HUMAN ACTIVITY RECOGNITION USING DEEP LEARNING TECHNIQUES

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1. Network architectures

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Net(
    (conv): Conv1d(in=561, out=256, kernel_size=3, stride=1, padding=1)
    (inp): Linear(in_features=561, out_features=256 / 64, bias=True)
    (rnn): LSTM(nodes=256, nodes=256, num_layers=2, batch_first=True)
    !! (act): Tanh()
    !! (d): Dropout(p=0.0, inplace=False)
    (out): Linear(in_features=256 / 64, out_features=12, bias=True)
)
```

Notes:

- RNN and layers do not require the *activation and dropout* layers, because of the RNN's internal structure
- input layers are used either Linear / Convolutional
- sequence length choices are: RNN (1, 5, 20), CRNN (5, 20)
- padding = kernel_size // 2

2. Training process

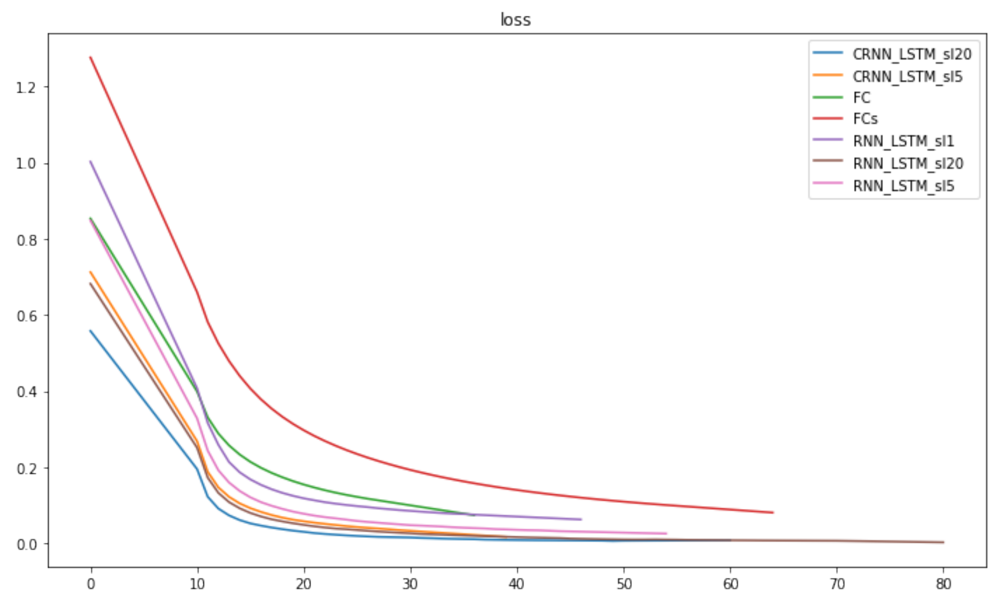

Figure 1: *Comparison of network training losses during training*

3. Feature analysis - using FCs

Utilizing SHAP (SHapley Additive exPlanations)

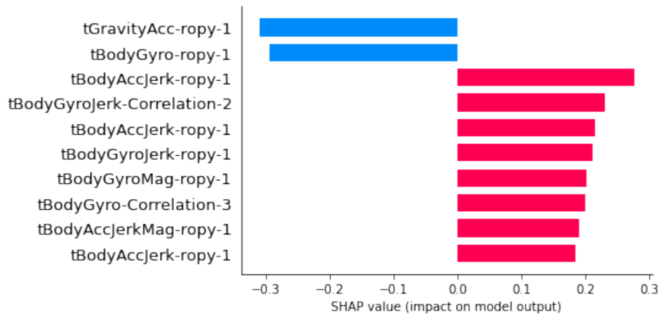

Figure 2: *GT: WALKING == Pred*

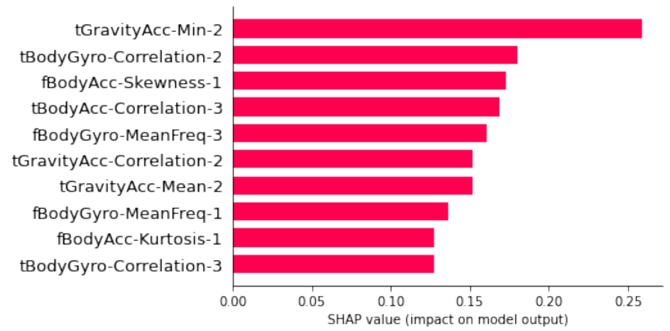

Figure 3: *GT: SIT_TO_STAND != Pred: STAND_TO_SIT*

4. Discussion

