

Dataset

WISDM: Contains data collected from accelerometer sensors of 6 human daily activities:

Walking: 424400 (38.6%)

Jogging: 342177 (31.2%)

Upstairs: 122869 (11.2%)

Downstairs: 100427 (9.1%)

Sitting: 59939 (5.5%)

Standing: 48395 (4.4%)

Link: <http://www.cis.fordham.edu/wisdm/dataset.php>

Method

1. CNN

Model

- `ip = Input(SEGMENT_TIME_SIZE, N_FEATURES)`
- `x = conv1D(32,7, RELU, BatchNormalization)(ip)`
- `x = conv1D(64,5, RELU)(x)`
- `x = GlobalAveragePooling1D()(x)`
- `out = Dense(N_CLASSES, softmax)(x)`
- `model = Model(ip, out)`

Result

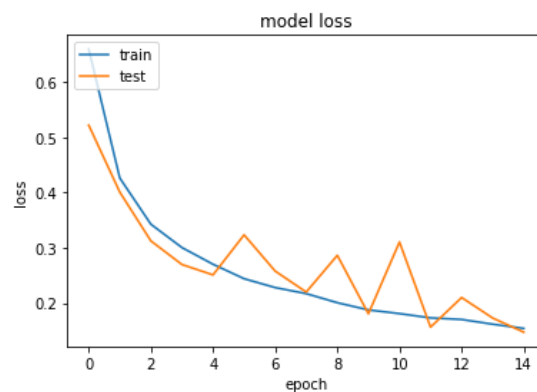
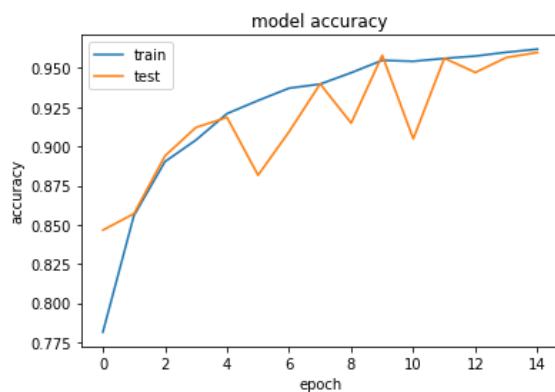
Accuracy: 0.9695038689121529

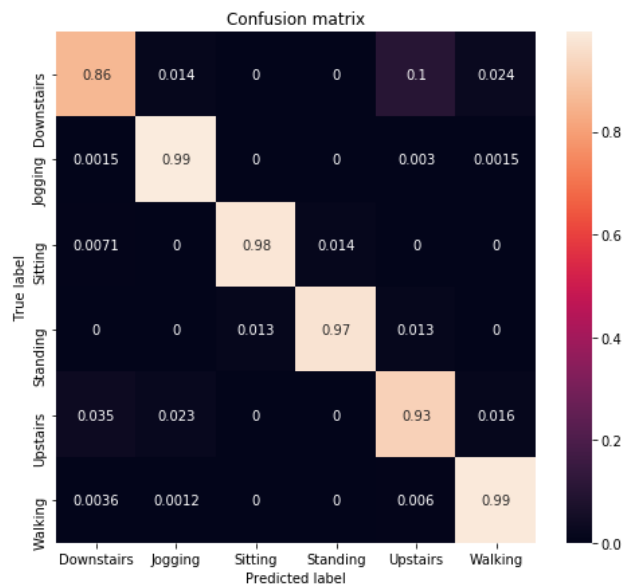
| | precision | recall | f1-score | support |
|---|-----------|--------|----------|---------|
| 0 | 0.93 | 0.86 | 0.89 | 212 |
| 1 | 0.99 | 0.99 | 0.99 | 676 |
| 2 | 0.99 | 0.98 | 0.99 | 140 |
| 3 | 0.97 | 0.97 | 0.97 | 78 |
| 4 | 0.89 | 0.93 | 0.91 | 258 |
| 5 | 0.99 | 0.99 | 0.99 | 833 |

avg / total 0.97 0.97 0.97 2197

Confusion matrix

```
[[182  3  0  0 22  5]
 [ 1672  0  0  2  1]
 [  1  0 137  2  0  0]
 [  0  0  1 76  1  0]
 [  9  6  0  0 239  4]
 [  3  1  0  0  5 824]]
```





