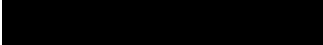# Armaan Sengupta

🏠 ██████████ 📞 ███████ ✉ senguptaarmaan@gmail.com 🌐 armaansengupta.ca

Relevant Skills

Programming: C++ (4 years), Python 3 (6 years), Java (4 years), Arduino (2 years), ROS2 (<1 year) 🔗
CAD (3D modeling): Fusion 360 (5+ years), Inventor (2 years), SolidWorks (1 year), AutoCad (1 year) 🔗
Manufacturing: CAM, FDM 3D printers, laser cutters (80W), CNC routers, design for injection molding 🔗

Work Experiences

Studica Robotics

Paid - Summer Internship - Research and Development - Robotics Engineer 📅 June 2022 – August 2022

- Promoted from an unpaid co-op in highschool (May/June, 2021) to a paid position.
- Designed 11 novel mechanical parts/sub-systems which are now being commercially sold.
- Reduced the price of a product by ~40% by designing the part using a single mold rather than 2 unique molds.
- Optimized for how plastic will cool when injection molded by accounting for material thickness.
- Extensively used CAD to design parts and subsystems, and simulated material properties using static stress FEA.
- Utilized rapid manufacturing techniques (3D printers & laser cutters) to test and validate prototypes.

FIRST Robotics Canada

Paid - Part Time - Programming Instructor 📅 January 2020 – Present

- Led robotics programming classes using a virtual robotics simulator (FTC SIM).
- Taught 100+ students from underserved communities.
- Created curriculum and lesson materials which are now used by several other instructors.

Awards and Achievements

- Schulich Leadership Scholarship (worth $100k) at: UofT, McMaster, Western. 📅 2022
- Brampton Citizen of the Year Award (Inspiration Award). 📅 2022
- Dean's list winner at the provincial level (international finalist) - FTC robotics competition. 📅 2020

Education

University of Waterloo

Candidate, Bachelors of Mechatronics Engineering 📅 September 2022 - April 2027

GPA: 3.95

- Awarded the Colonel Hugh Heasley Engineering Scholarship – $10,000.
- University of Waterloo President's Scholarship of Distinction – $2,000.
- Class Representative for Mechatronics Engineering Class of '27.
- Re-started the FRC Robot-in-3-Days student engineering design team.
- Member of the sponsorship committee that distributes ~$10,000 of funding to UW's various student design teams.

Massachusetts Institute of Technology

Introduction to Computer Science and Programming Using Python (6.00.1x) 📅 Completed: July, 2021

Grade Received: 99%

- Learned concepts such as data structures, iteration and recursion, abstraction, algorithms, and time-complexity

Related Experiences

Robotics Teams - FIRST Robotics Competition (FRC) and FIRST Tech Challenge (FTC)

Team Captain 📅 September 2019 – June 2022

- Displayed leadership, organization, and delegation skills by leading a team ~115 students (FRC),
- Intelligently budgeted upwards of $25,000 (FRC) and managed business relations with corporate sponsors
- Currently actively mentoring both teams, guiding primarily from a technical perspective

Relatively Quantum Robotics - Robotics Education Business

Founder - Summer Business 📅 September 2021– Present

- Created a robotics education business with beginner and advanced level robotics courses
- Made a total of more than $2000 over the summer in income
- Recipient of Brampton Summer Business Grant (12 grants for 200+ applicants)
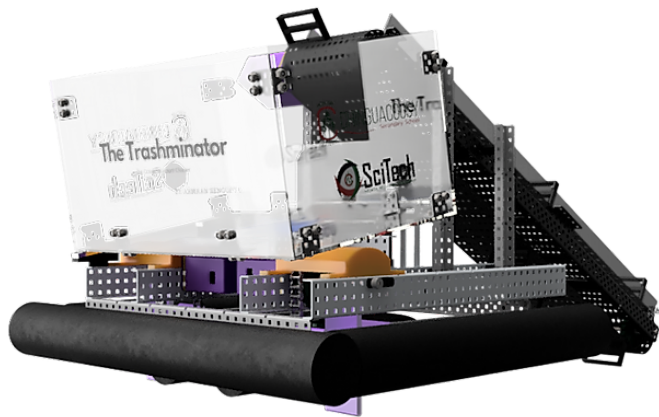- Learnt concepts such as marketing, product pricing, and customer acquisition/retention

Interests: Tinkering, Teaching, Martial arts, Video game design, Video Editing

Projects - Mechanical

🌐 Full Digital Portfolio: https://www.armaansengupta.ca/projects

## The Trashminator
*The ocean's vacuum cleaner*

- Surface level, macro, aquatic trash cleaning robot.
- Sweeps a waterbody using to pick up any debris
- Debug mode, where it can self-diagnose issues such as
  - Motors having communication errors
  - Excess friction on moving components.
- Detects and warns if the magnetically removable garbage storage has been mounted incorrectly via an animation
- Fully featured initiative custom UI with animations

