In this assignment you will classify capital letters of English A-Z using CNN.

1. Write the code to define a convolutional neural network with following details:

Conv layer with 16 filters of size 3x3 with input shape=30x30

Max pooling layer of size 2x2

Conv layer with 32 filters of size 3x3

Max pooling layer of size 2x2

Flatten layer

Dense layer that can classify into 26 categories

1. Find out output shape and number of parameters for each layer. Now verify your answer by coding it in tensorflow.
2. Create images of 26 categories A-Z using notepad or MS-Word or any other word processing software. Organize them in 26 folders for training and validation.
3. Create an image data generator and using data augmentation, generate 100 images of each category. Save them in respective folders.
4. Now, using the model created in step 1, train the model. What accuracy you achieved?
5. Now using feature extraction on a pretrained model Inception,
   1. Take the extracted feature and classify using SVM. (hint: use sk-learn for this purpose)
   2. Take the extracted feature and classify using another neural network with only dense layers.
6. Now use a pre-trained model and perform fine tuning with some layers freeze to classify the data into 26 categories. What accuracy you obtained?
7. Now save the model.
8. Visualize the first filter output of first CNN layer and second filter output of second CNN layer.

**Resources:**

Lecture slides: <https://sites.google.com/a/nu.edu.pk/noman-islam/artificial-intelligence/deep-learning-in-practice-module-3>

YouTube Lectures: <https://www.youtube.com/watch?v=U7tdJEt1Cz0&list=PLkvOxJFQW9RE-VZ-3w9-awJYqFFWszZ84>

FaceBook Group: Learn AI with Dr. Noman