Report On Image Classification Model Using Logistic Regression On MNIST Dataset

Objective

The goal of this project was to implement a simple image classification model using Logistic Regression to classify handwritten digits from the MNIST dataset.

Approach:

1. Dataset: We used the MNIST dataset, which contains 60,000 28x28 grayscale images of digits (0-9) for training and 10,000 images for testing.
2. Model: A Logistic Regression model was implemented using a single fully connected layer to predict one of the 10 classes (digits 0-9) from the flattened 28x28 pixel images.
3. Training: The model was trained using Stochastic Gradient Descent (SGD) as the optimizer, with Cross-Entropy Loss as the loss function. The training process ran for 5 epochs.

Results

- **Training Loss**: The model showed decreasing loss over the epochs, indicating successful learning from the training data.
- **Test Accuracy**: After training, the model achieved a test accuracy of **92.67%**. This is a decent result for a simple model like Logistic Regression on a basic dataset such as MNIST.

The model performed well, but there is still room for improvement by using more complex architectures (like Convolutional Neural Networks).

Conclusion

- Logistic Regression, while simple, can achieve a high accuracy on the MNIST dataset, demonstrating the power of even basic machine learning algorithms for image classification tasks.

- Future improvements could include experimenting with more complex models like Convolutional Neural Networks (CNNs) for higher accuracy, as Logistic Regression is limited in handling complex image data compared to CNNs.

Overall, this experiment highlights the importance of model complexity and the trade-offs involved when using simpler models for image recognition tasks.