Count/label: [90 76 70 71 83 78 4 3 5 6 11 3] length: 500

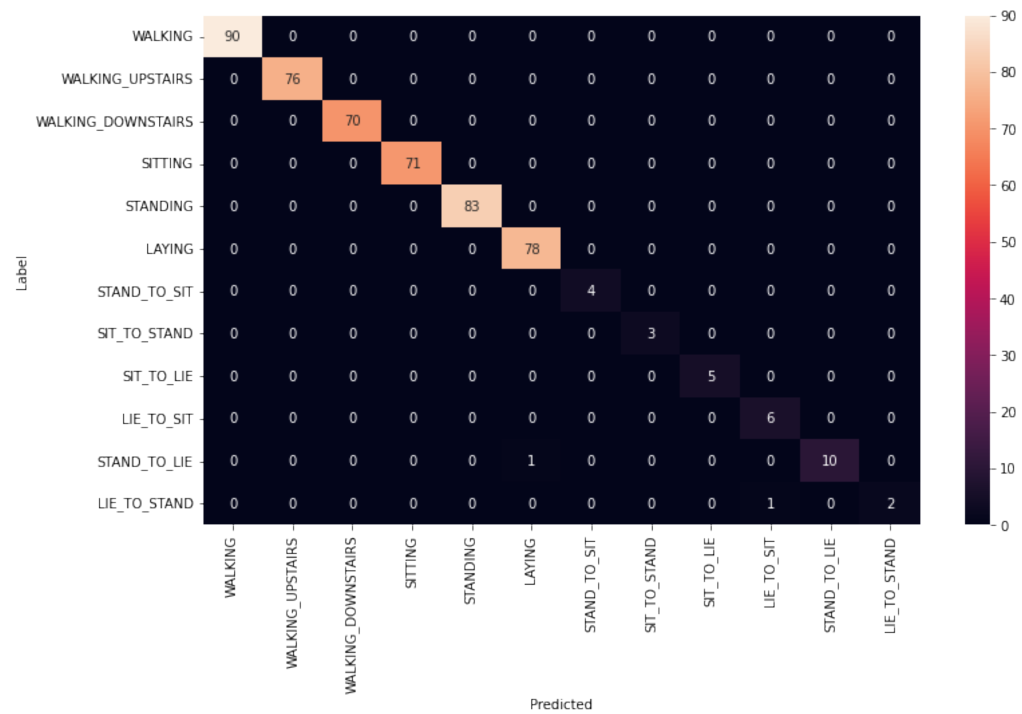

Figure 4: *Confusion matrix of LSTM network with sequence length of 20*

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(Optional) Feature analysis for every class - using FCs

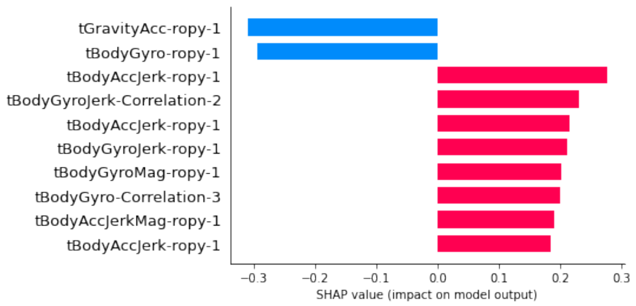

Figure 5: *GT: WALKING == Pred*

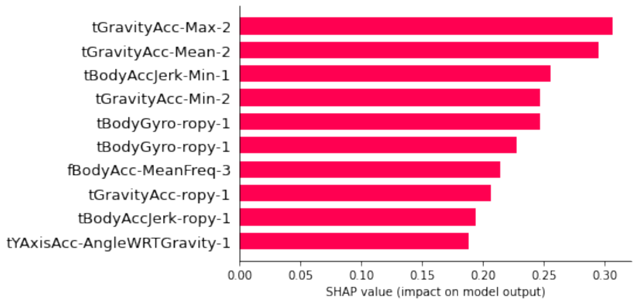

Figure 6: *GT: WALKING_UPSTAIRS == Pred*

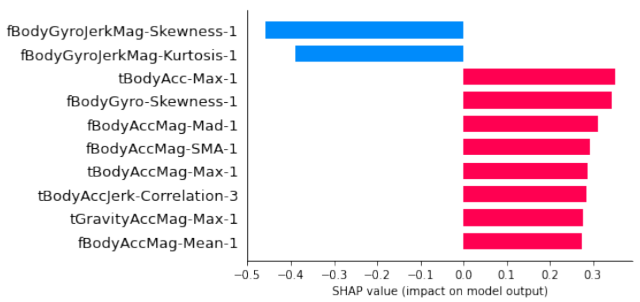

Figure 7: *GT: WALKING_DOWNSTAIRS == Pred*

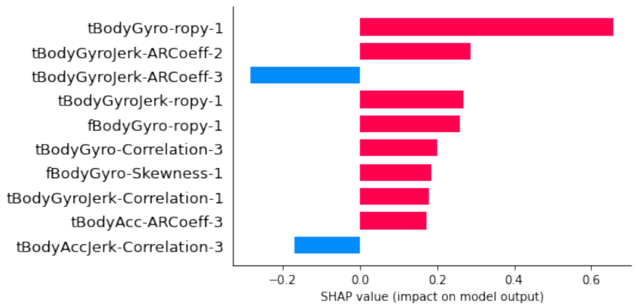

Figure 8: *GT: SITTING == Pred*

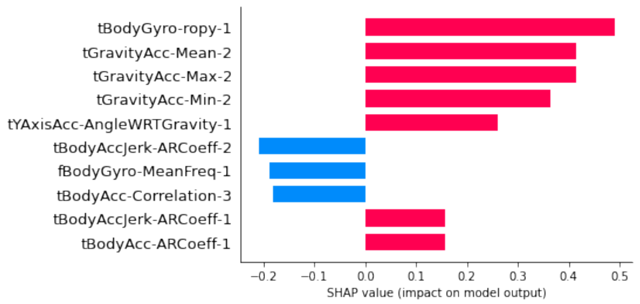

