Project Presentation Insights of HVAC Unit Vibrations

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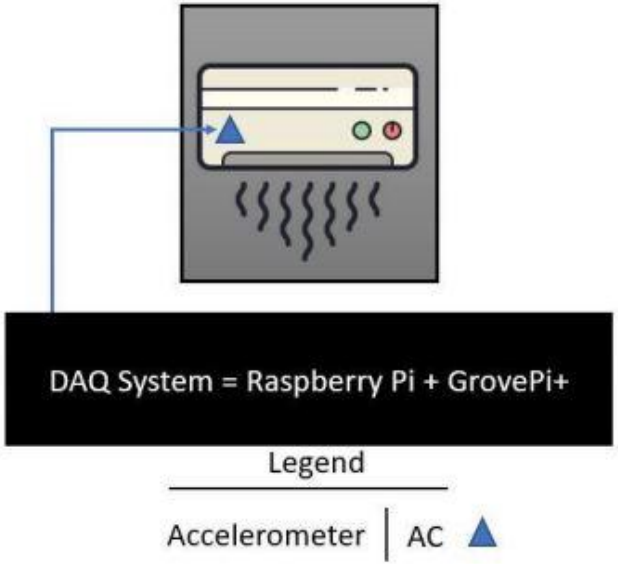
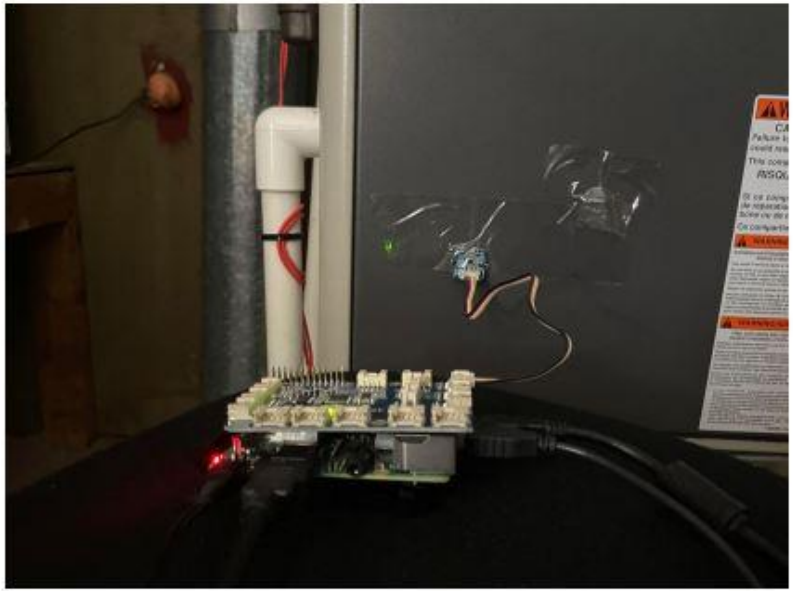
Motivation

- HVAC units consume **majority** of energy in residential homes.
- Is it possible to link **HVAC unit vibrations** to the amount of energy being consumed?
- Could be used to identify **early maintenance issues** can be detected?

