Yushi (Gavin) Guan

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EDUCATION

Master of Engineering, University of Toronto *September 2018 – June 2021*
Major in Computer Engineering *CGPA 3.96/4.0*
Bachelor of Applied Science, Engineering Science, University of Toronto *September 2013 - June 2018*
Major in Robotics Engineering *Graduated with High Honours, CGPA 3.76/4.0*

TECHNICAL SKILLS

- Proficient in: **Python (PyTorch, Tensorflow), C++, C**
- Experienced with: **CMake, Matlab & Simulink, Perl, Shell Script, R, Verilog, MySQL**
- Solid Understanding of and Hands-on Experience with:
  - **Neural Network Hardware Acceleration**, Inference Time Graph Optimizers
  - **Computer Vision,** Object Classification, Object Detection, Acceleration of CV Neural Networks on Hardware
  - **Natural Language Processing,** HMMs, RNNs, Transformers, BERT
  - **Generative Adversarial Networks,** DCGAN, Wasserstein GAN
  - **Neural Network Security**, Adversarial Attacks and Defenses, Data Confidentiality

RESEARCH EXPERIENCE

Synthetic Epilepsy Generation with Generative Adversarial Networks

Master of Engineering Research Project *May 2020 - Present*

- Designed and trained Wasserstein GAN model for generation of synthetic multi-channel epilepsy signals for EU epilepsy dataset; Eliminating the dependency on large amount of real seizure
- The synthetic epilepsy signals reduced the false positive rate of seizure detection by 72.72% while maintaining 100% sensitivity
- Submitted to IEEE Neuro 2021

Visual Question Answer Generation using Visual-Linguistic Transformer

CSC2547 Current Algorithms and Techniques in Machine Learning *January 2020 – April 2020*

- Modeled Visual Question Answering (VQA) as a generative task, enabling generation of novel answers instead of simple selection from predefined list, achieving 41.3% accuracy on VQA v2 dataset despite the lack of predefined answers
- Utilized faster RCNN for visual feature extraction; Trained Visual-Linguistic BERT for cross modality information flow; Implemented Attention based decoder for generation of novel answers

End to End ASR System with Automatic Punctuation Insertion

CSC2518 Spoken Language Processing *January 2019 - April 2019*

- Implemented an Automatic Speech Recognition System with BiLSTM and CTC that transcribes texts and punctuations simultaneously in PyTorch; Reduced punctuation Slot Error Rate (SER) by 31.3% compared to the previous best-performing BiLSTM + Pause model
- Proposed the Damerau-Levenshtein Slot Error Rate (DLev-SER) metric that can evaluate punctuation transcription accuracy amongst imperfect word alignment

Adversarial Defense and Detection using Quantized NNs with Inference Time Dropout

ECE1784 Trustworthy Machine Learning *September 2019 - December 2019*

- Demonstrated Quantized NNs with lower bit-widths improve classification accuracy on adversarial inputs. Monte Carlo Simulation via randomized dropout further improves the accuracy
- Showed that Quantized NNs with higher bit-widths are more effective for detecting adversarial inputs due to the larger difference in uncertainties between the clean and adversarial inputs
- Achieved 82.4% and 93.9% detection accuracy for FGSM and JSMA adversarial inputs respectively

Road Path Planning for Autonomous Vehicles with Improved Intersection Considerations

Engineering Science Robotics Undergraduate Thesis *September 2017 - April 2018*

- Developed API for location search and path-finding via QGIS on North America map
- Proposed new path-finding objectives that consider vehicle direction and reduces exposure to hazards due to left-turns and U-turns

Automatic Reprogramming of Stratasys Chips for Filter Reloading

Summer Research Exchange*, University of Liverpool*, *the UK* *June 2015 - August 2015*

- Developed Python programs on Raspberry Pi that writes and reprograms Stratasys cartridge chips through Maxim 1-wire
- Completed 3D models with PTC Creo and Created an integrated hand-held device for easy reprogramming of Stratasys chips in labs

INDUSTRY EXPERIENCE

Deep Learning Acceleration Engineer

Intel, *Toronto*, *Canada* *July 2018 - Present*

- Implemented graph compiler support for General Matrix-Matrix Multiplication (Gemm) and Attention mechanism on Intel FPGAs; Enabled Gemm computation via utilizing Convolution Engines on chip
- Debugging and optimizing graph compiler for object classification and object detection neural networks
- Improved CMake files for stable and scalable build flows; Performance benchmark with MLPerf

