

Image Classification Using Convolutional Neural Networks (CNN)

This project demonstrates how to build and train a Convolutional Neural Network (CNN) to classify images from the CIFAR-10 dataset into different categories such as airplanes, cars, birds, cats, deer, dogs, frogs, horses, ships, and trucks.

Project Features

- **Data Augmentation:** Implemented techniques like random flipping and rotation to improve model generalization.
- **Model Architecture:**
 - Input layer for images of size 32x32x3.
 - Two convolutional layers with ReLU activation followed by max pooling.
 - A fully connected dense layer with dropout for regularization.
 - Output layer using a softmax activation function for classification into 10 categories.
- **Frameworks Used:** TensorFlow and Keras for model building and training.
- **Visualization:** Training and validation accuracy/loss plotted for performance analysis.

Dataset

The project uses the CIFAR-10 dataset, a well-known dataset of 60,000 32x32 color images divided into 10 classes, with 6,000 images per class.

Prerequisites

Ensure the following are installed:

- Python 3.7+
- TensorFlow
- Matplotlib

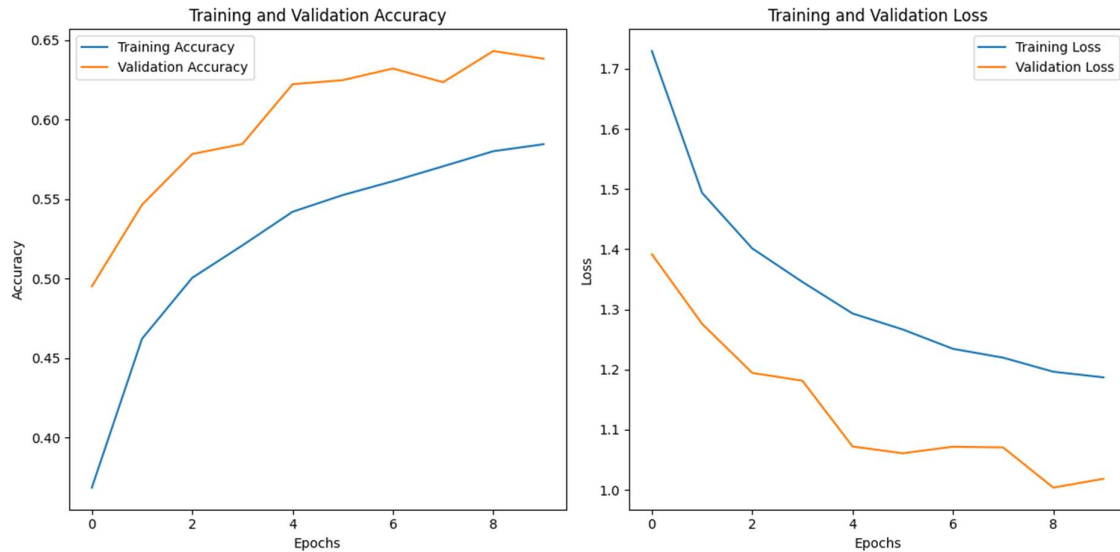
Project Workflow

1. Load and preprocess CIFAR-10 dataset.
2. Apply data augmentation for better generalization.
3. Build a CNN model.

4. Train the model and evaluate it on test data.
5. Visualize accuracy and loss trends over epochs.

Results

The model achieved an accuracy of approximately 65% on the test dataset. Additional tuning or advanced techniques could further improve performance.



Future Enhancements

- Implement additional data augmentation techniques.
- Use transfer learning with pre-trained models like ResNet or VGG.
- Optimize hyperparameters for better accuracy.