

**Lab 3**  
**EC9630: Machine Learning**  
**Chapter 6: Nonlinear Models**  
**Duration: 3 Hour**  
**Artificial Neural Networks**

**Introducing Keras datasets.**

**ANN for classification and regression.**

**Evaluating the model.**

**Introducing the validation dataset.**

1. Study the dataset 'Fashion-MNIST' in Keras. Answer the following questions in relation to the above dataset.
  - (a) Find out whether it can be used for regression or classification.
  - (b) What is the size of the images?
  - (c) How many images are there in the train data?
  - (d) State the number of images in test data.
  - (e) How many classes are there in the data? Write down those classes.
2. Load that dataset directly from Keras using Python.
3. View some images in training data, for example draw the 11th image in your training data.
4. Normalize your data (train and test) between 0 and 1.  
**Hint:** This is a grayscale image has pixel values between 0 and 255.
5. Now divide the training data into two: Validation images (first 5000 images from the initial training data) and Training images (rest of the images in your initial training data).
6. Initialize the weight and bias parameters of your model.
7. Now build the neural network model with the following characteristics:
  - (a) One Flatten layer as the input layer.
  - (b) Two dense relu layers as hidden layers.

- (c) A dense softmax layer as the output layer.
8. Answer the following questions.
    - (a) What is the use of Flatten layer?
    - (b) Generally, softmax activation function is used in the output layer of the classification networks. Why?
  9. Print the summary of the network.
  10. Now compile the model with the desired loss function, optimizer and metrics.
  11. Now train your model on the training data and validate your model.
  12. Evaluate your model on the test data. What is the accuracy of your model on the test data?
  13. Now take the first five samples of test data. Print the actual target classes and the predicted target classes of those five samples.