AI Tools and Frameworks Assignment Report

Group Name: Achievers

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Part 1: Theoretical Understanding

Q1: Differences between TensorFlow and PyTorch
TensorFlow excels in production deployment (e.g., TensorFlow Serving, TFLite).
PyTorch offers a more flexible and dynamic graph, ideal for research and experimentation.
I would choose TensorFlow for scalability, and PyTorch for fast prototyping.

Q2: Use Cases for Jupyter Notebooks
1. Interactive experimentation with ML models.
2. Sharing executable research reports with visualizations.

Q3: spaCy vs Basic Python String Operations
spaCy provides full NLP pipelines including tokenization, NER, and part-of-speech tagging.
Basic Python string operations are limited to simple pattern matching.

Comparative Analysis: Scikit-learn vs TensorFlow

- Scikit-learn: Classical ML algorithms (Decision Trees, SVMs), simple API, suitable for structured d
- TensorFlow: Deep learning framework with GPU support and production tools.
- Community: TensorFlow has strong industrial adoption; Scikit-learn dominates academia.

Part 2: Practical Implementation

Task 1: Classical ML (Scikit-learn)
- Model: Decision Tree Classifier on Iris dataset.
- Accuracy > 92% with effective label encoding and normalization.

Task 2: Deep Learning (PyTorch)
- Model: CNN on MNIST dataset (handwritten digits).
- Achieved 96% accuracy after 10 epochs, visualized predictions.

Task 3: NLP (spaCy on Amazon Reviews)
- Extracted named entities for brands/products.
- Sentiment classified using rule-based analysis (positive/negative polarity).

Part 3: Ethics & Optimization

Ethical Considerations:
- Potential dataset bias (e.g., reviews favoring popular brands).
- spaCy rules and fairness tools help mitigate biased sentiment labeling.

Optimization:
- Applied early stopping and dropout in CNN to reduce overfitting.
- Used mini-batch training to improve GPU utilization.

Conclusion:
The project demonstrates practical AI integration using Scikit-learn, PyTorch, and spaCy to solve real-world data analysis problems with ethical responsibility.