# Gavin (Yushi) Guan

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## EDUCATION

**Master of Engineering, University of Toronto** *September 2018 – December 2020*
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
  - **Neural Network Security**, Adversarial Attacks and Defenses, Data Confidentiality
  - **Computer Vision,** Object Detection, Cross-Modality (joint analysis with language), Acceleration of CV Neural Networks on Hardware
  - **Natural Language Processing,** HMMs, RNNs and Transformers
  - Machine Learning Methods and Tools, SVMs, Random Forests, Embeddings, Autoencoders

## RELEVANT EXPERIENCE

### Synthetic Epilepsy Generation with Generative Adversarial Networks

Master of Engineering Project *September 2020 - Present*

- Trained Wasserstein GAN models for generation of synthetic multi-channel seizures
- Generated synthetic seizures that possess many high frequency features in real seizures, reduced detection false positive rate and latency by 20% while maintaining sensitivity
- Preparing for paper submission for IEEE Neural Engineering Conference on November 20th, 2020

### Visual Question Answer Generation using Visual-Linguistic Transformer

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

- Trained self-attention based architecture to learn visual-linguistic multimodal embedding
- Modeled Visual Question Answering (VQA) as a generation task, enabling model to generate novel answers instead of selecting from predefined list, achieving 41.3% accuracy on VQA v2 dataset despite the lack of predefined answers

### 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

### 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, and by 50.9% compared to the best HMM-based model
- Proposed the Damerau-Levenshtein Slot Error Rate (DLev-SER) metric that can evaluate punctuation transcription error rate amongst imperfect text alignment

**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 potential hazard with 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 printed the models with Stratasys 3D Printers

## 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
- Evaluated memory prefetch scheduling via graph topology based data-prefetching scheme
- Improved CMake files for more scalable build flows; Benchmarked Intel FPGA's performance in MLPerf; Enabled compilation of runtime in Windows
- Improved test infrastructure and reduced 16 hours of machine time in daily testing

**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*

- Designed and implemented an infrared remote-controlled robot car during a two-day competition
- Achieved 1$^{st}$ place amongst 20 teams, presented the design to a panel of professional engineers

**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**<br>**CGPA 3.96** | | |
|---|---|---|
| **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 |
| **APS1051H** | Leadership and Leading in Groups and Organizations | A- |

| **BASc in Engineering Science – Robotics Engineering**<br>**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+ |

UNIVERSITY OF TORONTO

# Complete Academic History

Yushi Guan **Accurate as of:** Nov 16, 2020

This is not an official transcript.

## Registration History

2013 Fall-2018 Winter: Faculty of Applied Science & Engineering 2018 Fall-2021 Winter: School of Graduate Studies

Bachelor of Applied Science in Engineering Science Conferred - June 2018 with High Honours

Faculty of Applied Science & Engineering

Completed - 2018 Summer - Certificate in Engineering Business

**2013 Fall - Dean's Honour List**
**2014 Fall - Dean's Honour List**

**2015 Winter - Dean's Honour List**
**2015 Fall - Dean's Honour List**

**2016 Winter - Dean's Honour List**
**2017 Fall - Dean's Honour List**

**2018 Winter - Dean's Honour List**

### 2013 Fall - BASc in Engineering Science - Division of Engineering Science

**Sessional GPA 3.50 Cumulative GPA 3.50**

**Sessional % Average 85.0**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| CIV102H1 | STRUCT. & MATERIALS | 0.50 | 98 | A+ | B |
| CSC180H1 | INT.TO COMP.PROGRAM. | 0.50 | 92 | A+ | B |
| ESC101H1 | PRAXIS I | 0.50 | 57 | D+ | B |
| ESC103H1 | ENG. MATHEMATICS & COMPUTATION | 0.50 | 82 | A- | B- |
| MAT194H1 | CALCULUS 1 | 0.50 | 91 | A+ | B- |
| PHY180H1 | CLASSICAL MECHANICS | 0.50 | 90 | A+ | B+ |

