Martin (Ziwen) Ma

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I am passionate about developing computational models for autonomous laboratory.

Education

Massachusetts Institute of Technology Cambridge, US
MS Chemical Engineering Practice Sept 2021 - Aug 2022

- **Relevant Courses**: Numerical Methods, Systems Engineering, Machine Learning for Molecular 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**: Intro to ML, Intro to AI, Advanced Optimization, Data Mining, Autonomous Vehicles, Game Theory, Methods and Tools for Software Engineering, Algorithms & Data Structures, 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 (2020, 2021)
Engineering Faculty Upper Year Scholarship (2020)
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 May 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 and minimized expected calibration error by calibrating network output using temperature scaling.
- Developed a visualization tool for users to easily interpret 3D object detection result and gain confidence in model output, using saliency and integrated gradient with Captum.

Industrial Experience

Suncor Energy Calgary, Canada
Production Engineer Sept 2019 - Dec 2019

- Reduced unreachable underground oil field temperature prediction error by 30% through constructing a physics-based regression neural network, this led to 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 in operating data with Keras.
- Automated tasks of calculating oil sample saturation level from lab pictures, with normalization for different lighting conditions using OpenCV.

Petro-Canada Lubricants Mississauga, Canada
Process Engineer Jan 2019 - Apr 2019

- Reduced plant power consumption by 12% through optimizing the plant controller operating functions based on the cost/benefit analysis.
- Predicted quality-control results with 90% accuracy by designing a greedy selection algorithm and optimized parameters using dynamic simulation in Python.

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.

Skills

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

Extra Curriculars

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