an539@cornell.edu
https://snaswin.github.io/

Aswin's Portfolio

Cornell University MEng Biomedical Engineering

Unconventional tech enthusiast, with creative experience in taking admiration from Bio-systems to solve engineering problems.
Fascinated by solving complex problems in challenging environment.

What is Aswin's Uniqueness?

Inter-discipline technical knowledge & communication

What are my fields of expertise?

Computer Vision, Instrumentation & Product design

What is my long-term goal in the Industry?

To be a leader, who leaves his firm footprint in making Healthcare more accessible

How do I solve my engineering problems?

By studying similar problems in other disciplines/branches of science

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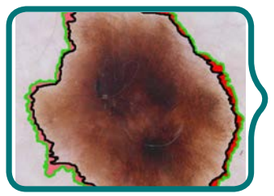
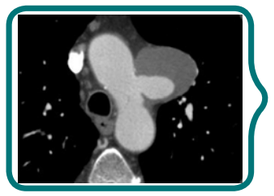
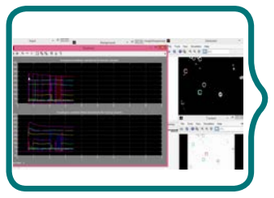
1. PROJECTS



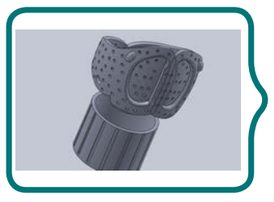
Segmentation of Skin Lesions using Combined Adaptive Thresholding and Connected Component Analysis
Machine/Computer Vision using C & VisionX. (Winner of 3rd best project award)



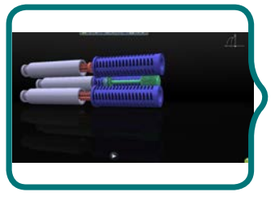
Masters Project: Automated Anatomical Landmark Detection in 3D Chest CT(DICOM) images
Machine/Computer Vision using C & VisionX in 3D images.



Observation and tracking of Erythrocyte Cell Membrane Vibrations for Differential Diagnosis
Video/Image sequence processing technique to translate Cell movement into measurable signal



Pore size estimation in developed Tracheal Scaffold using Circle Hough-transform
Design of Trachea & Image analysis of pore size using MATLAB



