Edge AI Prototype Report

Goal: Build and deploy a lightweight image classification model using TensorFlow Lite, simulating Edge AI behavior on Colab.

Tools Used:

- TensorFlow & TensorFlow Datasets
- Google Colab (no hardware device)
- TensorFlow Lite Interpreter

Dataset:

- tf_flowers from TensorFlow Datasets (5 flower categories)
- Split: 80% training, 20% testing
- Preprocessed: resized to 180×180, normalized pixel values

Model Architecture:

- Simple Convolutional Neural Network (CNN)
- Layers: Conv2D → MaxPooling → Flatten → Dense → softmax
- Lightweight and optimized for on-device inference

Training Results:

- Final test accuracy: 85.7% (after 5 epochs)
- Model successfully learned to classify images

Deployment:

- Trained model converted to TensorFlow Lite (.tflite)
- Inference simulated using tf.lite.Interpreter

- Model made correct predictions on test images

Edge AI Relevance:

- TFLite model is ~much smaller than original
- Can run without internet on devices like Raspberry Pi
- Enables real-time applications like smart recycling, plant recognition, etc.

Outcome:

- Prototype works!
- Shows how AI models can be trained in the cloud and deployed on small devices
- Learned how to preprocess data, build CNNs, convert to TFLite, and simulate inference

References

Abadi, M., Barham, P., Chen, J., Chen, Z., Davis, A., Dean, J., … & Zheng, X. (2016). TensorFlow: A system for large-scale machine learning. In 12th USENIX Symposium on Operating Systems Design and Implementation (OSDI ’16) (pp. 265–283). USENIX Association. https://www.tensorflow.org/

Google. (n.d.). TensorFlow Datasets. TensorFlow. https://www.tensorflow.org/datasets/catalog/overview

TensorFlow. (n.d.). TensorFlow Lite guide. TensorFlow. https://www.tensorflow.org/lite/guide

Google. (n.d.). Welcome to Colaboratory. Google Research. https://colab.research.google.com/

Chollet, F. (2015). Keras: The Python deep learning library. https://keras.io/

Python Software Foundation. (n.d.). os — Miscellaneous operating system interfaces. Python 3.12. https://docs.python.org/3/library/os.html

Barshan, B., & Yüksel, M. E. (2014). Recognizing daily and sports activities in two open source machine learning platforms using wearable sensors. Expert Systems with Applications, 41(10), 4464–4470. https://doi.org/10.1016/j.eswa.2013.12.046