Tensorflow

1. Introduction

a. Introduction to TensorFlow
b. Architecture of Tensorflow
c. Installation on Local Machine
d. Using TensorFlow in Google Colab
e. Working with Tensors and Operations
f. Keras Low level api
g. Labs:-
    1. Installing tensorflow on local machine
    2. Working with google colab
    3. Working with tensors and numpy

2. Introduction to Artificial Neural Networks

a. From Biological to Artificial Neurons
b. Different activation functions
c. What is perceptron?
d. Multilayer perceptron and back propagation
e. Working with sequential api
f. Working with the functional api
g. Using callbacks
h. Tensorboard for visualization
i. Labs:-
    1. Classification on iris dataset using perceptron model
    2. Image classification on fashion MNIST dataset using sequential and functional API
    3. Improving the model using callbacks

3. Training Deep Neural Nets

a. Challenges of Deep Neural Networks'
b. Vanishing and Exploding gradients
c. Glorot and He Initialization
d. Non Saturating Activation Functions
e. Different activation functions effect on deep neural nets

f. Batch normalization
g. Reusing the pre-trained layers in Neural nets
h. Faster optimizers
i. L1 and L2 regularization
j. Dropouts and their purposes
k. Labs:-
    1. Classification of MNIST dataset and performance of models by the use of different activation functions.
    2. Classification by using pre-trained layer of model to reduce the computation time.
    3. Reducing the overfitting through the use of regularization in various models.

4. Loading and preprocessing the data

a. The data api
b. Chaining transformations
c. Pre-processing the data
d. TFR record format and compressed files
e. Introduction to protocol buffer
f. Processing the Input features
g. TF transform
h. Tensorflow datasets project
i. Labs:-
    1. Implementation of basic functions like repeat, batch, shuffle required for preprocessing.
    2. Implement interleave() so as to read many files at a time using tensorflow for improving the performance.
    3. Storing and accessing the files stored in tfrecord format for better processing.

5. Computer Vision using CNN

a. Inspiration to the CNN
b. Architecture of CNN
c. Convolution layers in CNN
d. Filters in CNN
e. Pooling layer in CNN
f. Depth pooling in CNN
g. Different architectures of CNN

h. Labs:-
    1. Implementing different filters to find the different patterns from the image.
    2. Progressively reduce the spatial size of an image.
    3. Classifying the fashion MNIST dataset by using CNN.

6. Processing Sequences using RNN

a. Single neuron RNN
b. Working with RNN neural network
c. Input and Output Sequences in RNN
d. Introduction to Deep RNN
e. Forecasting using RNN
f. Unstable gradient problem
g. Architecture of LSTM
h. Architecture of GRU
i. Labs:-
    1. Forecasting using simple RNN, Deep RNN, LSTM and GRU

7. Natural Language Processing

a. Introduction to Natural Language processing
b. Shakespear text generation using char RNN
c. Stateless and stateful RNN
d. Concept of sentiment analysis
e. Encoder and Decoder Network for Neural Machine Translation
f. Pre-processing required for encoder and decoder
g. Concept of Beam Search
h. Overview of attention mechanism
i. Labs:-
    1. Generating Shakespearean text using character RNN, Bidirectional RNN.
    2. Sentiment analysis of IMDB dataset.

8. Representative Learning and Generative Learning using Autoencoders and GANs

a. Introduction to Autoencoders and GAN
b. Efficient data representation
c. Dimensionality reduction using autoencoders
d. Introduction to stacked autoencoders
e. Training one autoencoder at a time
f. Recurrent autoencoders
g. Sparse autoencoders
h. Generative adversarial networks
i. Deep Convolutional GANs
j. Labs:-
    1. Autoencoder for the dimensionality reduction
    2. Reconstruction of images using recurrent auto encoder.

9.Reinforcemnent Learning

a. Introduction to reinforcement learning
b. Learning to optimize rewards
c. Policy Search
d. Introduction to OpenAI Gym
e. Neural Network Policies
f. Credit Assignment Problem
g. Markov Decision Process
h. Q Learning
i. Deep Q Learning
j. Labs:-
    1. Train a Deep Q network with TF agent(Cartpole Environment)