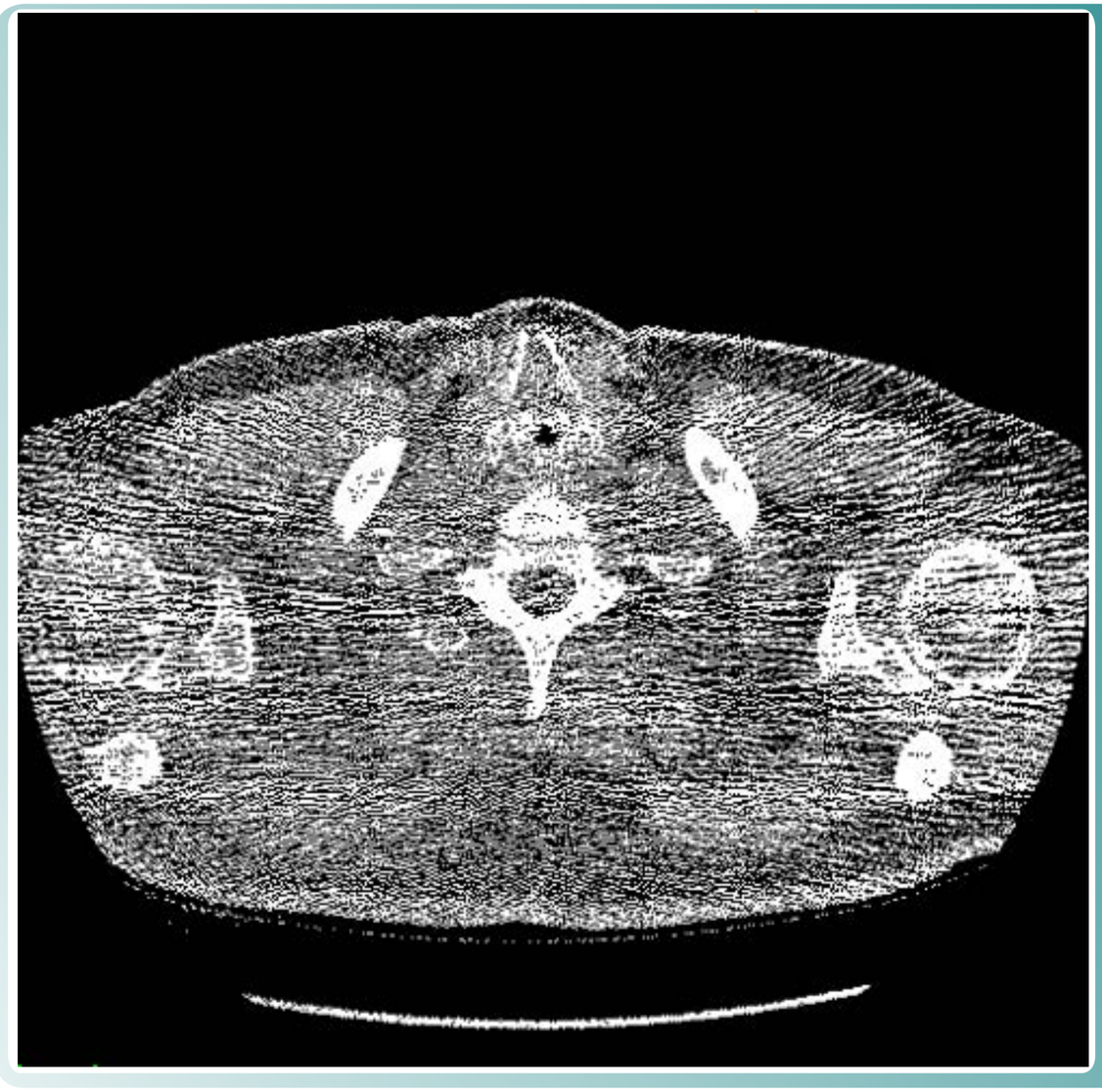
2. PATENTS

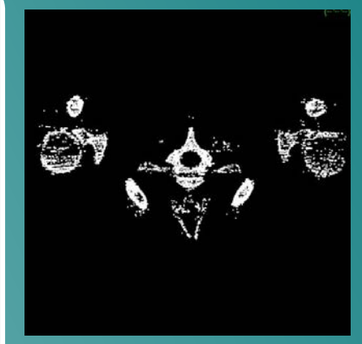
3. EXPERIENCE & LEADERSHIP

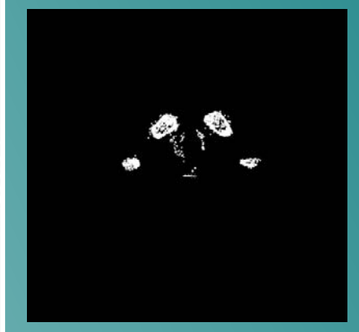
Contents

1A

Masters Project:
Automated Anatomical Landmark Detection in 3D Chest CT(DICOM) images]







Need: Current DICOM Computer Vision algorithms suffer from high error rate. Sternal Notch position can strengthen most algorithm performance

Machine Vision techniques

Thresholding in Hounsfield-units, Geometric filtering, ROI extraction, Slice based feature enhancement and tracking, Closing, Opening, Region growing, 2D to 1D mapping of features, Landmark localization etc

Skillset: C, Shell scripting, TCL, Server management

Dataset

50 cases of 3D DICOM images from LIDC

Inference

MDE of 56.54 pixels in 50 cases; 3.931cm mean deviation from Ground truth.

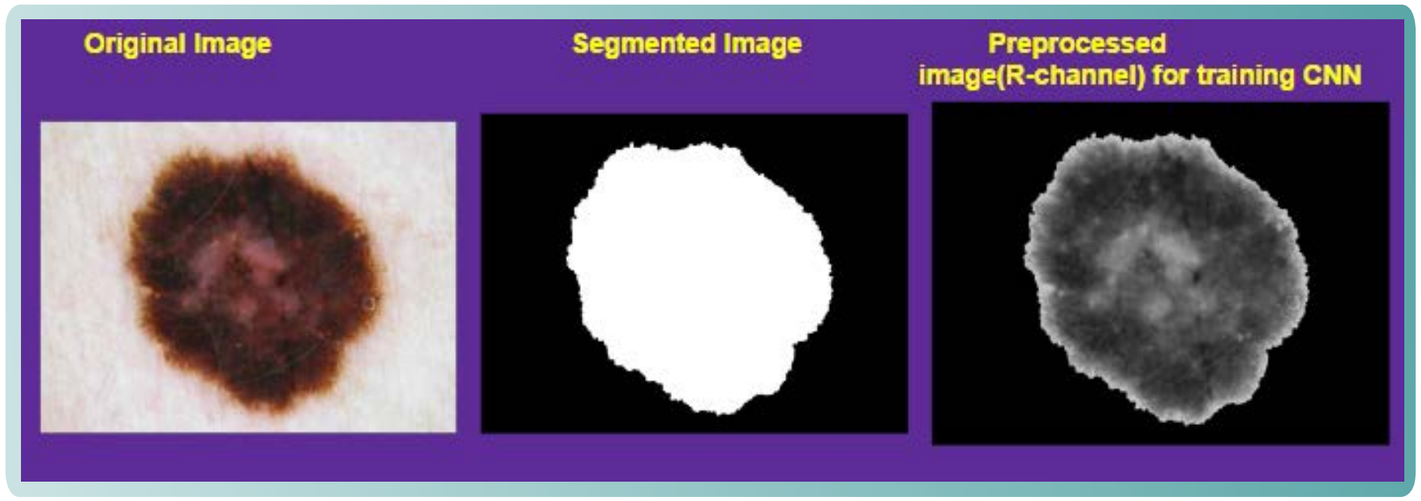
This project mostly involved not using any prebuilt libraries

1B

Segmentation of Skin Lesions using Combined Adaptive Thresholding and Connected Component Analysis

What is unique about this project?

The Segmentation technique is an unique combination of Otsu's thresholding and CCA. Performance Evaluation of existing techniques like Adaptive Snake and 2D color clustering was also done.



Need: A new dimension of Skin disease classification empowering smartphone based healthcare.

Machine Vision techniques

RGB color channel operation, filtering & equalization, Otsu-based thresholding and logical operation of channels etc.

Skillset: C, Shell scripting, TCL, Server management

Purpose of this project:

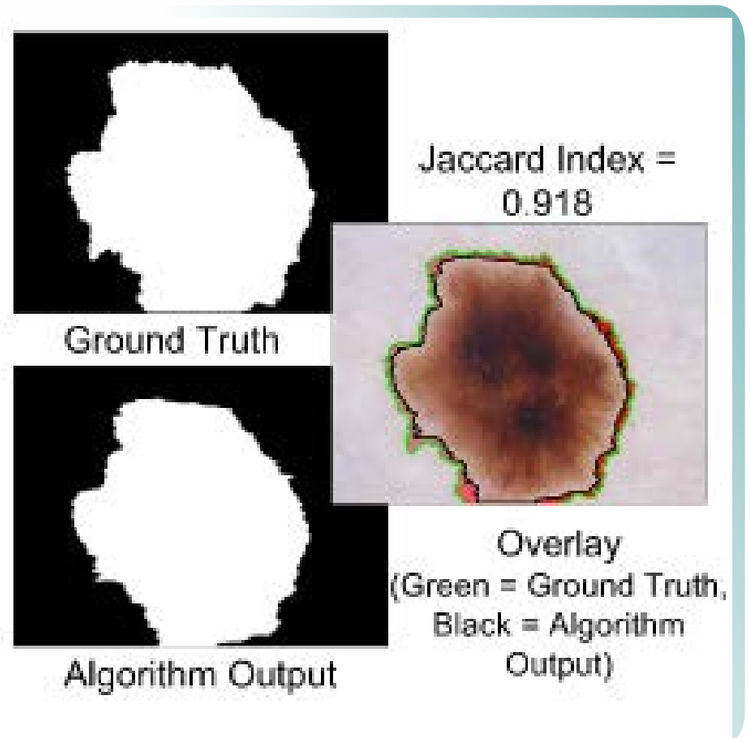
A Solid Segmentation algorithm for creating a training databse for Conv-Neural Networks.
Pre-processing segmentation technique to make skin disease classification

