

Samuel F. Neumann

PHD STUDENT · COMPUTING SCIENCE

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“Kind words do not cost much. Yet they accomplish much.” –Blaise Pascal

Education

PhD in Computing Science

UNIVERSITY OF ALBERTA

- Supervisor: Adam White
- Topic: Reinforcement Learning
- GPA: 4.0/4.0

Edmonton, Alberta, Canada

Sept. 2022 – Present

MSc. (Thesis) in Computing Science

UNIVERSITY OF ALBERTA

- Supervisor: Adam White
- Topic: Reinforcement Learning
- Thesis: Greedy Actor-Critic: A New Conditional Cross-Entropy Method for Policy Improvement
 - Nominated for departmental award
- GPA: 4.0/4.0

Edmonton, Alberta, Canada

Sept. 2020 – Nov. 2022

BSc. with Distinction Major in Mathematics and Major in Computing Science

MACÉWAN UNIVERSITY

- Primary Major: Mathematics
- Secondary Major: Computing Science
- Received the Governor General's Silver Medal for highest graduating GPA
- GPA: 4.0/4.0

Edmonton, Alberta, Canada

Sept. 2015 – June 2020

Research Experience

Greedy Actor-Critic: A New Conditional Cross-Entropy Method for Policy Improvement

UNIVERSITY OF ALBERTA

- Research with the RLAI lab
- Studying a new method of policy optimization for actor-critic algorithms based on the cross entropy optimization method
- MSc. thesis

Edmonton, Alberta

Jan. 2021 – Present

Empirical Reinforcement Learning

UNIVERSITY OF ALBERTA

- Research with the RLAI lab
- Studying current empirical practices in reinforcement learning and how these practices can be improved
- Paper in preparation ([Link](#))

Edmonton, Alberta

April. 2021 – Present

Modelling the Ageing Brain (NSERC USRA)

MACÉWAN UNIVERSITY

- Research with Dr. Dana Cobzas
- Paper published at the *IEEE International Symposium of Biomedical Imaging (ISBI) 2021* ([Link](#)).
- Collaboration with the Biomedical Engineering Department at the University of Alberta
- Introduced the first hippocampus segmentation method on a novel high-resolution diffusion MRI
- Introduced a novel data augmentation process to enable neural network generalization across MRI machines

Edmonton, Alberta

May 2020 – Sept. 2020

Xanthophyll Associations with Breast Cancer

MACÉWAN UNIVERSITY

- Research with Dr. Mohamad El-Hajj
- Association analysis and classification on the Exposome-Explorer dataset

Edmonton, Alberta

Jan. 2020 – May 2020

Stability Analysis of a Cell's Population (NSERC USRA)

MACEWAN UNIVERSITY

- Research with Dr. Cristina Anton
- Association analysis and classification on the Exposome-Explorer dataset

Edmonton, Alberta

Jan. 2020 – May 2020

Applications of the Korteweg – de Vries Equation

MACEWAN UNIVERSITY

- Group research project for MATH436
- Studied characteristics of the nonlinear travelling wave solution
- Presented results of research at MacEwan Student Research Day

Edmonton, Alberta

Jan. 2018 – May 2018

Distinctions, Honours, & Awards

DOCTOR OF PHILOSOPHY

2022/23 **Alberta Graduate Excellence Scholarship, \$12,000**, University of Alberta

Edmonton, Alberta

2022/23 **New Beginnings Bursary, \$5,000**, University of Alberta

Edmonton, Alberta

MASTER OF SCIENCE

2022 **FGSR Graduate Student Support for Parents, \$1,300**, University of Alberta

Edmonton, Alberta

2021/22 **Alberta Innovates Graduate Student Scholarship, \$26,000**, University of Alberta

Edmonton, Alberta

2021/22 **Alberta Graduate Excellence Scholarship, \$12,000**, University of Alberta

Edmonton, Alberta

2020/21 **Science Graduate Scholarship, \$2,000**, University of Alberta

Edmonton, Alberta

2020/21 **Walter H. Johns Graduate Fellowship, \$5,800**, University of Alberta

Edmonton, Alberta

2020/21 **NSERC CGS-M, \$17,500**, University of Alberta

Edmonton, Alberta

BACHELOR OF SCIENCE

2020 **Governor General's Silver Medal**, MacEwan University

Edmonton, Alberta

2020 **NSERC USRA, \$7,500**, MacEwan University

Edmonton, Alberta

2019/20 **Dean's List**, MacEwan University

Edmonton, Alberta

2019/20 **Louise McKinney Scholarship, \$2,500**, MacEwan University

Edmonton, Alberta

2019/20 **MacEwan Foundation Scholarship, \$1,000**, MacEwan University

Edmonton, Alberta

2019 **NSERC USRA, \$5,625**, MacEwan University

Edmonton, Alberta

2018/19 **Dept. of Mathematics Omega Award**, MacEwan University

Edmonton, Alberta

2018/19 **Dean's List**, MacEwan University

Edmonton, Alberta

2017/18 **Dept. of Mathematics Epsilon Award**, MacEwan University

Edmonton, Alberta

2016/17 **Dean's List**, MacEwan University

Edmonton, Alberta

2016/17 **Louise McKinney Scholarship, \$2,500**, MacEwan University

Edmonton, Alberta

2016/17 **Bachelor of Science Continuing Scholarship, \$1,700**, MacEwan University

Edmonton, Alberta

2015/16 **Dean's List**, MacEwan University

Edmonton, Alberta

2015/16 **Shell Canada Scholarship, \$1,200**, MacEwan University

Edmonton, Alberta

2015/16 **Bachelor of Science Entrance Scholarship, \$1,700**, MacEwan University

