DOG BREED IDENTIFICATION USING TRANSFER LEARNING

PROJECT REPORT

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1. INTRODUCTION

1.1 Project Overview

Dog Breed Identification using Deep Learning is a computer vision–based system designed to automatically recognize the breed of a dog from an input image. The system utilizes a pre-trained Convolutional Neural Network (VGG19) with transfer learning to classify dog images into multiple breed categories. A web application built with Flask enables users to upload images and receive real-time predictions.

1.2 Purpose

- Automate dog breed recognition using artificial intelligence.

- Reduce manual identification errors.

- Provide a user-friendly prediction interface.

- Demonstrate practical use of deep learning and deployment.

- Serve as an academic mini-project for image classification learning.
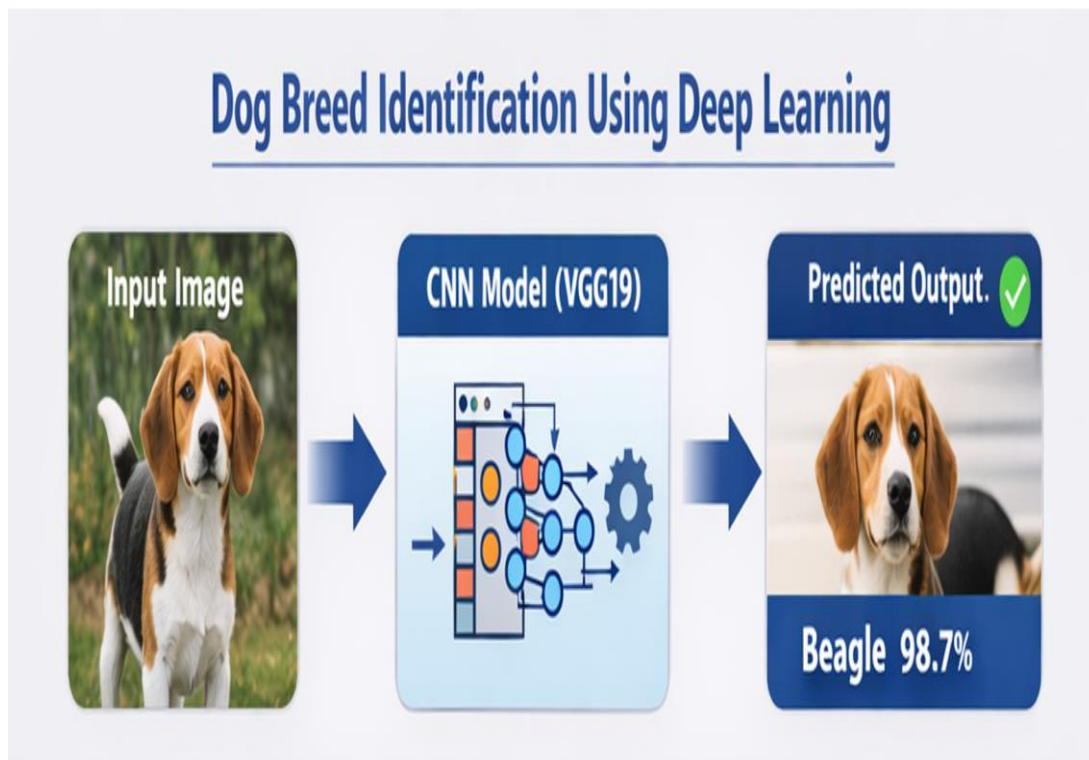
2. IDEATION PHASE

2.1 Problem Statement

Identifying dog breeds manually requires expert knowledge and is prone to errors. There is a need for an automated, accurate, and user-friendly system that can classify dog breeds from images using deep learning techniques.

2.2 Empathy Map Canvas

- **Users:** Pet owners, veterinarians, animal shelters, students.

- **Needs:** Quick and accurate breed identification.

- **Pain Points:** Lack of expertise, time consumption, misidentification.

- **Gains:** Instant AI-based prediction and easy accessibility.

2.3 Brainstorming

Possible solutions considered:

- Traditional image processing → low accuracy.

- Machine learning with handcrafted features → limited performance.

- Deep learning CNN with transfer learning → **selected best solution** due to high accuracy.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

1. User opens web application.

2. Uploads dog image.

3. System processes image using CNN model.

4. Breed prediction displayed instantly.

3.2 Solution Requirements

Functional

- Image upload feature

- Breed prediction

- Multiple image support

- Web interface display

Non-Functional

- Fast response time

- High accuracy

- Easy usability

3.3 Data Flow Diagram

Input: Dog image → **Processing:** CNN model prediction → **Output:** Predicted breed displayed on the web page.

