Brian Zheng

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Technical Skills

Languages: Java, Python, C/C++, JavaScript, HTML/CSS
Libraries: GStreamer, PyTorch, TensorRT, OpenCV, OpenGL, CUDA, WebRTC
Developer Tools: ROS2, Docker, CVAT, AWS ec2, Foxglove, Git, SOLIDWORKS, Linux/Ubuntu

Experience

enVgo - Autonomy Software Developer Sept 2025 – Present
Waterloo, ON

- Optimized and increased accuracy of a **Bilateral Segmentation Model** by **18%**, and improved inference speeds using **TensorRT** and **CUDA** on jetson architectures
- Created model-agnostic scripts in dockerized containers to evaluate metrics of segmentation models by computing **mIOU** and **f1 scores**
- Developed real-time **birdseye** view through **homography transformations** using **GStreamer/OpenGL** to stitch 4 fisheye camera feeds, and GLSL shaders with per-camera undistortion maps
- Implemented Structure-from-Motion **SFM** model using synchronized camera feeds to estimate vessel pose and reconstruct the 3D dock environment, allowing localization and motion planning for autonomous docking
- Developing high-speed obstacle avoidance system using radar-camera sensor fusion, **UKF's** for multi-target tracking, and **MPC** for real-time path planning.

WATonomous - Director of Eve Autonomy and Perception Software Jan 2025 – Present
University of Waterloo

- Leading a team of **40+** members in the research and development of an autonomous Kia EV, incorporating AI/machine learning, sensor fusion, and complex path planning algorithms
- Developed a multi-modal **3D object detection** and **tracking pipeline** by fusing LiDAR and camera data, **RANSAC Model Floor Segmentation**, and class-parameterized **DBSCAN** clustering of batched **YOLOv8** detections
- Developing **ROS2** wrappers for LiDAR ground segmentation and CV multi-object tracking algorithms like **ByteTrack**
- Enhanced object detection pipeline performance by optimizing the **YOLOv8 Model** using **TensorRT**and using **CUDA GPU acceleration**, maximizing hardware resources and inference speeds
- Implemented **ROS2 Drivers** and launch files for LiDAR and Cameras and calibrated camera intrinsics
- Implemented a hybrid **A*** and **BFS** search algorithm for local path planning and a **Pure Pursuit** and **PID** controller for path tracking

Projects

End-to-End Autonomous Drone | *C++, Python, ROS2, TensorFlow, AirSim, ArduPilot, PX4, YOLOv4* Jan 2025 – Present

- Designed and implemented an autonomous drone delivery system around campus
- Developed custom object detection models using **YOLOv4-tiny** and integrated them into a real-time drone control pipeline via **ROS2** and **MAVSDK**.
- Simulated and deployed flight missions in **AirSim** and **PX4** environments, with end-to-end autonomy from navigation to payload release with onboard AI inference.

6-DOF CV Robotic Arm | *C++, Python, MediaPipe OpenCV, SOLIDWORKS* May 2024 – Dec 2024

- Implemented **MediaPipe** and OpenCV's **HSV color thresholding** to detect and track gestures, extracting positions using **image moments** to determine movement
- Designed arm using **SOLIDWORKS**, implementing **PID** control, and **Inverse Kinematic** logic to control the arm and gripper

Expression-Detector — *GStreamer, OpenGL, MediaPipe, Pytorch* Aug 2025 – Present

- Built a **real-time, personalized facial expression recognition system**, using **MediaPipe Face Mesh** for landmarks and a lightweight **GRU** classifier over short frame sequences
- Trained a compact **PyTorch GRU** (hidden-64, last-timestep logits) with class weighting, label smoothing, gradient clipping, early stopping, and validation **macro-F1** reporting + confusion matrix
- Built a **real-time inference pipeline**: webcam → landmarks → standardized features → GRU → optional **EMA smoothing** + confidence thresholding, achieving **30+ FPS**

Education and Certifications

University of Waterloo Waterloo, ON
Bachelor of Applied Science, BASc, Mechatronics, Robotics, and Automation Engineering *Aug 2024 – May 2029*

Certified SOLIDWORKS Associate (CSWA) Waterloo, ON
CSWA Certificate - Issued by Dassault Systèmes *Issued Jan 2025*