Mingshi Chi

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EDUCATION

York University — Sept. 2023 – June 2025

Masters of Applied Science, Electrical Engineering and Computer Science — *Toronto, ON*
- 4.0 cGPA

University of Toronto — Sept. 2018 – June 2023

Bachelor of Applied Science, Engineering Science, Robotics and Machine Learning — *Toronto, ON*
- 90% average across 6 design project courses

RESEARCH EXPERIENCE

Masters Research Student — Sept 2023 – Present

Tsotsos Lab - Active and Attentive Vision Lab (Prof. Tsotsos) — *Toronto, ON*
- 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

Undergraduate Thesis Researcher — Sept 2022 - May 2023

Tsotsos Lab - Active and Attentive Vision Lab (Prof. Tsotsos) — *Toronto, ON*
- 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.

Research Assistant — Sept 2021 - May 2022

Tsotsos Lab - Active and Attentive Vision Lab (Prof. Tsotsos) — *Toronto, ON*
- 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

Research Assistant — Sept 2021 - May 2022

National Research Council (Prof. Tamblyn) — *Ottawa, ON*
- 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

INDUSTRY EXPERIENCE

Robotics Software Intern | *Docker, ROS2, Linux, C++, Python, CI* — May 2022 - Sept 2022

Applanix Corp./Trimble Autonomous Solutions — *Richmond Hill, ON*
- 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

Machine Learning and Embedded Systems Intern | *Python, Signal Processing* — May 2021 - Sept 2021

Cognitive Systems Corp. — *Waterloo, ON*
- 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

- Validated results with dynamic time warping and cross validation

Software Development Intern | *iOS, SWIFT, coreML, AWS*   May 2021 - Sept 2021
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