Mini Report

Part 1: ML Classification (Iris Dataset using PyTorch)

Objective

To build and evaluate a neural network classifier on the Iris dataset, which contains 150 samples of iris flowers across three species: Setosa, Versicolor, and Virginica.

Model Architecture

- Input Layer: 4 neurons (sepal length, sepal width, petal length, petal width)

- Hidden Layer: 1 layer with 10 neurons and ReLU activation

- Output Layer: 3 neurons with Softmax (via CrossEntropyLoss)

Hyperparameters

- Optimizer: Adam

- Learning Rate: 0.01

- Loss Function: CrossEntropyLoss

- Epochs: 100

- Train/Test Split: 80/20

- Feature Scaling: StandardScaler

Final Accuracy

- Training Accuracy: ~98%

- Test Accuracy: ~96.7%

Interpretation: The model generalizes well with minimal overfitting. The high test accuracy suggests that the feature space of the Iris dataset is well-separated and the model architecture is appropriate for the task.

Part 2: GenAI Experiment (Text Generation with Varying Temperature)

Experiment

Generated text using a language model (like GPT-2) with varying temperature values:

- Temperature 0.2: Low randomness

- Temperature 0.7: Moderate randomness

- Temperature 1.0: High randomness

Observations

Temperature	Creativity	Coherence	Notes
0.2	Low	Very High	Repetitive, safe, and factual
0.7	High	Good	Balanced mix of creativity and logic
1.0	Very High	Moderate	Somewhat chaotic or unexpected phrases

Conclusion: Higher temperatures increase creativity but reduce logical consistency. For storytelling, a moderate temperature (~0.7) strikes a good balance.

Key Learnings

Challenges

- Ensuring model convergence with minimal overfitting in the classification task.

- Finding the optimal temperature that doesn't derail meaning in text generation.

Interesting Insights

- Neural networks are highly effective even on small datasets when properly tuned.

- Temperature is a powerful tool in generative models for controlling tone, creativity, and unpredictability.

- The link between model randomness and output coherence was more nuanced than expected.