[View Full Presentation](#)

6 Cylinder Radial Engine (CAD)
The largest leap in my 3D modeling skills

- Using orthographic drawings, 20+ intricate pieces were 3D modeled
- Correct DOF constrained into a working 6-cylinder radial engine assembly
- You can view [animations](#) and the [CAD](#) of the engine by clicking the links.
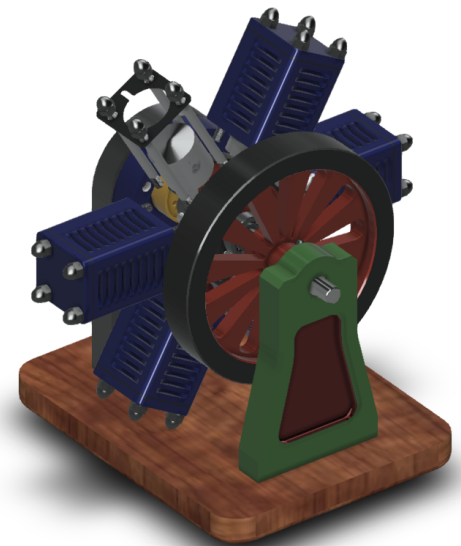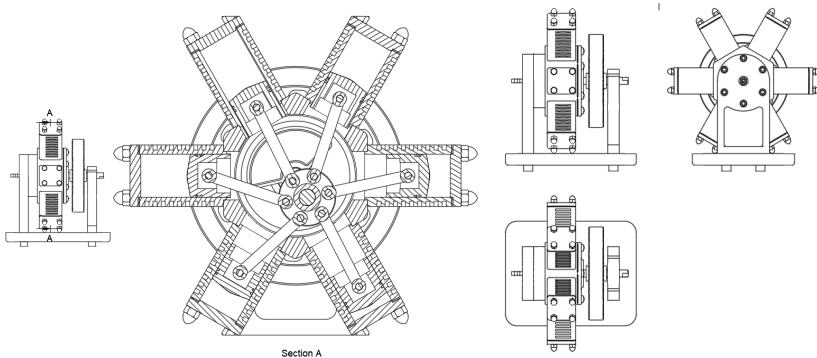
Tank Tread Off Road Drivetrain
*For the toughest terrain out there*
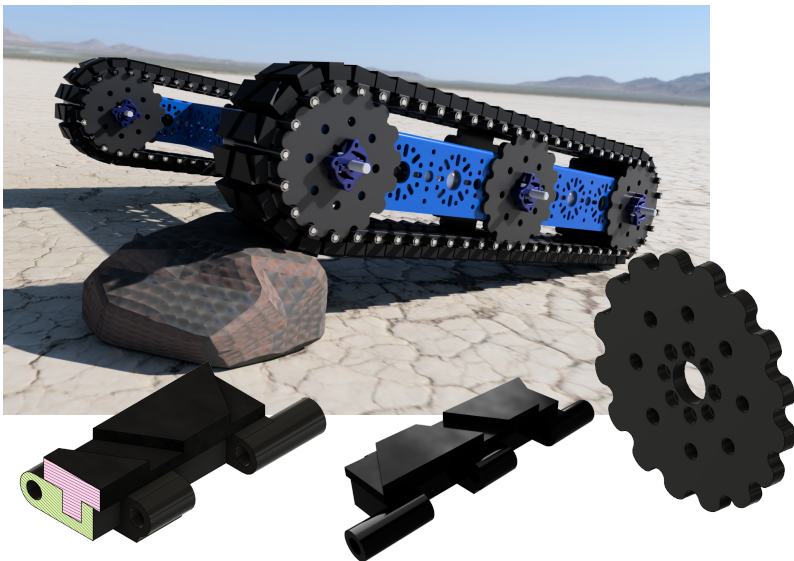
- One of [11 mechanical contraptions](#) built during my co-op.
- Off Road chassis with:
  - Custom sprockets
  - Tread links
  - Rubber gripping attachments,
- Incredibly robust and versatile drivetrain
- Tuned the geometry of the pulley so that operation was smooth and yet conveyed lots of torque
- Created a uniform pitch length so many configurations of sprocket sizes and center to center distances could be used
- CAD was entirely parametric, meaning, anything could be easily changed, like the pitch, link thickness, or pulley diameter, and it would all automatically update across the model.

