Theoretical Understanding (40%) - Short Answer Questions

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

TensorFlow uses a static computation graph, making it better for deployment. PyTorch uses a dynamic graph, making it easier and more flexible for research. Use TensorFlow for large-scale deployment and PyTorch for experimentation and academic work.

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

1. Interactive data exploration and visualization. 2. Model experimentation and testing different configurations step-by-step.

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

spaCy provides optimized language models and tools like tokenization, POS tagging, and entity recognition. It is faster and more accurate than simple string operations, which only handle pattern matching.

Comparative Analysis: Scikit-learn vs. TensorFlow

Aspect	Scikit-learn	TensorFlow
Target Applications	Best for classical machine learning tasks such as regression, classification, clustering, and feature engineering.	Designed mainly for deep learning tasks such as neural networks, image recognition, NLP, and large-scale model training.
Ease of Use	Very beginner-friendly. Simple and consistent API (fit → predict). Easy to learn and apply to datasets.	More complex for beginners. Requires understanding of neural network concepts and model architecture.
Community Support	Strong and stable community, widely used in education and traditional ML workflows. Many tutorials and resources.	Very large and active community due to industry usage and Google support. More research and deep learning tools are available.