

Mingshi Chi

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EDUCATION

York University

Masters of Applied Science, Electrical Engineering and Computer Science

- 4.0 cGPA

Sept. 2023 – June 2025

Toronto, ON

University of Toronto

Bachelor of Applied Science, Engineering Science, Robotics and Machine Learning

- 90% average across 6 design project courses

Sept. 2018 – June 2023

Toronto, ON

RESEARCH EXPERIENCE

Masters Research Student

Tsotsos Lab - Active and Attentive Vision Lab (Prof. Tsotsos)

- Conducted extensive literature review on stereo disparity algorithms and quantization to identify scope for research contribution
- Developed framework for error analysis, robot kinematics calibration, and reliable control on 9 DoF robotic head improving the hardware, embedded software, ROS system on the robot
- Created proof of concept simulations to test algorithms in Blender and Gazebo
- Implemented fixation changes in robot eyes and developing methods of 3D stereo reconstruction in mobile and convergent 6 DoF cameras

Sept 2023 – Present

Toronto, ON

Undergraduate Thesis Researcher

Tsotsos Lab - Active and Attentive Vision Lab (Prof. Tsotsos)

- Titled: Scene Classification using 3D Object Detection and Spatial Relations
- A scene recognition pipeline for vision-based scene classification with inspirations from cognitive science and neuroscience
- Encoded 3D spatial relationships of objects detected using the Frustum PointNets detector fine-tuned on the SUN RGB-D dataset
- Trained a R-CNN model to classify scenes based on objects and their spatial relationship.
- Obtained 65% accuracy with more efficient features and is comparable to the 67% accuracy SOTA method at the time.

Sept 2022 - May 2023

Toronto, ON

Research Assistant

Tsotsos Lab - Active and Attentive Vision Lab (Prof. Tsotsos)

- Designed controls and algorithms for collision avoidance for an autonomous assistive wheelchair
- Implemented local and global path planning, cost map formulation, pedestrian motion prediction, and object detection
- Utilized sensor fusion techniques for visual, IMU, and wheel odometry data for localization

Sept 2021 - May 2022

Toronto, ON

Research Assistant

National Research Council (Prof. Tamblyn)

- Aided in physics and chemistry reinforcement research by improving games and environments for agents to train on
- Familiarized myself with various RL algorithms and helped train agents to efficiently make chemical compounds, and to have smooth navigation of underground submarine

May 2019 - Sept 2019

Ottawa, ON

INDUSTRY EXPERIENCE

Robotics Software Intern | *Docker, ROS2, Linux, C++, Python, CI*

Applanix Corp./Trimble Autonomous Solutions

- Refactored code base for LiDAR keyframe SLAM which included updating timing functions providing analysis and unit tests, updating the CI pipeline, and updating internal SE(3) and SO(3) libraries to incorporate best coding practices
- Automated the process of testing LiDAR keyframe SLAM and integrating new changes into the CI pipeline

May 2022 - Sept 2022

Richmond Hill, ON

Machine Learning and Embedded Systems Intern | *Python, Signal Processing*

Cognitive Systems Corp.

- Designed and deployed Markov Chain Monte Carlos algorithm to detect different sleep stages using breath and motion data extracted from wifi signal disturbances. Algorithm yielded 80% accuracy
- Improved previous sleep detection algorithm by 20% by addressing false negatives and false positives

May 2021 - Sept 2021

Waterloo, ON

- Validated results with dynamic time warping and cross validation

Software Development Intern | *iOS, SWIFT, coreML, AWS*

May 2020 - Sept 2020

Amazon Web Services

Berlin, Germany

- Designed iOS app in SWIFT to use computer vision object detection and classification algorithms to identify household products based on camera video stream
- Leveraged serverless catalog database with DynamoDB to increase query efficiency

TEACHING EXPERIENCE

Lab Teaching Assistant

Sept 2023 - Present

York University

Toronto, ON

- Computational Thinking through Mechatronics: Provided tutorials and help sessions for beginner hardware level projects and Matlab
- Introduction to Computing for Psychology: Provided tutorials and marked assignments done in Matlab

PROJECTS

Drone Capstone Design

Jan 2023 - May 2023

- Built a small quad-copter drone for nuclear plant inspection and demonstrated its capabilities including station-keeping, waypoint navigation, obstacle avoidance, and environment understanding
- We used a Nvidia Jetson, RealSense stereo camera, and a PixHawk as our main hardware. We developed obstacle detection algorithms and created the entire ROS pipeline from scratch.

Image Super Resolution for Thermal Images in Autonomous Driving

Jan 2022 - May 2022

- Experimented with different Super-Resolution methods (RedNet, ResNet, SR Resnet, Pix2Pix) to improve the quality of thermal images to be used in self driving applications as a cheaper sensor alternative
- Generative network resulted in improved performance in downstream object detection tasks compared to baseline bi-cubic upscaling

Microprocessors and Embedded Controllers

Sept 2021 - Dec 2021

- Designed and built a productivity cube that tracks the hours someone spends on certain tasks. Paired with an online user interface that displays personal data and goals. The system architecture is governed by a finite state machine.
- We used two I2C compatible microcontrollers, a WiFi module, and a rechargeable battery

Robotic Electric Car Charger

Jan 2020 - May 2020

- With a team of 3, we designed, manufactured, and tested an autonomous robot capable of placing a Tesla car charger into the charging port and removing it after the charging is finished.
- We used Arduino, Pixy camera, Arduino sensors, Python OpenCV, CAD, DC motors, and stepper motors.

EXTRACURRICULAR

Robotics for Space Exploration Team

2019 - 2021

- Autonomy Team: Using Kalman Filtering to navigate through simulated Mars terrain. Worked on mini rovers and Raspberry Pis
- Arm Controls Team: created URDF of rover arm from scratch and used MoveIT to obtain a Jacobian of the end effector for simple commands during autonomous tasks

Brick Hacks (winner)

2019

- Full stack developer for Android mobile app that tracks daily moods and keeps journal of events for mental health tracking and data analysis

Concordia Hacks

2019

- Backend developer for a web-app using HTML, CSC, and PHP that scans barcodes of disposable garbage using QuaggaJK API to identify if the item is recyclable or not

SKILLS AND INTERESTS

Software Development: Python, C/C++, ROS, OpenCV, Pytorch, TensorFlow, Assembly, Matlab, Java, SWIFT, HTML, Mechatronics Design: CAD, Fabrication, PCB design, Debugging, Embedded systems

Robotics Knowledge: Control theory, Classical AI methods, CV, sensor fusion, robot modeling, localization, mapping, path planning, Gazebo etc

Research: literature review, technical writing and documentation, communication, adaptability, independence

Hobbies and Interests: Cognitive computer science, robotics, psychology, rock climbing, art (painting, wire sculpting, wood working, digital design), fishing, hiking, latte art, bonsai and gardening