

IMT3104 Artificial Intelligence

Assignment 02

February 17, 2021

1 NEURAL NETWORK

1.1 STL-10 CLASSIFICATION USING SIMPLE NEURAL NETWORK

In this exercise, the aim is to design a neural network for the image classification using STL-10 dataset. Model specification are the following:

- Single hidden layer and 10 way Softmax output. (For 10 classes)
- Use tanh activation for the hidden layers and sigmoid for the output layer
- Compute the cross entropy loss
- Implement forward and backward propagation

For the input to the network, we may use raw pixel values. Play with the number of nodes in the hidden layers for improving the classification accuracy.

1.2 STL-10 CLASSIFICATION USING CONVOLUTION NEURAL NETWORK

Design a simple convolutional neural network with 2 convolutional layers for the STL-10 classification. The network should be trained and evaluated on the following:

- Using classical RGB channels of image as input to the network.

Be creative with the design (depth) of the network to get the optimal performance.

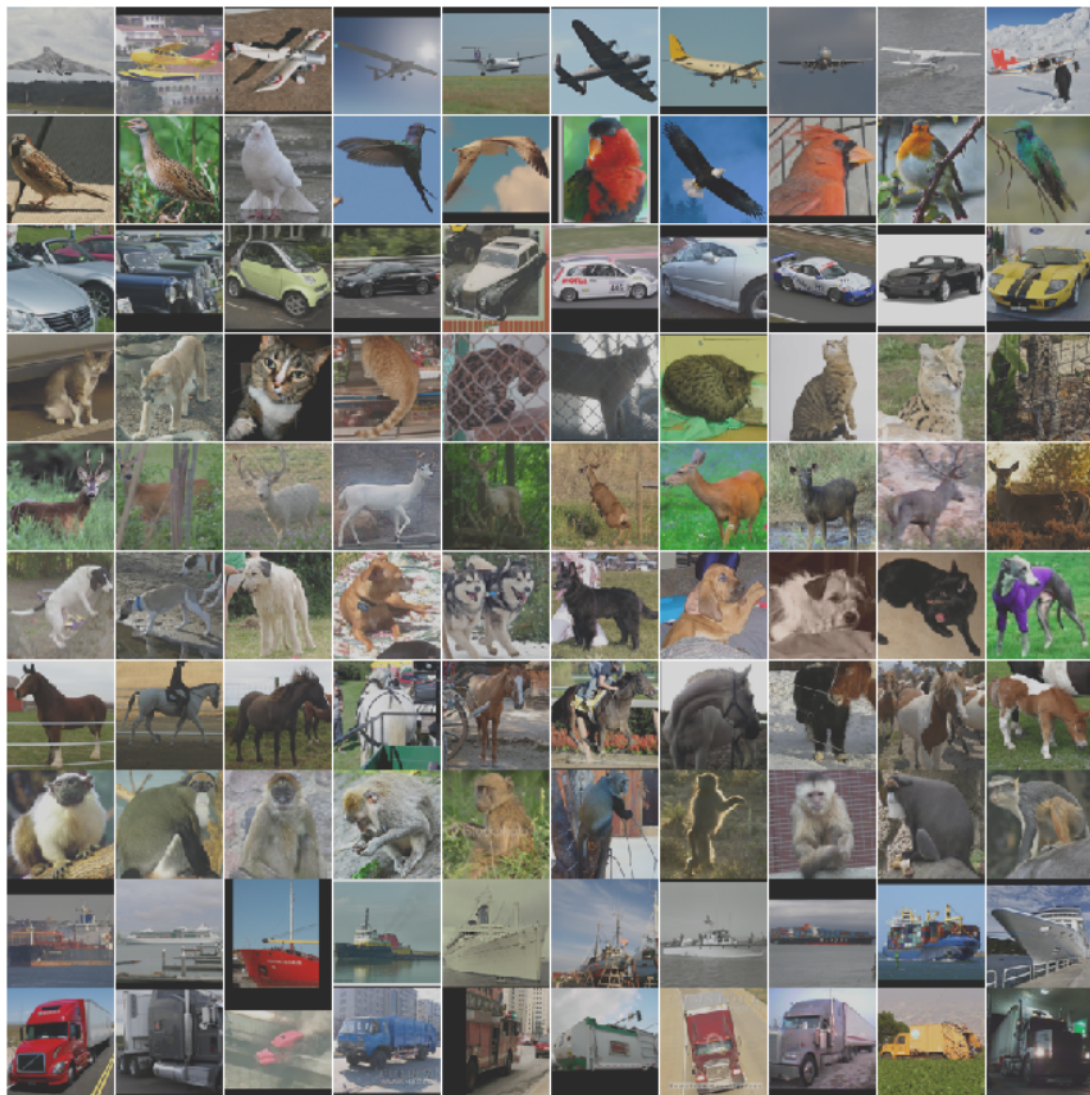


Figure 1.1: Samples from STL-10 dataset. The dataset has labeled and unlabeled data. The use of only labeled is required for these exercise.

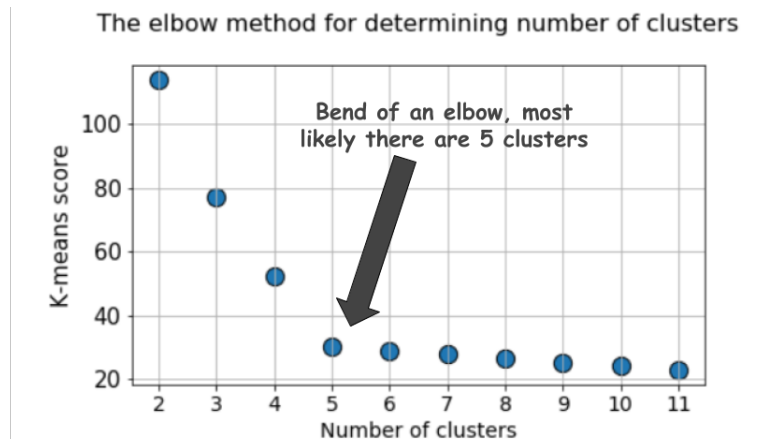


Figure 2.1: The elbow method is a heuristic used in determining the number of clusters in a data set. The method consists of plotting the explained variation as a function of the number of clusters, and picking the elbow of the curve as the number of clusters to use.

2 DATA CLUSTERING

2.1 K-MEAN CLUSTERING WITH INPUT K

K-Means Clustering is an unsupervised learning algorithm that identify patterns in the input data and group them according to their similarity based on a given distance metric. Write a python code for the K-mean clustering algorithm. The algorithm should be tested in the following scenarios.

- Synthetic data (you can choose any number of clusters)
- Iris flower dataset (3 clusters)

<https://archive.ics.uci.edu/ml/datasets/iris>

2.2 K-MEAN CLUSTERING

In the k-mean clustering, the number of clusters are usually given by the user. However, if the user don't know anything about the dataset, it is sometimes difficult to guess the optimal number of cluster. In this exercise, we will assume that we don't know the optimal number of clusters in the above mentioned datasets. Hence, instead of using pre-defined number of clusters, explore automatic techniques to come up with an approximate number of clusters in the data. Specifically, explore the following method for approximating the number of clusters in the data.

- Elbow method