MICHIGAN STATE UNIVERSITY

Alpha Presentation
Project Rumble

The Capstone Experience

Team Vectorform

George Schober
Danny Marshall
Tyler Lovell
Charles McIntire

From Students…
…to Professionals

Department of Computer Science and Engineering
Michigan State University
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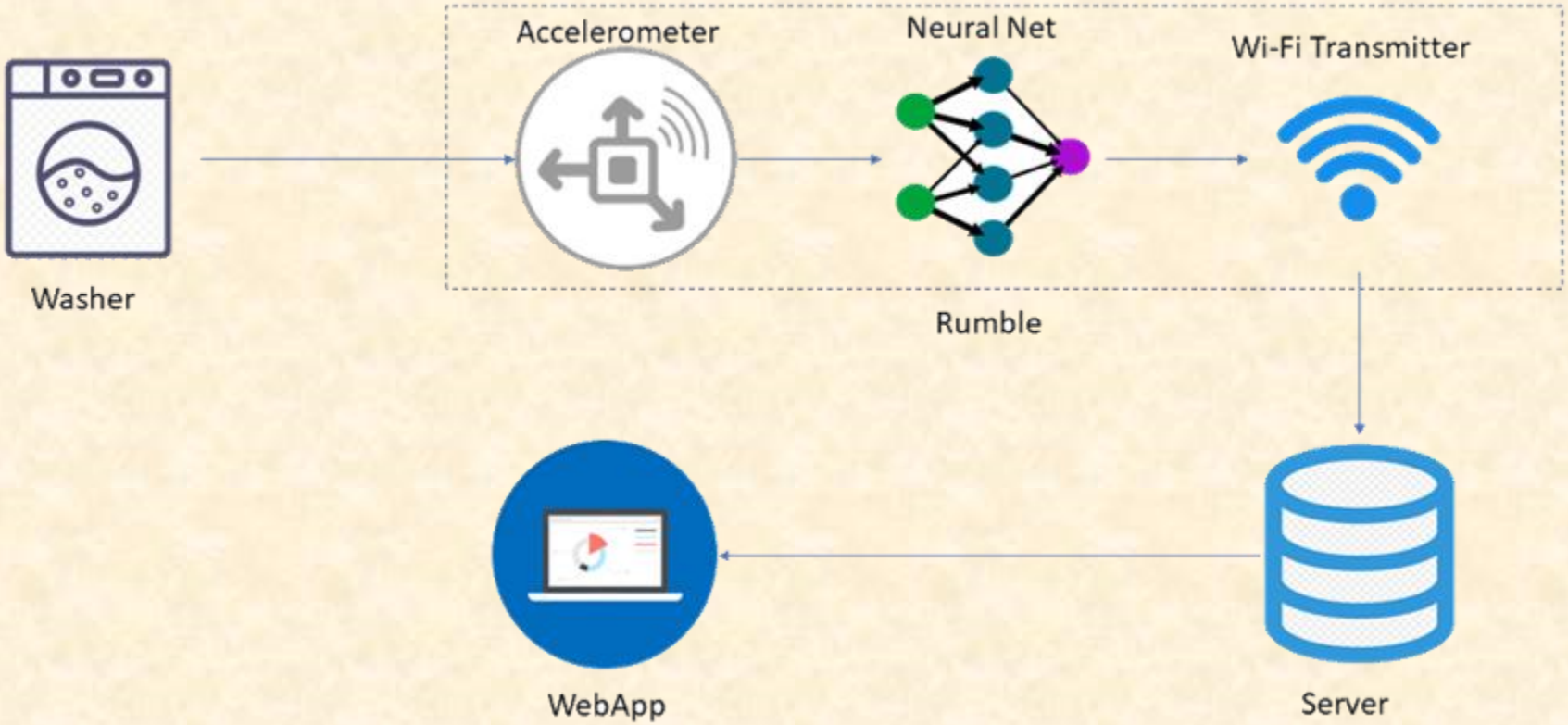
Project Overview

