Domestic Animal Breed Identification

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Outline

Abstract

- Breed identification of domestic animals from images is a challenging task.
- Traditional methods are costly and time-consuming, highlighting the need for a faster, cheaper solution.
- Deep learning, particularly CNNs, offers a promising approach to solve this issue.
- The study analyzes the performance of four deep CNN-based models to find the best model for accurate breed identification.

Project Background

- Accurate breed identification is crucial for veterinary care, breeding, and animal management. Traditional methods rely on physical appearance, which can lead to inaccuracies, especially with rare breeds or breeds with similar traits.
- This project aims to build a deep learning model for breed identification using image recognition. The system will be deployed as a user-friendly web application to improve efficiency in livestock management.
- The project supports animal welfare and enhances breeding and conservation strategies. Key activities include data collection, model development, web integration, and performance testing.
- Challenges include data quality and breed complexity, but the system offers a modern, AI-driven approach to breed classification. Advances in deep learning, especially CNNs, have transformed fields like facial recognition and species classification, making them ideal for breed identification.

Problem Statement

Accurate breed identification is essential in veterinary science, agriculture, and conservation, yet remains challenging due to:

- Genetic diversity and similar physical traits among breeds. - Crossbreeding leading to frequent misidentification. - Traditional methods relying on subjective visual inspection.

This project will develop a deep learning-based system for accurate, efficient breed identification to enhance animal care, breeding, and conservation.

Aims

The project aims to develop a deep-learning model for domestic animal breed identification through a user-friendly web application to improve livestock management.

Objectives

- Collect datasets and perform data processing.
- Build a deep learning model to recognize domestic animal breeds.
- Integrate the model with training datasets.
- Integrate the trained models into a web application.
- Test the performance of the trained models using unseen datasets.

Literature Review

- Animal Breed Identification: Critical for veterinary science and conservation, with deep learning offering more accurate classification methods.
- Sheep Recognition (Chao Ma et al.): Developed a Faster R-CNN model with Soft-NMS, achieving 95.32% accuracy in real-time sheep detection.
- Deep Neural Networks (DNNs): Used for animal classification, addressing noisy labels with techniques like iterative label refinement and network optimization.
- CNNs for Species Identification: Applied to large datasets from camera traps (e.g., Snapshot Serengeti), significantly improving species identification accuracy.

Literature Review (Continued)

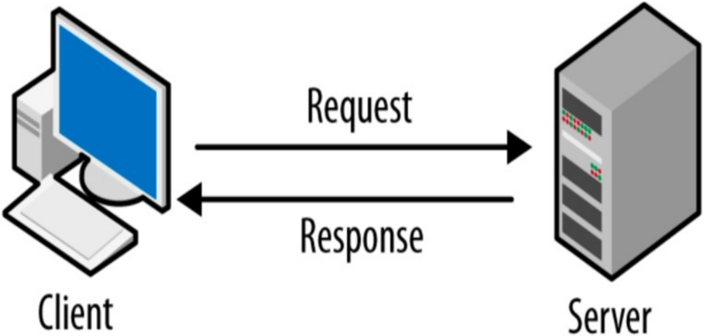
- Non-Intrusive Camera Trapping: Captures images for deep learning models to analyze, offering an alternative to invasive tracking methods like GPS.
- Fine-Grained Classification (FGC): Enhances model accuracy by extracting detailed image features for more precise classification.
- YOLOv3 for Wildlife Detection: Achieves high accuracy in animal detection despite challenges with image quality and variations in appearance.
- Dog Breed Prediction: CNN trained on a large dataset reached 90% accuracy, highlighting the importance of diverse datasets and data augmentation.

Literature Review (Continued)

- Snake Species Identification: CNN achieved 91.3% accuracy in identifying poisonous snakes, with transfer learning improving results on limited data.
- Vision Transformers (ViT): An alternative to CNNs, ViTs excel in image recognition tasks, even with small datasets.
- Transfer Learning & Ensemble Methods: Enhance classification accuracy by adapting pre-trained models and combining multiple models for better predictions.