Dataset

900 cases of Dermoscopic images

Inference

Average Jaccard Index is 0.497



1C

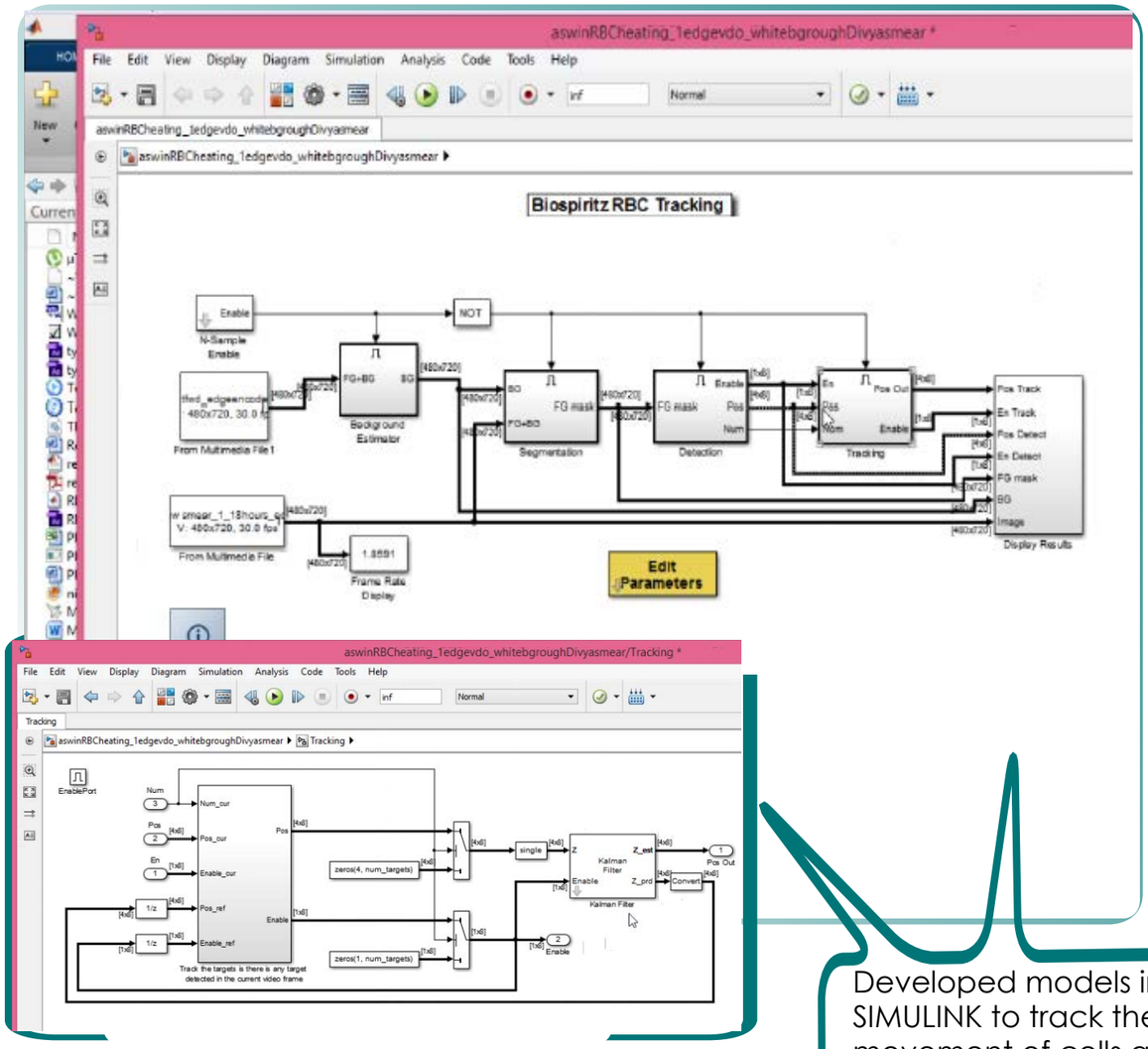
Tracking & translation of Cell vibration to 1D Signals using Kalman Filter (Video Processing)

Aim: To develop an algorithm which can detect cell vibration in the recorded image sequences using KALMAN filter to make a cell-characteristics classification

