PHOEBE LUO

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SKILLS

- Seasoned product designer with over **4 hackathon wins** for embedded projects
- Significant experience with **rapid prototyping** using **Arduino, Raspberry Pi, 3D Printing, motors,** and **breadboard circuits**
- Adept with **CAD** using **Inventor** and **Solidworks** for mechanical design
- Proficient with **C++, C, Python**, and **Java,** as well as **Git** for version control
- Expert **leadership** and **communication** skills with **20+** people managed in over **3** organizations

PROJECTS

Robot Arm | *Computer Vision, Control Systems, CAD* May 2021 - Present

- Designed a 5 DOF robot arm using Inventor and independently 3D printed, assembled, and integrated the arm with electrical and hardware components (servo motors, Raspberry Pi)
- Developing control software and interfacing the GPIO pins on a Raspberry Pi for arm movement, and a camera module to implement computer vision functionality using OpenCV libraries

Dumpling Dynamics | *C++, CAD, Rapid Prototyping, Machining* Sept 2021

- Built a robot to automate the dumpling-making process using CAD software, 3D printing, and machining to prototype a dumpling clamping mechanism, and programmed the motors using C++
- Manually implemented and modified stepper driver firmware in the Arduino IDE to increase torque of stepper motors
- Selected as a finalist out of 477 teams at Hack the North 2021, Canada's biggest hackathon

Braille-iant | *C++, CAD, 3D Printing, Embedded Systems* May 2021

- Created the world's cheapest braille printer for $15 using an Arduino, 3D printer, stepper, and servo motors
- Rapidly prototyped and iteratively tested a paper piercing mechanism using Autodesk Inventor, then 3D printed the parts
- Programmed the paper piercing mechanism in C++ to print braille text based on user input from a Python GUI
- Awarded best hardware hack at TOHacks 2021 out of 700+ participants

EXTRACURRICULARS

Connected Autonomous Vehicle Member | *UW Alternate Fuels Team* Nov 2021 - Present

- Learning ROS, MATLAB, and Simulink to help the Connected Autonomous Vehicle (CAV) team develop a hybrid semi-autonomous car for the EcoCar 4 Challenge
- Completed ROS training workshops using Linux to gain familiarity with ROS fundamentals for robot development

Lead Programmer | *FIRST Robotics Competition Team 1241* Nov 2018 - April 2021

- Programmed autonomous routines and PID control loops in Java, contributing to the team's placement as the highest ranked Canadian team in the subdivision at the 2019 World Championship
- Implemented state machine architecture, tuned a computer vision pipeline, and interfaced sensors with robot movements to score points with an accuracy of 90% in 2020
- Used Git to smoothly collaborate with four other team members
- Worked with Autodesk Inventor and a CNC router to design and fabricate the robot drivetrain and gearboxes

AWARDS

Schulich Leader Scholarship May 2021

- Awarded Canada's most coveted STEM scholarship awarded for exceptional leadership, worth $100K

DECA ICDC Champion - Third Place April 2021

- Placed 3rd out of 200+ top competitors around the world at the international level of DECA, a case study competition

EDUCATION

University of Waterloo

Candidate for Mechatronics Engineering, BASc
Sept 2021 - April 2026 (expected) | 3.84 GPA

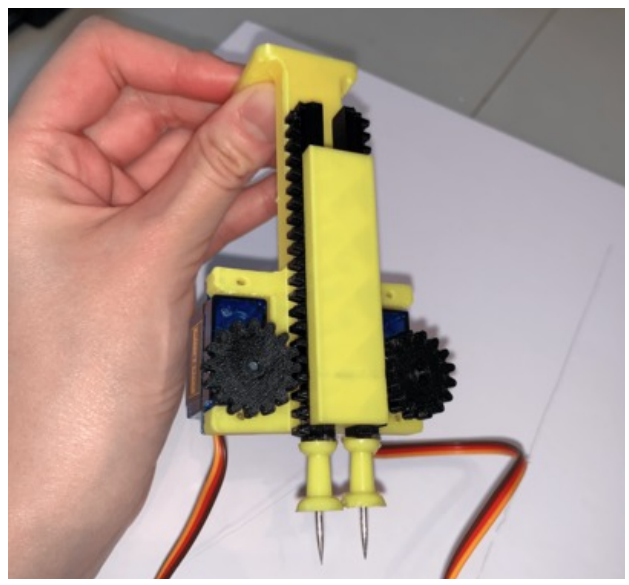
INTERESTS

- 3D Printing
- Reading
- Minecraft
- Anything Boston Dynamics does
- Food Reviewing and Cooking
- Hackathons