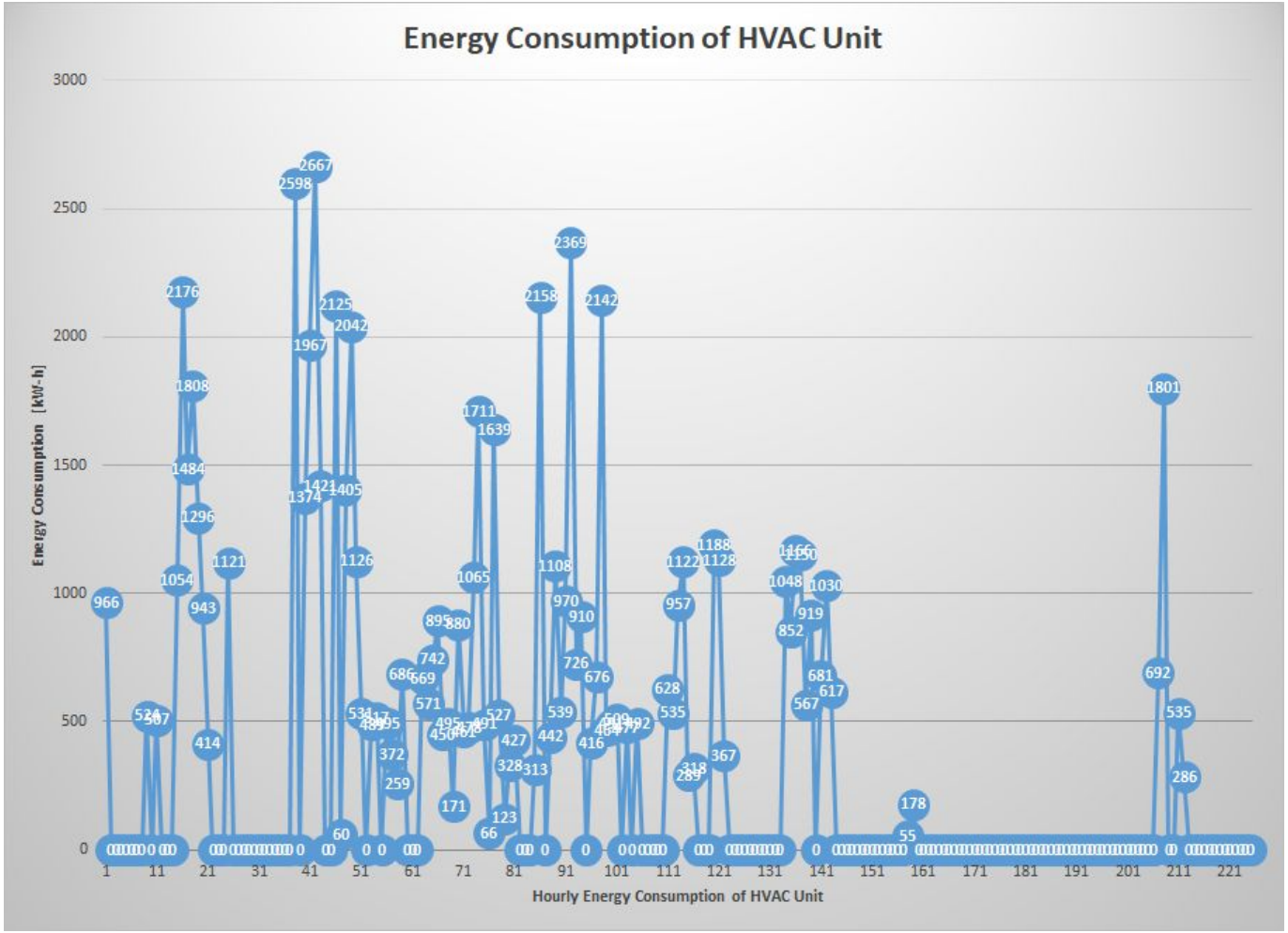
Setup of system



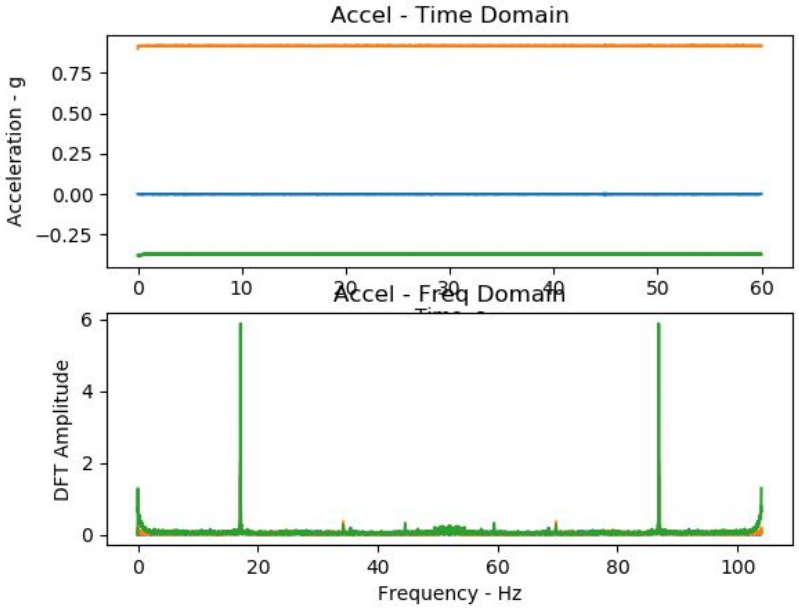


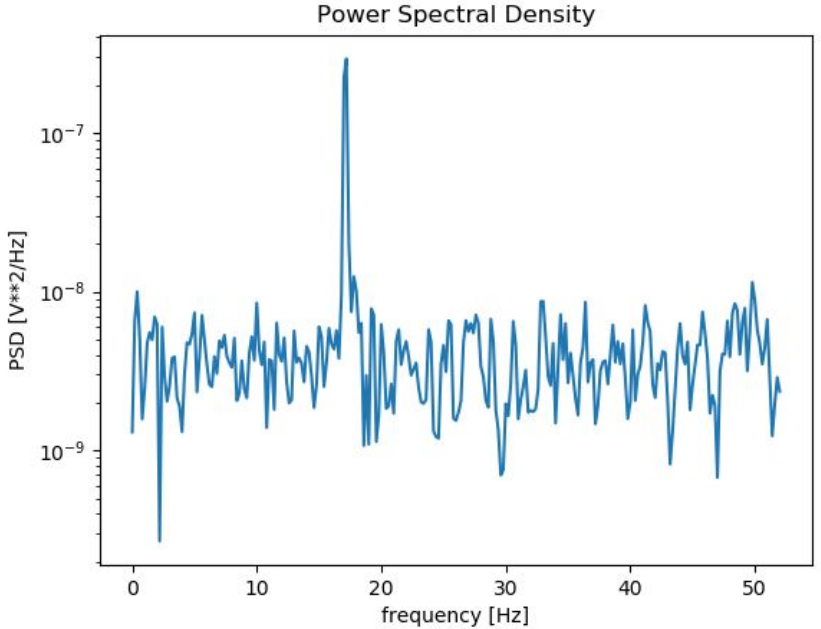
Method

- Collect Energy consumption data from HVAC unit
- Collection Vibration using lsm sensor
  - Off Mode
  - Cool Mode
  - Fan Mode
- DFT - Discrete Fourier Transform
