kristen3ho@gmail.com LinkedIn ke.ho@mail.utoronto.ca

Kristen Ho

mechanically minded, optimistic, and team-oriented

Undergraduate Student Engineer at the University of Toronto

Welcome

Welcome, thank you for viewing my portfolio! Listed below are a few of my current and past projects! Please feel free to reach out if you have any questions.

- Kristen

Welcome 2

About Me 3

Purpose 4

Vertical Axis Wind Turbine (VAWT) 5

Mechanical Design and Manufacturing of a Small-Scale Wind Turbine 6

Stainless Steel Starter Motor Shield 7

Conceptual CAD Model for a SCARA 3D Printer 8

ITP Metrics Analysis 9

The >0 Apples Bridge Design – CIV102 Bridge Project 10

SandStorm – Microplastic filter storm drain insert 11

About Me

I am an optimistic thinker and aspiring engineer with an acute interest in design and human processes. Activity and iteration will always be at my core whether it be learning a sport or developing models which fit engineering specifications. My engineering ideology can be described by three main contexts:

1. nature and sustainability
2. activity and collaboration
3. curiosity and mind of a hobbyist



Interested in problem-solving and design, I intend to enter the professional industry upon graduation in an environment where I can pursue a career path which lets me exercise my **creativity and passion for design** with tangible outcomes and a *contribution to real-world solutions*. I am a **team player** and aspire to work in a team on projects potentially involving mechanical design, sustainability, infrastructure, or responsibility; but with a central value of contributing to projects which *improve quality of life* or *make the world a better, safer place*. I believe in **human connection** and optimizing teams in highlighting team members' strengths and through **clear communication**.

I continuously strive to incorporate my values and beliefs in my professional and personal work in my career path.

Purpose

The purpose of this portfolio is to serve as a culminative overview of my engineering work and projects that are relevant to my career path. It documents a toolbox of:

- skills,
- traits,
- self-documentation,
- self-reflection,
- experiences, and
- projects,

which can be used to describe my values and positionality in an engineering context. Its intention is to be kept updated and up-to-present date, reflecting my ongoing development and learning in engineering and my personal values.

I am adaptable and although specific industries for my career path remain unclear, I am increasingly interested in developing a toolbox of skills and gaining experiences that are diverse and applicable to various spheres.

The purpose of this portfolio is to **document this toolbox** through an *ongoing collection of items and entries*.

Vertical Axis Wind Turbine (VAWT)

UTWind is a University of Toronto design team which designs an efficient and sustainable small scale wind turbine to compete in the International Small Wind Turbine Competition (ISWTC) each year.

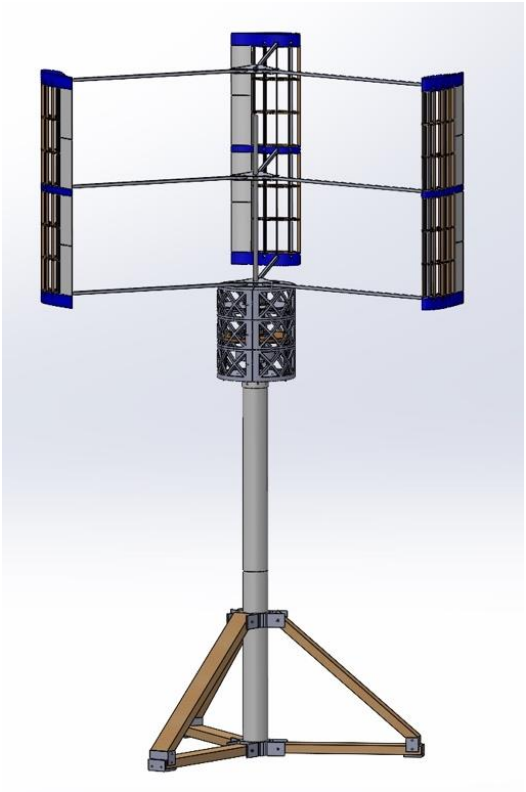
For the design cycles in 2025 and 2026, we competed with a vertical axis wind turbine (VAWT). VAWTs are better suited for turbulent wind and urban environments, contrary to most industry horizontal axis turbines.

