4.9. Experiment No. C-1

Aim: How to Train a Neural Network with TensorFlow/Pytorch and evaluation of logistic regression using Tensorflow

Theory:

What is TensorFlow?

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.It was developed by the Google Brain team for internal Google use in research and production. The initial version was released under the Apache License 2.0 in 2015. Google released the updated version of TensorFlow, named TensorFlow 2.0, in September 2019. It can be used in a wide variety of programming languages, including Python, JavaScript, C++, and Java. This flexibility lends itself to a range of applications in many different sectors.

What is Pytorch?

PyTorch is an open source machine learning (ML) framework based on the Python programming language and the Torch library. Torch is an open-source ML library used for creating deep neural networks and is written in the Lua scripting language. It's one of the preferred platforms for deep learning research. The framework is built to speed up the process between research prototyping and deployment. The framework supports over 200 different mathematical operations. It’s popularity continues to rise, as it simplifies the creation of artificial neural network models. PyTorch is mainly used by data scientists for research and artificial intelligence (Al) applications.

What is regression?

Machine Learning Regression is a technique for investigating the relationship between independent variables or features and a dependent variable or outcome. It’s used as a method for predictive modelling in machine learning, in which an algorithm is used to predict continuous outcomes. For example, if the model that we built should predict discrete or continuous values like a person’s age, earnings, years of experience, or need to find out that how these values are correlated with the person, it shows that we are facing a regression problem.

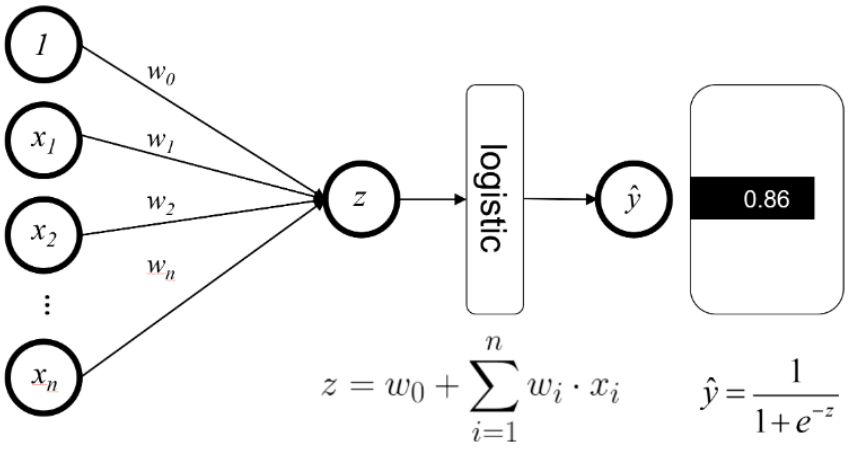
What is neural network?

Just like a human brain, a neural network is a series of algorithms that detect basic patterns in a set of data. The neural network works as a neural network in the human brain. A “neuron” in a neural network is a mathematical function that searches for and classifies patterns according to a specific architecture.

Logistic Regression:

Logistic regression uses probabilities to distinguish inputs and thereby puts them into separate bags of output classes. To better understand how this process works, let’s look at an example. Consider a case where you want to sketch a relation between your basketball shot’s accuracy and the distance you shoot from. On the whole, it’s about predicting whether you make the basket or not. Let’s

suppose you're going to predict the answer using linear regression. The relation between the win (y) and distance (x) is given by a linear equation, y = mx + c. As a prerequisite, you played for a month, jotted down all the values for x and y, and now you insert the values into the equation. This completes the training phase. Later, you want to estimate the possibility of making the shot from a specific distance. You note the value x and pass it to the trained math equation described above. It will now be a static equation, i.e. y = (trained_m)x + (trained_c).



Algorithm:

Step 1: Importing necessary modules
Step 2: Loading and preparing the mnist data set
Step 3: Setting up hyperparameters and data set parameters
Step 4: Shuffling and batching the data
Step 5: Initializing weights and biases
Step 6: Defining logistic regression and cost function
Step 7: Defining optimizers and accuracy metrics
Step 8: Optimization process and updating weights and biases
Step 9: The training loop
Step 10: Testing model accuracy using the test data

Input:
MNIST dataset e.g. Iris Dataset

Output:
Accuracy (Change of cost over the epochs)

Conclusion: We have successfully implemented a Neural Network with TensorFlow/Pytorch and evaluation of logistic regression using tensorFlow.

Experiment Level Outcome (ELO1): Students will be able to train the neural network and evaluate the performance using Tensorflow.

Questions:

1. What is One-hot Encoder?
2. How do you train a neural network for regression?
3. How to train neural network with TensorFlow?
4. What is neural network regression in ML?
5. Which neural network is best for regression?
6. Is Ann used for classification or regression?