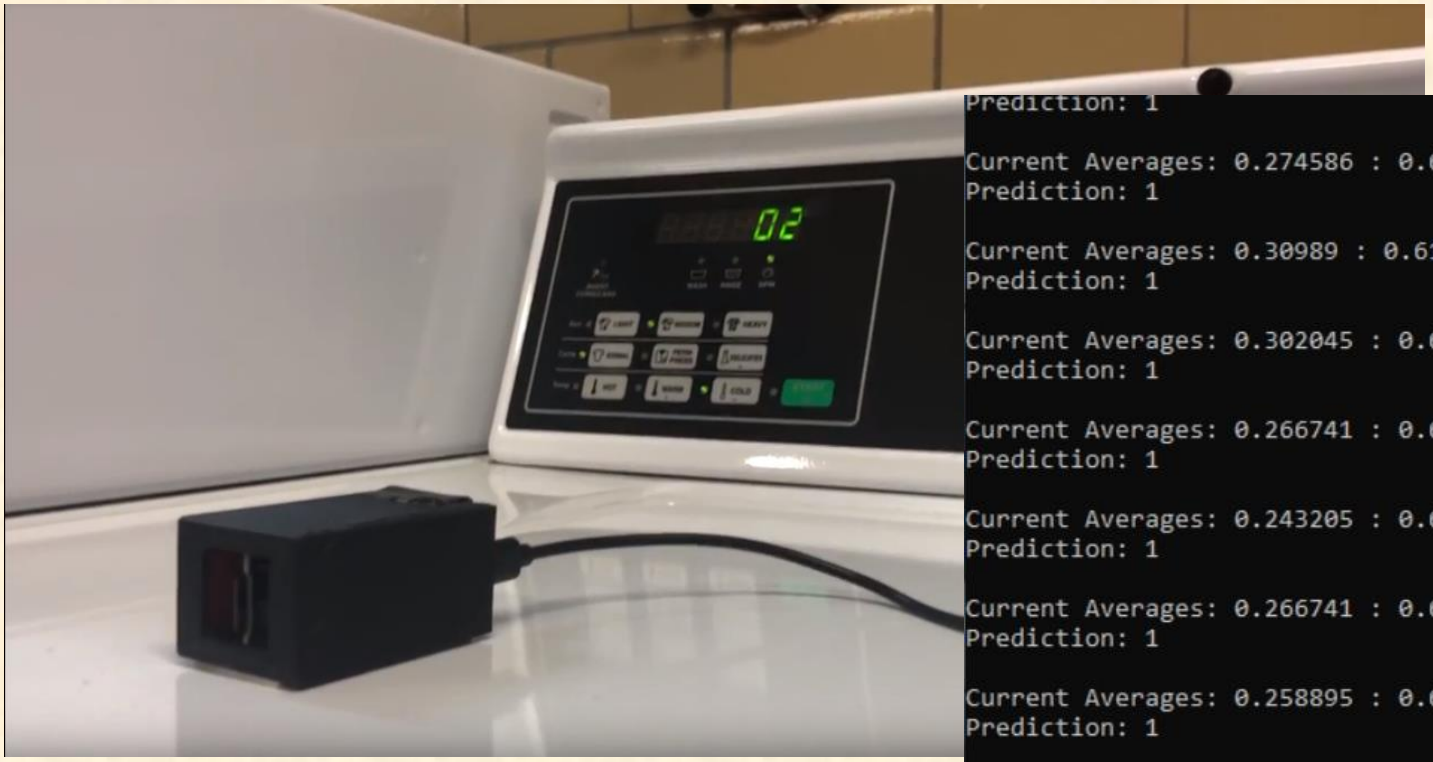
- Rumble sensor reads data from a mounted accelerometer
- A neural net predicts washer status (on/off) based on acceleration data
- Rumble sensor sends data to server via MQTT where it is stored with the devices MAC address
- A web app displays the historical acceleration data along with the predicted washer status

