Vena Vitals Internship

Shilpa Rao
UCLA ECE '24, Summer 2022

Impacts I left on the company

Load Cell Data Collection

- Helped discover new problems & design future experiments by collecting human-subject data, and analysing data from a prototype.
- Helped direct company focus / troubleshoot sensor behavior based on my data & analysis.

Impacts I left on the company

Movement Analysis

- Developed a lasting software tool & streamlined company workflow
- Tool automates the detection of movement events in accelerometer data.
  - Helps coworkers analyze data from experiments conducted in the operating room.

Impacts I left on the company

Code Documentation

- Identified opportunity for better code organization. To solve this problem, I:
  - Implemented Github in the company's workflow
  - Created central documentation for our internal tools, recording commonly used software tools

Technical Specifics

Areas I got to touch!

- Led human-subject data collection & post processing in-house and in the operating room
- Searching for relationships in data (through time-series analysis)
- Pulse waveform feature detection
- Automating motion detection
- Code documentation & Github

Load Cell Data Collection

- With my manager, Jared's guidance, I spearheaded data collection with the load cell + set screw device.

- We wanted to quantify the normal force applied to the sensor and artery, to study the physiological and sensor-specific effects.*
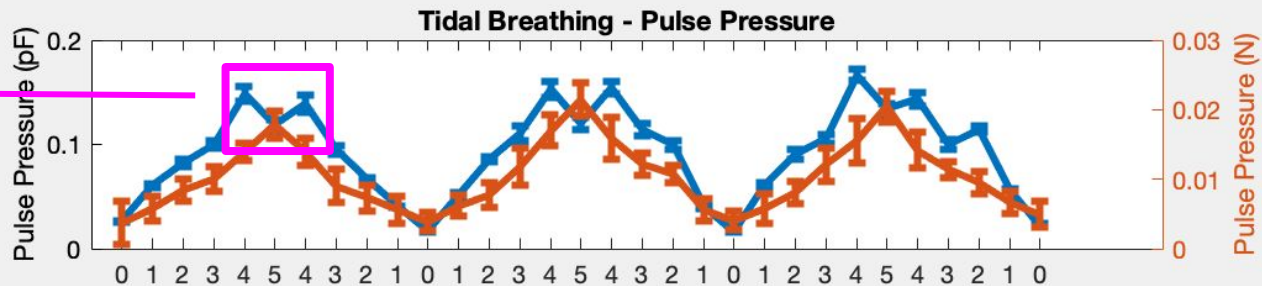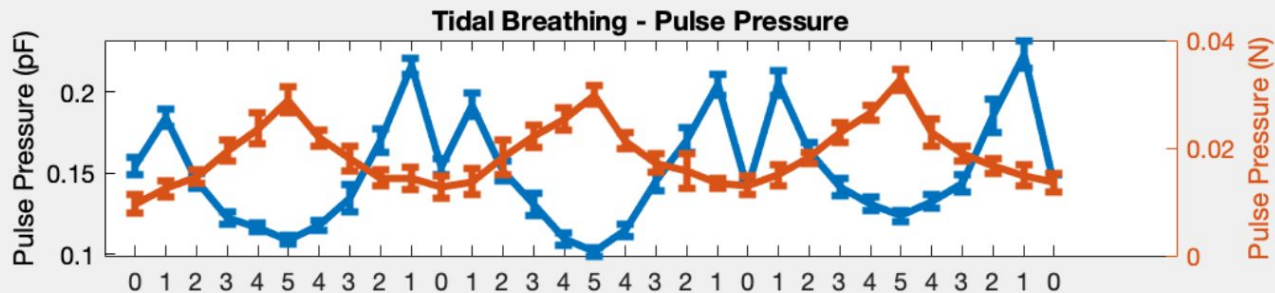

laying on the floor :)

*the load cell turned out not to be sensitive enough, so the team is working on a more sensitive load cell measurement tool.

