# SAFWAN HOSSAIN

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## EDUCATION

**University of Toronto** September 2018 - Present
M.S.c in Computer Science
Specialization: Machine Learning and Algorithmic Game Theory
Advisor(s): Dr. Nisarg Shah and Dr. Frank Rudzicz
Student affiliate of Vector Institute

**University of Toronto** September 2013 - June 2018
B.A.S.c in Electrical and Computer Engineering - High Honours GPA: 3.95/4.00
Specialization: Software and Control Systems

## RELEVANT COURSEWORK

Undergraduate: Robot Modelling and Control, Advanced Algorithms, Machine Learning, Probability and Statistics
Graduate: Random Processes, Deep Reinforcement Learning, Computational Linguistics, Statistical Learning Theory, Algorithms for Collective Decision Making

## TECHNICAL SKILLS

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| **Modeling/Simulations** | MATLAB, Mathematica |
| **Programming Languages/Framework** | Python, C/C++, pyTorch, bash |

## RESEARCH PROJECTS

**Nash Equilibrium in Linear Regression**
We consider linear regression wherein each data point is supplied by a self-interested agent which can misreport values to skew the regression toward their preference. We are investigating whether a pure equilibrium always exists in this game, the quality of this equilibrium and algorithms that achieve this. Under review at NeurIPS 2019.

**JacNet - Learning functions with structured Jacobians**
We consider learning functions satisfying regularity conditions expressible in terms of the derivative (eg: invertibility, Lipschitz). To achieve this, we propose learning a function's Jacobian, imposing regularity conditions via output activation, and using a numerical integrator for loss computation and evaluation. **Accepted to the 1st Invertible Networks Workshop at ICML 2019 (INNF)**.

**ChainGAN - A sequential approach to GANs**
We proposed a sequential architecture and training methodology for Generative Adversarial Networks. The generator transforms a noise vector into a crude sample, and a chain of networks thereafter attempt to sequentially enhance it using discriminator feedback. This model outperforms several existing models while being much more efficient in memory and network parameters. Submitted to ICLR 2019.

**DeepConsensus - Architecture for robust image classification**
We built a robust classifier whose test set is exposed to various perturbations not present in the training set. Each layer in our model performs a weak classification and the final classification is a consensus of these results. This model is also robust against adversarial perturbations. Submitted to CVPR 2019.

## WORK EXPERIENCE

**Vector Institute** May 2018 - August 2018
*Research Intern*

Worked with Dr. Frank Rudzicz on an NLP project investigating text generation using GANs by interpreting them as word vectors. Attempted to incorporate grammatical information to aid generation. Investigated various metrics to judge quality of the samples including BLEU scores and perplexity. **Accepted to the 4th Workshop on Representation Learning for NLP at ACL 2019**

**Intel** May 2016 - July 2017
*Compiler Engineering Intern*

Year long internship in Intel's FPGA compiler team. Worked on optimizing routing algorithms to reduce clock skew. Modelled clock placement as a constraint satisfaction problem that resulted in 1.5% increase in the maximum operating frequency of the latest Intel FPGA chips.

**Arista Networks** May 2015 - August 2015
*Software Engineering Intern*

Worked in the software defined networking team. Created an API to program against VSphere, VMware's cloud platform, to enable easy testing and deployment of cloud networking solutions.

## AWARDS AND DISTINCTIONS

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| Recipient of the Ontario Provincial Graduate Scholarship | June 2019 |
| Recipient of the Vector Research Grant | May 2019 |
| Recipient of the Vector Scholarship in Artificial Intelligence | November 2018 |
| Recipient of the Arts and Science Graduate Fellowship | October 2018 |
| Recipient of the Wolfond Graduate Scholarship | September 2018 |
| Ranked 2nd in the graduating class of Electrical Engineering | June 2018 |
| Recipient of the University of Toronto President's scholarship | April 2014 |
| Recipient of the Governor General's Bronze Medal | June 2013 |
| Ranked in the Top 20 students in British Columbia | June 2013 |