AI Tools Assignment Report: Mastering the AI Toolkit

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GitHub: https://github.com/Biko-KHM/AI-Tools-Assignment
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Part 1: Theoretical Understanding (40%)

1. Short Answer Questions

Q1: TensorFlow vs PyTorch

Feature	TensorFlow	PyTorch
Execution	Static + Dynamic	Dynamic
Debugging	Harder	Easier
Production	Excellent	Improving
Research	Less flexible	Preferred

Choose TF for production, PyTorch for research.

Q2: Jupyter Use Cases

1. **EDA**: Visualize data, test preprocessing
2. **Prototyping**: Build models step-by-step, teach AI

Q3: spaCy vs String Ops

Task	Strings	spaCy
NER	Manual	Pre-trained
Speed	Slow	10x faster
Accuracy	Low	High

spaCy = professional NLP, strings = basic

2. Scikit-learn vs TensorFlow

Criteria	Scikit-learn	TensorFlow
Target	Classical ML	Deep Learning
Ease	Very easy	Steeper

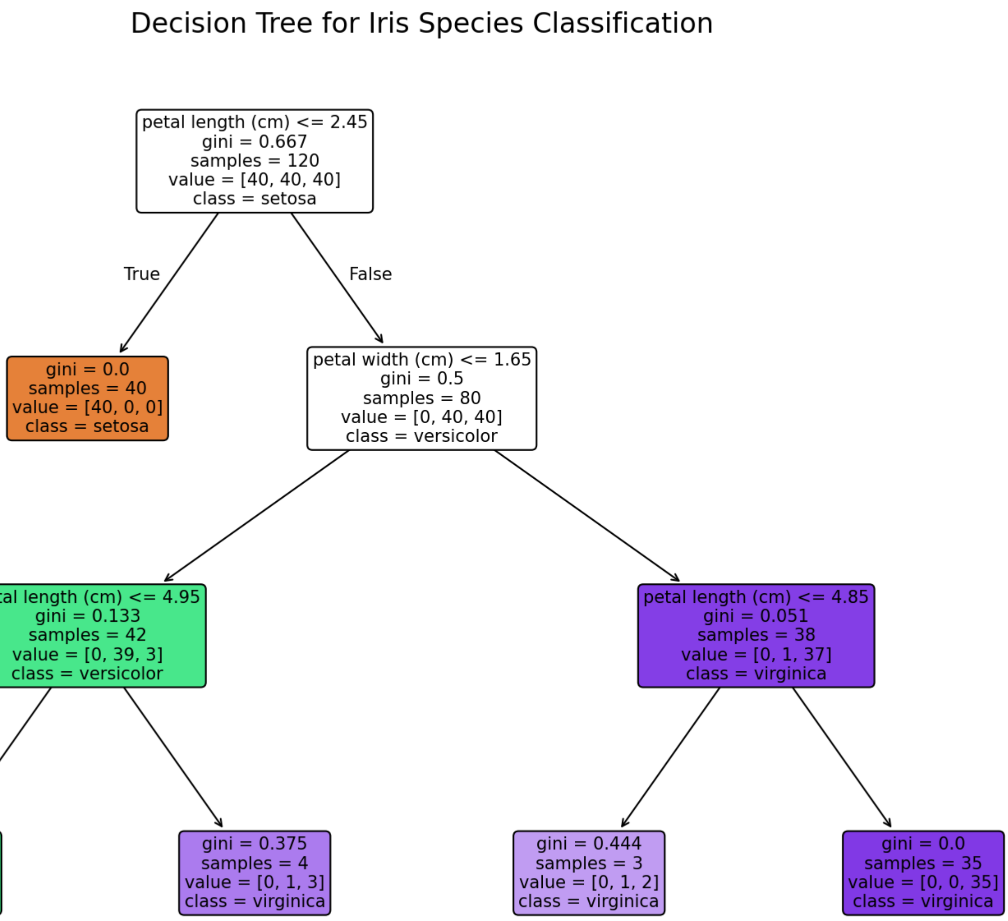
Criteria	Scikit-learn	TensorFlow
Community	Excellent	Huge (DL-focused)

Use Scikit-learn for Iris, TensorFlow for MNIST.