As Co-President, I oversaw design of the turbine, mainly contributing hands-on to the mechanical design and facilitating integration across 5 different technical subteams. I also supported admin, financial, and logistics duties of the club.

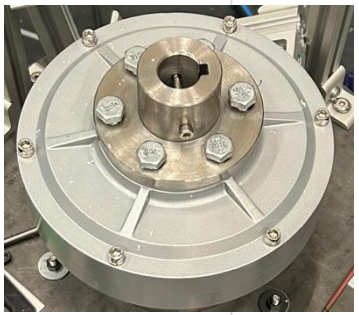


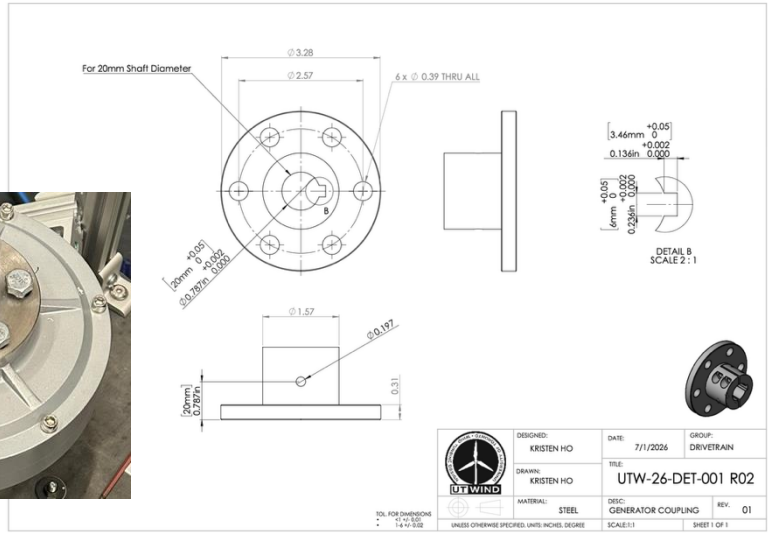


Wind-tunnel testing at competition in the Netherlands, Summer 2026



Master assembly CAD of VAWT

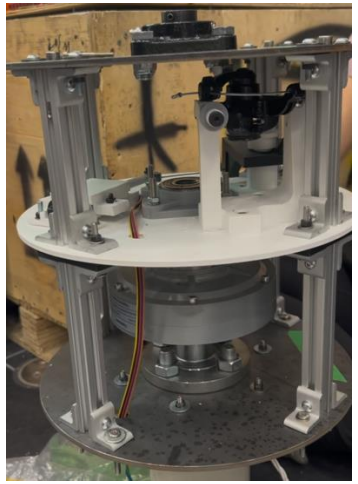




Led design and fabrication of the main steel generator coupling and central carbon steel shaft



Created custom generator testing rig – generator coupled to dc motor for power testing



Multi-level nacelle assembly – generator, braking, radial bearing

Mechanical Design and Manufacturing of a Small-Scale Wind Turbine

UTWind is a University of Toronto design team which designs an efficient and sustainable small scale wind turbine to compete in the International Small Wind Turbine Competition (ISWTC) each year.

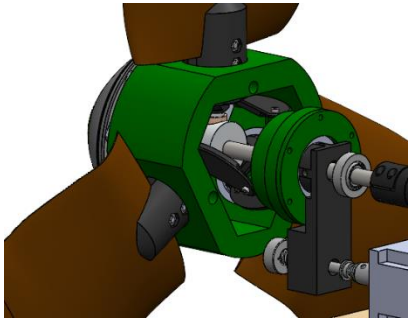
As the Mechanical and Manufacturing lead at UTWind, I am responsible for the complete mechanical assembly and manufacturing of the built turbine. I worked specifically on the brake assembly, nacelle cover, pitch mechanism, and testing rig assembly in SOLIDWORKS. I led component selection of the main shaft and main bearing, as well as machining of various couplings in the MIE Machine Shop on campus. I also performed stress analyses on turbine components in Ansys.

