cl^-$  Cotransporter KCC2 in Regulating Efficacy of Inhibitory Neurotransmission.**  
*Annik Yalnizyan-Carson, Melanie Woodin.* Poster Presentation at Canadian Association for Neuroscience Meeting 2014

## WORKSHOPS & SUMMER SCHOOLS

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- Neural Information Processing Systems Biological and Artificial Intelligence Workshop** | Vancouver, BC 2019
- Computational Systems Neuroscience (COSYNE) Workshop** | Lisbon, Portugal 2019
- Deep Learning & Reinforcement Learning (DLRL) Summer School** | Montréal, QC 2017
- IBRO-Simons Computational Neuroscience Imbizo (ISICNI)** | Cape Town, South Africa 2017
- Computational Systems Neuroscience (COSYNE) Workshop** | Salt Lake City, UT 2016
- Toronto Computational Neuroscience Workshop** | Krembil Research Institute 2016
- Connaught Summer Institute on Synthetic Biology** | University of Toronto 2014
- Comprehensive Course on Fluorescence Microscopy** | Advanced Optical Microscopy Facility, MaRS Centre 2014
- NEURON Summer Course** | University of California San Diego 2013

## AWARDS

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- Doctoral Completion Award** | University of Toronto 2019 — 2020
- Doctoral Fellowship Award** | University of Toronto 2015 — 2019
- VCC Graduate Award in Zoology** | Department of Cell & Systems Biology 2018
- ISICNI Scholarship Award** | IBRO-Simons Computational Neuroscience Imbizo 2017
- Mentorship Grant (with Blake Richards)** | Computational Systems Neuroscience (COSYNE) Meeting 2016
- Frederick P. Ide Graduate Award** | Department of Cell & Systems Biology 2015
- Masters Fellowship Award** | University of Toronto 2013 — 2015