**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 (Google) has static computation graphs better for production, while PyTorch (Facebook) has dynamic graphs better for research. Choose TensorFlow for deployment, PyTorch for rapid prototyping.

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

  1. Interactive model prototyping with instant visualization
  2. Sharing reproducible research with combines code, equations and visuals.

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

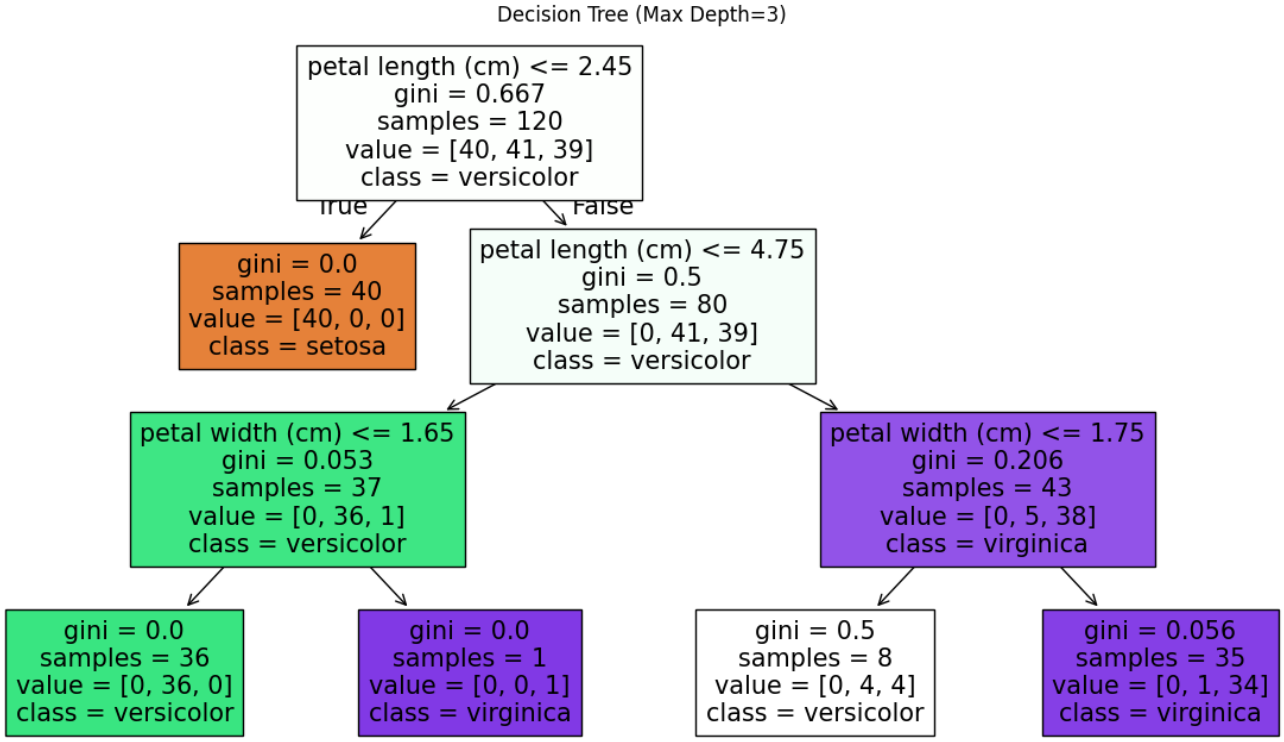
  spaCy provides pre-trained models, entity recognition, and linguistic features out-of-the-box, while string operations require manual pattern writing.

