CHRIST (Deemed to be University)
Department of Computer Science
Master of Artificial Intelligence and Machine Learning

Course: MAI371 – Deep Learning
Exercise No: LAB Exercise – 3
Date: 01 – 03 – 2024
Duration: 2 Hrs

Question (10 Marks)

1.Imagine you are the manager of an online retail store, and you want to optimize the pricing strategy for a specific product based on real-time data with the objective to minimize the revenue lost on the marketing/advertisements of a product. Assume the revenue function is given by $f(w) = 0.5w^2-30w+100$, where x is the cost on the product advertisement. Start with an initial price as w=20 and find the optimal price (w) using appropriate momentum based optimization algorithm that could minimize the revenue lost. (Note: repeat for at least 3 iterations with learning rate=0.1 & momentum=0.9)

2.You are working as a data scientist for a healthcare company that aims to predict the likelihood of patients developing a certain disease based on various medical parameters. You have been tasked with developing a deep learning model using a dataset obtained from Kaggle or any other repository. This dataset contains information about patients' demographics, medical history, and test results.

Your goal is to build a neural network model that can effectively predict the likelihood of a patient developing the disease. However, due to the complexity of the dataset and potential overfitting issues, you decide to implement three different regularization techniques: L1 regularization, L2 regularization, and elastic net regularization.

Here's how you proceed:

Load and preprocess the dataset: Load the dataset from Kaggle and preprocess it by handling missing values, encoding categorical variables, and scaling numerical features.

Split the dataset: Split the dataset into training and testing sets to evaluate the performance of the models.

Build the neural network model: Construct a deep learning model using TensorFlow or PyTorch with multiple hidden layers. Use ReLU activation functions for the hidden layers and a sigmoid activation function for the output layer since this is a binary classification problem.

Implement regularization techniques: Apply L1, L2, and elastic net regularization to the model to prevent overfitting. Experiment with different regularization strengths.

Train the model: Train the neural network model on the training data using the Adam optimizer and binary cross-entropy loss function. Monitor the training process by tracking the loss and accuracy metrics.

Evaluate the models: Evaluate the performance of the models on the testing dataset by calculating metrics such as accuracy, precision, recall, and F1-score.

Results Visualization and Interpretation:

Create visualizations such as learning curves, confusion matrices, and ROC curves to analyze the model's performance and interpret the results.Compare the performance of L1,L2 and Elastic net and highlight their impact on model generalization and robustness.

Evaluation Rubrics:

Momentum based optimization algorithm:2 marks
L1 Regularization:2 marks
L2 Regularization:2 marks
Elastic Net:2 marks
Comparison:2 Marks

Total:10 Marks

General Instruction:

1. Ensure that your code includes relevant comments to enhance readability and understanding. Subsequently, upload your code to GitHub for version control and collaborative access.
2. Include descriptive comments within the code, explaining its functionality and logic.
3. In the Google Classroom submission, include the GitHub URL where your code is hosted.
4. Attach a PDF document named "your_register_number_exercise_No.pdf" to the submission.The PDF document should include screenshots of the code and the output screen.
5. Upload the answer document&GitHub URL in Google Classroom on or before the deadline mentioned.Evaluation will not be considered for late submission