

Angus Galloway

✉ gallowaa@uoguelph.ca • 🌐 angusg.com

Summary

Lead researcher of several advances in robust machine learning, and defenses against the now well-known *adversarial examples phenomenon*, with implications for deep learning in performance-critical scenarios (e.g autonomous driving and making medical decisions). Experience as a co-founder of, and scientific advisor to machine learning/hardware startups, as well as a member of several engineering teams in a large semiconductor company. Formally recognized as an excellent communicator of technical topics to academic peers and senior business leaders.

Education

2016–present: MSc Engineering *University of Guelph, and Vector Institute for Artificial Intelligence*, ON, Canada.

Research emphasis on robust and interpretable machine learning models, supervised by Graham W. Taylor PhD, and Medhat Moussa PhD, P. Eng. Additional interest in model deployment in embedded systems, and reliable confidence estimates.

2012–2016: Bachelors in Engineering Systems and 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, nano-scale integrated circuit design, computer and microprocessor design, and large-scale software architecture.

Publications

Predicting Adversarial Examples with High Confidence, *Angus Galloway, Graham W. Taylor, and Medhat Moussa*, submitted to the International Conference on Machine Learning (ICML) 2018, doi arXiv:1802.04457, “top-6 recent-weekly” by arxiv-sanity.com community.

Attacking Binarized Neural Networks, *Angus Galloway, Graham W. Taylor, and Medhat Moussa*, to appear in the International Conference on Learning Representations (ICLR) 2018, doi arXiv:1711.00449, top 19% of 935 submissions, “top-10 recent-weekly” on arxiv-sanity.com.

The Ciona17 Dataset for Semantic Segmentation of Aquatic Invasive Species, *Angus Galloway, Graham W. Taylor, Aaron Ramsay, and Medhat Moussa*, Conference on Computer and Robot Vision (CRV) 2017, doi arXiv:1702.05564.

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 sensor for septic tank and drainfield monitoring, under U.S. and Canadian (pending) patents. Advise academic research collaborations, data management strategy, and scalable machine learning solutions for a growing time-series dataset.

- o Devised test plan and co-authored “Build in Canada Innovation Program” (BCIP) application for the procurement of up to \$500K pre-commercial goods by federal government organizations.
- 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 Review data and produce vector graphics in *Python* for industry relevant 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

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 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

Systems mindset: Able to design and debug complex systems involving custom hardware and software, quickly tracking down potential sources of error using standard bench equipment.

Leading multidisciplinary teams: Actively seek out opportunities to collaborate with others that have different experience and strengths, either with technical or less-technical backgrounds.

Other interests: Hacking electronics projects, cycling, rock-climbing, snowboarding, sailing, travel, public-speaking, writing.