2. LSTM

Model

- `ip = Input(SEGMENT_TIME_SIZE, N_FEATURES)`
- `x = LSTM(64)(ip)`
- `x = LSTM(64)(x)`
- `out = Dense(N_CLASSES, softmax)(x)`
- `model = Model(ip, out)`

Result

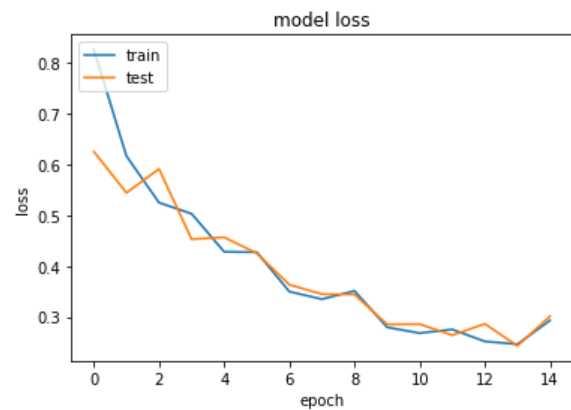
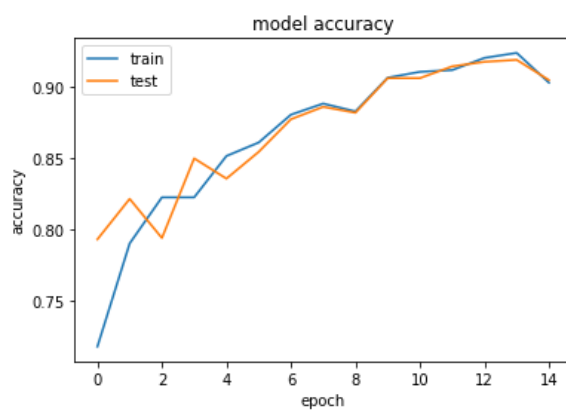
Accuracy: 0.9280837505689576

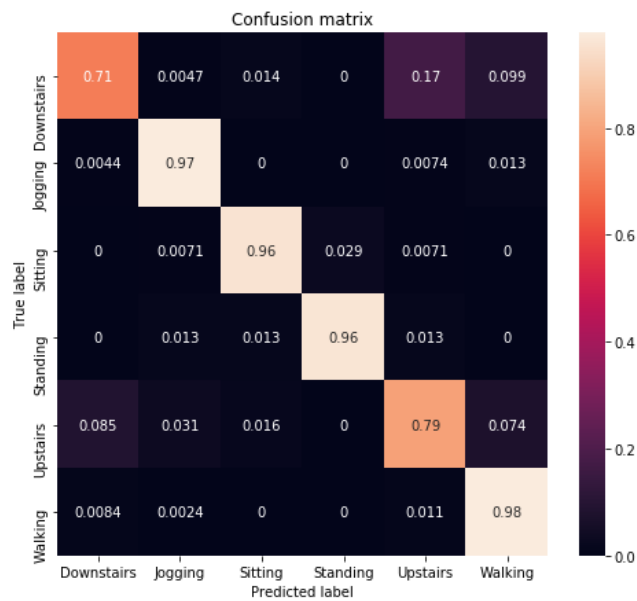
| | precision | recall | f1-score | support |
|---|-----------|--------|----------|---------|
| 0 | 0.83 | 0.71 | 0.76 | 212 |
| 1 | 0.98 | 0.97 | 0.98 | 676 |
| 2 | 0.94 | 0.96 | 0.95 | 140 |
| 3 | 0.95 | 0.96 | 0.96 | 78 |
| 4 | 0.80 | 0.79 | 0.80 | 258 |
| 5 | 0.94 | 0.98 | 0.96 | 833 |

avg / total 0.93 0.93 0.93 2197

Confusion matrix

```
[[151  1  3  0 36 21]
 [ 3 659  0  0  5  9]
 [  0  1 134  4  1  0]
 [  0  1  1  75  1  0]
 [ 22  8  4  0 205 19]
 [  7  2  0  0  9 815]]
```