I work in collaboration with the other subteam leads in Power, Controls, Aerodynamics, and Sustainability to ensure proper the integration of subsystems in the final turbine. My work has contributed to UTWind's track record of success, winning Best Overall in 2024 and 2022 as well as the Sustainability award in 2023.

UTWind's small wind turbine has a rotor diameter of 1.6m. The voltage output is 60V and power produced is 1200W.



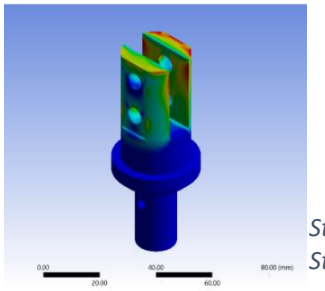
UTWind small scale wind turbine in SOLIDWORKS



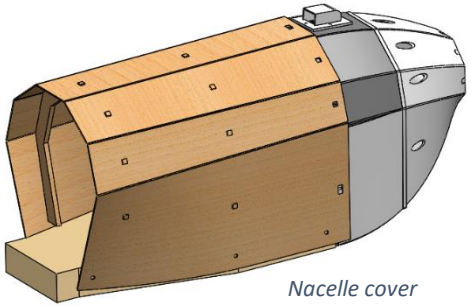
Pitch Mechanism



Brake assembly



Stress analyses of Blade Stub in Ansys



Nacelle cover

Stainless Steel Starter Motor Shield

During my internship at Metrolinx within the Bus Fleet Maintenance and Equipment Engineering team, I designed a solution for the premature failures of starter motors on our fleet of double-decker buses. In SOLIDWORKS, I designed and modeled a revised starter motor shield which was 13% lighter than the previous design, with a new mounting location which was sturdier and provided more support. The design is made to be simple and easy to manufacture out of 12 Gauge Stainless Steel sheet metal.

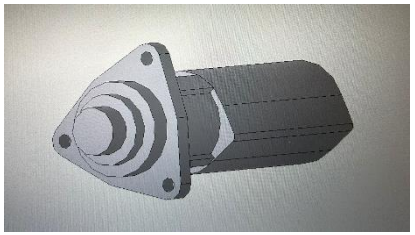
A root cause analysis of the starter motor failures determined that it was the nightly pressure washing that was causing particulate and fluids to get into the starter motors, resulting in the component failing.

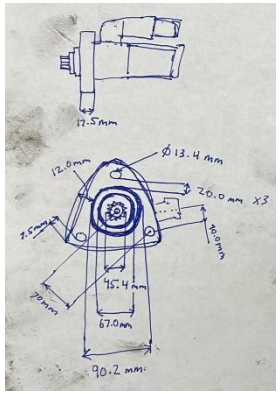
New starter motors are on the market for $200-$300. Across the fleet of 436 assets with the prematurely failing starter motor, a shield that could extend service life of the part could save up to $130,000. My next steps for the project included running a pilot program with the revised starter shield, performing a more rigorous cost analysis, and gaining additional feedback from coach technicians and technical services teams.

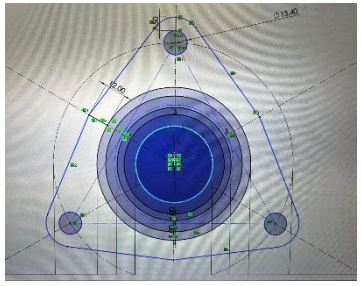
Photos of a failed starter motor and photos of the design process



