

TensorFlow vs. PyTorch: MNIST Classification Benchmark

This project benchmarks TensorFlow and PyTorch by implementing the same feedforward neural network on the MNIST dataset. It compares performance in terms of training time, test accuracy, inference speed, and deployment capabilities using TensorFlow Lite and ONNX.

Highlights

- Identical model structure (784-64-10) implemented in both frameworks
- Exported models to lightweight formats:
 - TensorFlow -> TFLite
 - PyTorch -> ONNX
- Run and evaluated on Google Colab using GPU (Tesla T4)

Tools & Setup

- Language: Python 3
- Frameworks: TensorFlow, PyTorch, NumPy
- Hardware: Intel i7, NVIDIA Tesla T4 (via Colab)
- Platform: Google Colab & local execution

Model Overview

- Input: Flattened 28x28 grayscale images (784 units)
- Hidden Layer: 64 neurons, ReLU activation
- Output Layer: 10 neurons (digits 0-9)

Results Summary

Framework | Train Time | Accuracy | Inference

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TensorFlow | 24.97 sec | 97.53% | 3.23 sec

PyTorch | 46.25 sec | 96.71% | 1.00 sec

TensorFlow trained faster; PyTorch inferred quicker.

Repository Structure

- tensorflow_model.py - TensorFlow script

- pytorch_model.py - PyTorch script
- model.tflite - TFLite model
- model.onnx - ONNX model
- Lab03_TensorFlow_vs_PyTorch.ipynb - Full notebook
- README.md - This file

References

- <https://www.tensorflow.org>
- <https://pytorch.org/tutorials>
- <https://onnx.ai>
- <https://www.tensorflow.org/lite>

Future Work

- Test on complex datasets (e.g., CIFAR-10)
- Validate models on mobile/edge devices
- Explore quantization and distributed training