Jonathan DiGiorgio

647-853-0102 | jddigior@uwaterloo.ca | https://www.linkedin.com/in/j-digiorgio/ | jonathandigiorgio.com

Education

University of Waterloo — Waterloo, ON

*BASc in Mechanical Engineering with Mechatronics option (**96%** CGPA)* — *Sept 2022 – April 2027*

- **2x** First in Class Engineering Scholarship, **4x** Dean's Honours List

Experience

Mechanical Design Engineering Intern — Aug 2024 – Dec 2024

Tesla (Detail limited by NDA) — *Fremont, CA*

- Designed new **sheet-metal stamped** and **high-pressure die-casted** parts for Cybertruck and RoboTaxi using **CATIA**, **DFM**, **Tolerance Stackup Analysis**, and **GD&T**, and projected to save customers **$10M** annually
- Created and conducted **design validations** and **functional investigations** using custom **3D Printed** parts
- Collaborated directly with part **suppliers** to optimize designs for **DFM**, **formability** and **cost-savings**
- Analyzed **CAE** crash simulations to optimize structural designs and ensure passing of FMVSS legal requirements
- Drafted and released **10 GD&T** drawings, utilizing my Tesla training and certification in **advanced GD&T**
- Conducted research on **aluminum** and **adhesive bond thickness** properties to support design and development
- Collaborated with various cross-functional teams and managing multiple high-priority projects simultaneously
- Developed **4** repair procedures along with fastening strategy for structural components relating to Model Y

Mechanical Engineering Intern — Jan 2024 – May 2024

Pratt & Whitney (Detail limited by NDA) — *Missisauga, ON*

- Contributed to various **R&D** projects, working within a multi-disciplinary team to optimize flight performance
- Conducted **FEA** on jet engine subassemblies using the **ANSYS Suite**, **LS-DYNA** and **Altair HyperWorks**
- Utilized **CATIA** and **SpaceClaim** to conduct iterative optimization to **CAD** models according to **FEA** results
- Led a **42%** weight-saving project, using **ACP** to analyze a part's replacement from aluminum to **composite**

Mechanical Team Lead - Chassis and Propulsion — May 2024 – Present

The Boring Company Competition - WatDig — *Waterloo, ON*

- Leading a team of 4 on the research and design of a tunnel boring machine to compete in NaBC 2025 in Texas
- Designed a **motorized** & **hydraulic** articulation system in **OnShape**, to steer and support **3kNm** of torque
- Performed **hand calculations** to determine required steering force, and obtain **hydraulic** actuator specifications

Mechanical Engineer Team Member — Sept 2023 – Present

Waterloo Aerial Robotics Group — *Waterloo, ON*

- Designed a drone arm clamping mechanism, reducing arm play by **56%**, resulting in reduced vibrations utililzed **DFM** principles for **3D Printing**, **water jet cutting**, and **tapping**
- Designed **PCB** housings in **Solidworks**, including safety considerations and thermal board ventilation

Quality Assurance Engineering Intern — May 2023 – Aug 2023

S&C Electric Canada — *Etobicoke, ON*

- Inspected high-voltage interrupt switches and subassemblies with **GD&T** drawings, using calipers, gauge calibrations/R&Rs, audits, hipot testing, and hardness testing, leading to **0** defective returns
- Developed a **Python** script to automate inspection data/image collection that was implemented department-wide, increasing inspection efficiency by **43%** and collecting photographic evidence for use in customer quality disputes

Projects

Autonomous Chess Robot | *Solidworks, AutoCAD, RobotC, Python, Arduino* — Jan 2023 – Apr 2023

- Used **Python** for move detection (**OpenCV**), move computation, and robot communication (**PyAutoGUI**)
- Utilized **C** code, motors, servos and sensors to facilitate a 3-axis gantry, resulting in a >**95%** succesful move rate
- Utilized **Solidworks**, **AutoCAD**, **3D printing** and **laser cutting** to create housings, racks, guides and more