Software Engineer

Self Driving Car AutoDrive Team, *University of Toronto* *August 2017 - December 2018*

- Enabled acceleration of ResNeXt, YOLO topologies on Intel FPGA through Intel OpenVINO framework
- Integrated Bumblebee stereo camera and Grasshopper camera drivers into Robotics Operating System, performed testing and verification of sensors' outputs

Graphics Card Test Automation Intern

AMD, *Markham, Canada* *May 2016 - August 2017*

- Implemented command broadcasting, test platform reboot, file transferring, and other features for a graphics card test automation tool in C++ to reduce manual testing effort
- Developed a Python program to parse txt, YML, and XML test results into SQL database

COMPETITION and AWARDS

Winner, UTEC Senior Design

University of Toronto Engineering Competition *January 2016*

- Achieved 1st place amongst 20 teams, designed an infrared remote-controlled robot

Designer, Fully-Automated Connect-4 Playing Robot

AER201 Engineering Science Engineering Design *January 2015 - April 2015*

- Top 3 amongst 50 teams, Designed and built a fully-autonomous robot that collects ping-pong balls from the field and plays connect-4 with them

Master of Engineering – Department of Electrical and Computer Engineering **CGPA 3.96**		
ECE2500Y	Master of Engineering Project	IPR
CSC2516H	Neural Networks and Deep Learning	A+
CSC2547H	Current Algorithms & Techniques in Machine Learning	A+
ECE568H	Computer Security	A+
ECE1784H	Trustworthy Machine Learning	A
APS1051H	Portfolio Manage. Praxis Under Real Market Constraints	A+
CSC2518H	Spoken Language Processing	A+
ECE552H1	Computer Architecture	A
APS1501H	Leadership and Leading in Groups and Organizations	A-

BASc in Engineering Science – Robotics Engineering **CGPA 3.76 Graduated with High Honours**			
AER521H1	Mobile Robotics & Perception	86	A
CSC401H1	Natural Language Computing	88	A
ESC499Y1	Thesis	89	A
JRE300H1	Foundations of Accounting & Finance	92	A+
MIE443H1	Mechatronics System: Design & Integration	88	A
ECE470H1	Robot Modeling and Control	82	A-
ECE557H1	Systems Control	88	A
JRE410H1	Markets & Competitive Strategy	88	A
ROB501H1	Computer Vision for Robotics	88	A
AER372H1	Control Systems	88	A
CSC384H1	Introduction to Artificial Intelligence	91	A+
CSC411H1	Machine Learning	89	A
ECE353H1	Systems Software	84	A-
MIE346H1	Analog & Digital Electronics for Mechatronics	89	A
AER301H1	Dynamics	90	A+
CHE374H1	Economic Analysis & Decision Making	91	A+
CSC263H1	Data Structures & Analysis	89	A
MIE342H1	Circuits with Appl. to Mechanical Eng. Sys.	94	A+
ROB301H1	Introduction to Robotics	82	A-
ROB310H1	Mathematics for Robotics	99	A+
AER201H1	Engineering Design	84	A-
BME205H1	Biomolecules and Cells	88	A
ECE259H1	Electricity and Magnetism	94	A+
HPS100H1	Intro History and Philosophy of Science	85	A
PHY294H1	Quantum and Thermal Physics	85	A
STA286H1	Probability & Statistics	89	A
AER210H1	Vector Calculus & Fluid Mechanics	91	A+
CHE260H1	Thermodynamics	91	A+

ECE253H1	Digital & Computer Systems	80	A-
ESC203H1	Eng. Society & Critical Thinking	79	B+
MAT292H1	Calculus III	83	A-
PHY293H1	Waves and Modern Physics	83	A-
CSC190H1	Comp. Algor. & Data Structures	77	B+
ECE159H1	Fundamentals of Elec. Circuits	78	B+
ESC102H1	Praxis II	68	C+
MAT185H1	Linear Algebra	67	C+
MAT195H1	Calculus II	86	A
MSE160H1	Molecules and Materials	85	A
CIV102H1	Structures & Materials	98	A+
CSC180H1	Introduction to Computer Programming	92	A+
ESC101H1	Praxis I	57	D+
ESC103H1	Eng. Mathematics & Computation	82	A-
MAT194H1	Calculus I	91	A+
PHY180H1	Classical Mechanics	90	A+