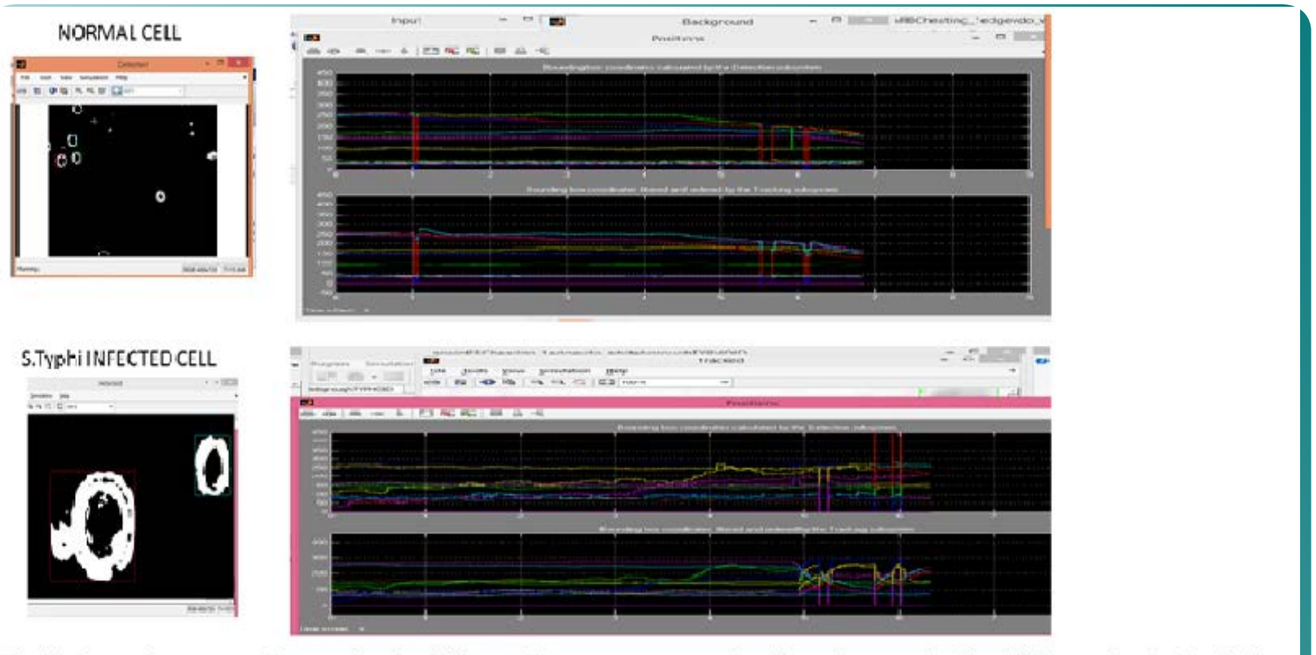
Machine Vision techniques

Median based Background estimation, Luminance Normalization, Autothresholding, Blob Analysis, Individual blob tracking, Kalman Filter etc

Skillset: MATLAB, SIMULINK.

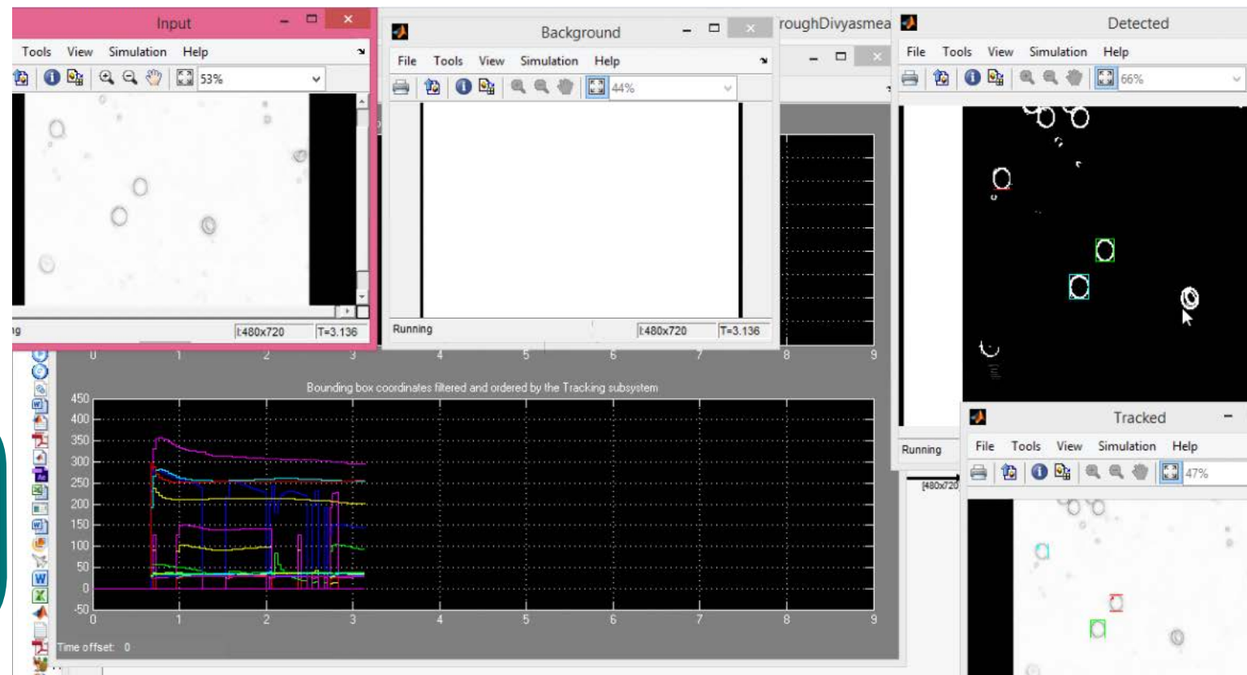


Developed models in SIMULINK to track the movement of cells and translate the motion into 1D signal



The Z^{est} waveform was observed to be different between a normal and an abnormal cell which may be the basis for a novel disease diagnosis. The frequencies were observed to be higher in a normal cell and peaks were observed when the bacteria invades or exists the cell.

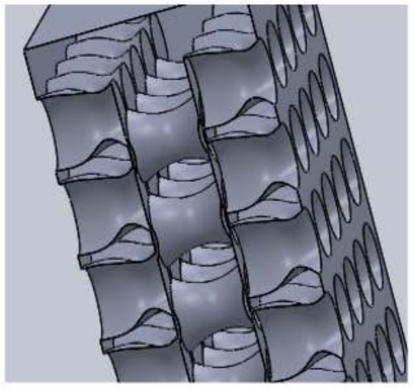
Instrumentation: Designed Electric arc circuits for thermal excitation of cells
Designed circuits to create Alternating Magnetic field
Designed circuits to control current.



