





# Amaar Quadri

## 3B WATERLOO MECHANICAL ENGINEERING

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### Summary of Qualifications

- **Certified SolidWorks Professional** experienced in designing parts and detailed drawings for **manufacturing processes** including laser cutting, sheet metal bending, welding, machining, injection molding, and 3D printing
- Accurately modelled, analyzed and acted on a variety of multipart **static simulations** in SolidWorks and Ansys
- Excelled in courses on structural analysis, thermodynamics, fluid mechanics, controls, and materials science
- Programmed solutions for a wide range of complex mechanical, software, and robotics problems in **Python**

### Work Experience

#### MECHANICAL DESIGNER – SUNNYBROOK RESEARCH INSTITUTE SEPT 2019 – PRESENT

- Prototyped a catheter with a steerable tip for use in a wide variety of cardiovascular intervention surgeries
- Designed an innovative, ergonomic, and fully mechanical mechanism for tensioning and actuation
- Authored a **patent** and an **academic paper** on the mechanism's usage as a cable driven parallel mechanism
- Iteratively modified Nitinol anchors at the catheter tip to prevent deformation using **nonlinear simulation**
- Continuing to work part time during school terms to create a **sub-millimeter precision** tracking system

#### MECHANICAL EQUIPMENT DESIGN ENGINEER – TIGERCAT INDUSTRIES JAN – APR 2019

- Worked on a special projects team to design custom parts for **heavy duty forestry** and silviculture machinery
- Designed a cost-effective **high precision** fixture for calibrating a camera box which reduced calibration time from **3 hours to under 10 minutes** and significantly improved accuracy
- Designed and simulated a moving linkage in a hydraulic arm, capable of withstanding **36,000 pounds** of force

#### MECHANICAL RESEARCHER – METER MAY – AUG 2020

- Worked on unsolved research problems relating to the design of an x-ray CT scanner for dimensional metrology
- Designed a mechanized x-ray filter assembly with 2 wheels of selectable filters controlled with a single motor
- Compared cooling solutions for an electronics enclosure by analyzing thermal effects with differential equations
- Identified the impact of rotational inaccuracies of the part by analyzing x-ray simulation results

#### FLUIDS MECHANICS RESEARCH ASSISTANT – UNIVERSITY OF WATERLOO SEP 2020 – PRESENT

- Refined meshes for computational fluid dynamic simulations of a ship's hull in OpenFOAM
- Verified the results via grid convergence using code optimized for high performance supercomputers

### Projects

#### MECHANICAL DESIGN LEAD – UW AQUADRONE DESIGN TEAM MAR 2019 – PRESENT

- Led a student team to design, build, and test an **autonomous submarine** for the 2021 RoboSub Competition
- Fabricated a robust frame with a waterproof enclosure, and a ballast-based buoyancy system
- Designed a fully custom **robotic arm** and **torpedo launcher** with a common underlying **pneumatic system**
- Determined the optimal materials and manufacturing processes to ensure functionality and **waterproofing**
- Collaborated with other sub-teams to incorporate dependable electrical, vision and path planning systems
- Justified the value of the team and presented to the university to get over \$30,000 in funding

### Education and Achievements

- Ranked one of the top students, with a **3.9 GPA**, in mechanical engineering at the University of Waterloo
- Completed the Udacity Robotics Software Engineer Nanodegree showing knowledge in controls and automation
- Trained a neural network to play Connect 4 at a superhuman level using self-play reinforcement learning

# Amaar Quadri – Work Sample

## Steerable Catheter Control Mechanism

### SUNNYBROOK RESEARCH INSTITUTE

My team is working on an experimental catheter device intended for use in cardiovascular procedures. It has 4 expanding branches to anchor itself in place in the artery. The 4 pull-wires are then manipulated by the surgeon to deflect the guidewire tip to help steer it through blockages in the artery.

During my coop, I was tasked with designing the mechanical mechanism that would convert the surgeon's input into actuation of the pull-wires. I devised a set of requirements, led brainstorming sessions, performed engineering calculations, and wrote Python code to evaluate potential designs.

I also wrote a patent, of which I am the primary author, based on the final design. The final design was ergonomic, intuitive and had an elegant simplicity. By the end of the coop, I also had a working 3D printed prototype. My employer was so impressed that I am still working part time during school.

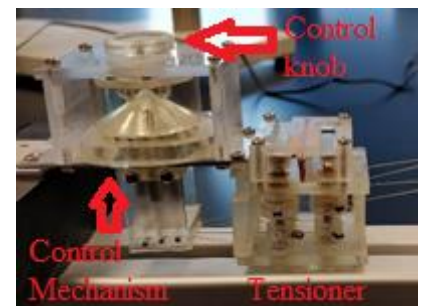
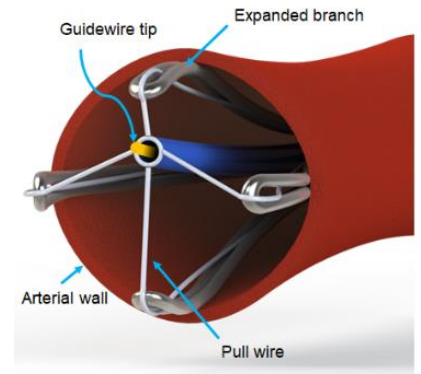
## Mulcher Tilt Adapter

### TIGERCAT INDUSTRIES

A mulcher is a heavy-duty forestry machine that has a high-speed rotating drum on a hydraulic arm. The drum has teeth on it that are used to grind up tree stumps and other debris after a set of trees have been harvested.

As part of my coop, I was tasked with designing an adapter that would fit between the hydraulic arm and the drum. The adapter would have a slot instead of a fixed joint which would allow the drum to tilt to better match the contours of the ground, yielding a more comprehensive mulching.

The part was designed to be made from thick laser cut structural steel welded together. I ran simulations and iterated on the design to ensure it could withstand the 10,000lb weight of the drum and the 36,000lb force from the hydraulic cylinders.



## WATERLOO AQUADROME

Created and Grew the Team

Submarine CAD Model

## TIGERCAT

Camera Calibrating Assembly