- Iterative Development
- Flexibility
- Faster Delivery
- Collaboration

Research Methodology
System Architecture



Datasets

- Dataset Source: Kaggle
- Total Images: 3190
- Species: Cats, Dogs, Cattle
- Breeds per Species: 5
- Total Categories: 15
- Organization: Labeled by species and breed

Dataset Overview

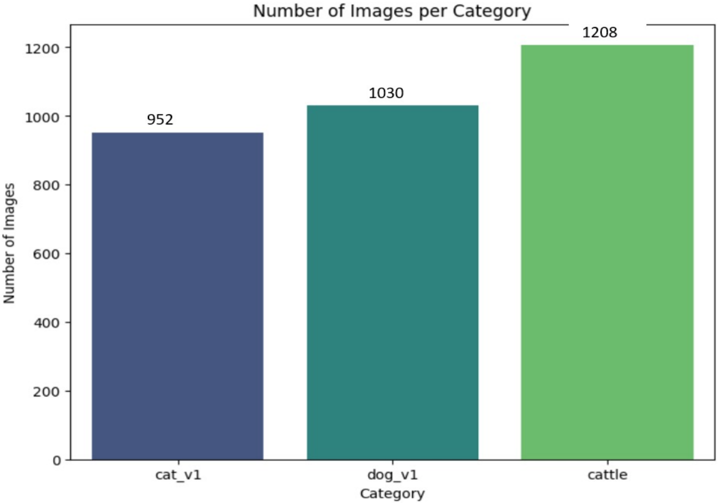


Figure: Total dataset before augmentation

Cats Species

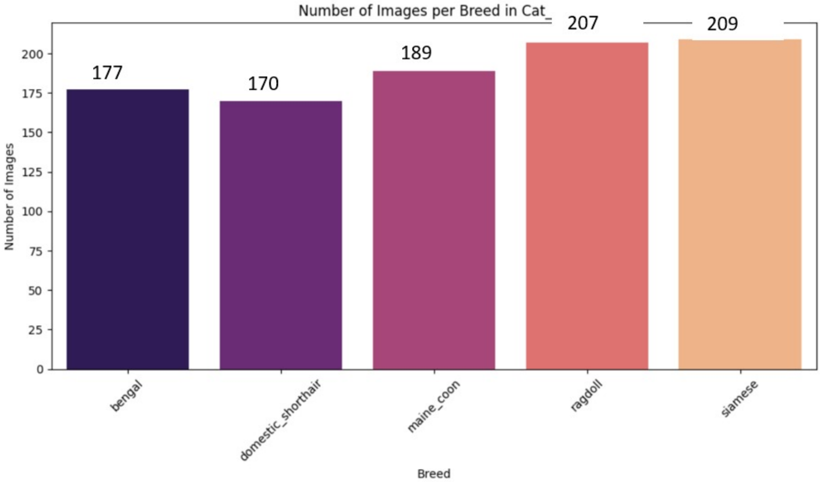


Figure: Number of dataset for different breeds of Cat

Dogs Species

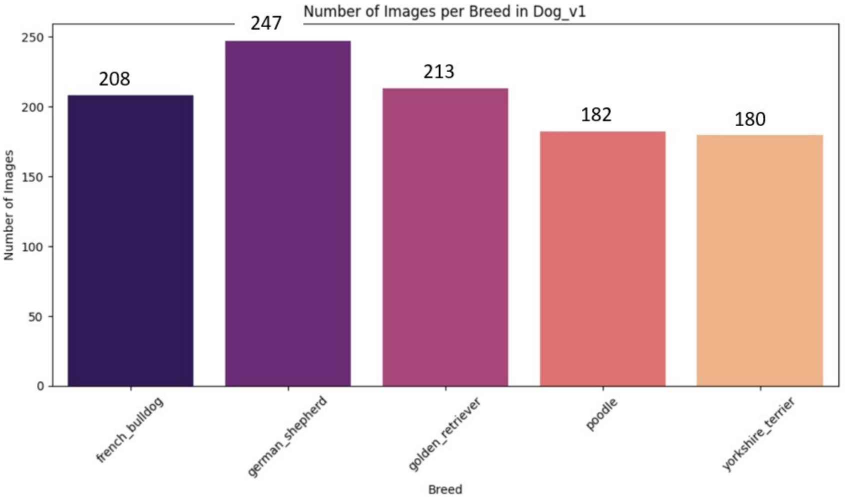


Figure: Number of dataset for different breeds of Dog

Cattles Species

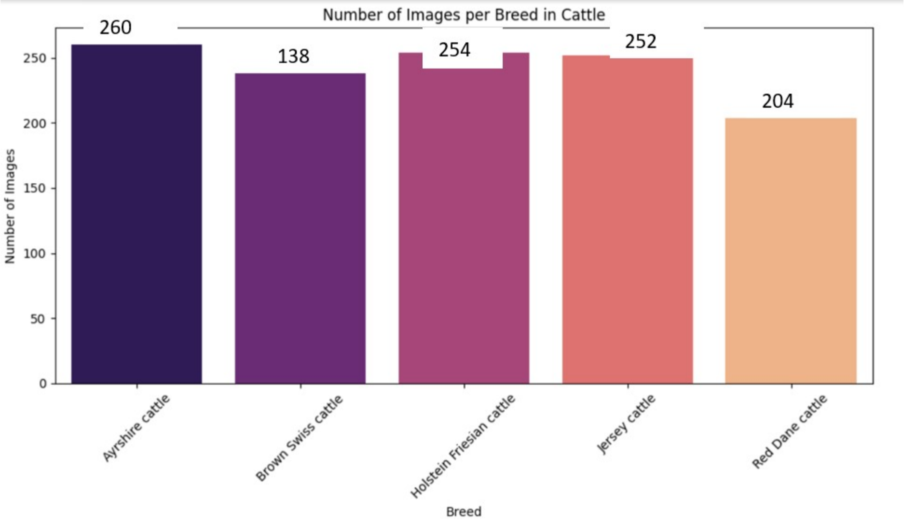


Figure: Number of dataset for different breeds of Cattle

Datasets Overview after Augmentation

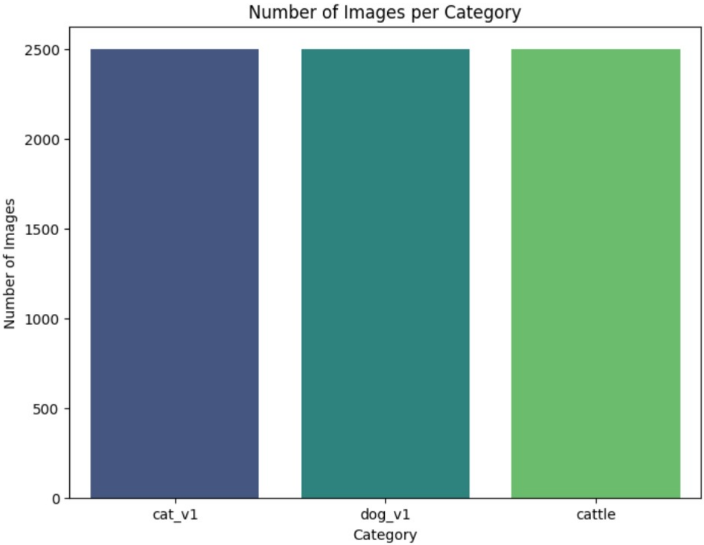


