Wearable Devices are:
- Unobtrusive, small and consume very low power
- Often equipped with IMU sensors which give us accelerometer and gyroscope readings.
- Main Applications
  - Health and fitness
  - Lifestyle
  - Productivity
  - Emotions

Main Applications
- Health and fitness
- Lifestyle
- Productivity
- Emotions

Build Deep Learning Models to:
- Infer Computer activities performed by the user (browsing, emailing, etc.)
- Infer the sentiment of the documents being typed by the user
- Obtain a behavioral profile for the user (Stressed, Happy, Angry, etc.)
Implement these models on the Edge devices

Preliminary Results
Testing on a new user
<table>
<thead>
<tr>
<th>Activity</th>
<th>Best Classifier</th>
<th>F1 –score</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typing or Not Typing</td>
<td>ConvLSTM</td>
<td>0.91</td>
<td>0.92</td>
</tr>
<tr>
<td>Predicting Pauses</td>
<td>ConvLSTM</td>
<td>0.82</td>
<td>0.84</td>
</tr>
<tr>
<td>Typing Speed</td>
<td>Temporal CNN</td>
<td>0.66</td>
<td>0.75</td>
</tr>
<tr>
<td>Sentiment</td>
<td>ConvLSTM</td>
<td>0.52</td>
<td>0.80</td>
</tr>
<tr>
<td>Emotions</td>
<td>Temporal CNN</td>
<td>0.54</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Future Work: Implementation on Edge

Hardware: Smartwatches, Android Phone, Apple/Windows Laptop

Software: Data Logger, LIWC, NLTK, Stanford NLP Core, Keras, Tensorflow

Experiment and Workflow

Data Collection
- Accelerometer and Gyroscope data is collected at 25Hz from the wristbands (worn in both hands)
- Key Presses are logged using Python based Keylogger

Data Processing
- Outliers and missing values are removed
- The data from wristbands are synchronized with each other and with the keylogger timestamp
- Sentiment labels are obtained from the NLP tools

Model Building
We create 3 different Deep learning Models:
1. Temporal- CNN
2. LSTM
3. ConvLSTM

Predictions

Make the following inferences:
- Typing behavior
- Computer tasks
- Productivity
- Sentiment Analysis
- Emotions

H/W Perspective

S/W Perspective

Applications

Model API

Compressed Models

OS

HAL

Sensors

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