[Video of small scale version running](#)

Low Profile Clamping Hub
Good things come in small packages

- Also made for my Studica summer co-op
- Identified that the [set screw shaft hubs](#) that were currently being sold would mar the shaft and would quickly come loose
- Developed and constructed an ultra-low profile clamping hub that provided a much stronger mar free grip on the shafts
- Re-designed the cutout ~37 times based on FEA simulations in an effort to to maximize the bending of the metal while retaining high torque transmission capabilities.
- This item is currently available for sale [here](#).
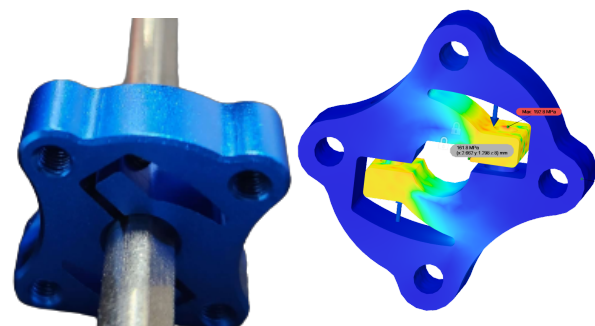
Projects - Software

🌐 Full Digital Portfolio: https://www.armaansengupta.ca/projects

Competitive FTC Robots
3 Competitive Robots Designed in 3 Years (1 year discussed)

- Entirely designed, built and programmed the robot
    - Other teammates had non-technical roles
- Ranked 2rd in Ontario for robot effectiveness (points scored) amongst ~70 teams
- Won the control award in the Asia Pacific Open Championship for the best software reliability
- Implemented PIDF control structures to ensure motor's held their position (arm) or velocity (flywheel) under load
- Used TensorFlow to implement computer vision that detected objects to influence robot behavior
- Utilized distance sensors and gyro's for localization

View software showcase or view top match
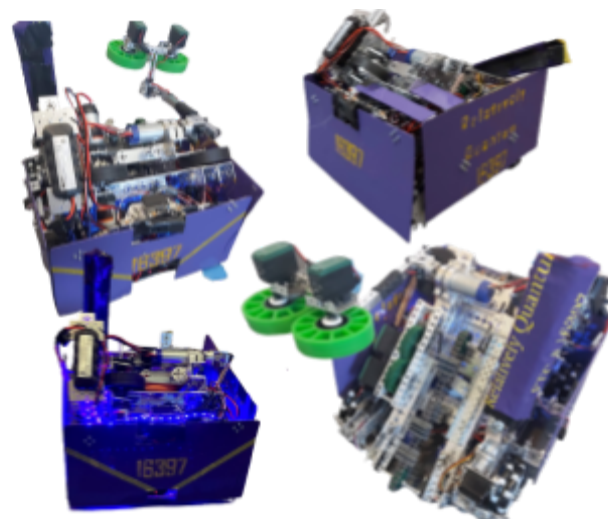
The Gooseminator
Mechatronics first term final project

- Sweep a designated area to collect and sort endangered and invasive species of bird eggs
- Used proportional feedback control system
    - Uses gyro sensor to accurately turn
    - Correct for drift in angle when driving straight
- Used a touch and color sensor to detect and categorize the type of egg collected
- Developed an algorithm based on the percentage of time a color was detected to detect eggs with a 100% accuracy (over 40 trials).
- Encoder based intelligent anti jam code

View Demo Video or view full engineering design report

Home Security System
Arduino based home defense

- Programmed in C++ using Arduino
- Components include lights, buzzers, motion sensors, distance sensors, a key pad and an LCD screen
- Loitering detection with automatic warning lights achieve through motion sensor
- Intrusion detection performed using a matrix of distance sensors to determine where the intruder is in the house
    - Alarm sounds (if system is armed)
    - System needs to be disarmed by entering the password into the keypad following instructions on the LCD

View Demo Video or view full presentation
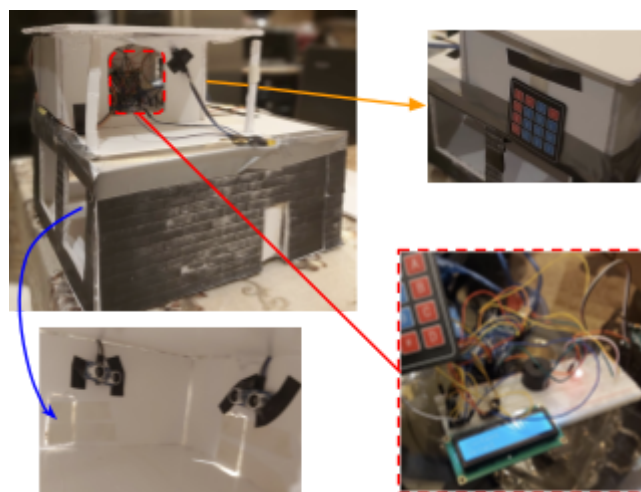
Video Game Design
20+ Games made in PyGame

- Used Python + PyGame library to make games
- PyGame is a lower level library compared to game engines like Unity
    - More control over each aspect
    - Optimization learning experience
- Developed extensive experience in OOP with each project containing 10+ main classes, inheriting from several more
- Learned programming techniques to modularize and work with thousands of lines of code for larger games

Some footage of gameplay and All games code