1D

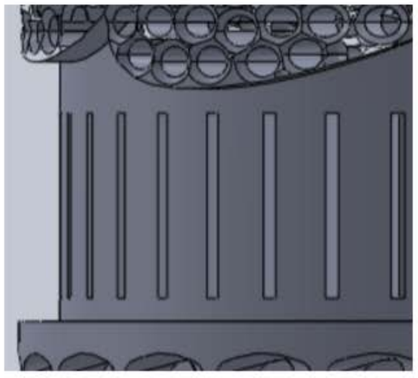
Pore size estimation using Circle Hough transform in developed Tracheal Scaffold

Novelty



Variable Interconnected pores

- Promotes layered cell growth
- Cell positioning



Longitudinal Stripes

- Promotes ligament growth longitudinally
- Leads to better tensile strength after Cell growth

Sutureless Implantation

- Snap-fit design eases surgeons
- Avoids loosening

Design & Prototyping

Design of Trachea in SOLIDWORKS and rapid prototyping (3D printing)

Image Analysis of prototype

Calibrated Pictures of the prototype were taken from different perspective and an analysis on the pore size was done in MATLAB;

Re-designing from Image Analysis

Estimated pore sizes and shapes were used to change the design.

Patents

MULTISYRINGE MODEL- JECTABLE

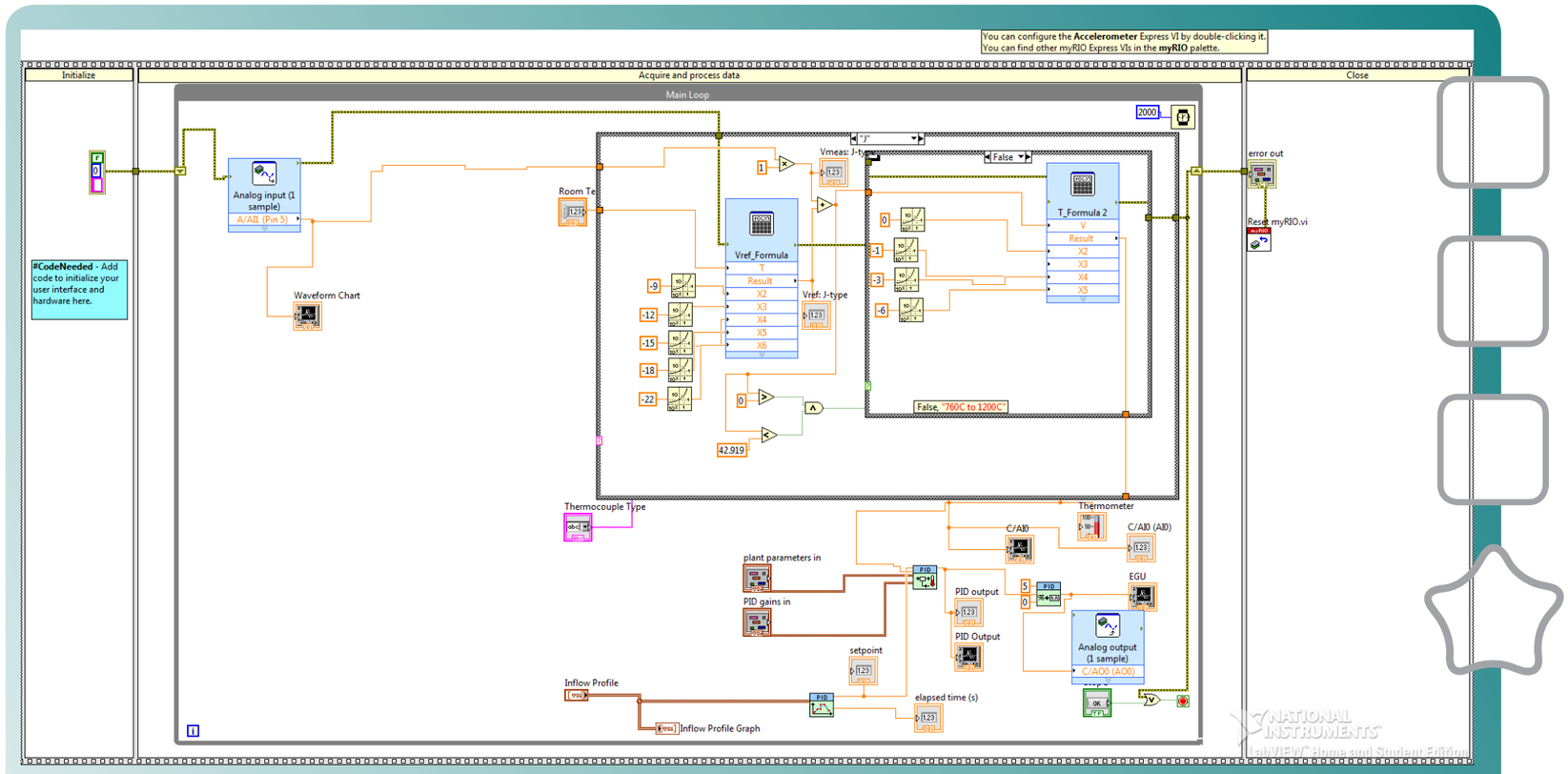
A dual purpose single & multi-injection pen

ELECTROMAGNETIC VASCULAR FORCEPS

A semi-automated electromagnetic surgical clamp


30%
70%
BUSINESS PLAN
time
money
quality
USER
USER
CLOUD
USER
USER
EXPERIENCE
cost
quality
price
EXPENSES
INCOME

SSN Research Center
Instrumentation/Control & Automation



Design of low current amplifier for K-type thermocouple

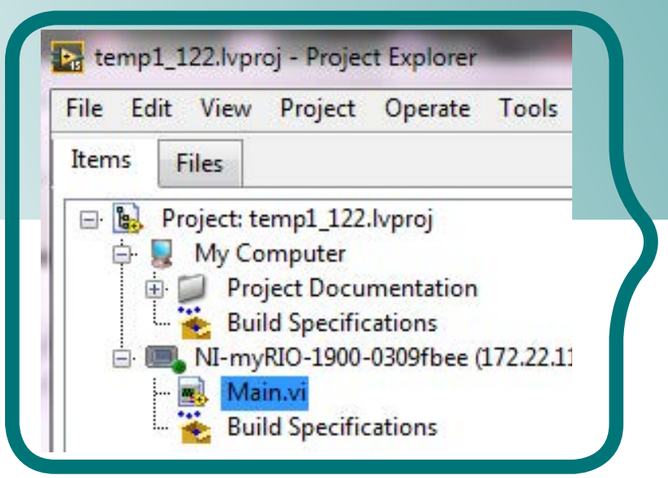
Designed a PCB for an amplifier and 2nd order filter!

