Martin (Ziwen) Ma

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Education

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

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

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 troubleshot rheology difficulties.

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

Suncor Energy Calgary, Canada
Production Engineer 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 Mississauga, Canada
Process Engineer 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 Cobourg, Canada
Manufacturing Engineer 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

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

Technical Skills

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

Extra Curriculars

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