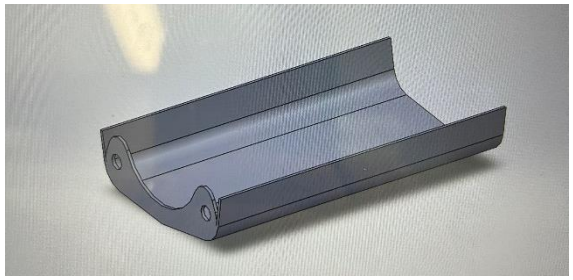


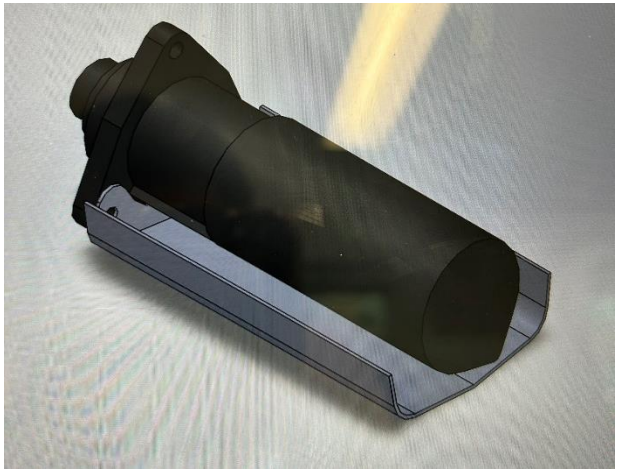






Revised Starter Motor Shield

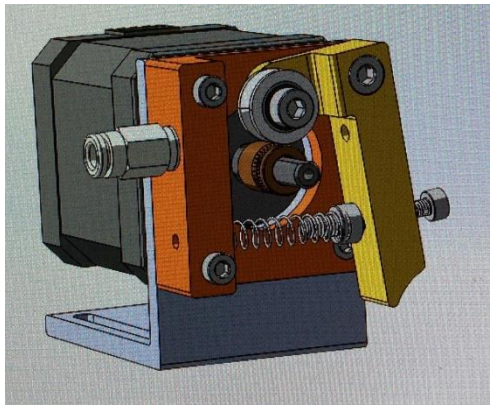




Conceptual CAD Model for a SCARA 3D Printer

The culmination of the course MIE243: Mechanical Engineering Design was a complete conceptual design for a 3D printer with the key objectives of speed and low cost. I contributed extensively to the CAD portion of the project, using SolidWorks to create the extruder, hotend, and z-axis lead screw mechanism. The final CAD assembly contains over 200 parts and can demonstrate movement in all 3 axes in SolidWorks.

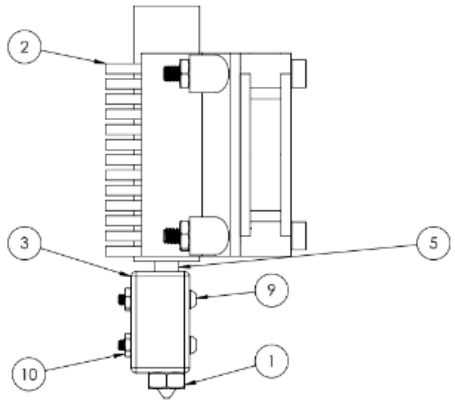
(a)



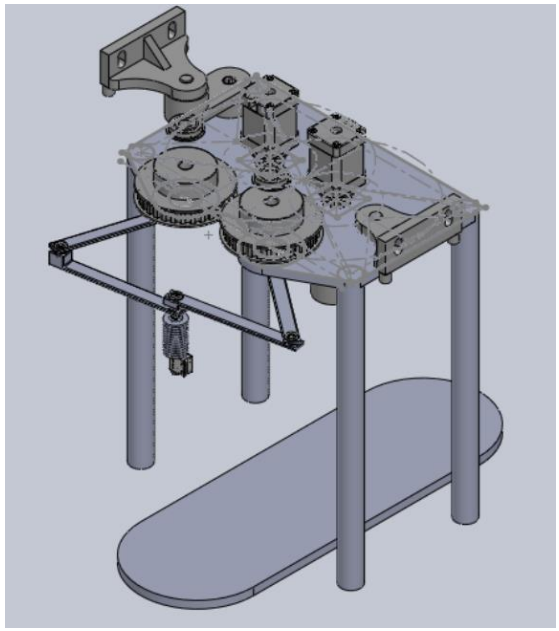
(b)



(c)



(d)



Relating to my career path, I was responsible for creating many of the main mechanisms in SolidWorks, developing my CAD and design skills. Working within a technical team, it was integral that I communicated clearly in developing the parts that I was responsible for to ensure a smooth implementation with the rest of the teams' parts. This took various iterations, where we had to return to designing in order to integrate the different parts which helped me learn about technical and effective communication. I feel comfortable in the CAD environment and working further with similar tools and software in industry work interests me in the future.

