Sara El-Shawa

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Education

University of Guelph **September 2020–September 2022**

Master of Applied Science in Engineering
Collaborative Specialization in Artificial Intelligence
Vector Scholarship in Artificial Intelligence Recipient 2020-21 (CAD $17 500)
Queen Elizabeth II Graduate Scholarship 2021-22 (CAD $15 000)
Vector Research Grant (CAD $4 000)
GPA: 4.0/4.0
Supervisor: Dr. Graham Taylor

University of Toronto **September 2014–November 2018**

Honours Bachelor of Science
Double major in Computer Science and Biology
GPA last two years of study: 3.88/4.0, **Dean's List**
Thesis Advisor: Dr. Rob W. Ness

Work Experience

Applied Machine Learning Intern **September 2021- Present**

Vector Institute

- Analyzing COVID-19 viral genome sequences and classifying Variants of Concern using **Graph Convolutional Networks** (GCNs).
- Presented poster at CIFAR Deep Learning + Reinforcement Learning Summer School.

Applied Machine Learning Intern **May 2021- August 2021**

Vector Institute

- Explored privacy-enhancing techniques such as **federated learning** in the healthcare sector.
- Used **TensorFlow Federated** to simulate three scenarios of different privacy levels in hospitals.

Health AI Intern **January 2021–May 2021**

Vector Institute

- Used mobility data to make COVID-19 forecasts in Ontario at the Public Health Unit level.
- Automated weekly reports using Python package **Luigi**.

Software Developer **April 2020–Present**

University of Toronto

- Designing GUI and developing a data processing pipeline for analyzing videos of social interaction networks of flies.
- Developing tests to assess **information flow** between and among social interaction networks.

Teaching Assistant **January 2021–April 2021**

University of Guelph

- Conducted tutorials, made videos, and explained linear algebra concepts to students in ENGG1500.

AI Researcher **November 2020–March 2021**

Public Health Agency of Canada

- Predicted the severity of COVID-19 cases by investigating associations with clinical symptoms and comorbidities.

Data Manager & Web Programmer **May 2020–March 2021**

Stanford University

- Updating MetaLab's website and conducting **meta-analyses** for cognitive development research using **R**.

Data Science Research Intern **December 2018–February 2020**

Harvard University

- Identified and analyzed **social networks** among groups of interacting animals using **MATLAB** and **Python**.
- Calculated and compared network measures such as **Bonacich power centrality** between female and male groups, and groups with and without early-life stress.
- Used Python packages **NetworkX**, **Pandas**, and **DeeplabCut** for animal tracking.

Robotics Research Intern **September 2019–February 2020**

International Research Center for Neurointelligence, University of Tokyo

- **Humanoid robot-infant** interaction to assess how a robot's contingent responsiveness contributes to infants' elicitation of gaze following.
- Designed and programmed GUI in Python for **Nao robot** to react contingently to a child through movements and vocalizations.

(Research experience continued)

Genomics Research Assistant **May 2018–August 2018**

University of Toronto

- Identified basic **graph theory** centrality measures in two biological networks using **Python** and **Bash**.
- Converted genetic network into **SQL** database for more efficient data retrieval using **python-sql** library.

Bioinformatics Research Assistant **May 2017–August 2017**

University of Toronto

- Conducted analysis to study the effect of metabolic network topology using **Python**.
- Established and managed an analytical pipeline in **Bash** and created graphs in **R** for data analyses.

Undergraduate Research Experience

Senior Thesis Project **September 2017–August 2018**

University of Toronto

- Analyzed the influence of genetic network properties on selection by using divergence and diversity measures.
- Conducted analysis to find how the rate of adaptive evolution varies across the genetic network.
- Found that positive selection is more prevalent in genes that are highly connected and have a high betweenness centrality measure.
- Used Python packages such as **NumPy**, **Matplotlib**, and **Pandas** and R packages such as **dplyr** and **ggplot2**.
- Poster Presentation at SMBE 2018 in Japan, **Award**: Best Undergraduate Poster (USD $500).
- **Manuscript in preparation**: **El-Shawa S.** and Ness, R. W. The effect of connectivity on the strength of selection in *Chlamydomonas reinhardtii*.

Computational Biophysics Undergraduate Researcher **May 2018–October 2018**

University of Toronto

- Ran simulations in **C** and **Python** using fluctuation data to infer direction of molecular interactions within cells and presence of feedback in a multi-component system.
- Used stochastic processes by modifying the **Gillespie algorithm** to calculate covariance data between components to correctly identify positive and negative correlations.

Bioinformatics Undergraduate Researcher **January 2018–August 2018**

University of Toronto

- Identified and used graph theory measures such as **clustering** and **connectivity** to analyze genetic mutations in a gene co-expression network using **Python** packages such as **NetworkX** and **Seaborn**.
- Compared network parameter distributions between salt-stress and de novo mutations in **R**.

Evolutionary Genomics Undergraduate Researcher **May 2017–August 2017**

University of Toronto

- Conducted analysis to identify the full set of homologous genes between two model genomes.
- Worked with **Python** and **Bash**, and used Augustus, UBLAST, MUSCLE, Blast, and Standalone Blast.

Volunteer Experience

AI4Good Lab Mentor **May 2021 - June 2021**

AI4Good Lab

- Provided technical, hands-on support to participants.

Program Representative **October 2020 - Present**

Vector Institute

- Sharing feedback and suggestions from peers and communicating opportunities for students in my graduate program.

Workshop Co-Organizer **November 2019**

University of Toronto Mississauga Mathematics and Computational Sciences Society

- Introduced students to **Streamlit**, an app framework for machine learning and data science.
- Workshop was aimed for students with little to no background in tech.