When the blue waveform (the sensor data) dips, we see "over applanation" take place. Note how the load cell (red waveform) doesn't do this.
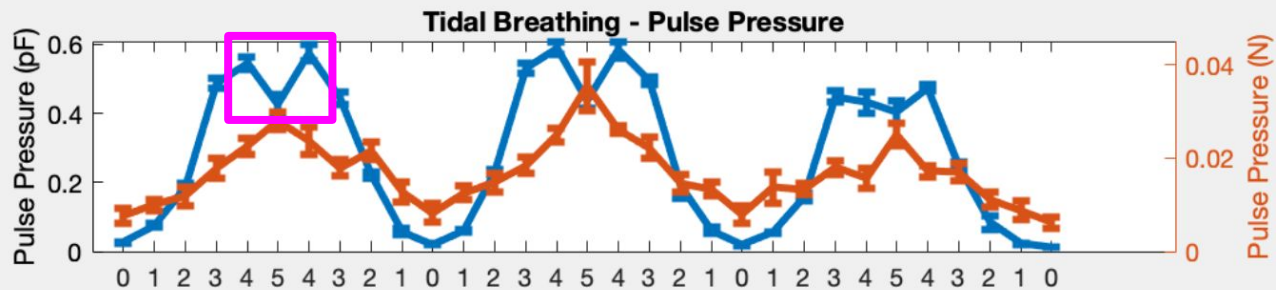
Abby Dorsalis

Arturo Dorsalis

Eng Radial

Waveform Feature Detection

- During the load cell analysis, we uncovered a bug in the ramp test analysis app: the dicrotic notch function call would detect pre-dicrotic peaks as dicrotic peaks if triple peaks were present.

- Micah and I went on an adventure to hunt down that function call, and see if we can fix it.

- In the process we wrote a function to pull out waveform features, including the dicrotic notch.
  - waveform_featuresv1.m
  - https://github.com/VenaVitalsGithub/MatlabScripts/blob/main/waveform_featuresv1.m

3 people to a desk?

