

Angus Galloway

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Summary

I am an engineering graduate student with a research emphasis in robust machine learning and characterizing the *adversarial examples* phenomenon. My work has implications for the performance of critical tasks by machine learning-based systems such as autonomous driving and medical imaging. I have experience as a co-founder and scientific advisor to startups at the intersection of hardware and machine learning, and previously interned with several engineering teams in the semiconductor industry. I enjoy writing and have been recognized as an excellent presenter of technical topics to diverse audiences.

Education

2016–present: MSc Engineering *University of Guelph*, ON, Canada.

Research emphasis on robust and interpretable machine learning, with applications in computer vision and sequential data analysis, supervised by Graham W. Taylor PhD, and Medhat Moussa PhD, P. Eng.

2012–2016: Bachelors of Engineering Systems & Computing *University of Guelph*, ON, Canada.

Capstone project titled “*Epileptic Seizure Prediction via Mobile Non-Invasive Electroencephalogram*” supervised by Dr. April Khademi PhD, P. Eng. Senior courses in signal processing, mixed-signal integrated circuit design, computer and large-scale software architecture.

Publications

Adversarial Training Versus Weight Decay *Angus Galloway, Thomas Tanay, Graham W. Taylor*, arXiv preprint arXiv:1804.03308, 2018.

Predicting Adversarial Examples with High Confidence *Angus Galloway, Graham W. Taylor, and Medhat Moussa*, arXiv preprint arXiv:1802.04457, 2018.

Attacking Binarized Neural Networks *Angus Galloway, Graham W. Taylor, and Medhat Moussa*, in the International Conference on Learning Representations (ICLR) 2018, top 19% of 935.

The Ciona17 Dataset for Semantic Segmentation of Aquatic Invasive Species *Angus Galloway, Graham W. Taylor, Aaron Ramsay, and Medhat Moussa*, in the Conference on Computer and Robot Vision (CRV) 2017.

Teaching

2018 – Guest lecturer and principal TA for graduate machine vision (30 students)

2017–2018 – Guest lecturer and TA for senior undergraduate robotics (40–90 students)

2016 – Principal TA for senior undergraduate real-time systems design (60 students)

Professional Experience

2017–Present: Scientific Advisor *Dynamic Monitors*, Stratford, PE.

Consult on the *SepticSitter.com* project, a novel non-contact system for onsite wastewater monitoring.

- o Develop recurrent models for anomaly and event detection in time-series data.
- o Co-authored and devised test plan for a “Build in Canada Innovation Program” (BCIP) proposal selected for Pre-Qualified Pool, facilitating procurement of up to \$500K pre-commercial goods.
- o Design digital filters and machine learning models in *Python* and *C*, for temporal localization of ultrasonic reflections, suitable for deployment on a microcontroller with no floating-point unit.
- o Produce high quality graphics illustrating unique insights derived from the system for industry specific publications and magazines.

2017: Co-Founder *NextAI* venture, Toronto, ON.

CTO of a NextAI-backed venture providing speech transcription and context searching services for telephony applications. Ours was among 6 of 20 ventures invited to present to media and sponsors at the *NEXT Canada 2017 Prototype Day*.

2016: Systems Engineering Intern *NXP Semiconductors Inc.*, Austin, TX.

Was actively involved in the new product introduction (NPI) of a dual-radio bluetooth low-energy ARM based SoC. Developed a device characterization framework in C for ongoing use by the automated test team, and helped devise data collection procedures for official datasheet. Prototyped application level software for “low-power beacon” use cases (e.g as a Google Eddystone), and worked with design team to replicate and resolve an early-adopter systems integration challenge.

2015: Engineering Intern *Freescale Semiconductor Inc.*, Austin, TX.

Prototyped Internet-of-Things software reference designs (e.g in Linux and with an RTOS), and enabled *Kinetis family* microcontrollers with open source transport layer-agnostic connectivity frameworks. Maintained an R3 form factor CAN-bus PCB “shield” as part of the project, as well as a technical blog on Freescale’s public community that received tens of thousands of views and was translated to several languages.

2014: Microprocessor Engineering Intern *Freescale Semiconductor Inc.*, Austin, TX.

Responsible for the power characterization of a new heterogeneous ARM Cortex-A9/M4 SoC under various benchmarks and multimedia use cases, publishing results in an application note.

2013: Microcontroller Engineering Intern *Freescale Semiconductor Inc.*, Austin, TX.

Prototyped software use cases in C and conducted experiments for an online power estimator tool KINETIS-PET, initially for ARM M0+ microcontrollers. Fully characterized several device peripherals including the UART, SPI, I2C, ADC, and DAC, under a range of scenarios and servicing schemes.

Awards

2016: Helen Grace Tucker Design Award *University of Guelph*.

Award for the highest overall average in undergraduate engineering design courses for my major.

2016: 2nd place, NXP Semiconductors Inc.

Final project presentations to senior management and peers. Out of 30 interns in the microcontrollers business unit.

2015: 2nd place, Freescale Semiconductor Inc.
Global employee information technology hackathon.

2013: 1st place, Freescale Semiconductor Inc.
Final project presentations to senior management and peers. Out of 80 interns in the microcontrollers business unit.

Community Involvement

Vector Institute Summer School on Fairness & Privacy (Apr. 2018): Invited talk.

Canada Learning Code (Dec. 2017): Volunteer instructor for “Ladies Learning Code: Data Insights with Python for Beginners” workshop in Charlottetown, PE.

University of Guelph IEEE Student Branch Chair (2015–2016): Designed an inverted pendulum robotics kit including custom 3D printed components, and lead a workshop teaching circuits and digital control theory with microcontrollers to 60 students, in collaboration with the “Women in Science and Engineering” club. Additional activities included:

- o Ran an autonomous line-following car racing challenge, and developed starter code in MATLAB/Simulink for teams. Devised a related challenge for the Guelph Engineering Competition (GEC) and provided technical assistance to teams.
- o Plan and M.C. research talks, helped run an Android programming workshop.

Unmanned Systems Canada (2015–2016): Lead a multidisciplinary effort involving the development of an embedded object recognition and navigation system for a UAV competition with an agricultural focus.

Technical Skills

Python: Over 2+ years for masters-level research experiments and tooling, including core scientific computing suite e.g `numpy`, `scipy`, `sklearn`, `opencv`, `matplotlib` and GUIs in PyQT.

TensorFlow: Over 2+ years experience as differentiable programming framework of choice, and contributed several open-source TensorFlow based works providing custom low-level CUDA operations and e.g to the CleverHans library for evaluating the robustness of machine learning models against adversarial examples.

High Performance Compute: Conducting large scale deep learning experiments on distributed GPU clusters and troubleshooting performance bottlenecks.

C: Over 4+ years experience with C programming including data-structures, algorithm development, microcontroller interfacing (CAN-bus, I2C, etc), bare-metal, and managing complex wireless networking stacks (e.g BLE) with a RTOS.

Competencies and Interests

Leadership: Seek to harness individual strengths in multidisciplinary teams.

Systems: Design and debug complex systems involving custom H/W and S/W.

Other interests: Reading, writing, public-speaking, outdoor sports, electronics.