John Cho

3rd Year Software Engineering Student at McMaster University

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Education

McMaster University, BS in Software Engineering — Sept 2022 – May 2027

- **GPA:** 3.9/4.0
- **Coursework:** Computer Architecture, Discrete Math, Object-Oriented Programming, Data Structures and Algorithms, Linear Optimization, Digital Signals and Systems

Extracurriculars

Software Team Lead, McMaster Mars Rover Team – Hamilton, ON — Nov 2022 – present

- Lead a team of 5 people to successfully enhance and maintain current rover software stack using tools such as Git and Kanban boards
- Using ROS 2 to develop complex control systems for the rover such as automonous 3D mapping with SLAM, 2D GPS mapping (mapviz), and point-to-point navigation with obstacle avoidance
- Developed firmware for sensor boards to communicate GPS, IMU, and temperature data over ethernet to Jetson AGX Orin using micro-ROS and control custom motor controller boards with PID over CAN bus
- Team placed 1st in Canada (4th overall) at **Summer CIRC 2023** and 2nd overall at **Winter CIRC 2024**

Programming Leader, FIRST Robotics Competition – LaSalle, ON — Oct 2018 – June 2022

- Member and leader of the programming section for FRC Team 772, the Sabre Bytes
- Drive Team Operator for 2021-2022 season, Rapid React
- Wrote commands to control drivetrain, flywheel, turret, and intake subsystems of robots using WPILibC++
- Mainly responsible for PID and vision control of turret to automatically aim and shoot balls into the Hub using data from motor encoders and limelight cameras

Experience

Camp Counselor, STEM Camp – Hamilton, ON — July 2023 – Aug 2023

- Managed a group of 20 to 30 kids interested in learning STEM
- Taught basic programming concepts using MakeCode
- Helped campers utilize micro:bit microcontrollers to control motors, servos, pumps, and sensors to complete a variety of tasks such as making automated robots to plant seeds, basic wind turbines, and water plant dispensers

Projects

Minecraft Turing Machine

- Created a Turing Machine using Minecraft redstone, complete with a functional memory tape and 8-bit register to store current state, write symbol, and tape direction
- Program is a FSM (Finite-state machine) with 14 states which accepts the language or set of strings $\mathcal{L} = \{a^n b^n c^n \mid n \geq 0\}$
- Utilized many concepts in digital systems and discrete math such as combinational logic, k-maps, formal language theory, finite automata, and state minimization

Pure Pursuit Path Controller

- Implemented a controller of the pure pursuit path following algorithm for a differential drive system
- Works by inputting a set of waypoints, then calculates a smooth path for the robot to follow while feeding back constant odometry data to keep track of its position relative to the path
- Used by FIRST Robotics Team 772 to successfully traverse and collect balls around the field in autonomous mode (video demonstration **here**)

Polynomial Regression Calculator

- Python script that takes in a CSV file of x and y values and outputs a polynomial that best fits the set of points
- Calculates coefficients of polynomial equation using matrix operations
- Uses Bayesian information criterion to select a desired model and prevent overfitting the data
- Used by FIRST Robotics Team 772 to find relationship between distance of Hub and flywheel speed needed to shoot balls into the Hub

Skills

Languages: C++, C, Java, Python, Verilog, Bash, YAML, UML

Technologies: ROS, ROS 2, micro-ROS, Git, CMake, SSH, Arduino IDE, STM32CubeIDE, Linux, Docker, SLAM, PID, SPI, I2C, CAN, UART, SonarQube, Maven