Technical Skills

Engineering Software: 3DExperience, CATIA V5/V6, Solidworks CAD/FEA/PDM (CSWA), ANSYS Workbench, LS-DYNA (PrePost), Altair Hyperworks, ArduinoIDE, OnShape, Enovia VPM, AutoCad, ACP, PLC, Excel, Jira
Engineering Skills: CAD, GD&T, Drafting, FEA, Stamping, Casting, 3D Printing, Rapid Prototyping, Arduino
Programming: Ladder Logic, Python (PyAutoGUI, OpenCV), C/C++, MATLAB , HTML, CSS, Github, VS Code

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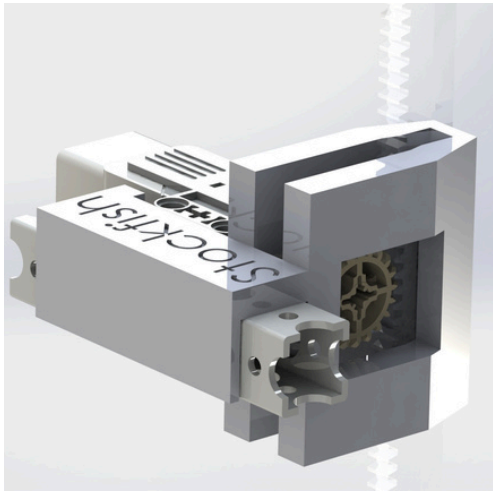
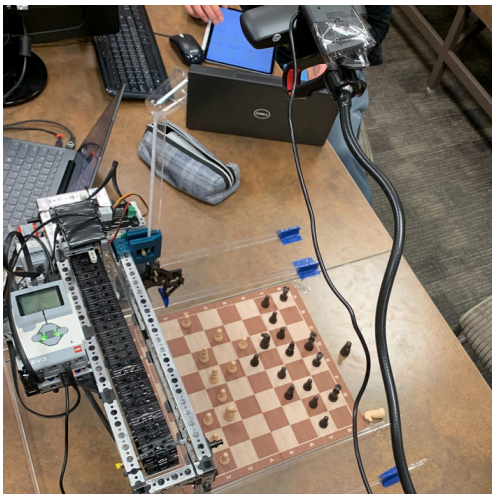
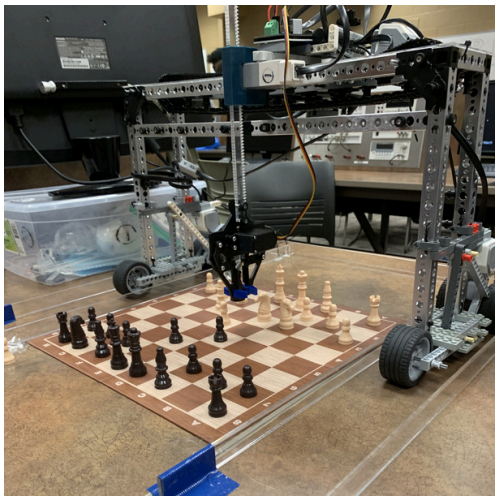
FULLY AUTONOMOUS CHESS ROBOT







What?

- Led a team of 4 to design and create a fully functional, pro-level chess robot
- Fully autonomous computer vision
- Operates on 3-Axis Gantry with a gripping mechanism
- Documented the entire design process from ideation to prototyping to time management

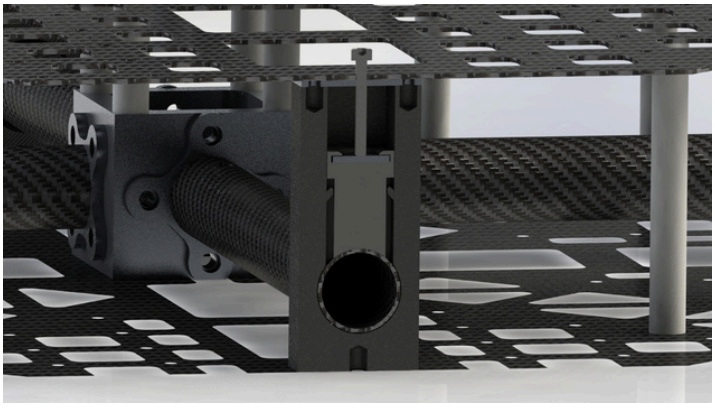
How?