System Architecture



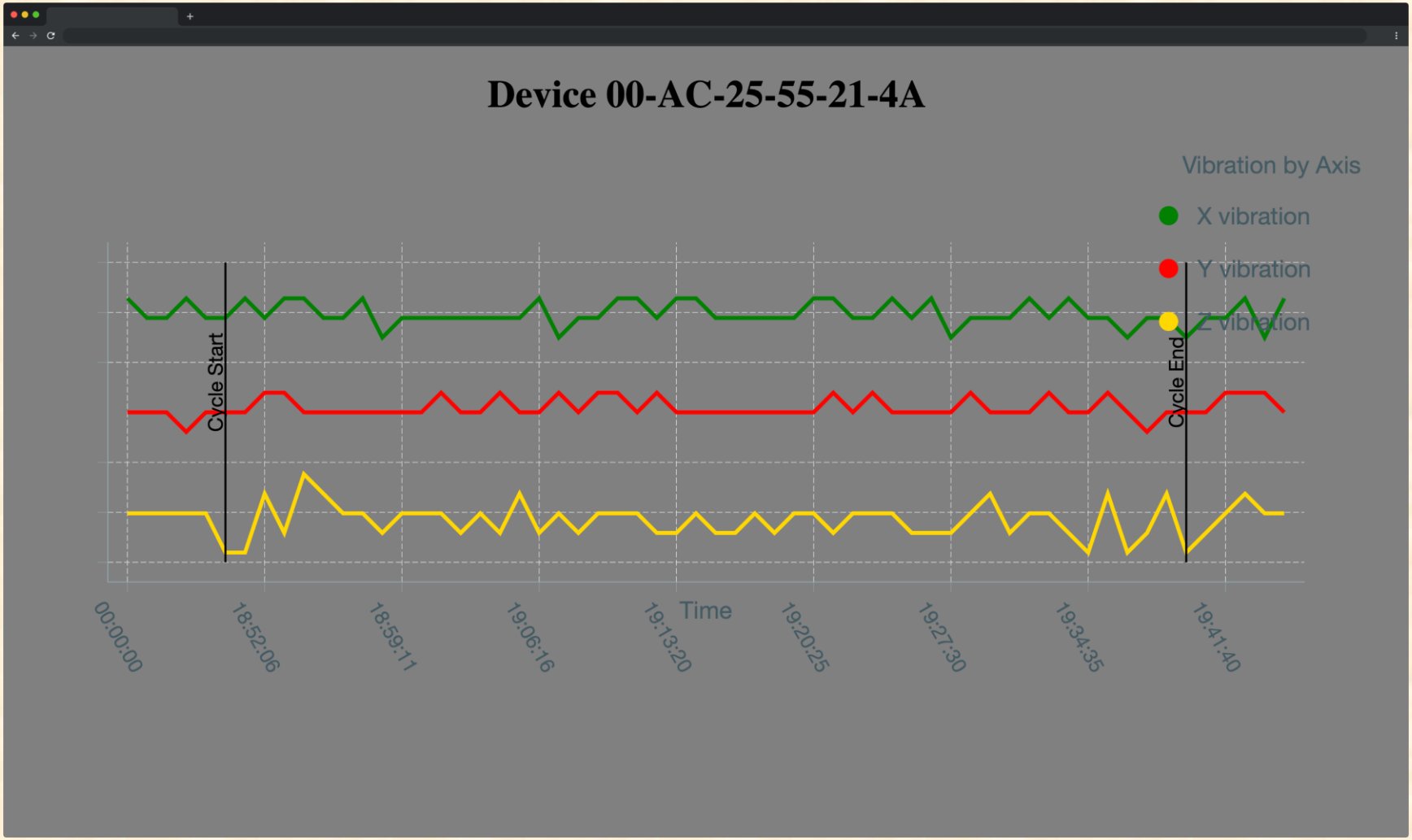
Rumble Sensor on Mini Washer

Rumble Sensor and Net Predictions



```
Prediction: 1

Current Averages: 0.274586 : 0.615857 : 0.17652
Prediction: 1

Current Averages: 0.30989 : 0.61978 : 0.141216
Prediction: 1

Current Averages: 0.302045 : 0.604089 : 0.141216
Prediction: 1

Current Averages: 0.266741 : 0.600167 : 0.141216
Prediction: 1

Current Averages: 0.243205 : 0.615858 : 0.149061
Prediction: 1

Current Averages: 0.266741 : 0.631548 : 0.149061
Prediction: 1

Current Averages: 0.258895 : 0.651161 : 0.152984
Prediction: 1

Current Averages: 0.239282 : 0.694311 : 0.180442
Prediction: 1

Current Averages: 0.262818 : 0.753151 : 0.219669
Prediction: 1
```

Web App Device Details Page



MySQL Database

```
Timestamp|  x accel.|     y accel.|   z accel.|
| 19:44:28 | 9.92433 |          0 | -1.96133 |
| 19:44:29 | 9.96356 |          0 |  -1.9221 |
| 19:44:30 | 9.92433 |          0 | -2.00056 |
| 19:44:31 | 9.96356 |          0 | -1.88288 |
| 19:44:32 | 9.92433 |          0 | -1.96133 |
| 19:44:33 | 9.96356 |          0 |  -1.9221 |
| 19:44:34 | 9.92433 |          0 | -1.96133 |
| 19:44:35 | 9.96356 |          0 | -1.96133 |
| 19:44:36 | 9.92433 |          0 |  -1.9221 |
| 19:44:37 | 9.92433 |  0.039227 |  -1.9221 |
| 19:44:39 | 9.92433 |          0 | -2.00056 |
| 19:44:40 |  9.8851 |          0 | -1.96133 |
| 19:44:41 | 9.92433 |  0.039227 |  -1.9221 |
| 19:44:42 | 9.96356 |          0 |  -1.9221 |
