

# MARTIN (ZIWEN) MA

@ martinma@mit.edu ☎ +1 (857)-285-8939 in martinzwm 📁 github.com/martinzwm  
🔗 martin-ma-ziwen.github.io

## EDUCATION

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**Massachusetts Institute of Technology**

Cambridge, Massachusetts

MS Chemical Engineering Practice

Sept 2021 - Aug 2022

- **Relevant Courses:** Numerical Methods, Systems Engineering, Systems Engineering

**University of Waterloo**

Waterloo, Canada

BASc Chemical Engineering

Sept 2016 - Apr 2021

- Cumulative GPA: 95%, Rank: 2/50, Dean's Honours List
- Option (similar to Minor) in Artificial Intelligence, Option in Management Science, Specilization in Process Modelling, Optimization and Control
- **Relevant Courses:** Advanced Optimization, Intro to ML, Data Mining, Autonomous Vehicles, Methods and Tools for Software Engineering, Algorithm Design & Analysis, CNN for Computer Vision (Stanford), Reinforcement Learning (Stanford)

## AWARDS & HONOURS

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Vice President of Chemical Engineering Student Society (2018-2021)

First-in-class Scholarship (2019, 2020)

Engineering Upper year Faculty Scholarship (2019)

President's Scholarship (2017)

## RESEARCH EXPERIENCE

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**Professor George Shaker**

Waterloo, Canada

*Machine Learning Applications in Wireless Sensing*

Sept 2020 - Feb 2021

- Developed a novel Convolutional LSTM network to localize passenger and classify occupant type using multi-input multi-output (MIMO) frequency modulated continuous wave (FMCW) radar, improved accuracy by 20% compared to the previous method.
- Model detected unattended children in-vehicle with 0.9 precision and 0.95 recall.

**Professor Krzysztof Czarnecki**

Waterloo, Canada

*Autonomous Vehicle*

June 2020 - Aug 2020

- Designed and implemented an active learning framework for LiDAR-based 3D object detection and improved sample efficiency by 5% through designing uncertainty-based acquisition functions.
- Characterized epistemic and aleatoric uncertainty using Monte Carlo dropout in PointPillars network.
- Developed a visualization tool for users to easily interpret the 3D object detection results and gain confidence in model output, using Captum.

**IPEX - Dr. Louis Daigneault**

Mississauga, Canada

*Fire-Resistant PVC Pipe*

Sept 2017 - Dec 2017

- Composed a new PVC piping formulation that enhanced smoke resistivity by 30% while maintaining other physical properties through conducting a design-of-experiment (DOE).
- Scaled up the proposed formulation in plant-scale trials and troubleshoot rheology difficulties.

**University of Waterloo - Professor Boxin Zhao**

Waterloo, Canada

*Electrically Conductive Adhesive*

Jan 2017 - April 2017

- Improved Electrically Conductive Adhesive (ECA) formulation to achieve 15% increase in conductivity compared to currently commercialized products, while maintaining viscosity, mechanical strength, adhesiveness and curing profile.
- Performed Ultraviolet-Ozone surface treatments on various substrates and stencil printed ECA on flexible and stretchable materials (i.e. PDMS).

## INDUSTRIAL EXPERIENCE

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**Suncor Energy**  
*Production Engineer*

Calgary, Canada  
Sept 2019 - Dec 2019

- Reduced the unreachable underground oil field temperature prediction error by 30% through constructing a physics-based neural network, this led to a 1.3 million dollar annual benefit.
- Enabled refinery system malfunction alert 1-3 days in advance with 83% precision using an autoencoder for anomaly detection with Keras.
- Automated tasks of calculating oil sample saturation level from lab pictures, with normalization for different lighting conditions with OpenCV.

**Petro-Canada Lubricants**  
*Process Engineer*

Mississauga, Canada  
Jan 2019 - Apr 2019

- Reduced power consumption by 12% through optimizing parameters in the operating function of the anti-surge compressor controller in the dewaxing unit.
- Improved heat exchanger reliability and forecasted degree of fouling by automating heat coefficient calculations through transmitter data and energy balance.

**SABIC**  
*Manufacturing Engineer*

Cobourg, Canada  
May 2018 - Aug 2018

- Reduced downtime by 3 hours / week by designing a greedy selection algorithm to predict QC results with 90% accuracy and eliminate QC waiting time for high success formulation.
- Improved the plant yield by 5% through modifying over 50 high failure formulations and operation conditions.

## PROJECTS

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**Manufacturing Design of Gluten-Free Beer** - *Professor Christine Moresoli*

Developed a beer production model using fungal peptidase to produce beer with a gluten content  $< 20$  ppm for people with Celiac Disease, at a cost lower than commercially available gluten-reduced beer.

**Robust Shortest Path** *Professor James Bookbinder*     [github.com/martinzwm/robust-shortest-path](https://github.com/martinzwm/robust-shortest-path)  
Applied Benders decomposition to solve real-world shortest path problem, in which arc length is a random variable within an upper and lower bound.

**Tetris.ai** - *Personal Project*

[github.com/martinzwm/tetris-ai](https://github.com/martinzwm/tetris-ai)

Trained an RL agent from raw pixels with Double Deep Q-Learning and Prioritized Experience Replay to achieve super-human performance in Tetris.

**Path Planner** - *Personal Project*

[github.com/martinzwm/lane-detection](https://github.com/martinzwm/lane-detection)

Pipeline: Gaussian blur, Canny edge detection, RoI identification, Hough transform, Lane following / planning.

## TECHNICAL SKILLS

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Tools: Docker, CPLEX, Simulink, COMSOL, MATLAB, ASPEN  
Languages: Python, Java, C++, SQL  
ML Library: PyTorch, Tensorflow, Keras, Captum

## EXTRA CURRICULARS

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Champion of intramural hockey  
Assistant soccer coach for U15  
Intramural basketball  
Guitarist in a band  
Rock climbing