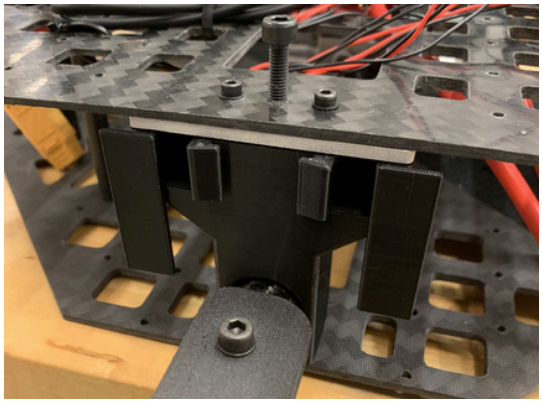
- Modelled entire assembly in **Solidworks** along with **FEA** for structural analysis
- Used motors, servos, sensors, belts, gears and various **3D printed** / **laser cut** parts
- Developed program in **Python** for move detection, computation & communication

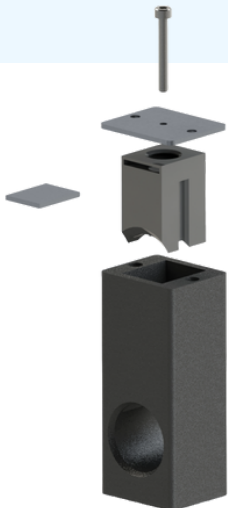
Results

- The robot performs a successful move **>95%** of the time
- The robot correctly identifies opponent's moves **>95%** of the time
- Is undefeated, winning **100%** of games
- Has a theoretical chess Elo of **3620** (Higher than the best in the world)

X-FRAME ARM CLAMPS - WATERLOO AERIAL ROBOTICS







What?

- Led the design and manufacturing of 4 X-frame arm clamps for the competition drone
- Ensures there is no play in drone arms when in flight
- Ability to be tuned by adjusting screw tightness

How?

- Modelled entire assembly using **Solidworks PDM**
- Utilized **DFM** principles to allow for easy **3D Printing** without supports
- Drafted **GD&T** drawings for the aluminum parts, and machined them using a waterjet, tap and drill
- **3D printed** non-metal parts using carbon-fiber PETG for durability

Results

- Very lightweight (**34g**)
- 3D printable without supports with a **<3hr** print time
- Eliminates play in the arms
- Will be used in the Aerial Evolution Association Canada competition '25

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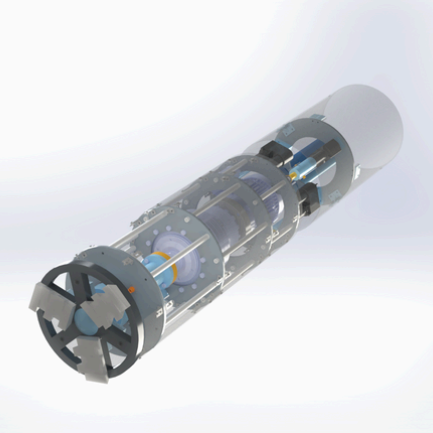
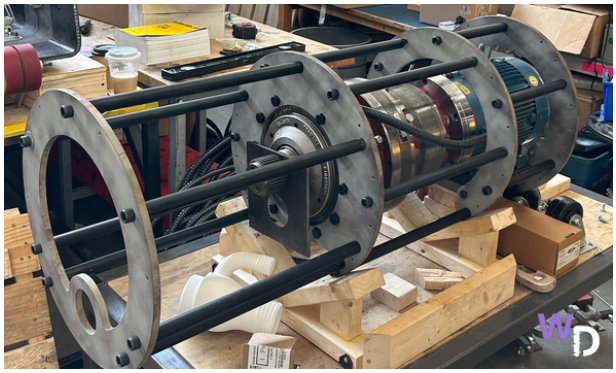
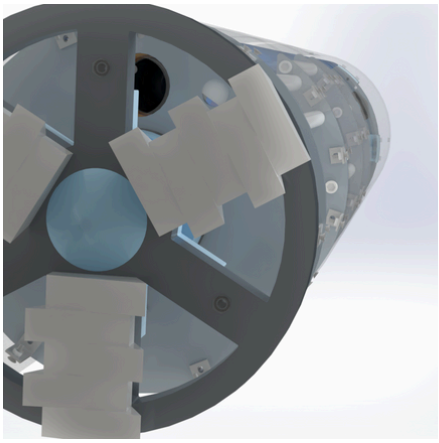
TUNNEL BORING MACHINE - WATDIG

NOT-A-BORING COMPETITION







What?

