

Mark Do

[Portfolio Website](#) | mdo@uwaterloo.com | [GitHub](#) | [LinkedIn](#)

Technical Skills

Languages: Python, C++, CSS, HTML, JavaScript, Git, SQL, Arduino, MATLAB

Libraries & Frameworks: TensorFlow, PyTorch, Scikit-learn, Pandas, NumPy, Matplotlib, PySerial, OpenCV, Flask

Design & Manufacturing: Siemens NX, SolidWorks, AutoCAD, 3D-Printing, Laser-cutting, Soldering, Oscilloscope

Work Experience

Production Technician | *Data Analysis, Scikit Learn, Pandas, Excel, NumPy, Process Optimization* Jan. 2023 – Apr. 2023
Olymel S.E.C

- Conducted studies on ingredients, machinery, production defects & yields to create 7 optimization reports
- Aggregated & preprocessed ~50,000 cumulative datapoints using Excel, Pandas, and Scikit-learn for further analysis
- Developed application which automatically performs statistical analysis on input datasets. Application outputs a sorted list of most significant trends in the data, speeding up 1-on-1 feature comparisons by 50%
- Visualized results using histograms, 3D scatterplots, and heatmaps with Matplotlib for recommendation reports

Projects

Emotional Cardiography (ECG) | *OpenCV, TensorFlow, Flask, Python, C++, JavaScript* [GitHub](#)

- Developed and trained Convolutional Neural Network using Keras-TensorFlow, achieving an accuracy of over 70% in recognizing 5 emotions. Integrated with Flask, the model transfers the real-time emotion predictions to a NodeJS backend
- Iteratively improved model performance using error analysis, image augmentation, and skip connections inspired by ResNet.
- Designed and programmed Arduino C/C++ model to detect users' heartbeat, using serial communications to transfer data

Jesture Bot (Hand Motion Controlled RC Car) | *C++, Arduino, OpenCV* [GitHub](#)

- Built a Bluetooth RC Car that works as a portable speaker, controlled by hand gestures over webcam
- Used OpenCV to detect hand gestures, left-hand controls car movement and right-hand for speaker volume
- Communicated with Arduino Due microcontroller using PySerial and an HC-05 Bluetooth module
- Used a logic level converter to drop 5V voltage from microcontroller to 3.3V for Bluetooth and motor controller

Experience

Satellite Thermals Team Member | *SolidWorks, Siemens NX, Thermal Analysis* Sept. 2022 – Jan. 2023
UWOrbital

- Simulated CubeSat satellite models in Siemens NX to investigate chassis' thermal behavior in while in different stages of orbit
- Satellite chassis modeled in SolidWorks, exported to, and modified in Siemens NX for thermal simulations
- Developed 5 simulation models with surface-to-surface calculations for max flux and min flux orbit cases
- Researched thermal & optical properties for Aluminum alloys, FR4, Copper and PVC for use in-place of default material values

Automated Defect Detection | *Object Localization, Transfer Learning, YOLOv5, Python CLI* May 2023 - Present
Toyota Innovation Challenge

- Implemented transfer learning on YOLOv5 object detection model to detect sticker defects on interior car chassis
- Collected and pre-processed original dataset into .xml file format compatible with YOLOv5s model
- Utilized Python CLI and PyTorch to integrate webcam feed for real-time sticker localization and defects prediction

Education

University of Waterloo Sep. 2022 – May 2027

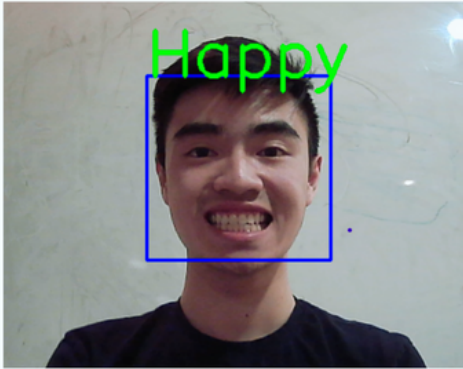
Candidate for Bachelor of Mechanical Engineering

- Dean's Honors List: Fall 2022 - 4.0 GPA
- President's Scholarship of Distinction: Awarded for a 95+ entrance average

EMOTIONAL CARDIOGRAPHY (ECG)

January 2023 - Present

Emotional Cardiology

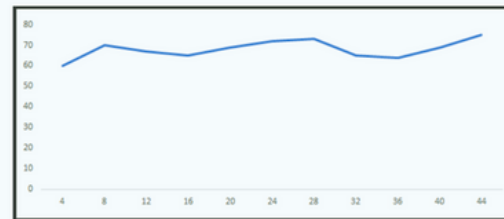


John Doe
Room 317
Condition: Healthy

Emotion Likelihood

Happiness: 87%
Sadness: 1%
Pain: 3%
Fear: 7%
Surprise: 2%

Heart Rate



Neural Network Architecture:

- KER 2013 dataset- 27,000 (48 x 48 x 1 greyscale) images, divided into 24,000 images for the train set, 3000 images for the cross-validation set.
- 70% Validation Set Accuracy
- 4.7 million parameters total from 12 convolutional layers and 2 fully-connected layers (ELU non-linearity), with 5 units SoftMax output.

