# Jonathan DiGiorgio

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## Technical Skills

**Engineering Software**: Solidworks CAD/FEA/PDM (CSWA), AutoCAD, Fusion360, COMSOL
**Design Processes**: GD&T, Drafting, FEA, DFMA, Quality Assurance, R&R, Rapid Prototyping
**Manufacturing Processes**: Engineering Drawings, 3D Printing, Laser Cutting, Machining, 5S
**Programming**: Python (PyAutoGUI, OpenCV), C/C++, MATLAB , HTML, CSS, Github, VS Code

## Experience

**Mechanical Engineer Team Member** Sept 2023 – Present
*Waterloo Aerial Robotics Group* *Waterloo, ON*

- Designed and modelled a light-weight carbon-fibre drone landing gear with a crash failsafe, using **Solidworks**
- Designed ESC & PDB circuit housings in **Solidworks**, including safety considerations and board ventilation
- Conducted **FEA** to determine landing gear load distribution, landing angles, and housing ventilation effectiveness

**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, 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
- Led an automated package inspection project that uses Dori AI to detect and warn of missing parts from orders
- Conducted **30+** gauge calibrations/R&Rs, audits, hipot testing, and hardness testing every week to ensure quality
- Assembled various switches and sub-assemblies, gaining insight into manufacturing and **DFMA** principles
- Effectively tracked quality of **300+** products weekly using **Excel** and **Oracle**, to produce weekly quality reports

**Airframe Design Team Member** Sept 2022 – April 2023
*Waterloo Rocketry* *Waterloo, ON*

- Led the safety team for the oxidizer loading system, through the UV-light inspection and assembly of ball valves
- Working on the airframe subteam to machine and assemble a competition-ready rocket frame using carbon fibre

## Projects

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

- Led a team of 4 to design a robot which autonomously plays pro-level chess against a live opponent
- Used **Python** for move detection (**OpenCV**), move computation, and robot communication (**PyAutoGUI**)
- Utilized **RobotC** , 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
- Conducted simulations using **Solidworks FEA** to determine the best structure for load distribution and tipping
- Created a work breakdown structure and Gantt chart for project management, resulting in timely completion

**Magnetic Whirpool - Fishing Toy** | *Solidworks, Machining, 3D Printing* Sept 2022 – Dec 2022

- Led a team of 4 to design a fishing toy with a magnetically influenced whirlpool and spring-powered 'fishing rods'
- Made whirlpool mechanism using a motor, magnets, potentiometer and switch, sustaining a **15+** min vortex
- Used **drill press** and **saw** to construct the PVC housing for a pinball-like launcher, resulting in a **∼70cm** range
- Used **Solidworks** and **3D printing** for a reel mechanism that friction-fits into a ball bearing, storing **1m** of reel

**Lithophane Picture Stand** | *Solidworks, 3D Printing* May 2023 – Jun 2023

- Designed pictures that display only when lit from behind, by using varying thicknesses to create different shades
- Used **Solidworks** to design a sleek LED housing with a lithophane mount, allowing for easy picture swapping
- Designed product to be easily **3D printed** without supports, saving material and around **2 hours** in print time

## Education

**University of Waterloo** Waterloo, ON
*Bachelor of Applied Sciences in Mechanical Engineering (95.0% Average)* *2022 – 2027 (Expected)*

