

# Hybrid Approach for Animal Breed Classification Using EfficientNet: A Deep Learning Model for Multi-Class Image Recognition

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*Many technologies and breakthroughs would not be possible without research. It is important to keep members of the community informed about the latest updates. One way to do that is through research posters.*

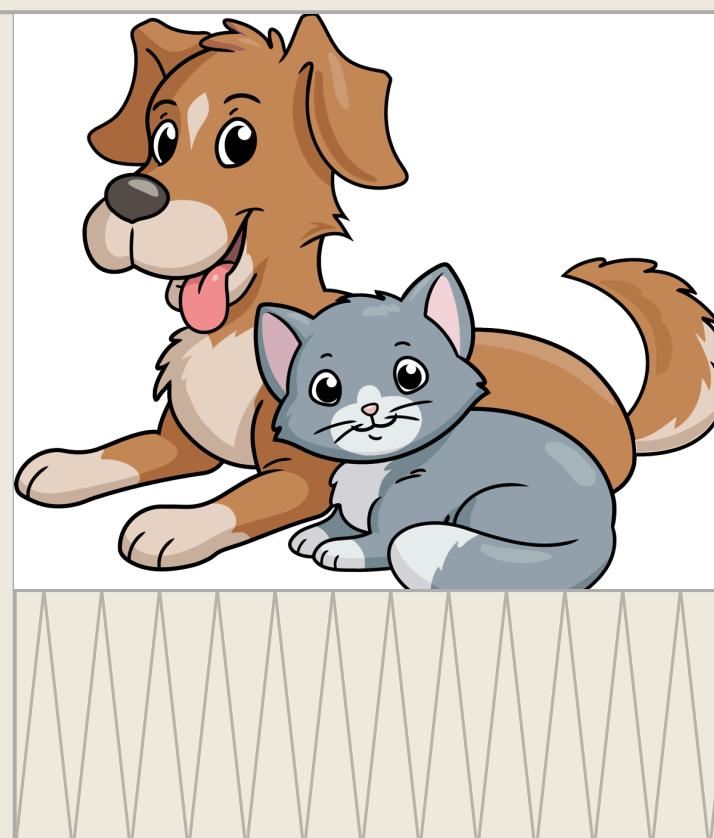


## *01. Introduction*

We compared EfficientNetB0, ResNet50, InceptionV3, and MobileNetV2 models for accurate breed classification. Advanced data augmentation and fine-tuning achieved high accuracy, aiding applications in veterinary diagnostics and pet identification.

## *02. Objective*

To develop a machine learning model capable of accurately classifying animal breeds from images. We aim to compare the performance of several pre-trained convolutional neural network (CNN) models on this task to identify the most effective architecture.



03. Methodology

Four pre-trained CNN architectures from the TensorFlow/Keras library:

- EfficientNetB0
  - ResNet50
  - InceptionV3
  - MobileNetV2

These models were initialized with weights pre-trained on the ImageNet dataset, then fine-tuned on our specific dataset. Each model was modified with:

- Global Average Pooling Layer
  - Dropout Layer (0.5)
  - Dense Output Layer for breed classification with softmax activation.

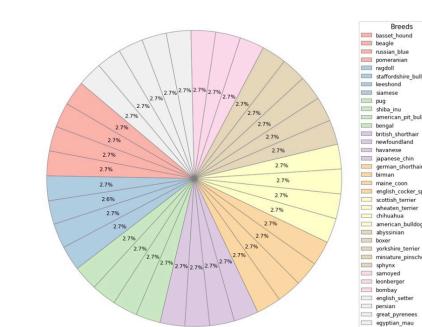
## *04. Results/Findings*

1. Model Performance:
    - Trained four models: EfficientNetB0, ResNet50, InceptionV3, MobileNetV2 for breed classification.
    - Validation accuracy varied, indicating differing effectiveness.
  2. Data Augmentation Impact:
    - Techniques like rotation, zoom, and horizontal flipping enhanced model generalization, boosting validation accuracy.
  3. Top-Performing Model:
    - Identified the model with the highest validation accuracy for further tuning and real-world deployment.
  4. Breed Distribution:
    - Analyzed breed proportions in the training dataset, revealing potential imbalances affecting performance. Pie chart visualized dataset structure.
  5. Prediction Examples:
    - Displayed random test images with predicted breed labels to demonstrate model capabilities.
  6. Comparative Analysis:
    - Pie chart summarized validation accuracy across models, aiding in selecting the best-performing models.

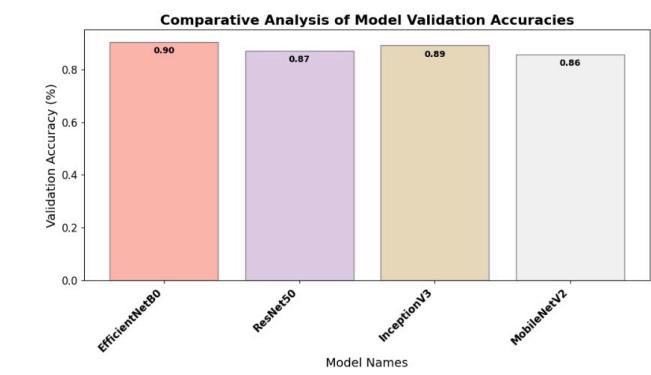


05. Analysis

In this project, CNN models (EfficientNetB0, ResNet50, InceptionV3, MobileNetV2) were fine-tuned with data augmentation for animal breed classification, with InceptionV3 and ResNet50 achieving the highest validation accuracy. Key metrics like validation accuracy and F1 scores were used for performance evaluation, and visualizations highlighted class distributions and accuracy trends. Addressing class imbalance may further improve model accuracy.



## *Animals in dataset and their species*



### ***Compared model and their Accuracy***

06. Conclusion

Summarize your study and let the viewers know two to three key findings. You can also add a description of each that can give them an idea of what comes next. This section can also include any implications of the study, and if there are any actions or recommendations for future study.



## Detect Dog Breed with Dog Breed Detector App