Team Members:

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Introduction:

The lab assignment is associated with programming of Deep Learning models to perform analysis across a varying range of data sets involving images, text, data sets etc. using Python language for coding.

Objectives:

The lab work involves a collection of tasks to be accomplished listed as below.

- Build a linear regression sequential model on a chosen data set, display the results obtained using Tensor board analysis along with the accounting for any changes impacted from variations in learning rate, batch size, optimizer and activation function.
- Implementation of logistic regression analysis on heart disease related data using normalization of the data fed to the model, graphical representation of loss associated to the model using tensor flow analysis and evaluation of impact on loss and accuracy resulting in change in certain hyper parameters.
- Development of a CNN model to perform image classification on either the data set of 10 different monkey species or the natural images.
- Performing text classification leading to sentiment analysis on movie review data using CNN and LSTM models along with evaluation of the difference in the results based on the different model approaches.
- Using the MNIST data set, encode and decode specific images using Autoencoder.

Concepts Incorporated:

The following concepts have been explored and utilized to work on data of different forms to accomplish different objectives.

- Linear regression sequential data analysis
- Logistic regression data analysis
- Image classification using CNN model
- CNN model-based text classification
- LSTM model-based text classification
- Autoencoding resulting in encoding and decoding of images

Data Sets Used:

Multiple data sets have been to accomplish different objectives.

- Heart disease
- 10 Monkey species or Natural images (Image classification)
- Sentiment analysis on movie reviews (Text classification)
- MNIST data set

General Process of Workflow:

The basic flow of work involved across all the deep learning concepts are explained below.

Basic Analytical Process:

- Identify the data set to be used for the deep learning model
- Load the appropriate data set as needed
- Preprocess the data set to identify the more prominent and important features, eliminating the less important or irrelevant features
- Split the data set into training, validation and test data sets to be used on the model
- Identify the deep learning model to be used for the process of deep learning
- Identify the input, hidden (one or more as considered appropriate) and output layers to be applied to the model defined
- Compile the model using appropriate optimizer, loss and metrics functions
- Using the training data set, fit the model defined
- Evaluate the efficiency of the model derived using the test data
- Identify the accuracy and loss associated with the model obtained using the test data
- Visualize the results (accuracy, loss) obtained as graphical presentation

Tensor Flow Based Analysis:

Along with the basic steps of identifying and loading the data set as input, preprocessing the data, splitting it into training and test data sets and defined the model and its associated layers to be used, the following steps are also included as a part of tensor flow based analysis of the deep learning models.

- Define the tensor call back model using Tensor Board
- Using the training data set, fit the model incorporating the tensor call back
- Evaluate the performance of the model derived using the test data
- Identify the accuracy and loss associated with the model obtained from tensor flow
- Visualize the results (accuracy, loss) obtained from the tensor flow as graphical presentation

Parameters & Evaluation:

The parameters involved in the building of the deep learning model varies based on the approach used and the purpose of the use case. The models obtained are evaluated both on a general basis as well as based on tensor flow.

Code, Results & Graphs:

The source codes, results and graphs obtained for each of the use case may be accessed from the code section of github. The link to access the same is source codes, results and graphs (https://github.com/pkankariya/Deep-Learning-using-Python/tree/master/LAB_DL_PK) .

References:

Along with the in-class programming lessons, online resources were also referred to some of which are listed as follows.

- Google search
- https://towardsdatascience.com/ (https://towardsdatascience.com/)
- wikipedia
- https://www.geeksforgeeks.org/machine-learning/ (https://www.geeksforgeeks.org/machine-learning/)