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MECHANICAL ENGINEER

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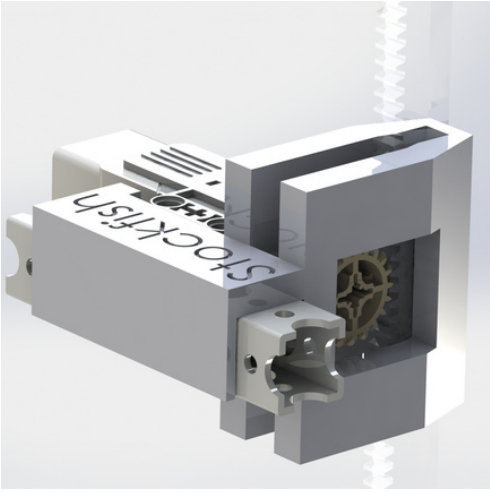
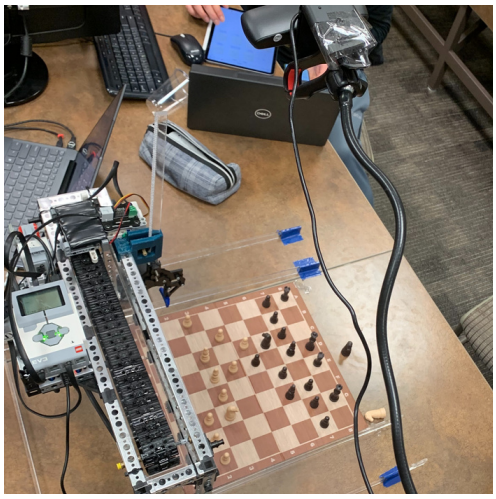
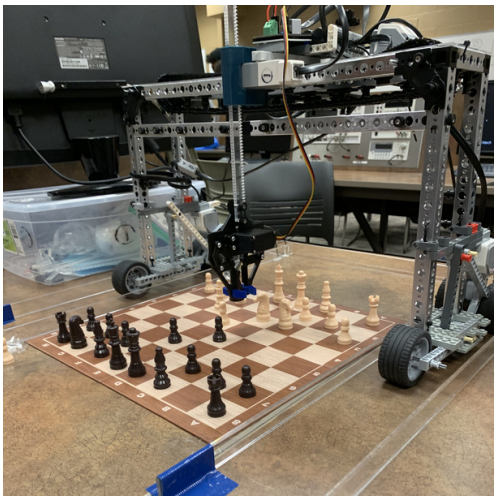
## FULLY AUTONOMOUS CHESS ROBOT





**What?**

- Led a team of 4 students 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

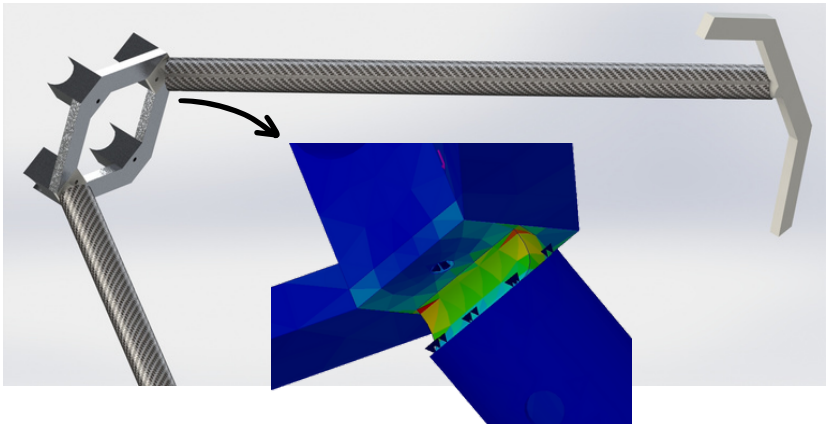
**How?**

- 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)

## DRONE LANDING GEAR - WATERLOO AERIAL ROBOTICS GROUP



**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
- May be used in the Aerial Evolution Association Canada competition '24