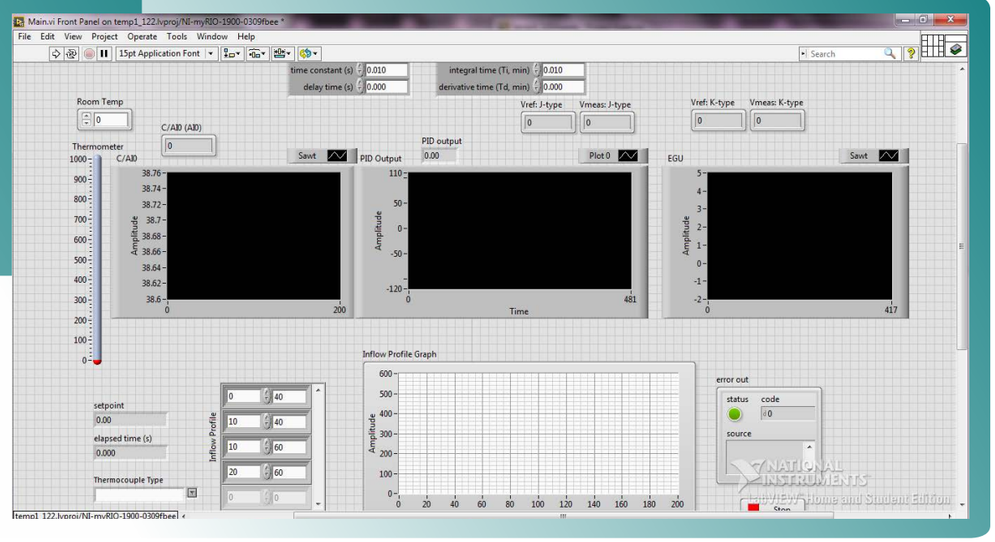
MyRIO based Instrumentation

Acquired raw temperature data using myRIO, and calibrated using NIST standard with a LABVIEW code; The calibrated temperature data was logged in periodically.

PID Closed-loop Control system

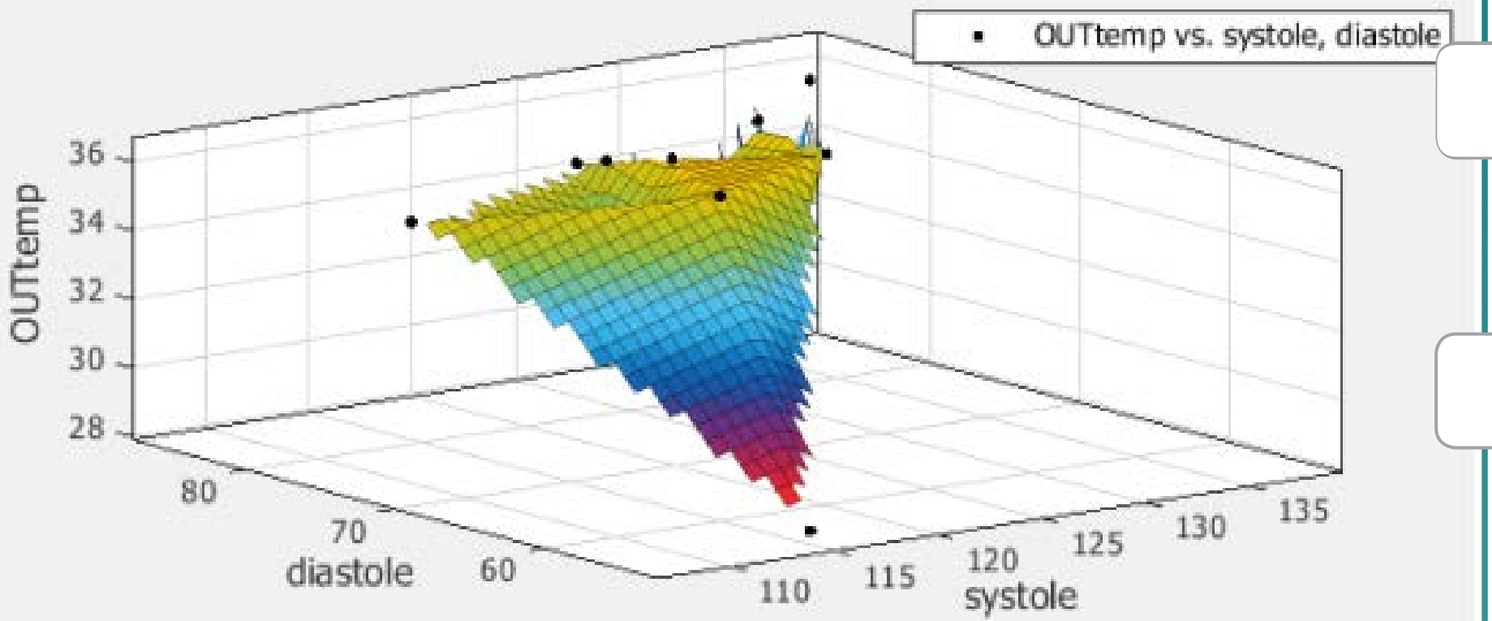
The calibrated temperature data was used for a constructed PID loop and used to give out 0-5V control output, which controls Thyristor output!





