Cat vs Dog Classifier (TensorFlow + Keras)

Overview

This project implements a binary image classifier using a Convolutional Neural Network (CNN) built with TensorFlow and Keras. It classifies input images as either cats or dogs, trained on a publicly available dataset and evaluated with validation data. The final model is saved and can be used for real-time predictions or deployment in a web interface.

1. Environment Setup

```
!pip install tensorflow matplotlib
import os
os.environ['TF_CPP_MIN_LOG_LEVEL'] = '2'
```

2. Dataset Download and Preparation

Dataset is downloaded and extracted from Google's cloud storage using tf.keras.utils.get_file. It contains filtered images of cats and dogs for both training and validation. Structure:

- train/cats/
- train/dogs/
- validation/cats/
- validation/dogs/

3. Data Preprocessing

Images are rescaled to [0, 1] and augmented using ImageDataGenerator. This helps improve model generalization by applying random transformations such as rotation, zoom, and horizontal flipping.

4. Model Architecture

A CNN model is created using Keras Sequential API with three convolutional blocks, followed by a fully connected layer, dropout, and a sigmoid output layer for binary classification.

5. Training the Model

The model is compiled with binary crossentropy loss and the Adam optimizer, and trained using model.fit(). Accuracy and loss are tracked during training.

6. Accuracy and Loss Visualization

Matplotlib is used to plot training and validation accuracy and loss, helping detect underfitting or overfitting.

7. Saving the Trained Model

model.save('cat_dog_classifier_model.h5') is used to persist the trained model, including weights and configuration.

8. Making Predictions

A random image is selected from the validation set, preprocessed, and passed to the model for prediction. The result is visualized using Matplotlib with a confidence score.

Conclusion

This project demonstrates a complete machine learning pipeline with TensorFlow and Keras, including data handling, CNN modeling, training, evaluation, saving, and inference.