Project Report: Cats and Dogs Image Classification

Objective:

The goal of this project is to build a Convolutional Neural Network (CNN) to classify images of cats and dogs. The dataset contains training, validation, and test sets for this purpose.

Dataset:

The dataset includes images of cats and dogs, divided into training and validation sets. It is structured with separate folders for each class in both training and validation sets.

Model Architecture:

The CNN model is designed with the following layers:

- Conv2D with 32 filters, kernel size (3, 3), and ReLU activation
- MaxPooling2D with pool size (2, 2)
- Conv2D with 64 filters, kernel size (3, 3), and ReLU activation
- MaxPooling2D with pool size (2, 2)
- Conv2D with 128 filters, kernel size (3, 3), and ReLU activation
- MaxPooling2D with pool size (2, 2)
- Flatten layer
- Dense layer with 512 units and ReLU activation
- Dense layer with 1 unit and Sigmoid activation (for binary classification)

Image Preprocessing:

The image data generators are used for both training and validation sets. The training set data generator includes additional data augmentation techniques, such as rotation, width and height shift, shear, zoom, and horizontal flip.

Training:

The model is compiled using the Adam optimizer and binary crossentropy loss, suitable for binary classification. It is then trained using the fit method with the training data generator. The training history is stored for later analysis.

Evaluation:

The accuracy and loss for both training and validation sets are visualized using Matplotlib. The model is then evaluated on a separate test set, and the predictions are compared to the ground truth.

Challenge Criteria:

The challenge criteria involve correctly identifying a specific percentage of images. The evaluation is based on the model's accuracy in classifying cats and dogs. The challenge is considered passed if the accuracy exceeds a specified threshold.

Results:

The model achieved a certain accuracy on the test set, surpassing the required threshold. The training and validation accuracy and loss plots indicate the model's performance during training.

Conclusion:

The implemented CNN successfully classifies images of cats and dogs. The use of data augmentation in the training set contributes to better generalization. The model has met the specified challenge criteria, showcasing its effectiveness in image classification tasks.