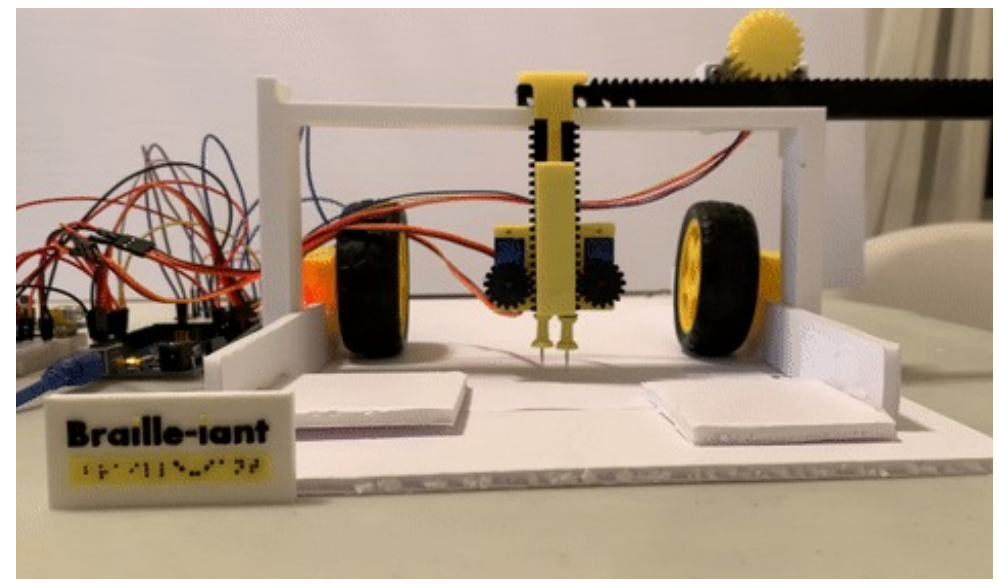
PORTFOLIO

phoebeeluo.com

Braille-iant



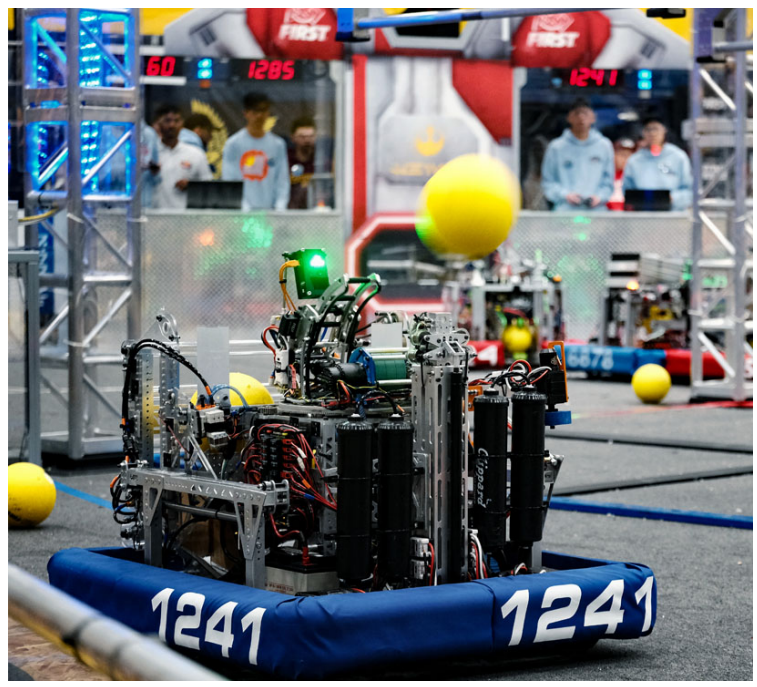
Close up of the final paper piercing mechanism design, which was sliced, 3D printed, and assembled by me