Figure 9: *GT: STANDING == Pred*

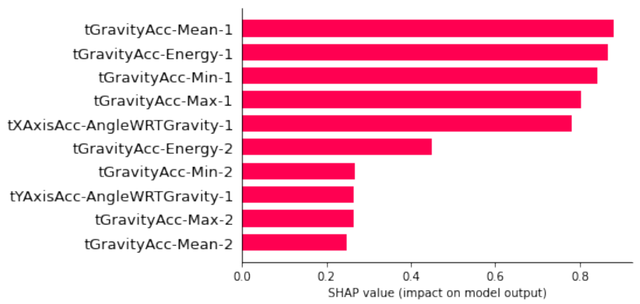

Figure 10: *GT: LAYING == Pred*

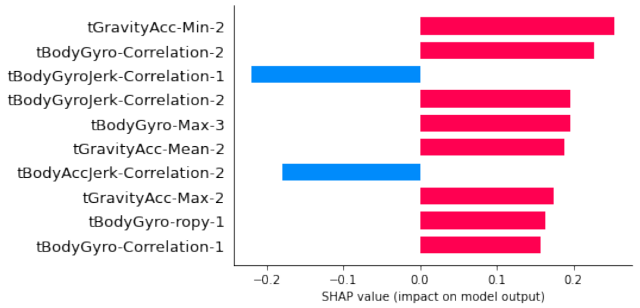

Figure 11: *GT: STAND_TO_SIT == Pred*

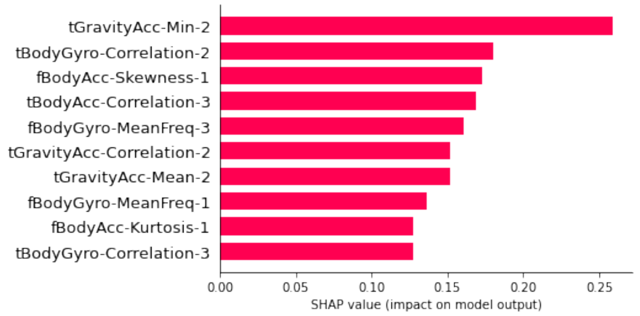

Figure 12: *GT: SIT_TO_STAND != Pred: STAND_TO_SIT*

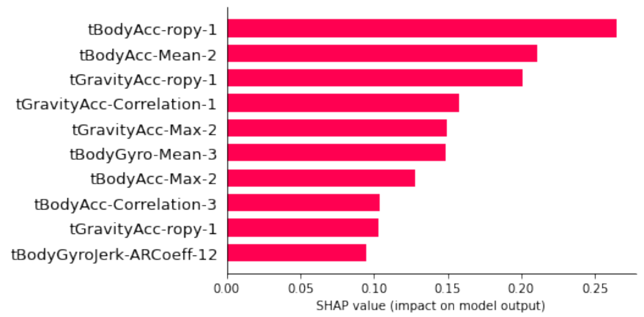

Figure 13: *GT: SIT_TO_LIE == Pred*

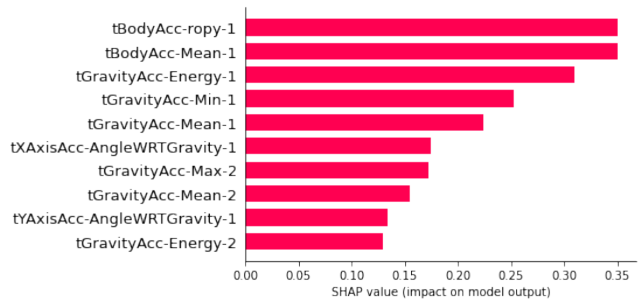

Figure 14: *GT: LIE_TO_SIT == Pred*

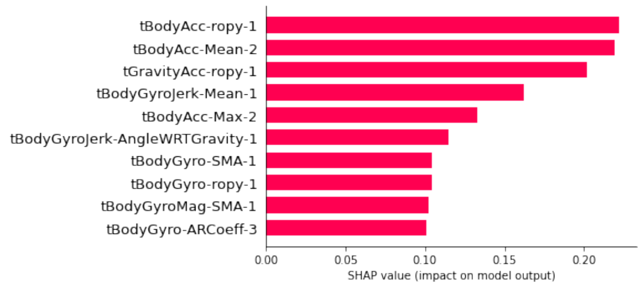

Figure 15: *GT: STAND_TO_LIE == Pred*

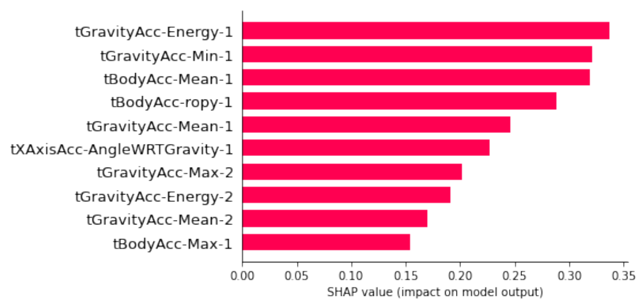

Figure 16: *GT: LIE_TO_STAND == Pred*