- PSD - Power Spectral Density
- Event Detection
  - Cool Mode
  - Fan Mode

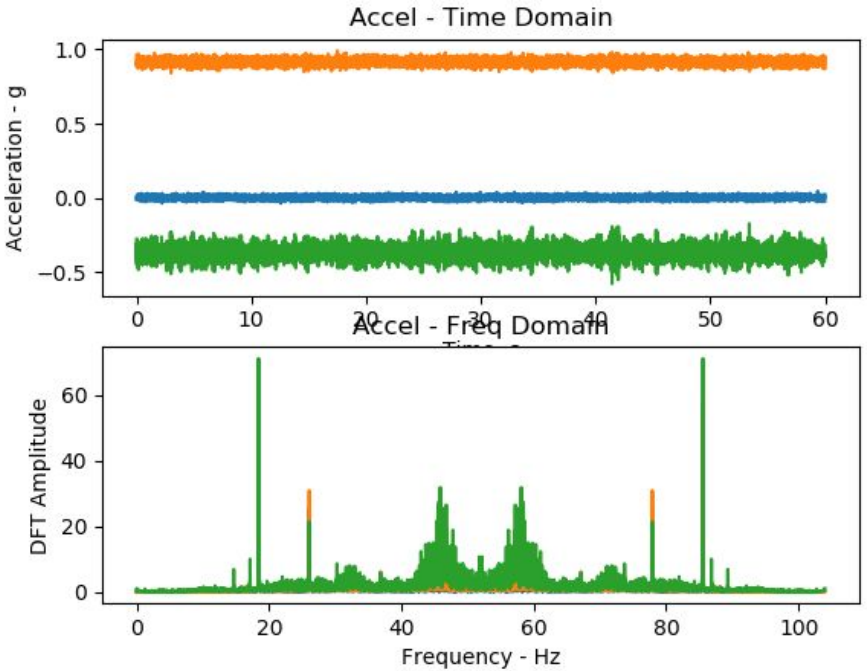

Energy Consumption of HVAC Unit
Energy Consumption [kW/- h]
Hourly Energy Consumption of HVAC Unit
3000
2500
2000
1500
1000
500
0
1
11
21
31
41
51
61
71
81
91
101
111
121
131
141
151
161
171
181
191
201
211
221