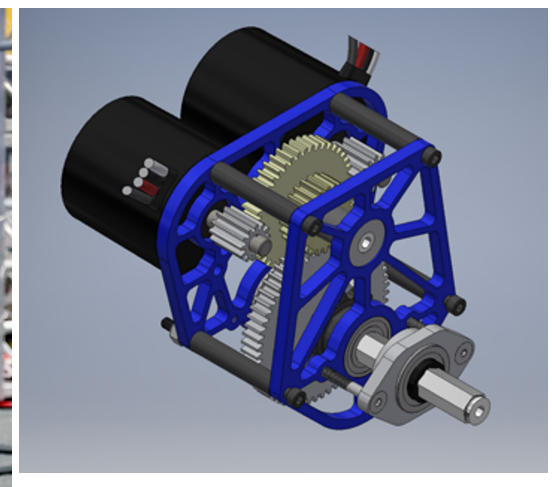


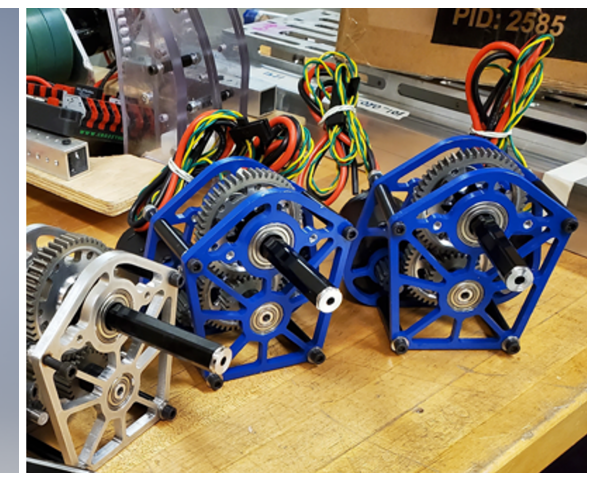
Full image of Braille-iant midway through prinitng

- Built the world's cheapest braille printer for only $15 as a solution for making physical documents (receipts, contracts, doctors notes) more accessible to the blind.
- Rapidly prototyped and 3D printed the paper piercing mechanism in under 24 hours. The mechanism went through two iterations, the second design utilized 2 rack and pinion gears to convert a servo motor's rotational motion into linear motion
- My C++ code took input from a Python GUI where the user would input the text they wanted, which then communicated with the Arduino's serial port. From the user input, the desired commands were run
- We used a breadboard to connect all the components, including servos, stepper motors, DC motors, and the motor controllers
- Braille-iant was awarded Best Hardware Hack out of 700+ participants and is seen working here

FIRST Robotics Competition







(Above) Gearbox CAD assembly, and the gearboxes in real life

(Left) Picture of the full robot shooting. The camera is actively tracking the target (the green light) and has shot the yellow ball.

- Designed, manufactured, and programmed a 125 pound robot to compete at the regional, provincial, and international level
- As lead programmer of the team, I collaborated with 3 other individuals to write control software for the robot, including
  - PID loops in Java using the WPILib Libraries for drivetrain control, then tested and tuned PIDs using LabVIEW
  - Tuned a computer vision pipeline and interfaced data from the camera to control the orientation of the robot. The distance to the target was also determined by the camera and this data was used to adjust the hood and speed of the shooter

- As a designer and manufacturer on the team, I also helped with
  - Rapid prototyping mechanisms using wood and basic tools (screwdrivers, etc) like the robot drivetrain
  - Used Inventor for CAD to design the chassis of the robot and the gearbox plates. I performed parametric modelling to ensure the validity of my design, and calculated gearbox ratios to appropriately determine the required gears
  - Selected off-the-shelf parts from McMaster-Carr and other robotics retailers, including motors, sensors, gears, and bearings
  - Manufactured robot parts using machine shop tools including lathes, drill press, and the CNC router table