3. CNN-LSTM

Model

- `ip = Input(SEGMENT_TIME_SIZE, N_FEATURES)`
- `x = conv1D(16,7, RELU, BatchNormalization)(x)`
- `x = conv1D(32,5, RELU)(x)`
- `x = LSTM(32)(x)`
- `x = LSTM(32)(x)`
- `out = Dense(N_CLASSES, softmax)(x)`
- `model = Model(ip, out)`

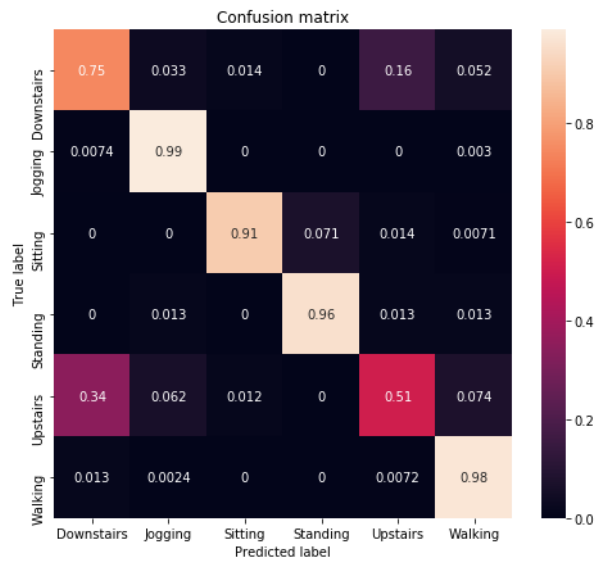
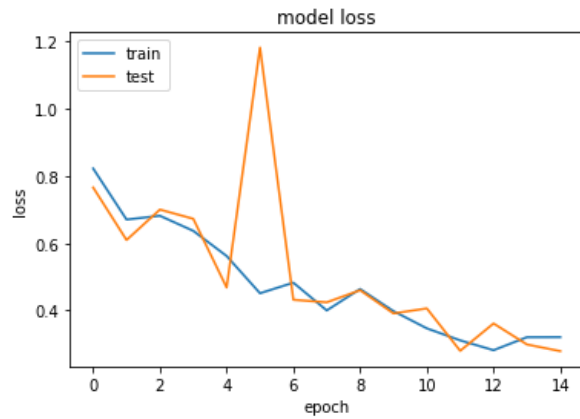
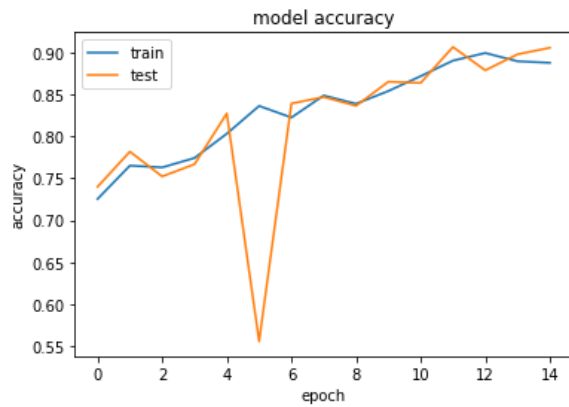
Result

Accuracy: 0.8984979517523897

| | precision | recall | f1-score | support |
|-------------|-----------|--------|----------|---------|
| 0 | 0.60 | 0.75 | 0.67 | 212 |
| 1 | 0.96 | 0.99 | 0.98 | 676 |
| 2 | 0.95 | 0.91 | 0.93 | 140 |
| 3 | 0.88 | 0.96 | 0.92 | 78 |
| 4 | 0.76 | 0.51 | 0.61 | 258 |
| 5 | 0.96 | 0.98 | 0.97 | 833 |
| avg / total | 0.90 | 0.90 | 0.90 | 2197 |

Confusion matrix

```
[[158  7  3  0 33 11]
 [ 5 669  0  0  2]
 [ 0  0 127 10  2  1]
 [ 0  1  0 75  1  1]
 [89 16  3  0 131 19]
 [11  2  0  0  6 814]]
```



Implementation

Code: <https://github.com/SimonNgj/DL-ung-dung/blob/master/2019July7/simon.py>

Using: Keras (Tensorflow backend), Python3.6

Other publication uses the WISDM dataset

1. Andrey Ignatov, "Real-time human activity recognition from accelerometer data using Convolutional Neural Networks" Applied Soft Computing, pp. 915-922, 2018.