PART1 REPORT - SOC'23

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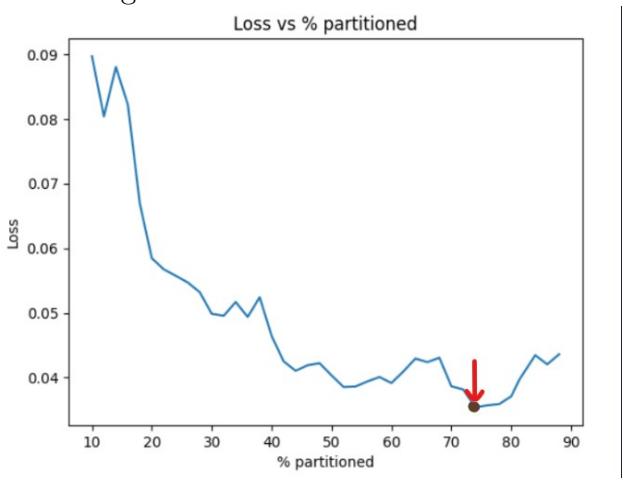
1 Module 1

In our first module I started with brushing up basics of python libraries such as numpy, pandas, matplotlib and learnt about the most famous library for ML i.e., Scikit-Learn, which we used to build our ML model.
Assignment 1 consisted of 2 tasks.

Task 1: For Task 1 I have used **Linear Regression** model on the **Iris dataset** for partitioning and got optimal partition as 74% for train dataset and remaining for test.



Task 2: In this task I calculated the losses and accuracy concerned with different ML models and tried to find out which model fits best on the given Dataset.
For this, the data was first loaded as pandas dataframes and **preprocessed** using various methods, like **droping** columns in train dataset which did not seemed useful and **One-hot encoding** for conversion of *'string'* values into 0 or 1.
I used *KNN, Naive Bayes and Decision Tree* models on the Dataset and got the best classifier as **Naive Bayes** with max accuracy of 86.12% .

2 Module 2

In this module we learnt about Neural Nets and CNN models, and implemented the same in our Assignment 2.
Neural Networks: Neural Networks consist of interconnected nodes, called artificial neurons, organized in layers. Neural networks are designed to process and learn from input data to produce desired outputs or make predictions.
CNN (Convolutional Neural Network): Convolutional Neural Networks are a specialized type of neural network commonly used for analyzing visual data, such as images. CNNs are designed to automatically learn spatial features from the input data, making them well-suited for tasks like image classification, object detection, and image segmentation.
As a part of this assignment, I performed image classification using CNNs in **PyTorch**. The dataset used was the standard **CIFAR-10** dataset, which contained 60,000 images (5:1 :: Train:Test) of size $32 * 32$.
The work was done in few steps:

- **Loading and Splitting:** The Dataset was loaded and splitted into train:validation:test sets respectively.
- **Modelling:** I constructed a CNN model with **6 layers** (2 conv, 1 pooling, 3 fully connected), and input/output channels and other parameters were defined accordingly.
- **Training:** Defined a function *'train_model*(num_epochs)', which calculated train/val accuracies and losses. **Adam**(SGD) optimizer was used along with **Cross Entropy Loss** as loss criterion.
- **Result:** My Final Training Accuracy came out to be 76.92% .
- **Model saving:** Saved the Trained model in a pytorch notebook:- *'final_model.pt'*

3 Module 3

In this module we learnt about RNN, LSTMs and NLP.

3.1 RNN

Recurrent Neural Networks are a type of artificial neural network designed to process sequential data. Unlike traditional feedforward neural networks, RNNs have loops in their network architecture, allowing them to retain information from previous steps and use it as input for the current step. This makes them effective in handling tasks such as language modeling, speech recognition, and machine translation, where context and sequence are crucial.

3.2 LSTM

Long Short-Term Memory is a specific type of RNN architecture that addresses the limitations of standard RNNs in capturing long-term dependencies. LSTM networks were designed to overcome the "vanishing gradient" problem, which is common in traditional vanilla RNNs. LSTMs introduce memory cells and additional gates to control the flow of information, enabling the network to selectively remember or forget information over long sequences. They are widely used in tasks involving sequential data and have been successful in various applications such as speech recognition, sentiment analysis, and language translation.

3.3 NLP

Natural Language Processing is a field of artificial intelligence that focuses on the interaction between computers and human language. It involves the development of algorithms and models to process, understand, and generate natural language data. NLP encompasses a range of tasks, including text classification, sentiment analysis, machine translation, question answering, and language generation. NLP techniques often involve applying machine learning and deep learning approaches to analyze and extract meaningful information from textual data, enabling computers to understand and generate human language.

4 PoA

I plan to complete the content given in Module 4 by 10th July, and then after that will carry on with our task of Image captioning as we proceed towards Module 5.