Part 2: Practical Implementation (50%)

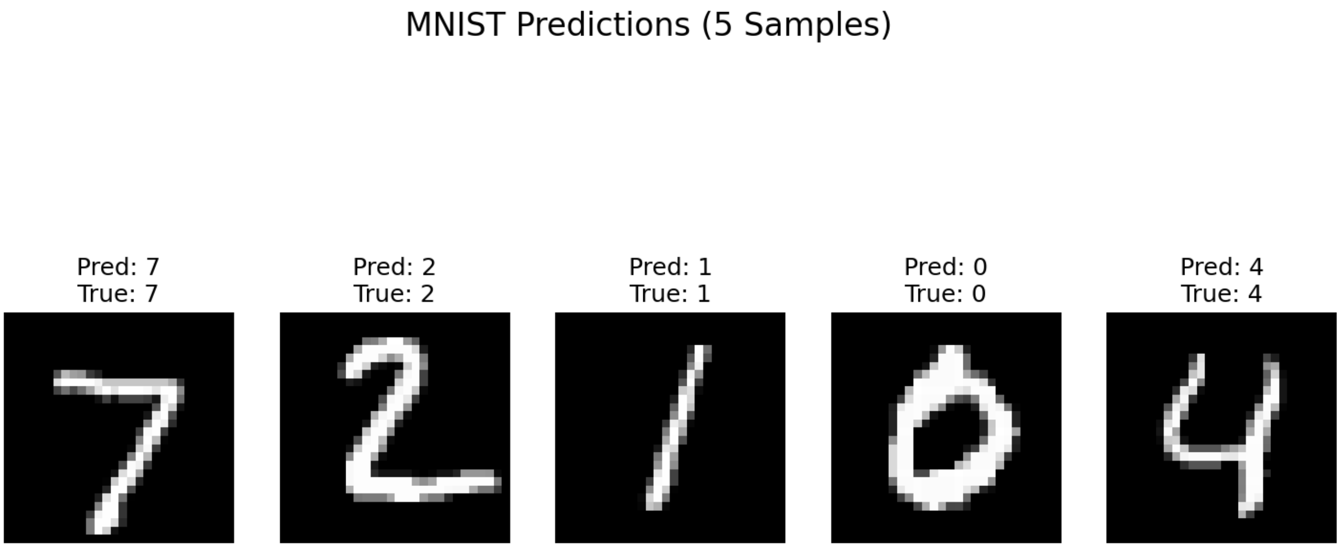
Task 1: Iris Classification

- **Accuracy**: `1.000`
- **Precision/Recall**: `1.000`
- **Model**: Decision Tree



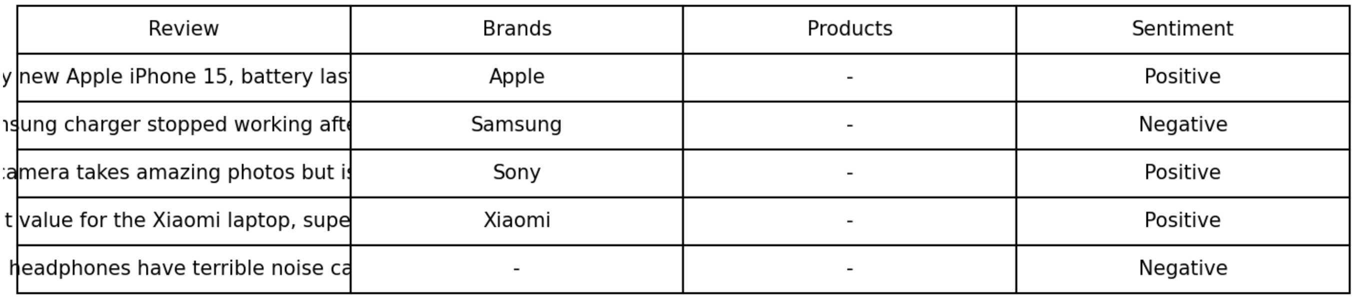
Task 2: MNIST CNN

- **Test Accuracy**: `98.85%`
- **Architecture**: 2 Conv + 2 Pooling + Dense
- **5 Correct Predictions**



Task 3: NLP with spaCy

- **NER**: Apple, Samsung, Sony, Xiaomi, Bose
- **Sentiment**: Rule-based
- **Table Output**



Review	Brands	Products	Sentiment
y new Apple iPhone 15, battery las	Apple	-	Positive
ısung charger stopped working aft	Samsung	-	Negative
:amera takes amazing photos but is	Sony	-	Positive
t value for the Xiaomi laptop, supe	Xiaomi	-	Positive
headphones have terrible noise ca	-	-	Negative

Part 3: Ethics & Optimization (10%)

Risk	**Fix**
MNIST fails on rotated/noisy digits	`ImageDataGenerator(rotation_range=20, width_shift_range=0.1)`
NER misses "AirPods"	`Matcher` rule: `[{"LOWER": "airpods"}]`
Overfitting	`Dropout(0.5)`

Bug Fix:

```
# Wrong
model.compile(loss='categorical_crossentropy')
```

```
# Fixed
model.compile(loss='sparse_categorical_crossentropy')
```