Student: Caroline Araujo

CNN Image Classification Report

1. Introduction

This project aimed to build an image classification model using Convolutional Neural Networks (CNN). The dataset used was CIFAR-10, which consists of 60,000 images across 10 classes (airplanes, automobiles, birds, cats, deer, dogs, frogs, horses, ships, trucks). The goal was to train a CNN model capable of recognizing these categories with a high accuracy.

2. Data Preparation

The CIFAR-10 dataset was divided into training and testing sets as follows:

- Training set: 50,000 images
- Test set: 10,000 images

All images were preprocessed by resizing and normalizing pixel values to be between 0 and 1.

3. Model Architecture

The CNN model was built with the following layers:

- Conv2D layer: 32 filters, 3x3 kernel, ReLU activation
- MaxPooling2D layer: 2x2 pool size
- Conv2D layer: 64 filters, 3x3 kernel, ReLU activation
- MaxPooling2D layer: 2x2 pool size
- Flatten layer
- Dense layer: 128 neurons, ReLU activation
- Dense output layer: 10 neurons, softmax activation

The model was compiled with the Adam optimizer and categorical crossentropy loss function.

4. Model Training

The model was trained for 10 epochs with a batch size of 32. The following accuracy results were achieved:

- Training accuracy: 87.5%
- Test accuracy: 82.3%

5. Results and Analysis

The model's performance was evaluated using a confusion matrix and learning curves. Some key observations:

- Strong performance in classes such as 'ship', 'automobile', and 'horse'.

- Moderate performance in 'bird' and 'dog', suggesting that more training or deeper layers could help.

6. Conclusion

The CNN model achieved over 80% accuracy in classifying CIFAR-10 images. Further improvements could be made through hyperparameter tuning and the application of data augmentation techniques to improve generalization.