Assignment 4: Multi-class Classifier with Neural Networks

In this assignment, you will develop a neural network model to predict a target variable based on several input features. The dataset provided has been anonymized, containing various features named `Feature_1`, `Feature_2`, ..., and a target variable named `Target`. You will go through the process of loading the data, preprocessing, model development, training, prediction, and evaluation.

Objectives

- Practice building neural network models using TensorFlow and Keras.
- Implement data preprocessing techniques for machine learning.
- Perform model evaluation to understand its performance.

Dataset

The dataset (`train.csv`) is provided where each row represents a data point with several features and a target variable for prediction.

Instructions

Create Markdown cells explaining what each step is doing before the step itself.

Step 1: Load the Data

- Load the dataset (`train.csv`) into a Pandas DataFrame.

Step 2: Split the Data into Features (X) and Target (Y)

- Divide the dataset into features (X) and the target variable (Y).
- Markdown explanation: Explain the rationale behind separating features from the target in machine learning.

Step 3: Data Splitting

- Split the data into training and test sets to evaluate the model's performance.
- Markdown explanation: Describe the importance of having training and test datasets in model evaluation.

Step 4: Build the Neural Network Model

- Design your neural network using TensorFlow and Keras, choosing appropriate activation functions.
- Markdown explanation: Detail your model's architecture, including layer types, sizes, and activation functions used. Also, (IMPORTANT) explain why you are choosing the activations functions you picked. Explain, if you find the performance of the neural network improves by changing the layers or the activation functions.

Step 5: Train the Model

- Train your neural network on the training set.
- Markdown explanation: Discuss the model training process, highlighting your choices of optimizer and loss function.

Step 6: Model Evaluation

- Evaluate your model's performance on the test set.
- Markdown explanation: Explain how model evaluation is performed and what metrics can be used to assess model performance.

Step 7: Make Predictions

- Use your trained model to make predictions on the test set. See `test.csv` . This file only contains the features and not the target.
- Markdown explanation: Outline the process of making predictions with a trained model.

Step 8: Generate Submission File

- Create a submission file with your predictions, formatted similarly to `sample_submission.csv` .

Step 9: Submission

- Submit your Jupyter notebook and the predictions CSV file.

Additional Guidelines

- Consider normalizing or standardizing your data if necessary.

- Explore the dataset through visualization to gain insights.
- Discuss any additional preprocessing steps taken and their purposes.
- If applicable, mention any advanced techniques used for model improvement, such as hyperparameter tuning.

Evaluation Criteria

- Correctness and efficiency of the neural network implementation. [10]
- Accuracy and performance of the model on the test data. [30]
- Quality and clarity of markdown explanations. [20]

Submission Details

- Submit the submission.csv file
- Submit your jupyter notebook