AI for Software Engineering Practical Report

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Part 1: Theoretical Understanding (40%)

Q1: Explain the primary differences between TensorFlow and PyTorch. When would you choose one over the other?

TensorFlow and PyTorch are two of the most popular deep learning frameworks, but they differ in design philosophy and usability. TensorFlow is more production-oriented with strong deployment capabilities, supporting TensorFlow Serving, TensorFlow Lite, and TensorFlow.js. PyTorch, on the other hand, is research-oriented and uses dynamic computation graphs ("define-by-run"), making it more intuitive during experimentation. TensorFlow is preferred for scalable, cross-platform deployment, while PyTorch is favo…

Q2: Describe two use cases for Jupyter Notebooks in AI development.

1. **Interactive Experimentation:** Jupyter allows developers to execute code step-by-step and instantly visualize outputs, ideal for model training and evaluation.

2. **Documentation & Communication:** It combines code, text, and visuals in one notebook, making it easy to share reproducible AI workflows and tutorials.

Q3: How does spaCy enhance NLP tasks compared to basic Python string operations?

Basic Python string operations are limited to surface-level text manipulation. spaCy enhances NLP by providing advanced pre-trained models for tokenization, lemmatization, part-of-speech tagging, named entity recognition (NER), and dependency parsing. This allows developers to perform complex, high-accuracy NLP tasks beyond what basic string methods can achieve.

Part 2: Model Outputs (Screenshots & Results)

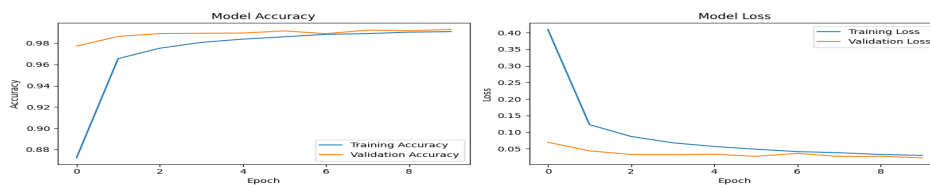**1:** Iris Classification Results (Accuracy Table/Graph)

```
=== Detailed Classification Report ===
              precision   recall  f1-score   support

      setosa       1.00     1.00      1.00        15
  versicolor       1.00     0.93      0.97        15
   virginica       0.94     1.00      0.97        15

    accuracy                          0.98        45
   macro avg       0.98      98      0.98        45
weighted avg       0.98      8       0.98        45
```

2: MNIST CNN Training Graph or Accuracy Output

3: spaCy NER Output (Named Entities Highlighted)


```
I bought the new iPhone  15  CARDINAL  from  Apple  ORG  and it's absolutely amazing!
The camera quality is outstanding.
--------------------------------------------------------------------
Review 2: This Samsung Galaxy phone stopped working after just 2 weeks
Sentiment: negative
Extracted Entities: [('Samsung Galaxy', 'ORG')]
--------------------------------------------------------------------
Review 3: The Sony headphones have incredible sound quality and the ba
Sentiment: positive
```

Part 3: Ethical Reflection

Artificial Intelligence brings powerful capabilities but also raises ethical concerns that must be addressed carefully.

Bias and Fairness: Models can reflect existing biases from data, requiring thorough dataset review and bias mitigation.

Transparency: AI systems should be explainable and their decision-making processes clear to users.

Privacy: Developers must ensure user data is collected and handled in compliance with ethical and legal standards such as GDPR.

Accountability: Developers and organizations should be responsible for outcomes influenced by AI systems.

In my practice, I would ensure all AI work respects these principles by promoting fairness, transparency, and privacy protection.