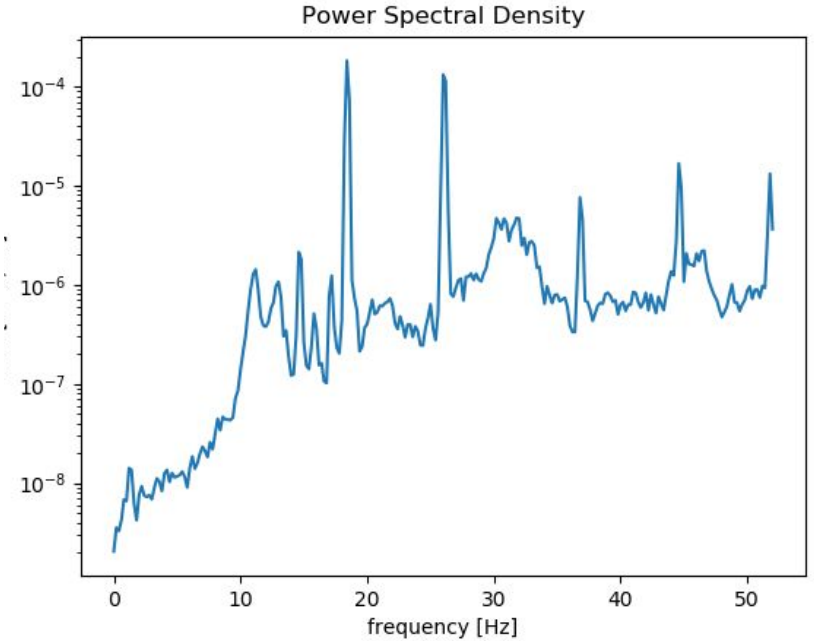
Results DFT and PSD OFF condition



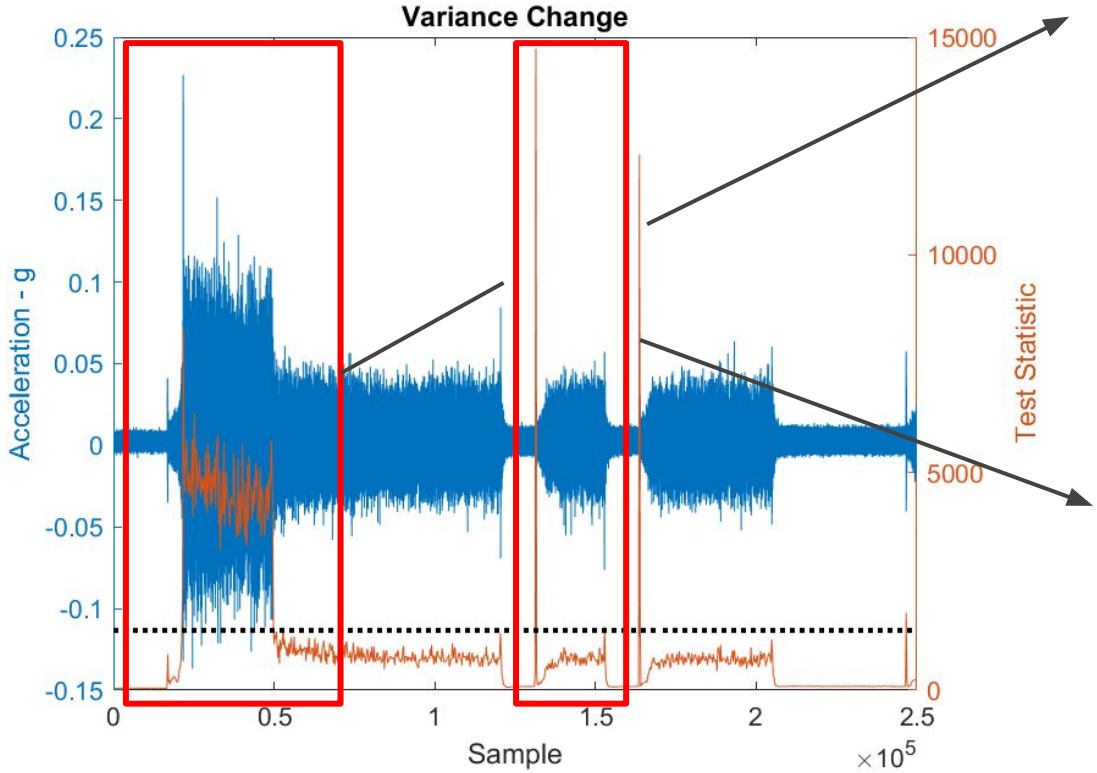


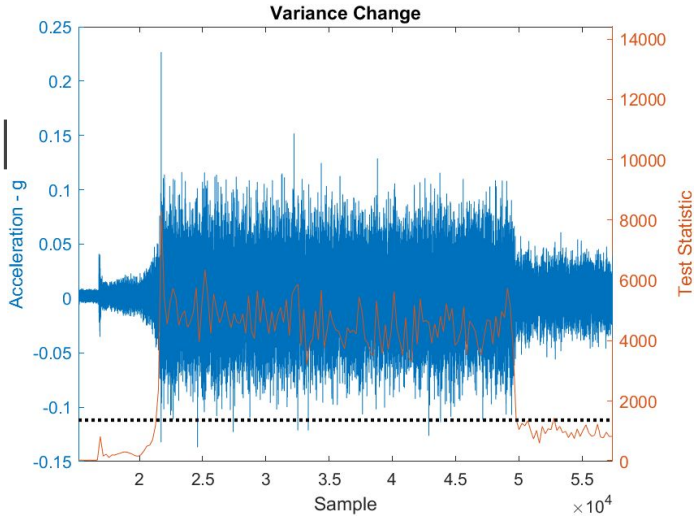
Results DFT and PSD Cool Mode Condition

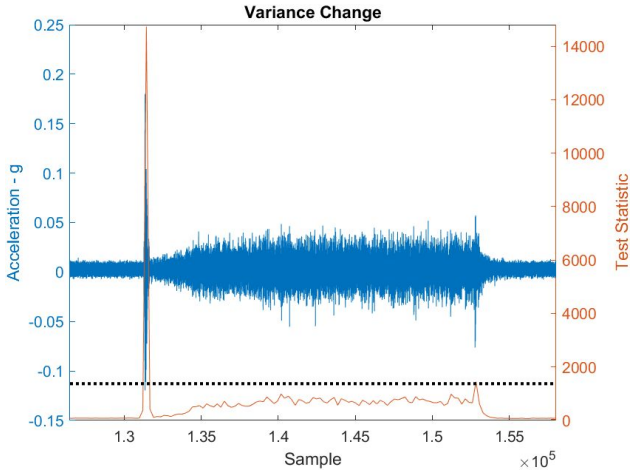