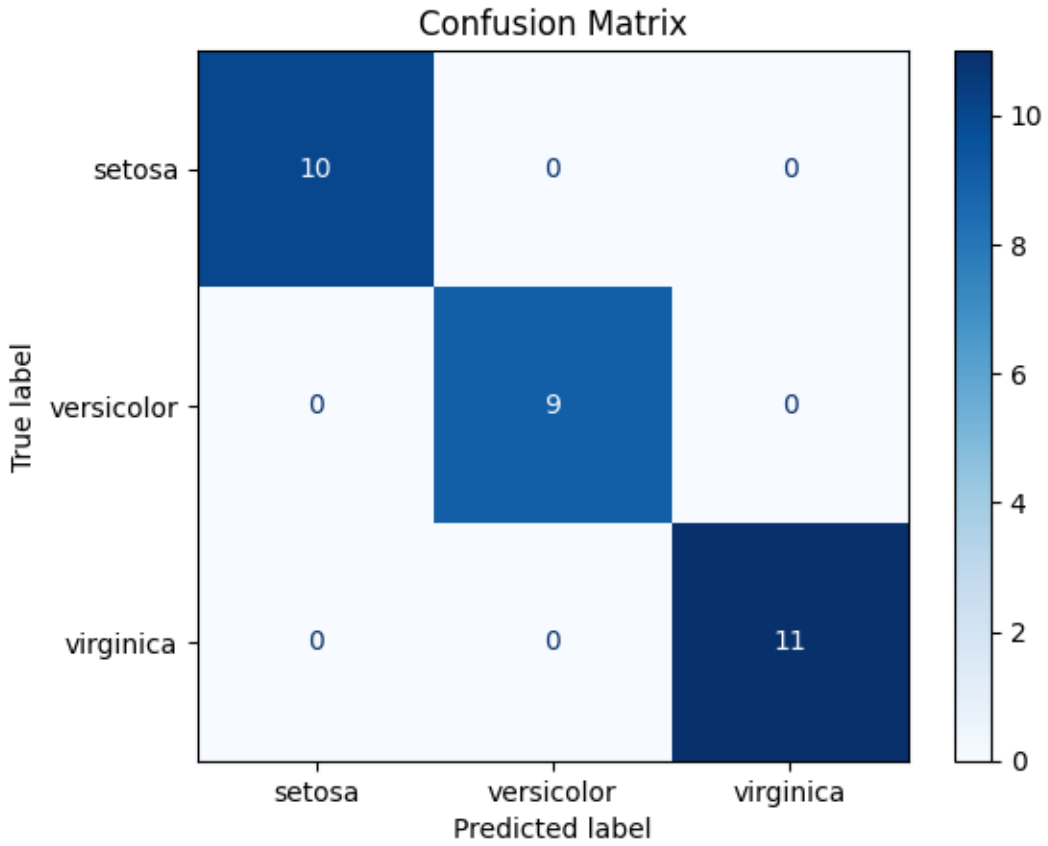
**2. Comparative Analysis**

- Compare Scikit-learn and TensorFlow in terms of:
  - Target applications (e.g., classical ML vs. deep learning).
  - Ease of use for beginners.
  - Community support.

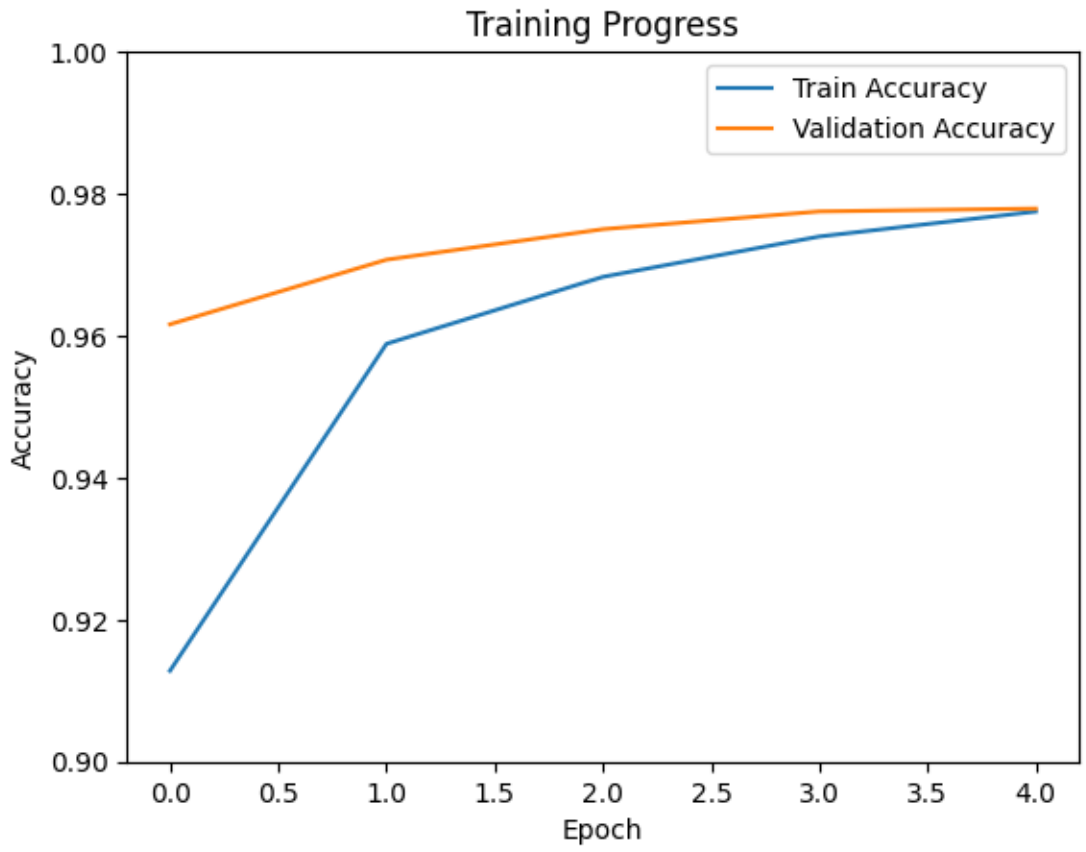
| Feature | Scikit-learn | TensorFlow |
|---|---|---|
| Applications | Classical ML | Deep Learning |
| Ease of Use | Easier | Steeper learning curve |
| Community | Strong for ML | Larger for DL |

