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
- Used 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 using micro-ROS and control custom motor controller boards 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

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