- Research and design of a tunnel boring machine to compete in the Not-A-Boring Competition 2025
- Supporting a team of 4 to design the machine chassis, propulsion and articulation systems
- Contributing to the design and development of various structural components of the machine

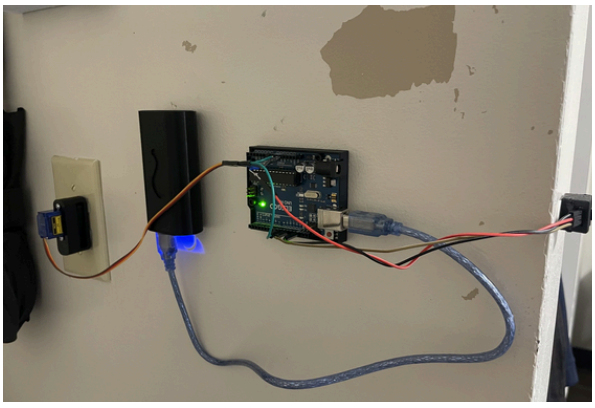
How?

- Conducted **hand calculation** and **FEA** to spec hydraulic requirements
- Utilized **OnShape** to realize ideas into **CAD** models
- Designed an articulation system based on the Stewart-Motion platform, using **hydraulics** for power and **sensors** for controls

Results

- Successfully designed and manufactured various structural parts
- Preliminary design mockup has been approved for competition
- TBM has been partially built and will be completed by comp
- Received **$10000+** in funding from sponsors to continue developing our boring machine

REMOTE CONTROLLED LIGHT FLICKER



Why/What?

- I took on this project to resolve a daily annoyance of mine: getting out of bed to turn the light off
- I wanted a light switching device which I could activate from bed
- Designed and developed all aspects of the project including mechanical electrical and software

How?

- Spec'd a **servo** and **battery** using dynamics and electrical principles
- Operates using **Infrared Sensing** to send commands from the bed, and converting them into mechanical outputs using a **microcontroller**
- Designed component housings in **OnShape** to facilitate fastening
- Used **soldering** and **heat-set inserts**
- Coded all electrical controls in **C++**

Results

- The mechanism works comfortably using an IR remote from my bed
- The system is very reliable, and flicks the switch properly **99%** of the time
- Has an effective battery life of **3 days**
- The system operates independently, allowing manual light switching when it is more convenient
- The final design is renter-friendly and wont make my landlord hate me

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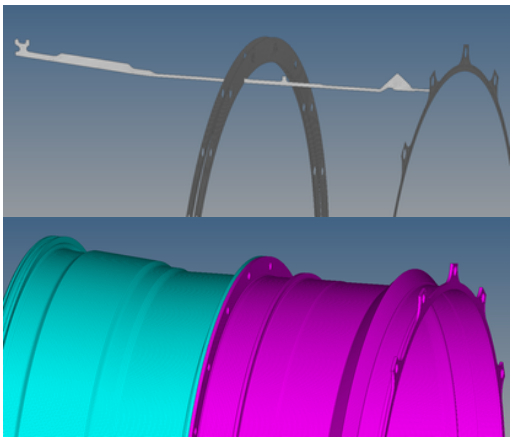
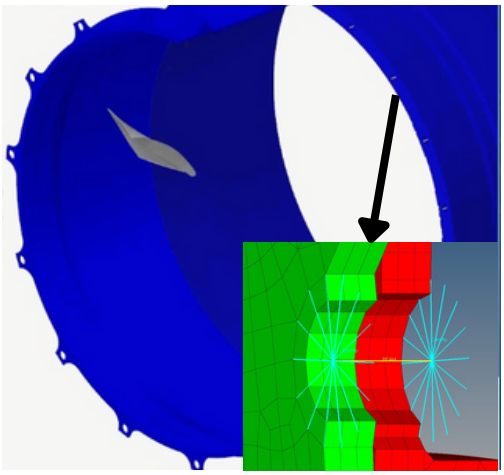
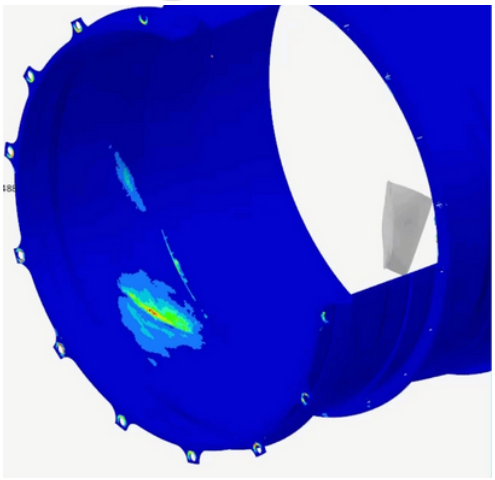
JET ENGINE CONTAINMENT STUDY - PRATT & WHITNEY







