# AI Tools Assignment

## Part 1: Theoretical Understanding (40%)

### 1. Short Answer Questions

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

- TensorFlow is developed by Google and designed for research and production. It uses static computation graphs (with eager execution in TF 2.x), has strong deployment tools, a large ecosystem, and is ideal for scalable production models and cross-platform deployment.  
- PyTorch is developed by Facebook, popular in research due to dynamic computation graphs (eager execution), making debugging easier and code more intuitive. Preferred for rapid prototyping and research.  
- Choose PyTorch for research and prototyping; choose TensorFlow for production systems and deployment.

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

1. Interactive Data Exploration and Visualization: Load datasets, explore, visualize data interactively.  
2. Prototyping and Sharing AI Models: Rapid prototyping with stepwise code execution, visualization, and sharing.

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

- spaCy provides pre-built NLP pipelines for tokenization, POS tagging, NER, dependency parsing, lemmatization.  
- Basic Python string operations handle text at a character/substring level without linguistic context.  
- spaCy models are fast, accurate, and enable efficient structured info extraction.

### 2. Comparative Analysis: Scikit-learn vs. TensorFlow

|  |  |  |
| --- | --- | --- |
| Feature | Scikit-learn | TensorFlow |
| Target Applications | Classical ML algorithms (SVM, decision trees, clustering) | Deep learning (neural networks like CNNs, RNNs) |
| Ease of Use | Easier for beginners; simple API for traditional ML | Steeper learning curve; requires understanding tensors and neural nets |
| Community Support | Large, mature community widely used in academia and industry | Very large and rapidly growing community with strong corporate backing |