

Dog Breed Identification Using Transfer Learning

Abstract

Dog Breed Identification using Transfer Learning is a deep learning-based image classification project aimed at accurately identifying different dog breeds from images. The system leverages pre-trained Convolutional Neural Networks (CNNs) and fine-tunes them on a dog breed dataset. By using transfer learning, the project achieves high accuracy even with limited training data.

Introduction

Image classification is a major application of computer vision. Identifying dog breeds is challenging due to similar appearances, lighting variations, and different poses. Transfer learning helps overcome these challenges by utilizing models pre-trained on large datasets like ImageNet.

Problem Statement

To develop a machine learning model that takes a dog image as input and accurately classifies it into the correct breed using transfer learning techniques.

Objectives

- Collect and preprocess dog breed dataset
- Implement transfer learning using a pre-trained CNN
- Train and fine-tune the model
- Evaluate model performance
- Deploy the model using Streamlit

Methodology

1. Data Collection – Use labeled dog breed dataset.
2. Data Preprocessing – Resize images to 224x224, normalize pixel values.
3. Model Selection – Use MobileNetV2 / VGG16 / ResNet50.
4. Model Training – Freeze base layers and add custom layers.
5. Evaluation – Use accuracy and loss metrics.
6. Deployment – Build web app using Streamlit.

Tools & Technologies

- Python
- TensorFlow / Keras
- NumPy
- PIL / OpenCV
- Streamlit

Results

The model achieved high training and validation accuracy depending on dataset size. Transfer learning significantly reduced training time and improved performance.

Conclusion

The Dog Breed Identification system demonstrates the effectiveness of transfer learning in image classification tasks. The project successfully classifies dog breeds with high accuracy and provides a practical web-based application for real-world use.