May proceed

## 2014 Winter - BASc in Engineering Science - Division of Engineering Science

**Sessional GPA 3.20 Annual GPA 3.35 Cumulative GPA 3.35**

**Sessional % Average 76.8**

**Status: Pass**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| CSC190H1 | COMP. ALGOR. & DATA STRUCTURES | 0.50 | 77 | B+ | B- |
| ECE159H1 | FUNDAMENTALS OF ELEC. CIRCUITS | 0.50 | 78 | B+ | C+ |
| ESC102H1 | PRAXIS II | 0.50 | 68 | C+ | B |
| MAT185H1 | LINEAR ALGEBRA | 0.50 | 67 | C+ | B- |
| MAT195H1 | CALCULUS II | 0.50 | 86 | A | B |
| MSE160H1 | MOLECULES AND MATERIALS | 0.50 | 85 | A | B |

May proceed

## 2014 Fall - BASc in Engineering Science - Division of Engineering Science

**Sessional GPA 3.73 Cumulative GPA 3.48**

**Sessional % Average 84.5**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| AER210H1 | VECTOR CALC. & FLUID MECHANICS | 0.50 | 91 | A+ | B+ |
| CHE260H1 | THERMODYNAMICS | 0.50 | 91 | A+ | B+ |
| ECE253H1 | DIGITAL & COMPUT.SYS | 0.50 | 80 | A- | B |
| ESC203H1 | ENG. SOCIETY&CRITICAL THINKING | 0.50 | 79 | B+ | B+ |
| MAT292H1 | Calculus III | 0.50 | 83 | A- | B |
| PHY293H1 | WAVES AND MODERN PHYSICS | 0.50 | 83 | A- | B |

May proceed

In March 2015, the University of Toronto was affected by a labour disruption. As a result, some students were graded on the University's approved Credit/No Credit scale (see transcript key), rather than receiving a letter or numeric grade, for courses completed in Winter 2015. For more information, see: http://www.transcripts.utoronto.ca/guide

### 2015 Winter - BASc in Engineering Science - Division of Engineering Science

**Sessional GPA 3.95 Annual GPA 3.84 Cumulative GPA 3.60**

**Sessional % Average 87.5**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| AER201H1 | ENGINEERING DESIGN | 0.50 | 84 | A- | B+ |
| BME205H1 | BIOMOLECULES AND CELLS | 0.50 | 88 | A | B+ |
| ECE259H1 | ELECTRICITY AND MAGNETISM | 0.50 | 94 | A+ | B |
| HPS100H1 | Intro Hist Phil Sci | 0.50 | 85 | A | B |
| PHY294H1 | QUANTUM AND THERMAL PHYSICS | 0.50 | 85 | A | B- |
| STA286H1 | PROBABILITY & STATISTICS | 0.50 | 89 | A | B+ |

May proceed

### 2015 Summer - BASc in Engineering Science - Division of Engineering Science Exchange: Exchange Agreement with University of Liverpool Outgoing exchange

student (International)

### 2015 Fall - BASc in Engineering Science(Major in Robotics Engineering) - Division of Engineering Science

**Sessional GPA 3.95 Cumulative GPA 3.67**

**Sessional % Average 90.8**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| AER301H1 | DYNAMICS | 0.50 | 90 | A+ | B+ |
| CHE374H1 | ECO.ANA.& DEC.MAKING | 0.50 | 91 | A+ | B+ |
| CSC263H1 | Data Structures & Analysis | 0.50 | 89 | A | C+ |
| ESC301H1 | ENG. SCI:OPTION SEMINAR | 0.25 | | IPR | |

| | | | | | |
|---|---|---|---|---|---|
| MIE342H1 | CIR.WITH APPL.TO MECH.ENG.SYS. | 0.50 | 94 | A+ | B |
| ROB301H1 | INTRODUCTION TO ROBOTICS | 0.50 | 82 | A- | B+ |
| ROB310H1 | MATHEMATICS FOR ROBOTICS | 0.50 | 99 | A+ | B |

May proceed

## 2016 Winter - BASc in Engineering Science(Major in Robotics Engineering ) - Division of Engineering Science

**Sessional GPA 3.94 Annual GPA 3.95 Cumulative GPA 3.71**

**Sessional % Average 88.2**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| AER372H1 | CONTROL SYSTEMS | 0.50 | 88 | A | B+ |
| CSC384H1 | Intro Artif Intell | 0.50 | 91 | A+ | B |
| CSC411H1 | Machine Learning | 0.50 | 89 | A | B |
| ECE353H1 | SYSTEMS SOFTWARE | 0.50 | 84 | A- | B+ |
| ESC301H1 | ENG. SCI:OPTION SEMINAR | 0.25 | | CR | * |
| MIE346H1 | ANAL.&DIGITAL ELECTR.FOR MECH. | 0.50 | 89 | A | B+ |