*TSRIH02
Data:
Eng Dorsalis
(345-355
seconds)*
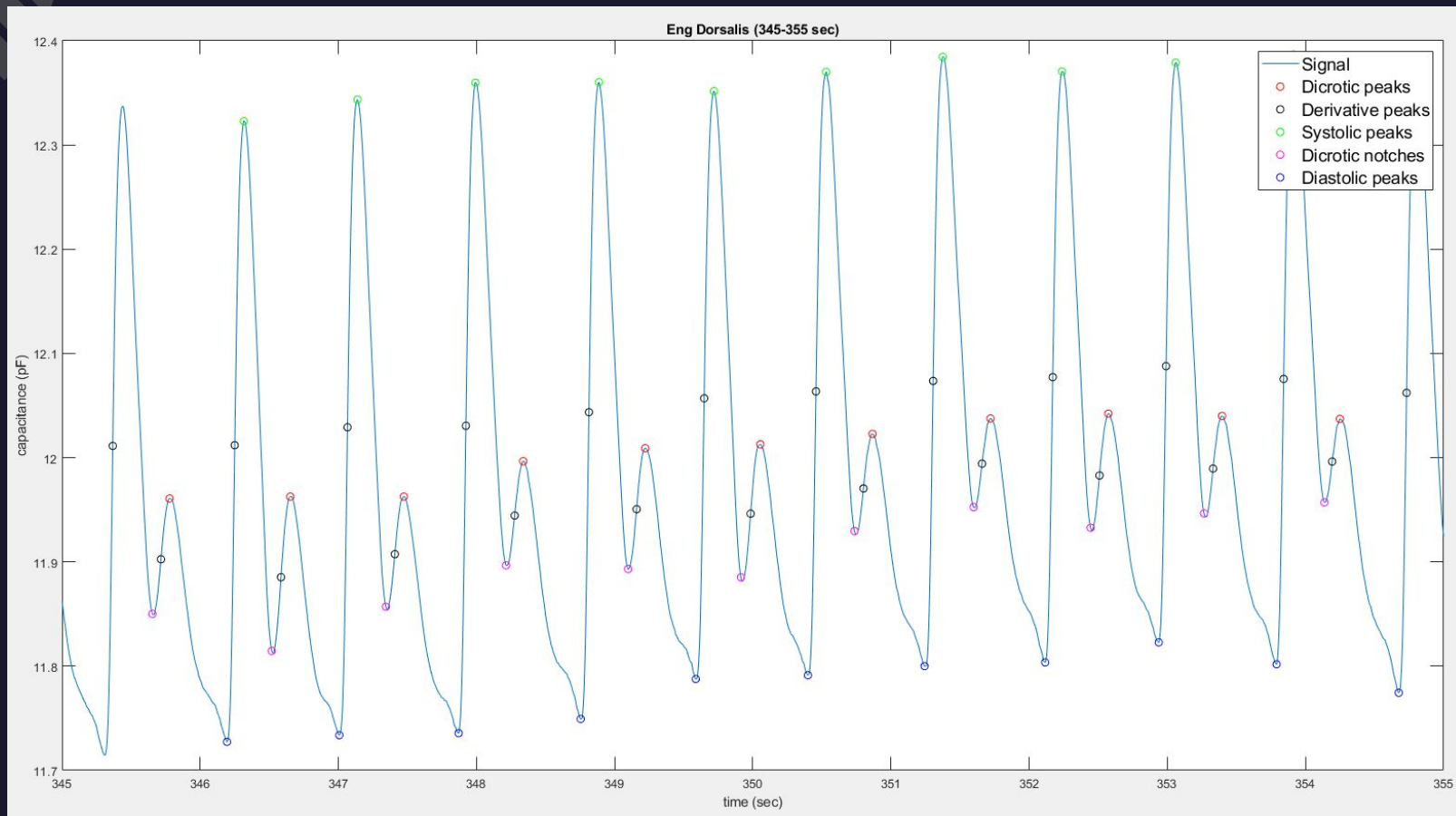
Movement Analysis - Motion Detection
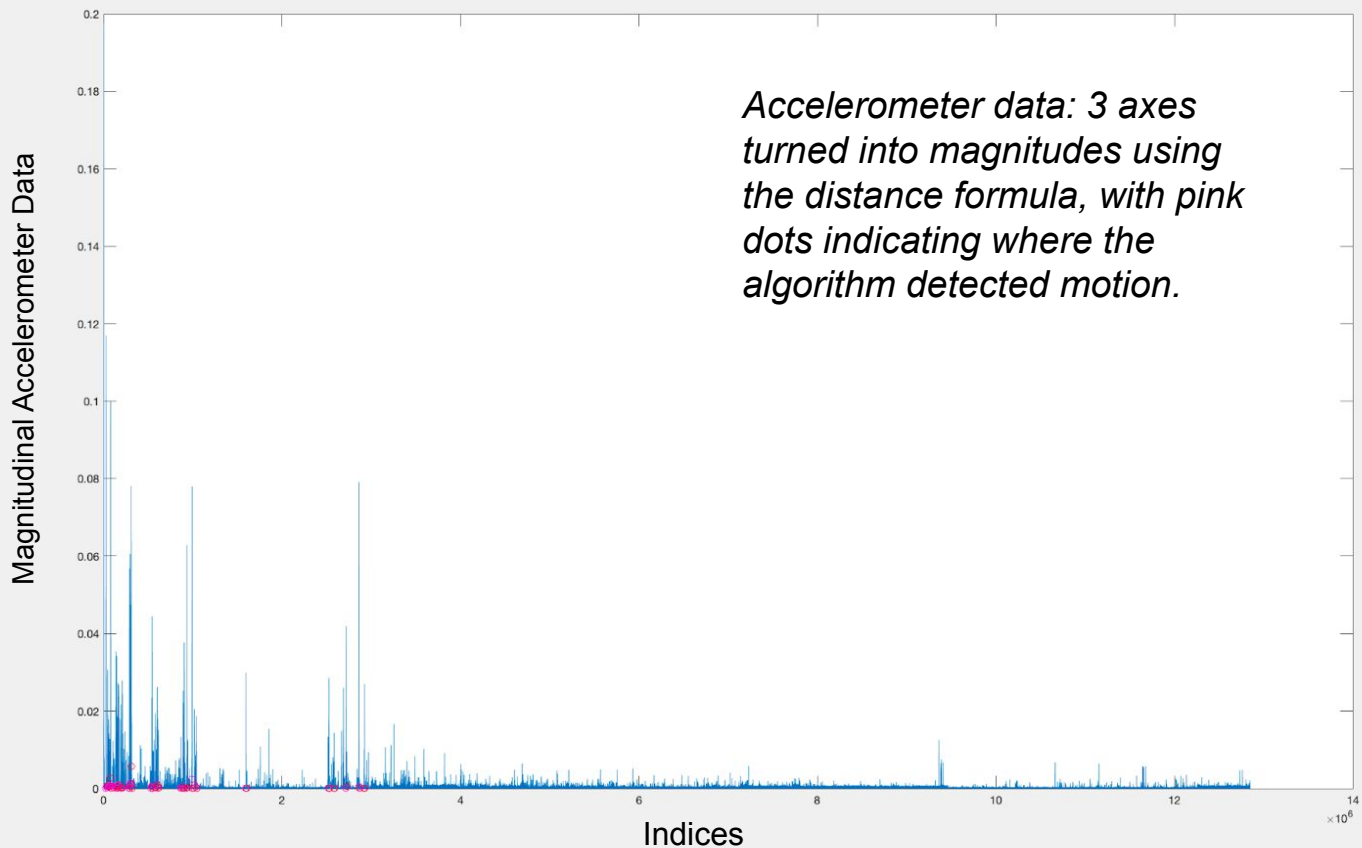
- When Micah and I were called in to develop a quick script to analyze Jared's ratchet movement data from the OR, the script we threw together evolved into another project:

- Automating motion detection.
    - Used accelerometer data
    - Detects discrete motions, which consist of quick movements & eventual returns to the original position.

courtesy of a vena vitals ipad

UCI Pt. 253 Discrete Motions identified in Magnitudinal Accelerometer Data

Accelerometer data: 3 axes turned into magnitudes using the distance formula, with pink dots indicating where the algorithm detected motion.
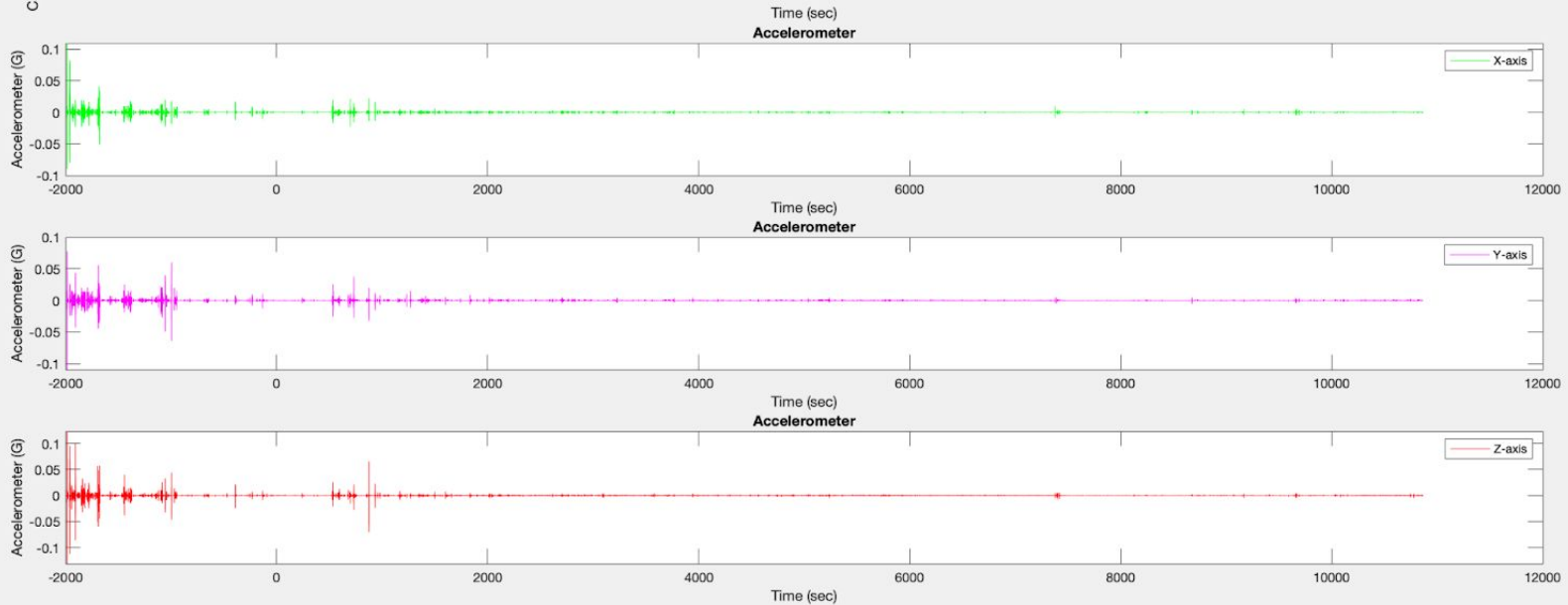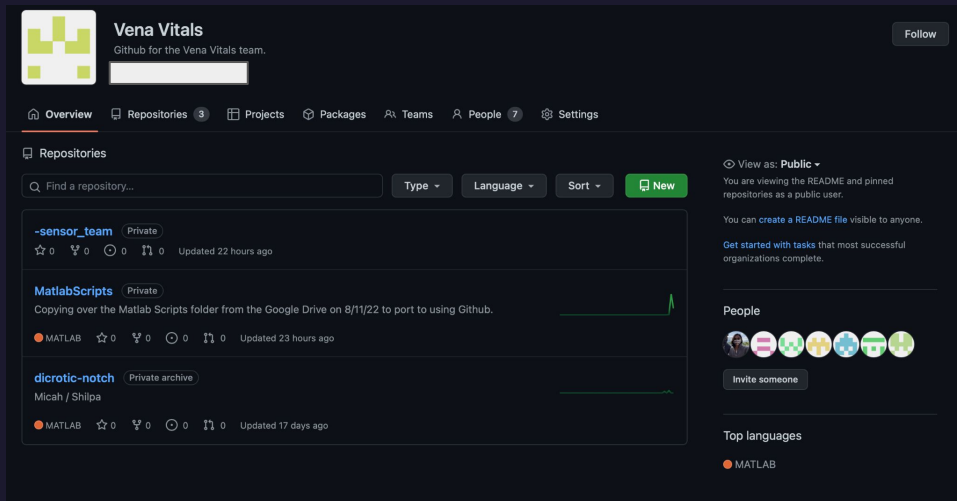
UCI Pt. 253
Raw accelerometer data -
you can see instances of the
motion yourself, to verify my
algorithm's results.

