

Image Classification using CNN (CIFAR-10 and ImageNet)

1. Introduction

This project implements image classification using Convolutional Neural Networks (CNNs) on CIFAR-10 and ImageNet datasets. The objective is to build a robust model capable of identifying multiple classes of objects from two distinct datasets.

2. Datasets Used

- CIFAR-10: Contains 60,000 32x32 colour images across 10 classes like airplane, dog, truck, etc.
- ImageNet (subset): A large-scale image dataset used for visual object recognition with over 1,000 classes.

3. Model Architecture

The CNN architecture includes:

- Input Layer (32x32x3 for CIFAR-10)
- Convolutional Layers with ReLU activation
- MaxPooling Layers
- Batch Normalization
- Dropout for regularization
- Flatten Layer
- Dense Layers (Output layer uses Softmax for classification)

4. Training Details

- Optimizer: Adam
- Loss Function: Categorical Crossentropy
- Epochs: 20-50 (early stopping enabled)
- Batch Size: 64
- Accuracy Achieved: >75% for both CIFAR-10 and ImageNet (subset)

5. Evaluation & Visualization

Model performance is evaluated using metrics like accuracy and loss curves. Confusion matrices and sample prediction visualizations were included to interpret model results.

6. Technologies Used

- Python 3.10
- TensorFlow / Keras
- NumPy, Matplotlib
- Streamlit for interactive dashboard (if applicable)

7. Conclusion

The CNN-based image classifier performs well on both CIFAR-10 and ImageNet subsets, demonstrating good generalization. Future improvements could include transfer learning using pretrained models like ResNet or VGG for better accuracy.

8. Author Info

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