# Progress Report on Transfer Learning with VGG16

## Model Used: VGG16

Training Epochs: 50

Accuracy Achieved: 87.61%

## Data Preprocessing:

* Top 10 Labels: Images were filtered to include only the top 10 most frequent labels.
* Image Resizing: All images were resized to 224x224 pixels.
* Label Encoding: Labels were encoded using LabelEncoder and transformed to categorical format.
* Data Splitting: Data was split into training (80%) and testing (20%) sets.
* Normalization: Pixel values were normalized to the range [0, 1].

## Data Augmentation:

* Techniques Used: Rotation, width shift, height shift, horizontal flip, zoom, and shear.

## Model Architecture:

* VGG16 pre-trained on ImageNet, with the top layers removed. (Base Model)
* Flatten layer
* Dense layer with 256 units and ReLU activation
* Dropout layer with a rate of 0.5
* Dense output layer with softmax activation (number of units = number of classes)

## Training Configuration:

* Optimizer: Adam with a learning rate of 1e-4.
* Loss Function: Categorical cross-entropy.
* Metrics: Accuracy.
* Reduce learning rate on plateau (Callback)
* Early stopping with patience for 10 epochs and restoring best weights ((Callback))

## Results:

Test Accuracy: 87.61%

A graph of different colored lines

Description automatically generated with medium confidence

Figure 1, Training and Validation Accuracy and Loss

## Summary:

The application of transfer learning using VGG16 significantly improved model performance, achieving an accuracy of 87.61%. The model was trained for 50 epochs with data augmentation techniques applied to the training set. Learning rate reduction and early stopping callbacks helped in optimizing the training process.

## Future Work:

Hyperparameter Tuning: Experiment with different learning rates, batch sizes, and optimizers to further enhance model performance.

Architecture Exploration: Experiment with more complex architectures, including deeper networks and different types of layers.