3B

Healthcare Technology Innovation Center- Wearable R&D



Core Body temperature relationship

Estimated the relationship between core body temperature and physiological parameters like HR, BP, SpO2, Skin temp & Humidity

Data acquisition & Analysis

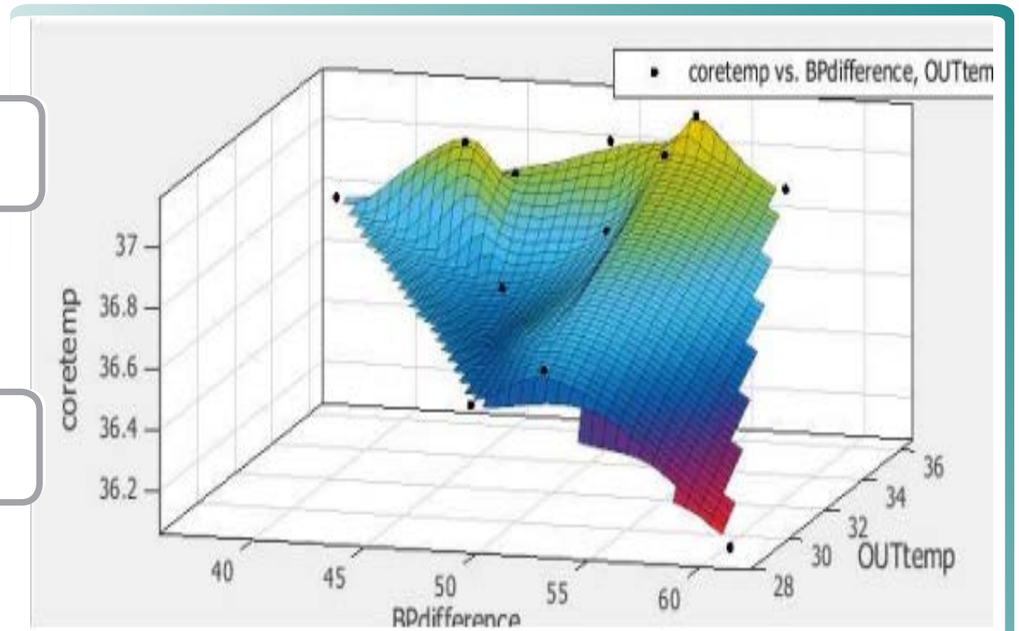
Acquired data from local random population of 532 people for relationship estimation.

Embedded programming in K53 MCU- ARM Cortex M4.

Implementation of preliminary analysis/results

Circuit design-Body fat percentage estimation.

Designed preamplifier, amplifier and filter circuits for Body fat percentage estimation



3C

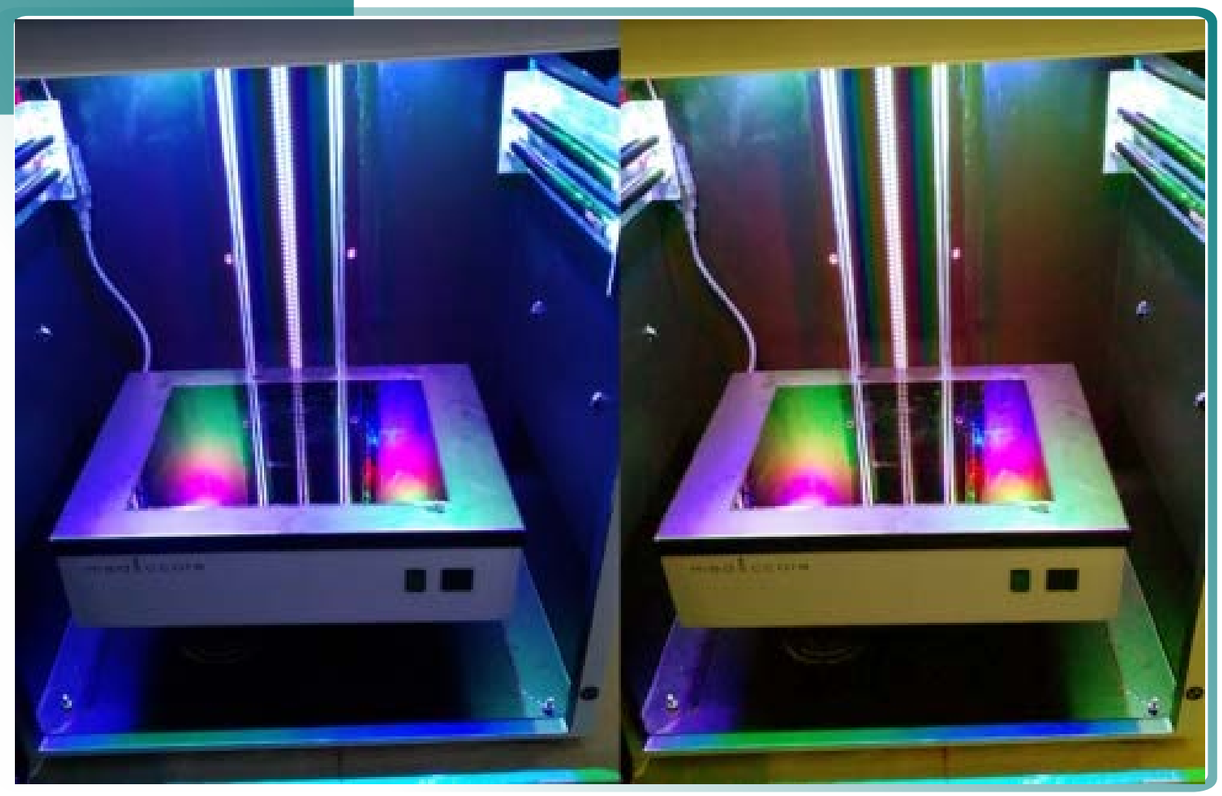
The Mediccare Scientific Supplies-
Image Analysis, Design & Automation

2D Image Analysis

Extracted bands in the captured Electrophoresis Gel Images, found their relative distances

Optical filter Automation

Designed a plastic case to hold optical filter
Designed power amplifier & driver circuits- H Bridge, ULN 2004 for Stepper motors.



3D

Laboratory Teaching Assistantship

Phys 2213- Electromagnetism

Topics include electrostatics, behavior of matter in electric fields, DC circuits, magnetic fields, Faraday's law, AC circuits, and electromagnetic waves.