(a) Bowden extruder, (b) Z-axis lead screw mechanism, (c) hotend, (d) Conceptual 3D printer design

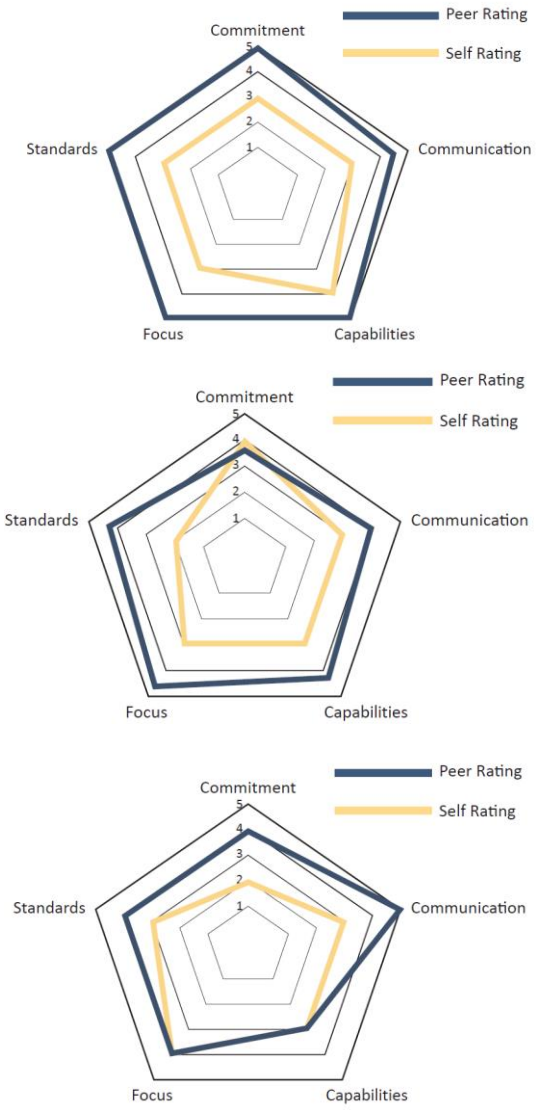
ITP Metrics Analysis

ITP metrics is a survey tool used in courses at the University of Toronto to gain feedback from team members when working on group projects. I have received data and feedback in 3 different courses. Figures 1, 2, and 3 are visual summaries on the last surveys from each course. The yellow line is a self-assessment of my abilities, and the blue line is my teammates' assessments of the same abilities. Each corner represents a teamwork competency scored on a scale of 1-5. I can make a few key observations based on the data:

- I am generally a strong communicator with an average score of 4.5 from the Figures. This is in line with my beliefs of emphasizing clear and effective communication when working with others as a must-need for success. This high level of communication is a trait that I intend to continue to develop and incorporate into my future goals, professions, and projects.

- My self-rating is consistently lower than my peer rating, where the blue line extends past the yellow in the Figures. This indicates a blind spot in my teamwork competencies where there is an underestimation of my abilities. This is a trait that I notice frequently where I am hesitant to believe in the strengths of my competencies. I am actively working towards in closing this gap as it affects my work in being able to present ideas and my confidence in contributing to a team. In the future, I want to be able to more accurately assess myself and present myself with more confidence which would allow me to better contribute to team environments.

- I have potential to be a good leader as I am well rounded in the peer-rating competency scores, and I think that if I work on identifying and believing in my strengths, I will be able to a better teammate and leader in the future. I work towards taking on more responsibility within a team, understanding that my ideas hold value, and being less hesitant when voicing my ideas or concerns.