Edmonton, Alberta

2015/16 **Louise McKinney Scholarship, \$2,500**, MacEwan University

Edmonton, Alberta

2015/16 **Alexander Rutherford Scholarship, \$1,800**, MacEwan University

Edmonton, Alberta

Papers and Publications

*Greedy Actor-Critic: A New Conditional Cross-Entropy Method for Policy Improvement (LINK)

Edmonton, Alberta

VENUE: *International Conference on Learning Representations*

2023

AUTHORS: S. NEUMANN, S. LIM, A. JOSEPH, Y. PAN, A. WHITE, AND M. WHITE

*An Association Analysis of Breast Cancer with Carotenoids (LINK)

Edmonton, Alberta

VENUE: *International Conference on Bioinformatics and Computational Biology*

2023

AUTHORS: S. NEUMANN AND M. EL-HAJJ

Empirical Design in Reinforcement Learning (LINK)

Edmonton, Alberta

VENUE: *In preparation*

2022

AUTHORS: A. PATTERSON, S. NEUMANN, M. WHITE, AND A. WHITE

* Hippocampus Segmentation on High Resolution Diffusion MRI ([LINK](#))

Edmonton, Alberta

2021

VENUE: *IEEE International Symposium on Biomedical Imaging*

AUTHORS: C. EFIRD, S. NEUMANN, K. G. SOLAR, C. BEAULIEU AND D. COBZAS

DOI: 10.1109/ISBI48211.2021.9434094

Presentations

Greedy Actor-Critic: A New Conditional Cross-Entropy Method for Policy Improvement

Edmonton, Alberta

MSC. THESIS SEMINAR

August 2022

- Seminar on MSc. thesis project.

Xanthophyll Associations with Breast Cancer

Edmonton, Alberta

MACÉWAN COMPUTING SCIENCE CAPSTONE PRESENTATION DAY

April 2020

- Presented results and methods of association analysis on Exposome-Explorer dataset

Applications of the Korteweg – de Vries Equation

Edmonton, Alberta

MACÉWAN STUDENT RESEARCH DAY

April 2018

- Discussed the linear, nonlinear, and travelling wave solutions of the Korteweg – de Vries Equation
- Discussed applications of the Korteweg – de Vries Equation

Professional Experience

Teaching Assistant

Edmonton, Alberta

UNIVERSITY OF ALBERTA

Sept. 2020 – Present

- CMPUT367: Intermediate Machine Learning
 - Instructor: Martha White
 - Date: Sept. 2022 - Dec. 2022
- CMPUT391: Database Systems
 - Instructor: Denilson Barbosa
 - Date: Sept. 2020 - Apr 2021

MACÉWAN UNIVERSITY

Jan. 2019 - Apr. 2019

- MATH228: Ring Theory
 - Instructor: Cristina Anton
 - Date: Jan. 2019 - Apr. 2019

Coursera Course Moderator

Edmonton, Alberta

ALBERTA MACHINE INTELLIGENCE INSTITUTE

March. 2022 – Present

- Moderator for the Reinforcement Learning Coursera course: [link](#)
- Duties include performing maintenance on the online course and assisting students with technical issues

Mathematics and Statistics Help Centre

Edmonton, Alberta

MACÉWAN UNIVERSITY

Jan. 2020 – Mar. 2020

- Duties included helping students with mathematics or statistics questions related to courses
- Worked one-on-one with students

Skills

Programming Languages Go, Python, LaTeX, Bash, Julia
English

Research and Teaching Interests

- Reinforcement Learning
- Policy Optimization
- Numerical Analysis
- Machine Learning and Artificial Intelligence
- Deep Learning and Neural Networks
- Probability Theory

* INDICATES A PUBLICATION WHILE REGISTERED IN THE GRADUATE PROGRAM AT THE UNIVERSITY OF ALBERTA

- Linear Algebra

I am interested in research in the field of reinforcement learning, a form of artificial intelligence. In this field, we study how a device (often called a *control system*) such as a robot can be controlled through trial-and-error interactions. Although I am interested in general research in this area, my main focus has been on actor-critic algorithms. Actor-Critics are a class of algorithm that have two parts: an actor and a critic. The actor controls the device. The critic evaluates the actor's performance, which helps the actor learn how to better control the device. For example, the actor could control a self-driving vehicle. The critic would evaluate how the actor is driving, and the actor would learn to drive better using the critic's evaluation.

Actor-Critics are specifically designed for controlling industrial control systems, such as water treatment plants. Unfortunately, these algorithms are not often used in industry because they require a prohibitively large amount of training, typically feasible only under simulation and not in real life. My research is focused on how these algorithms can be improved to be more applicable to industry. Applying these algorithms to industry is desirable because they can help reduce monetary and environmental costs. Furthermore, the application of actor-critics to industry can increase the availability of industrial automation to marginalized communities.

References

Adam White

University of Alberta

- Assistant Professor, Department of Computing Science at the University of Alberta
- Senior Research Scientist at Google DeepMind
- Fellow of the Alberta Machine Intelligence Institute (AMII)
- PI of the Reinforcement Learning and Artificial Intelligence Lab (RLAI)

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Adi Tcaciuc

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- Professor, Department of Mathematics and Statistics at MacEwan University
- Department chair, Department of Mathematics and Statistics at MacEwan University

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Cristina Anton

MacEwan University

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Martha White

University of Alberta

- Associate Professor, Department of Computing Science at the University of Alberta
- Member of the Reinforcement Learning and Artificial Intelligence Lab (RLAI)
- PI of the Alberta Machine Intelligence Institute (AMII)

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