[GitHub - ECG](#)

Project Description:

- ECG is an application that monitors a patient's emotional state and heart rate using OpenCV, Machine Learning & heartrate sensors.

Software:

- Emotion recognition CNN model built on Python with **OpenCV and TensorFlow Keras**
- Built a **web application** that receives all the data and displays it to a doctor, with an algorithm that predicts the patients state based off sensor data
- Streamed video feed and model predictions to the website's **Node.js backend** using **Flask**

JESTURE BOT - GESTURE CONTROLLED RC CAR

Feb 2023



[GitHub - JestureBot](#)

Project Description:

- Jesture Bot is a Bluetooth RC car that works as a portable speaker that can be controlled by using just your hands, built in under 24 hours as a part of UofT's hardware hackathon

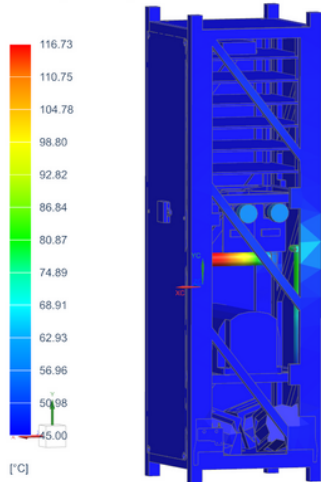
Software:

- Used Google's **mediapipe OpenCV** library to recognize and process points on users hands, the left hand being used for car movement and the right for volume
- Sent data to an **Arduino Due** using an **HC-05** Bluetooth module, controlling the 4 TT motors using a **L298N motor controller** and a basic speaker.
- Used a **logic level converter** to drop voltage levels from Arduino to **3.3V** to communicate to the Bluetooth module.

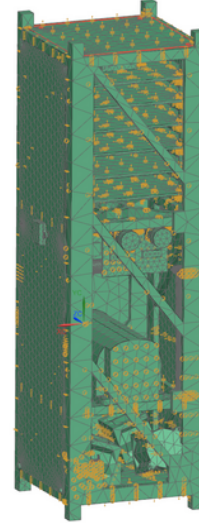
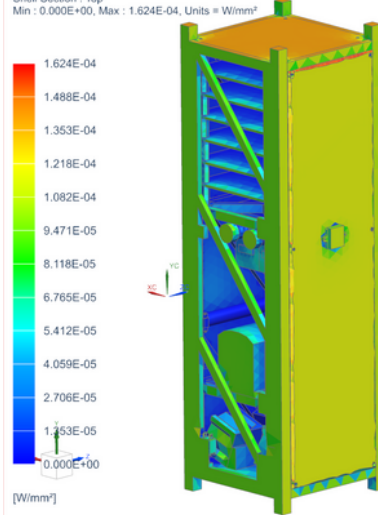
UWORBITAL THERMAL TEAM

October 2022

CDRSim : CDRChassisSolution Result
Load Case 1, Time Invariant
Max Temperature - Elemental, Scalar
Min : 45.00, Max : 116.73, Units = °C



CDRSim : CDRChassisSolution Result
Load Case 1, Increment 6, 5.562E+03s
Absorbed Radiative Flux, PLANET IR - Elemental, Scalar
Shell Section : Top
Min : 0.000E+00, Max : 1.624E-04, Units = W/mm²



LEFT:
Maximum temperature reached by components throughout duration

MIDDLE:
Total Heat Flux Absorbed

RIGHT:
CubeSat meshing preparation for simulation

What:

- Simulated CubeSat satellite models in Siemens NX to investigate chassis' thermal behavior in while in different stages of orbit
- Researched thermal & optical properties for Aluminum alloys, FR4, Copper and PVC for use in-place of default material values

How:

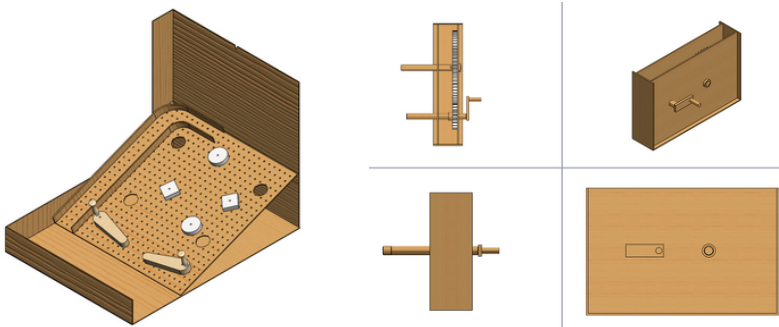
- Exported **SolidWorks** models to **Siemens NX** thermal testing

Why:

- To verify that the CubeSat design will malfunction due to extreme temperatures in space

CUSTOM PINBALL MACHINE

October 2022



What:

- Designed & fabricated a custom **pinball machine** with **removable obstacles & steepness adjuster**
- Used a **pulley system** & a **gear box** to raise and lower board

Development:

- Used **SolidWorks** to design main body, obstacles, main board, & gear box
- Initial prototype made from cardboard to test raising & lowering system

Prototyping:

- Paddles **laser cutted** from plywood
- Obstacles & Gears **3D printed** out of ABS
- Machine body manufactured from Plywood