What?

- Conducted a study to determine engine damage as a result of a rotor blade cracking off in flight
- Developed the study according to FAA and P&W best practices
- Collaborated with various departments to collect study data
- Documented study in a formal report along with a presentation

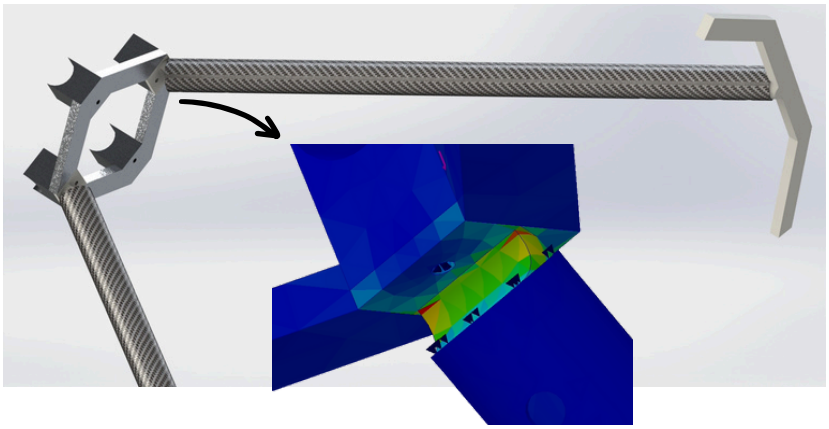
How?

- Defeatured the compressor assembly in **CATIA** & **Spaceclaim**
- Meshed and prepared assembly for **FEA** in **Altair Hypermesh**
- Applied boundary conditions in accordance with **LS-Dyna** solver
- Iterated through several models to improve model realism

Results

- Succesfully conducted **8** different runs, increasing in complexity
- Confirmed that a blade-off event would remain contained after new design changes
- Provided valuable data to be used for engine certification by FAA

DRONE LANDING GEAR - WATERLOO AERIAL ROBOTICS



What?

- Led the design and modelling of a carbon-fiber drone landing gear
- Mechanical crash failsafe to concentrate impact energy away from the expensive carbon fiber
- Withstand the impact of repeated landing at various angles

How?

- Modelled entire assembly in **Solidworks,** using **FEA** for center of mass and structural analysis
- Used **3D Printing** for the failsafe joint, tuning the print settings for optimal impact absorption
- Drafted a **GD&T drawing** to be used for the aluminum machining

Results

- **130 Degree** effective landing angle
- Strong yet lightweight (**300g**)
- Withstands drone takeoff and landing
- Was used in the Aerial Evolution Association Canada competition '24

