Deep Learning Project Report

For my research, I chose MobileNetV2, a pre-trained lightweight convolutional neural network on **ImageNet**, using a dataset of **202** images.

To create an efficient training set, I decided to allocate **80**% (161 images) for training and **20**% (41 images) for validation. To improve the robustness of the model and reduce overfitting, I used **ImageDataGenerator** during the training phase to apply data augmentation techniques such as rotation, width and height shifts, shear transformation and scaling, flipping, brightness range, horizontal and vertical shift. In this project, I implemented a deep learning-based image classification system using transfer learning with **MobileNetV2**. The MobileNetV2 model was chosen for image classification due to its small size and excellent accuracy, which allowed for efficient training on my hardware and produced excellent results.

The dataset used for training and evaluation consisted of images grouped into **10** different folders, each representing a different class. To improve the generalization ability of the model, the images were pre-processed and augmented. The dataset was divided into three groups: training, validation, and testing. Transfer learning was chosen to use pre-trained weights on the ImageNet dataset, which allows for faster convergence and better performance with a smaller dataset.

Using the Adam optimizer, the pre-trained model was tuned to a learning rate of **0.01**. I found that the best result for the results I obtained with training was **0.01** by varying this learning rate each time.

With carefully selected training cycles of 32 and 300, the model performed well, achieving ~**30**% test accuracy and ~**2.0** test loss. The robustness of the model was further ensured by the implementation of ModelCheckpoint recall, which retained only the best-performing model weights based on the validation loss. Comprehensive visualizations, including loss and accuracy plots, confusion matrix, and classification report, provide a comprehensive assessment of the model’s training and performance metrics.