Cornell OFFICIAL Student Reviews: **https://drive.google.com/drive/folders/0B6C7oRbkugtnRUJKTmFGUUxBbzQ?usp=sharing**

Phys 2214- Oscillations, Waves, and Quantum Physics

Covers physics of oscillations and wave phenomena, including driven oscillations and resonance, mechanical waves, sound waves, electromagnetic waves, reflection and transmission of waves, standing waves, beats, Doppler effect, polarization, interference, diffraction, transport of momentum and energy, wave properties of particles, and introduction to quantum physics. With applications to phenomena and measurement technologies in engineering, the physical sciences, and biological sciences.

Cornell OFFICIAL Student Reviews: **https://drive.google.com/drive/folders/0B6C7oRbkugtnLTZaeElRUWVNWXc?usp=sharing**

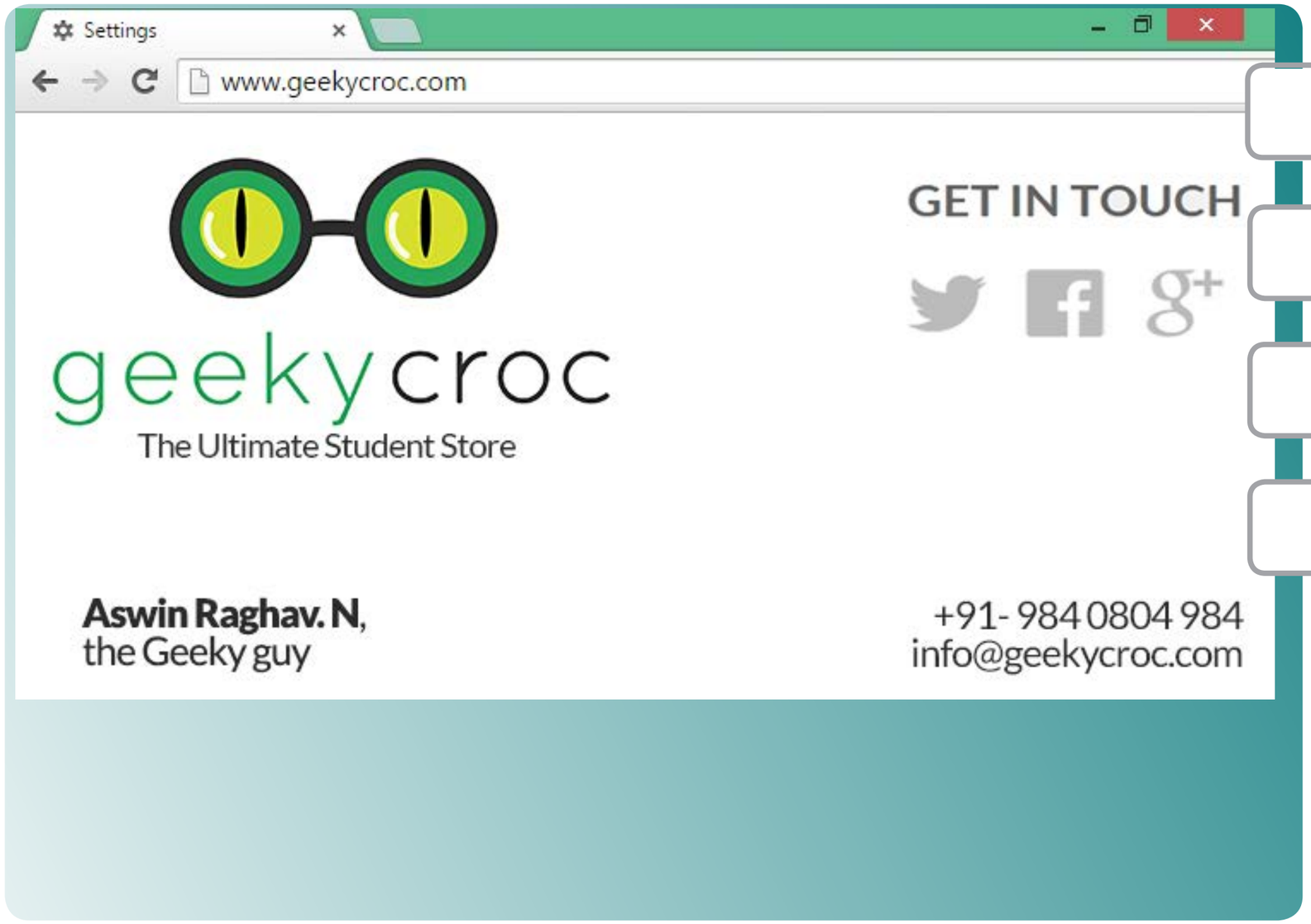
Phys 1112- Mechanics & Heat

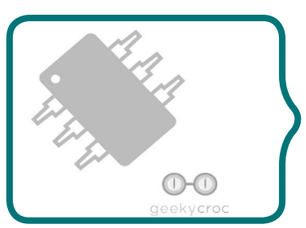
Covers the mechanics of particles with focus on kinematics, dynamics, conservation laws, central force fields, periodic motion. Mechanics of many-particle systems: center of mass, rotational mechanics of a rigid body, and static equilibrium. Temperature, heat, the laws of thermodynamics.

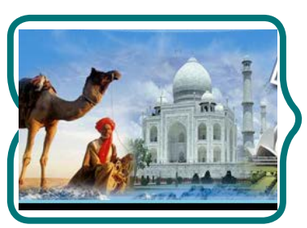
Cornell OFFICIAL Student Reviews: **https://drive.google.com/file/d/0B6C7oRbkugtncko3eHJ6Ti1oOTg/view?usp=sharing**

3E

Leadership & Business Skills







Founder & CEO

Experiences turned into a Business
(currently in Stealth mode)

Formed a Logistics network with no investment

Formed a team of people living across the state to cut down delivery costs of the product

Negotiating with clients for Partnerships

University Relations, Included Student sellers to take part

Students can post their products upon approval; initiated conversations with Universities

Content Designing, Online Marketing & Analytics

Aswin

an Unconventional tech guy

6822300992
an539@cornell.edu
Rethink Innovation through Vision