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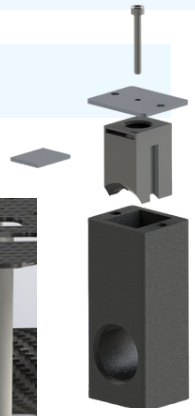
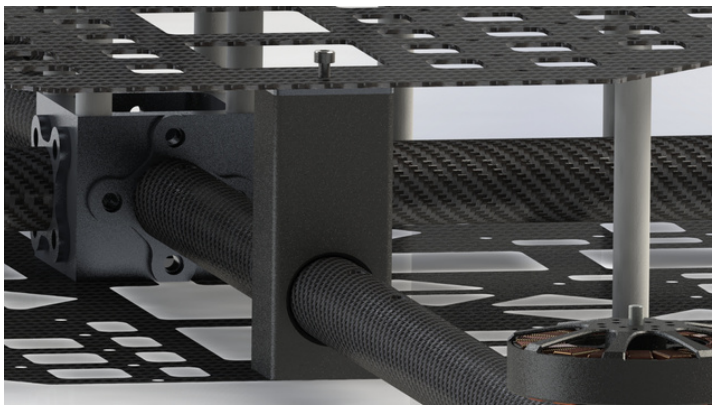
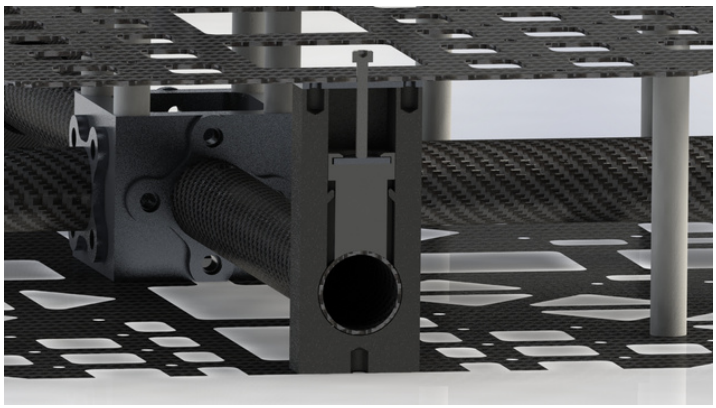
## X-FRAME ARM CLAMPS - WATERLOO AERIAL ROBOTICS GROUP







**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

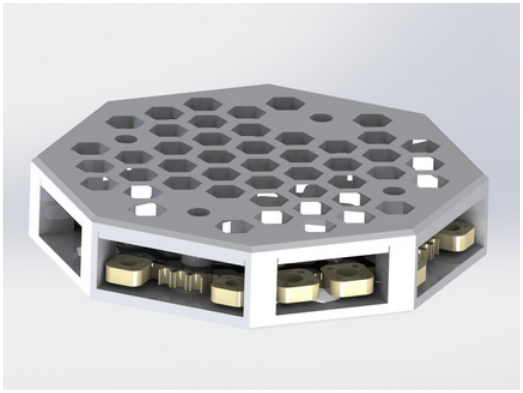
**How?**

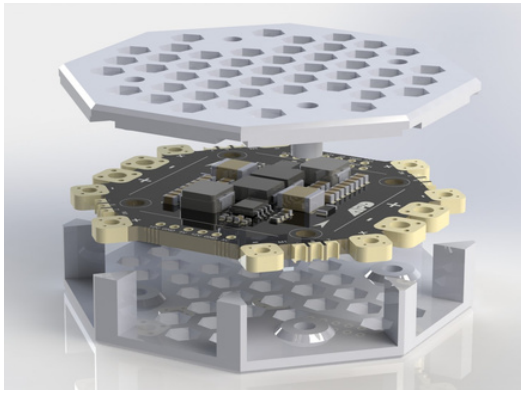
- Modelled entire assembly using **Solidworks PDM**
- Utilized **DFM** principles to allow for easy **3D Printing** without supports
- Drafted **GD&T** drawings for the aluminum parts, and machined them using the CNC, drill and tap
- **3D printed** non-metal parts using carbon-fiber PETG for durability

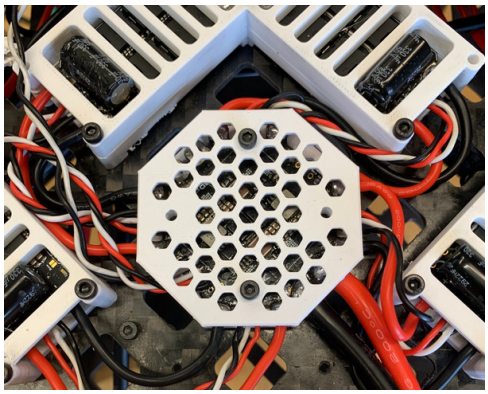
**Results**

- 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 '24

## DRONE PDB HOUSING - WATERLOO AERIAL ROBOTICS GROUP







**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