# Mobile Computing (CS23400/1)
## Lab 1 - Report

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## 1 Task

* Here we can write something about what is the task we are trying to solve in this lab (i.e., activity classification). A simple copy-paste of their description of the lab should be enough.

* Let's emphasize that we want this model to work on cheap IMUs (like those embedded in modern mobile phones).

## 2 Challenges

* Here we can say something about the fact that cheap IMUs produce noisy readings that make the problem of classifying activities harder.

## 3 Proposed Approach

* Here we can talk about what is the main idea behind our approach. We can say that we framed the problem as a general data classification problem and use state-of-the-art machine learning techniques to solve it.

* Why we chose Recurrent Neural Network, why the LSTM in particular.

* Let's introduce the fact that we do some data post-processing before feeding it to the model (the next section will be about data post-processing).

### 3.1 Data post-processing

* Here we talk about the fact that we downsample the readings from $128Hz$ to $16Hz$. Let's justify it by saying that we tried different factors and empirically chose the one that maximizes reduction while preserving signal shape (we tried $2, 4, 8, 16, 32$).

* Let's also talk about the trimming phase, in which we discard the first and last 2 seconds of each trace because of the time spent to say "Now you can start jumping", or the time required to switch windows (while Driving the car) and the time when somebody stops earlier and asks "Can I stop jumping¿'.

* We also explain that since the signals are periodic (for all the activities that we have), we can easily classify the activity based on a few seconds of data. Thus we split a 10 seconds long trace into 6 smaller samples of 1 second each (the 4 seconds that are missing are removed in the trimming phase above).

### 3.2 Recurrent Neural Network

* Here we explain and show the architecture of our neural network by unwrapping the timesteps.

* Explain what is X, what is Y, and what is the hidden state. Do not talk about batching here.

* Explain (briefly) the training process and how gradient back-propagation works.

### 3.3 Dataset

* Here we just talk about how much data (samples) we used for training, how much for validation and how much for testing.

* Depending on whether we decide to use cross-validation we talk about it too.

## 4 RESULTS

\* Here we discuss and show a plot of the training/validation loss/accuracy over time (over epochs).

\* We show the confusion matrix computed either on the validation set (if not cross-validation) or on the training set (if cross-validation).

## 5 CONCLUSION

\* Here we can talk about the possibility to deploy our model on mobile devices. Let's just say that there exist an implementation for mobile devices of tensorflow so our approach can be easily and seamlessly deployed on a mobile device.