

Charles Zhang

University of Waterloo | 4A (Class of 2023)

B. Computer Science, AI Specialization | 4.0/4.0 GPA

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Summary of Qualifications

- Experience with real time systems, embedded software, computer vision, and machine learning
- Strong knowledge of low latency networking systems through internships at Apple and Cisco
- Leading a team of 60 students building a level 4 self-driving car for the SAE Autodrive Challenge
- **Programming:** C++, C, Python, Bash, Swift, SQL, HTML, CSS
- **Technical:** Unix, ROS, PyTorch, Git, MacOS, Docker, Kubernetes, MATLAB, Simulink, CARLA, GitLab CI

Work Experience

Apple Inc. | *Software Engineer Intern* | *Cupertino, California (Remote)* *May 2021 – Present*

- Developing the first feature on MacOS to use the WiFi Aware low latency networking protocol
- Implemented secure encryption and authentication for peer discovery using public key cryptography
- Wrote kernel level C APIs for WiFi Aware used by third party chipset vendors

Apple Inc. | *Software Engineer Intern* | *Cupertino, California (Remote)* *June 2020 – August 2020*

- Improved a Swift application that parses gigabytes of Apple device logs into meaningful Wi-Fi visualizations.
- Developed automatic packet bug triaging between low latency Wi-Fi devices
- Implemented concurrent processing of multiple log archives using Swift condition variables and semaphores

uWaterloo WISE Lab | *Autonomous Vehicle Research Assistant* | *Remote* *May 2020 – June 2020*

- Trained and built a real-time LIDAR object detection network in ROS (Python, PyTorch) using the PointPillars convolutional network, achieving 0.75 mean Average Precision (mAP) for Cars on the NuScenes dataset
- Created a real time multi-object tracker utilizing a linear Kalman Filter, Hungarian algorithm, and Mahalanobis distance metric, improving tracking framerate from 15hz to >100hz

Cisco Systems | *Software Engineer in Test* | *Ottawa, Ontario* *May 2019 – August 2019*

- Built unit tests for Cisco ASR9000 routers, used for routing major internet traffic by Verizon, Google, Bell
- Improved Jenkins test infrastructure stability, reducing test case instability from 15% to < 1%

Ciena Networks | *Software Automation* | *Ottawa, Ontario* *July 2018 – August 2018*

- Automated migration of Ciena's requirement database from IBM DOORS to Jama with Python, DXL
- Updated Ciena's Budgeting Website's frontend using Angular 6, Angular Material, and TypeScript

Waterloo Design Teams

WATonomous | *Team Captain* | *Waterloo, Ontario* *January 2019 – Present*

- Team Captain leading an 80-student team converting a Chevrolet Bolt into a level 4 autonomous vehicle
- Finished 2nd out of 8 universities competing in the SAE Autodrive Competition
- Built an object tracker capable of sensor fusion with dynamic obstacles from LIDAR, Camera, and RADAR.
- Developed a Dockerized development and production environment using Docker-Compose, Gitlab CI.
- Architected a software-in-the-loop AV simulation pipeline using ROS, CARLA, MATLAB, Simulink, and Docker
- Implemented a lattice-based optimal trajectory generator in the Frenet space using ROS C++ and Python

Projects

Self-supervised Monocular Depth Estimation

December 2020

- Trained and built a self-supervised monocular depth estimation neural network based on the CVPR 2017 paper by Godard et al: "Unsupervised Monocular Depth Estimation with Left-Right Consistency". arXiv:1609.03677
- Implemented with PyTorch and trained on the KITTI dataset

Article Generator iOS App

July 2018 – January 2019

- Created an iOS app in Swift that generates style-mimicking text using a Recurrent Neural Network
- Used Python, Keras, Tensorflow to train the model, CoreML to integrate the model into the app
- Trained the model on Amazon Web Services using Docker

Tetris Neural Network

March 2018

- In a week, developed a Neural Network from scratch that plays Tetris using a Genetic Algorithm
- Built a Tetris game simulator in Python with a standardized API to allow programmatic interaction

EzJigsaw iOS App

August 2017 – October 2017

- Built a Swift iOS app that allows users to build customized Jigsaw games from their own images
 - Downloaded over 300 times in 6 different countries within the first month

Education

University of Waterloo | Waterloo, Ontario

Expected April 2023

- Bachelor of Computer Science, Artificial Intelligence Specialization. Completed 3B term.
- 92.5% Cumulative GPA, Dean's Honours List, President's Scholarship of Distinction
- **Relevant Courses:** CS480 Machine Learning, CS458 Security & Privacy, ECE 493 T21 Autonomous Vehicles, CS484 Computer Vision, CO487 Cryptography, CS343 Concurrent and Parallel Programming, CS350 Operating Systems, CS341 Algorithms, CS348 Databases, STAT240 Advanced Probability and Markov Models