| 19:44:43 | 9.96356 |          0 | -1.88288 |
| 19:44:44 |  9.8851 |          0 |  -1.9221 |
| 19:44:45 | 9.96356 |          0 |  -1.9221 |
| 19:44:46 | 9.96356 |          0 |  -1.9221 |
| 19:44:47 | 9.92433 |  0.039227 | -1.96133 |
| 19:44:48 | 9.96356 |          0 | -2.00056 |
| 19:44:49 | 9.96356 |          0 | -2.00056 |
| 19:44:50 | 9.92433 |  0.039227 |  -1.9221 |
| 19:44:51 |  9.8851 |          0 | -1.96133 |
| 19:44:52 | 9.96356 |          0 | -1.96133 |
| 19:44:53 | 9.96356 |          0 |  -1.9221 |
| 19:44:54 | 9.96356 |          0 | -1.96133 |
| 19:44:55 | 9.92433 |          0 |  -1.9221 |
| 19:44:56 | 9.96356 |          0 | -1.96133 |
| 19:44:57 | 9.96356 |          0 | -1.88288 |
| 19:44:58 | 9.92433 |          0 | -1.96133 |
| 19:44:59 | 9.96356 |          0 |  -1.9221 |
| 19:45:00 | 9.92433 |          0 | -1.96133 |
+----------+---------+-----------+----------+
3500 rows in set (0.00 sec)

mysql>
```

What's left to do?

- Adjust neural net to use time as a metric in addition to accelerometer readings
- Increase size of neural nets running average and devise a way to format training data programmatically
- Improve scalability, in terms of both supporting large datasets and large amounts of sensors
- Create a menu on the web app for selecting devices data by MAC address
- Implement ability to set time period for display of data
- Add table below graph display that lists start and end times for all past cycles

Questions?