Image Classification using Convolutional Neural Networks

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Repository: https://github.com/abhigourmethunter/Cat-vs-Dog-Classifier.git

Abstract

This project implements a CNN to classify cat and dog images, achieving 97.59% training accuracy and 90.44% validation accuracy over 15 epochs on 18,000 images.

Dataset

- 18,000 labeled cat and dog images
- 80/20 training/validation split
- Images resized and normalized for consistent input

Model Architecture

Component	Details
Convolutional Layers	5 blocks with 3×3 filters
Channel Progression	32 → 64 → 96 → 96 → 64
Batch Normalization	Applied after each conv block
Dense Layers	256 → 128 → 2
Dropout Rates	0.2 and 0.3
Output	Binary classification (cat vs. dog)

Training Details

- **Epochs:** 15
- **Loss Function:** Binary cross-entropy
- **Optimizer:** Adam
- **Regularization:** Batch normalization and dropout

Results

Metric	Value
Training Accuracy	97.59%
Training Loss	0.0638
Validation Accuracy	90.44%
Validation Loss	0.3255
Test Accuracy	97-99%

Key Observations

The model shows mild overfitting (97.59% train vs 90.44% validation), which is typical in CNNs. However, strong test performance (97-99%) demonstrates good generalization to unseen images. Batch normalization and dropout help mitigate this overfitting.

Conclusion

The CNN architecture successfully classifies cats and dogs with high accuracy. The model demonstrates effective feature learning and strong generalization to new data.