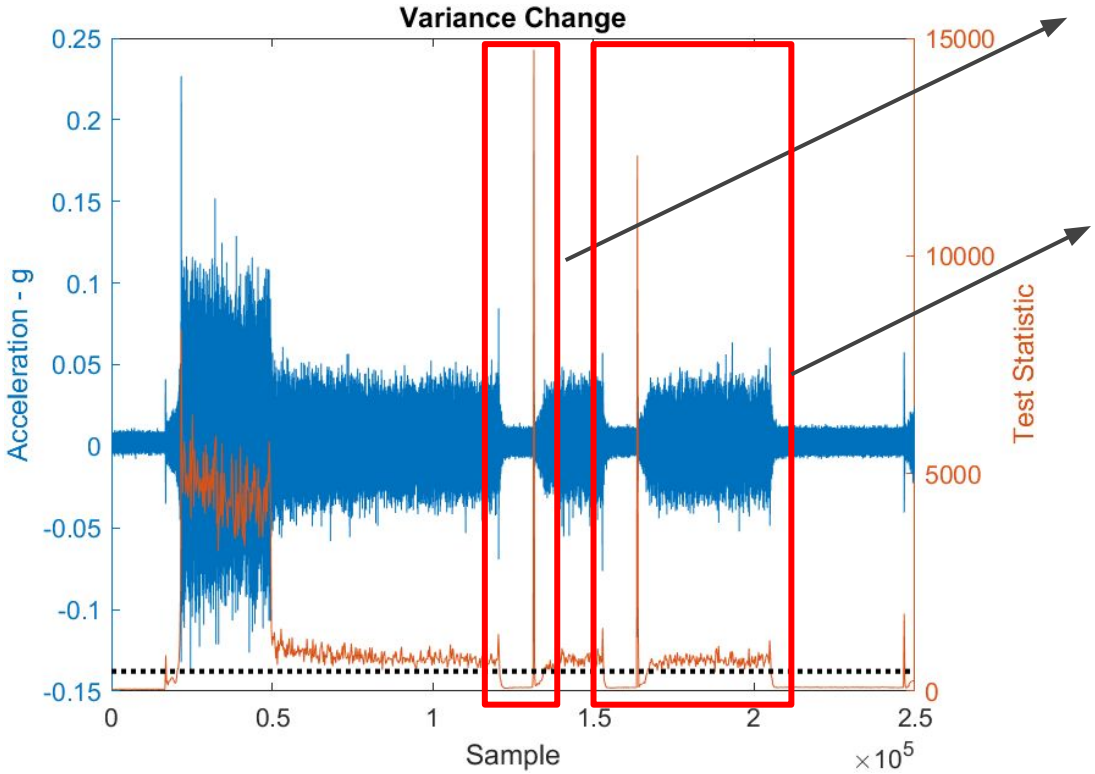
Event Detection - Cool

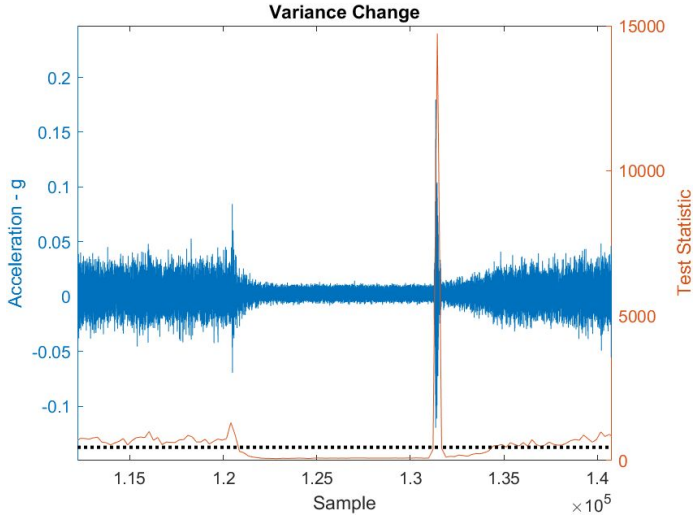


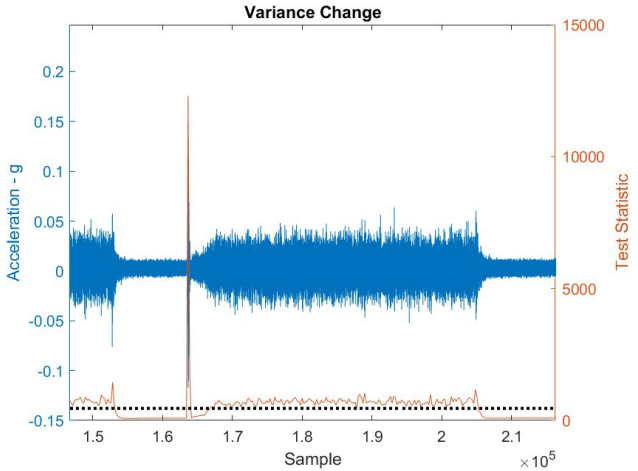




Event Detection - Fan







Challenges

• Tuning the PSD.	• Is the PSD displaying the correct information?
• Is the HVAC unit a variable, 1, or 2 stage system?	• Confirm type of HVAC unit
• Develop Code to...	• Determine the correlation between vibrations and energy consumption.
• Develop Code to...	• Detect early signs of maintenance issues.

Questions?