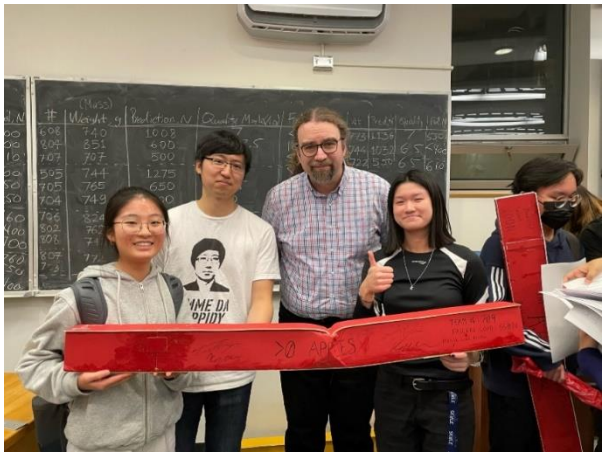


ITP Metrics survey results pictured top-to-bottom: MIE243, Praxis I, and Praxis II

The >0 Apples Bridge Design – CIV102 Bridge Project

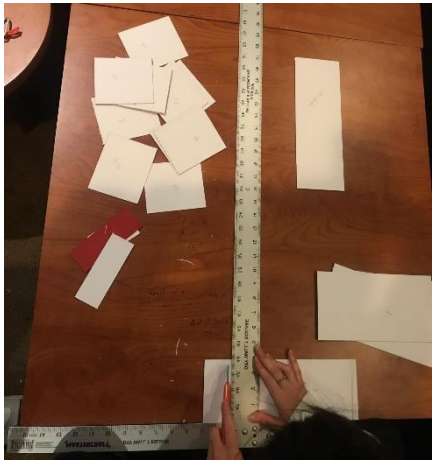
The final course project for CIV102: Structure and Materials – An Introduction to Engineering Design, was the task of working in groups of three to build a small-scale bridge out of a single sheet of matboard (about 80cm x 100cm x 0.13cm), which is a type of poster board. The bridge was tested with a moving load of weighted carts pushed along the length of the bridge. The project included creating code to calculate the maximum train load that the bridge could support, which part of the bridge would fail first based on six different potential failure sources, engineering drawings of the chosen bridge design, and a final design report.

The >0 Apples bridge was a result of sleepless nights and hours of hands-on work. I am proud to say that our bridge ended up performing in the top 15 out of over 100 teams, carrying a max load of over 75 kg.





- Code for calculating the maximum load that the bridge could withstand based on six different modes of failure was written in Python. The design was developed based on these calculations, where I learned about engineering design and choosing a final design based on factors of safety, rigorous calculations, and iterations. These are **universal skills and applications for engineers**, and I found the project exciting in being able to practice and carry these out in my first year. These are general processes and methods that will carry throughout my career, maybe not in the context of a bridge but in another engineering design application.



- For my team, we began our project with setbacks and failures, including issues with our code and a series of communication errors. Despite these initial obstacles, we were able to complete the deliverables and present a bridge which performed well in testing. This experience further taught me about the **value of communication**, where I had failed and made mistakes in communication early on, which set our team back. I work on these mistakes by applying the mindset of **improvement through iteration** based on knowledge in the past, which is a mindset that I will continue to adopt in the future.

Top-right: My teammate Melissa and I after bridge testing
Mid-left: Our bridge during testing
Bottom-right: Bridge construction cutting the Matboard panels

SandStorm – Microplastic filter storm drain insert

My team's main opportunity for Praxis II, the Engineering Science design course at UofT, was designing a device to improve the efficiency of plastic collection to prevent plastic in the great lakes. The work done by teams in choosing and designing a solution is presented in a culminative showcase near the end of the semester.

The final design that my team prototyped, tested, and presented was a triple layer sand filter and storm drain insert, named the SandStorm. The SandStorm uses three different rock and sand particle sizes as a filter to be installed inside storm drains which will catch and prevent microplastics from entering the great lakes through storm drain systems.

The course-long project was a learning process in engineering design, working with clients, developing engineering specifications, technical writing documents, and how to effectively communicate and present these findings and a final design concept concisely and in an easy-to-understand way. I believe that this course project was extremely relevant to what I want to pursue in the future as I gained experience in diverse engineering processes carried out in a short time-line, but accurate and not unlike processes carried out in industry.





Top: My teammates and I at Praxis II Showcase
Bottom: Prototype of SandStorm