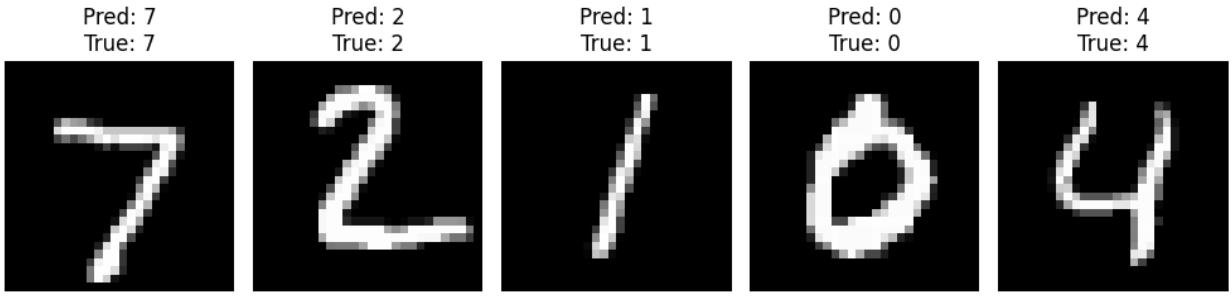
## TASK1 GRAPHS


Decision Tree (Max Depth=3)
petal length (cm) <= 2.45
gini = 0.667
samples = 120
value = [40, 41, 39]
class = versicolor
True
False
gini = 0.0
samples = 40
value = [40, 0, 0]
class = setosa
petal length (cm) <= 4.75
gini = 0.5
samples = 80
value = [0, 41, 39]
class = versicolor
petal width (cm) <= 1.65
gini = 0.053
samples = 37
value = [0, 36, 1]
class = versicolor
petal width (cm) <= 1.75
gini = 0.206
samples = 43
value = [0, 5, 38]
class = virginica
gini = 0.0
samples = 36
value = [0, 36, 0]
class = versicolor
gini = 0.0
samples = 1
value = [0, 0, 1]
class = virginica
gini = 0.5
samples = 8
value = [0, 4, 4]
class = versicolor
gini = 0.056
samples = 35
value = [0, 1, 34]
class = virginica

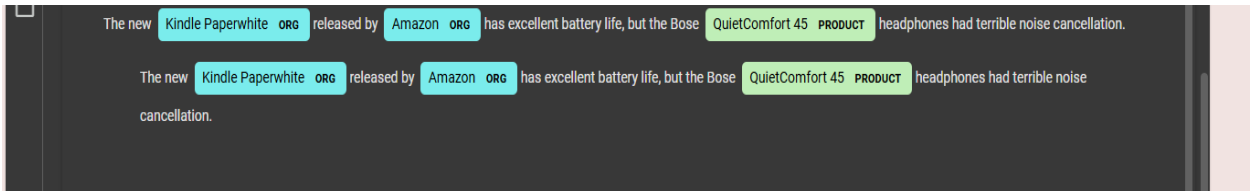

Confusion Matrix
setosa
versicolor
virginica
True label
10
0
0
0
9
0
0
0
11
setosa
versicolor
virginica
Predicted label
10
8
6
4
2
0

## TASK 2 GRAPHS




## TASK 3 NER RESULTS


The new Kindle Paperwhite ORG released by Amazon ORG has excellent battery life, but the Bose QuietComfort 45 PRODUCT headphones had terrible noise cancellation.
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