HERIOT WATT UNIVERSITY

# F20BC/F21BC - Lab
Deep Learning I

This lab is about Deep Learning. You will download the main frameworks and learn how to use them by running examples provided.

## Computing Facilities

You are strongly recommended to use the MACS Linux Environment. If you have network connection issues, you can do it on your own computer or the MACS VM. See more details on the "**BIC Computing Facilities**" document.

## Setting up the environment

The following instruction will be based on MACS Linux Environment, and you first need to log in to the MACS linux sever first. Please see the "**MACS Linux Environment (Remote Access)**" section in the "BIC Computing Facilities" document.
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**a) Open a terminal and create a virtual environment, in which you are going to install the required libraries.**

```
virtualenv -p python3 venv
source ~/venv/bin/activate
```

**b) Install the required Python3 libraries.**

```
pip install numpy sklearn h5py
pip install tensorflow==1.14
pip install keras
```

**c) Clone and enter the repository with the examples.**

https://github.com/pangweijlu/dl_tutorial
```
cd dl_tutorial
```

**d) Please check the results of every experiment in the following sections.**

## Part 1:

**a) Check the code from** `mnist_mlp.py` **and run it.**

**b) Leave it with only one hidden layer, remove the dropouts and run it again.**

**c) Change the activation of the hidden layer to a "**`sigmoid`**", the loss function to** `mse` **(mean squared error).**

**d) Change the optimization algorithm to `"sgd"` (Stochastic Gradient Descent).**

## Part 2:

**a) Check the code from `mnist_cnn.py` and run it.**

**b) Add a `MaxPool1D` layer after the first convolutional layer, and a dropout of 25% after it. Also, change the optimization algorithm to `"adam"`.**

## Part 3:

**a) Check the code from `lstm_text_generation.py` and run it.**

**b) Change the length of the inputs to 80 characters.**

**c) Change the length back to its original size and load the previously trained model, with the following syntax:**

```
model.load_weights('model_lstm_text.h5')
```

**d) Train the same network for 50 epochs with Isaac Asimov's tale "The Last Question", available at `the_last_question.txt`. For the sake of time, remove the callback parameter from the `model.fit(...)` function and add a call to `on_epoch_end(0,0)` at the end of the program, so that you can check text generated by the model.**

## Part 4:

**a) Check the code from `data_handler.py` and `convlstm.py` and run it.**

**b) Change the dropout rate on the LSTM layer to 80%.**

**c) Train the network with only the 6 first features (columns) of the data.**