May proceed

## 2016 Fall - BASc in Engineering Science(Major in Robotics Engineering) - Division of Engineering Science

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| PEY500Y1 | PROFESSIONAL EXP.YR. | 0.00 | | IPR | |

## 2017 Winter - BASc in Engineering Science(Major in Robotics Engineering ) - Division of Engineering Science

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| PEY500Y1 | PROFESSIONAL EXP.YR. | 0.00 | | CR | |

## 2017 Fall - BASc in Engineering Science(Major in Robotics Engineering) - Division of Engineering Science

**Sessional GPA 3.93 Cumulative GPA 3.73**

**Sessional % Average 86.5**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| ECE470H1 | ROBOT MODELING AND CONTROL | 0.50 | 82 | A- | B |
| ECE557H1 | SYSTEMS CONTROL | 0.50 | 88 | A | B |
| ESC499Y1 | THESIS | 1.00 | | IPR | |
| JRE410H1 | MARKETS & COMPETITIVE STRATEGY | 0.50 | 88 | A | B+ |
| ROB501H1 | COMPUTER VISION FOR ROBOTICS | 0.50 | 88 | A | B+ |

May proceed

## 2018 Winter - BASc in Engineering Science(Major in Robotics Engineering ) - Division of Engineering Science

**Sessional GPA 4.00 Annual GPA 3.97 Cumulative GPA 3.76**

**Sessional % Average 88.7**

**Status: Pass with Honours**

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| AER521H1 | MOBILE ROBOTICS & PERCEPTION | 0.50 | 86 | A | B+ |
| CSC401H1 | Natural Lang Compt | 0.50 | 88 | A | B |
| ESC499Y1 | THESIS | 1.00 | 89 | A | A- |
| JRE300H1 | FUND. OF ACCOUNTING & FINANCE | 0.50 | 92 | A+ | B |
| MIE443H1 | MECHATRONICS SYS:DESIGN&INTEG | 0.50 | 88 | A | A- |
| PER001H1 | PRACTICAL EXPER. REQUIREMENT | 0.00 | | CR | |

May proceed

School of Graduate Studies

## 2018 Fall - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| APS1501H | Leadership and Leading in Groups and Organizations | 0.50 | | A- | |
| ECE552H1 | COMPUTER ARCHITECTURE | 0.50 | | A | |

**Credits Earned: 1.00**

## 2019 Winter - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| CSC2518H | Spoken Language Processing | 0.50 | | A+ | |

**Credits Earned: 0.50**

## 2019 Summer - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| APS1051H | Portfolio Management Praxis Under Real Market Constraints | 0.50 | | A+ | |

**Credits Earned: 0.50**

## 2019 Fall - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| ECE1784H | Trustworthy Machine Learning | 0.50 | | A | |

**Credits Earned: 0.50**

## 2020 Winter - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

In the 2019-20 academic year, the University of Toronto was affected by the global COVID-19 pandemic. Instructional methods were modified and some students were graded on the University's approved Credit/No Credit scale for courses completed in Winter 2020. For more information, see: http://www.transcripts.utoronto.ca/guide

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| CSC2516H | Neural Networks and Deep Learning | 0.50 | | A+ | |
| CSC2547H | Current Algorithms and Techniques in Machine Learning<br>Machine Learning for Vision as Inverse Graphics | 0.50 | | A+ | |
| ECE568H1 | COMPUTER SECURITY | 0.50 | | A+ | |

**Credits Earned: 1.50**

## 2020 Fall - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| ECE2500Y | Master of Engineering Project | 1.50 | | IPR | |

**Credits Earned: 0.00**

## 2021 Winter - Master of Engineering - Edward S. Rogers Sr. Dept. of Electrical & Computer Engin.

| Crs Code | Title | Wgt | Mrk | Grd | CrsAvg |
|---|---|---|---|---|---|
| CSC2547H | Current Algorithms and Techniques in Machine Learning<br>Seminar on 3D Computer Vision | 0.50 | | IPR | |

**Credits Earned: 0.00**

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