Figure: Number of dataset per cataegory after augmentation

Data Splitting

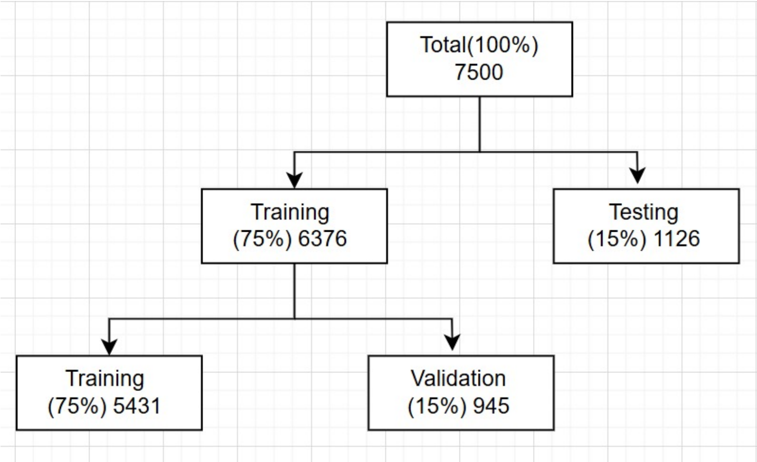


Figure: Spliting of Data

Model Performance Comparison Table

Table: Comparison of Model Performance Metrics

Model	Accuracy	Precision	Recall	F1-Score
LeNet-5	71%	72.8%	71.04%	70.99%
VGG16	88%	89%	88%	88%
ResNet	46%	55%	46%	44%
AlexNet	77.35%	79.1%	77.35%	77.11%

Conclusion

- VGG16 achieved the highest accuracy (88%) for breed classification.
- AlexNet and LeNet-5 performed well for low-resource scenarios.
- ResNet underperformed due to overfitting or insufficient training.
- Deep learning improves breed classification in veterinary medicine, farming, and conservation.
- Future research could explore EfficientNet and DenseNet for better accuracy and efficiency.

Demonstration

Thank You!