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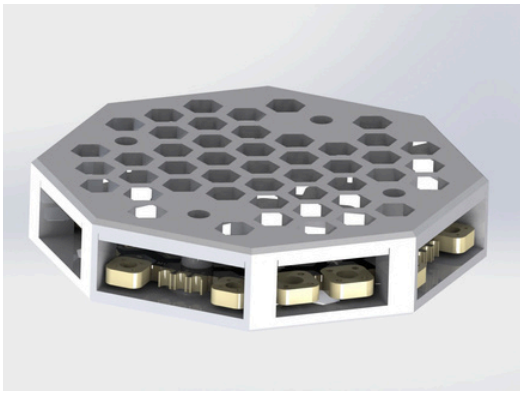
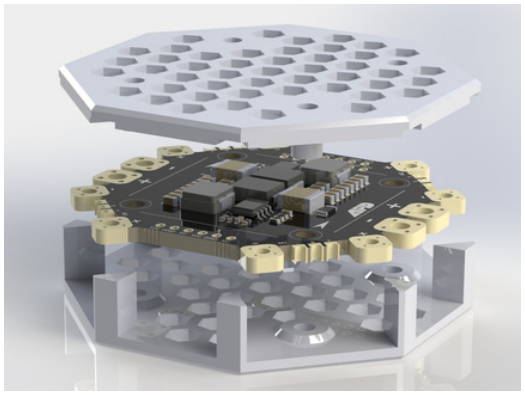
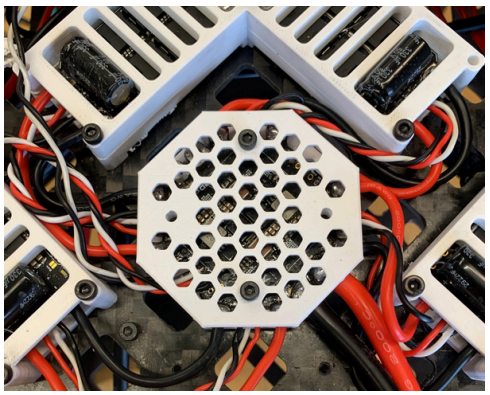
DRONE PDB HOUSING - WATERLOO AERIAL ROBOTICS







What?

- Led the design and manufacturing of a PDB circuit board housing for the competition drone
- Worked with the electrical team to design for their constraints
- Snap-fit assembly along with screws to lock onto drone frame
- Protects from accidental shorting

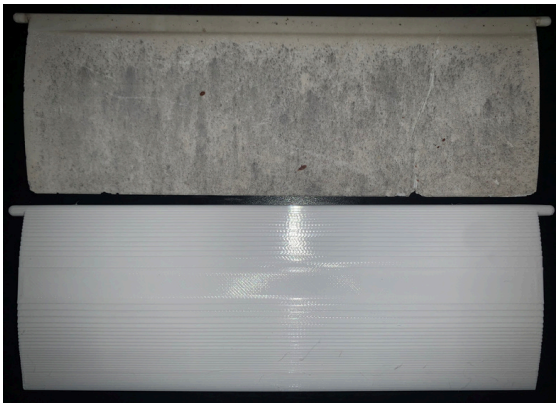
How?

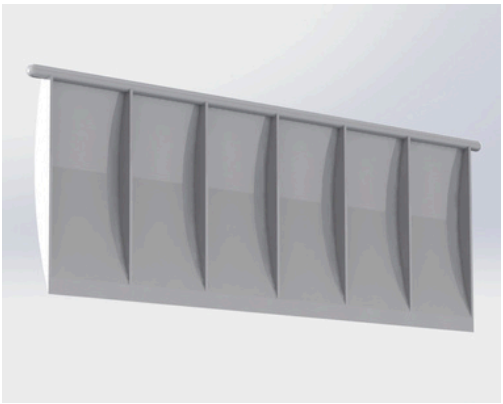
- Modelled entire assembly in **Solidworks** along with **FEA** for structural analysis
- Utilized **DFMA** principles to allow for easy **3D Printing** and assembly
- Ensured safety by restricting fingers from electrical short points
- Manufacted by **3D Printing** in PLA

Results

- Extremely lightweight (**12g**)
- 3D printable without supports with a **<2hr** print time
- PDB stays within rated temperature
- Will be used in the Aerial Evolution Association Canada competition '24

VENT FLAP REPLACEMENT





What?

- Reverse engineered my house's vent flaps, in order to model replacements for the broken ones
- Snap in place model for easy installation into vents

Results

- **3D Printable** without supports, saving on material and print time
- Saved **$40** in flap replacements by taking on this project
- Operates as intended, opening when vent is engaged
- **30 users** online have printed my free model to fix their vents

How?

- With **calipers**, measured an intact flap to take critical dimensions
- Used **Solidworks** to model the flap using measured dimensions
- **3D Printed** several flaps using PETG, for its weather resistance