Code Documentation

- Finally, one last impact I hope to leave on the company is improved code organization!

- Vena Vitals Code Documentation
  - This is a growing library of software tools developed by our team

- Github implemented for version control & greater collaborativity
  - Wrote a Github standard operating procedure

Version control!

Vena Vitals
Github for the Vena Vitals team.

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📌 Repositories

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-sensor_team Private
☆ 0 🍴 0 ⊙ 0 ⑃ 0 Updated 22 hours ago

MatlabScripts Private
Copying over the Matlab Scripts folder from the Google Drive on 8/11/22 to port to using Github.
🔴 MATLAB ☆ 0 🍴 0 ⊙ 0 ⑃ 0 Updated 23 hours ago

dicrotic-notch Private archive
Micah / Shilpa
🔴 MATLAB ☆ 0 🍴 0 ⊙ 0 ⑃ 0 Updated 17 days ago

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Training Wheels Code 🚲

So, you want to write your own MATLAB script? Well, you've come to the right place! 🧙

Example code to get started
📁   :/MATLAB Scripts/PlotCAP_8ch.m
This commented code will walk you through loading a .csv file and segmenting it.
It uses the accelerometer data to detect when the signal should be segmented into 5 distinct sections to compare.

Useful MATLAB functions
-     [Findpeaks](#)
-     [Interp](#)

Table of Contents 🦌

Hunting for a function? Search Here!

[Cap_load_MultiChv3.m](#)

[Exc_data.m](#)

[SpatialMesh.m](#)

[Beat_marker.m](#)

[Ramp Test Analysis App](#)

[Dicrotic_notch_benchtop.m](#)

[Pressure_Sensitivity_Calculation_8channel.m](#)
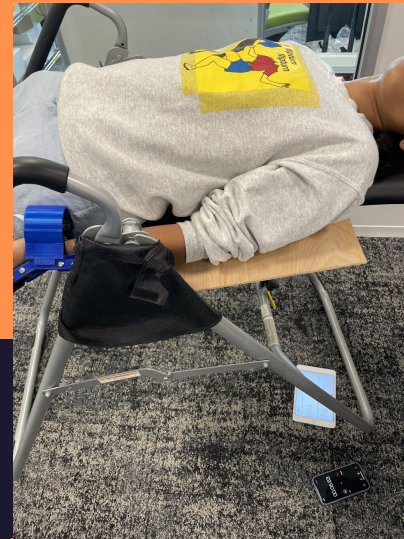
[Find_lag_twosignals.m](#)

Collecting data to support a hypothesis in the operating room

Collecting in-house data from a coworker

Operating room visit with Abby!

Becoming a human subject for a bit

Thanks for an awesome summer!