3.4 Technology Stack

- **Programming:** Python

- **Deep Learning:** TensorFlow, Keras

- **Model:** VGG19 Transfer Learning

- **Web Framework:** Flask

- **Frontend:** HTML, CSS, Bootstrap

- **Dataset:** Dog breed image dataset
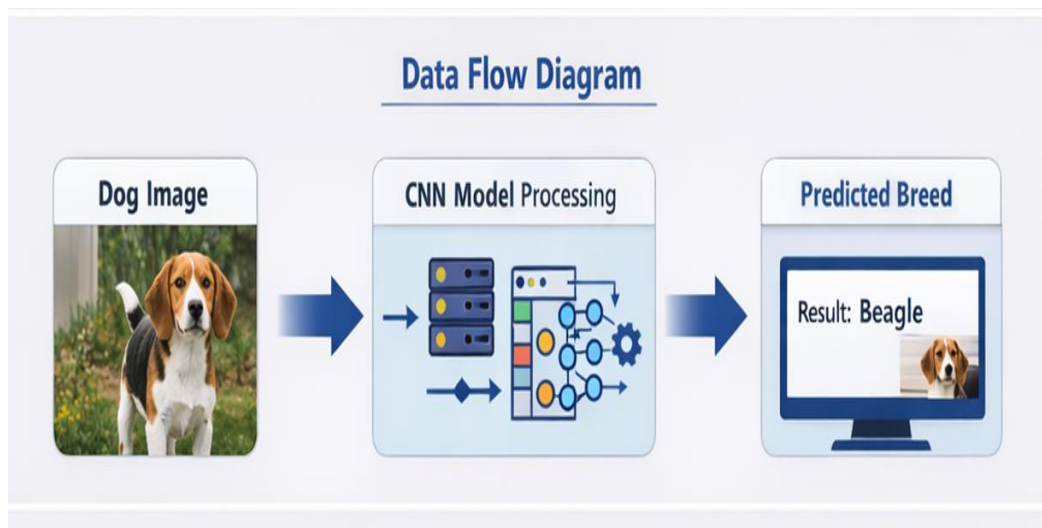
## 4. PROJECT DESIGN

4.1 Problem Solution Fit

Deep learning-based image classification provides the highest accuracy for visual recognition problems, making it suitable for dog breed identification.

4.2 Proposed Solution

Train a transfer-learning CNN model and deploy it through a Flask web application to enable real-time predictions.

4.3 Solution Architecture

User → Web Interface → Flask Server → CNN Model → Prediction Output → Display
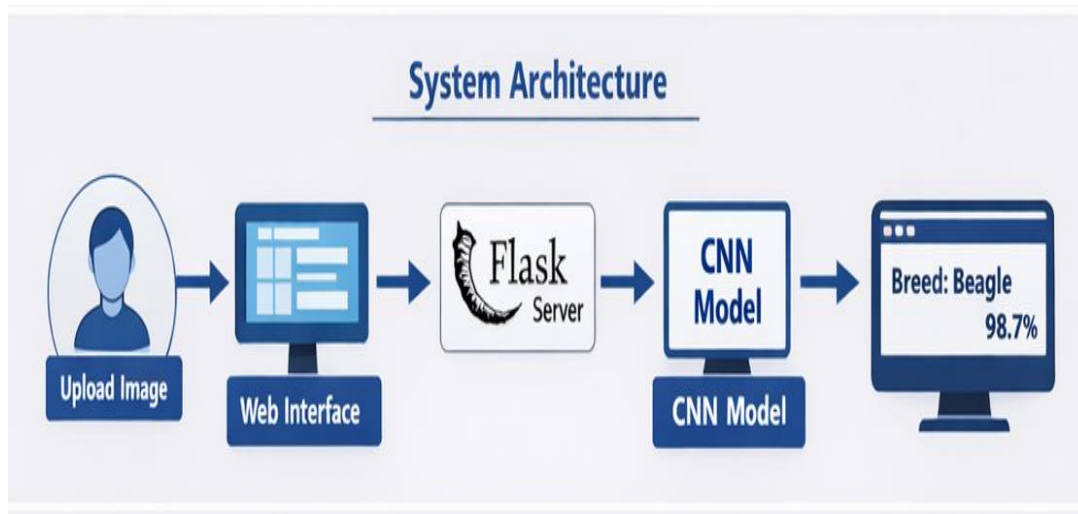

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

- Dataset collection and preprocessing

- Model training using VGG19

- Evaluation and testing

- Web application development

- Deployment and documentation

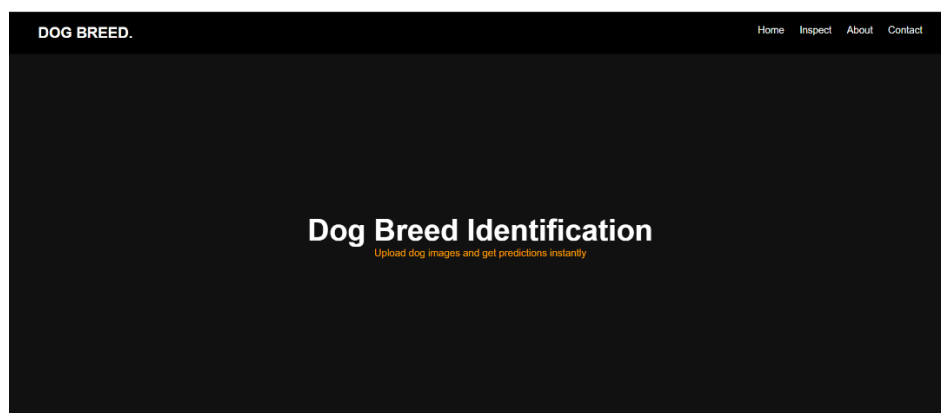**6. FUNCTIONAL AND PERFORMANCE TESTING**

6.1 Performance Testing

- Accuracy measured using validation dataset.

- Model response time tested during prediction.
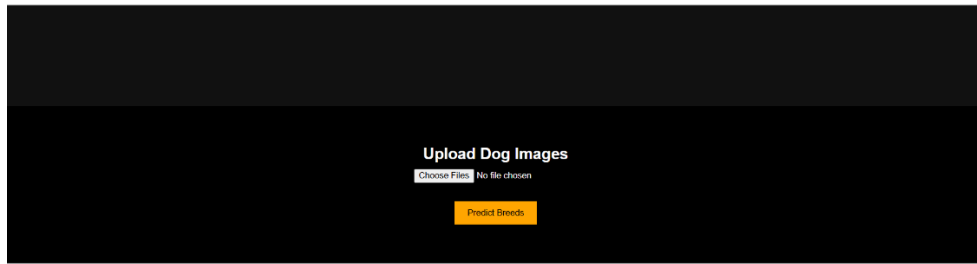
- Multiple image upload functionality verified.
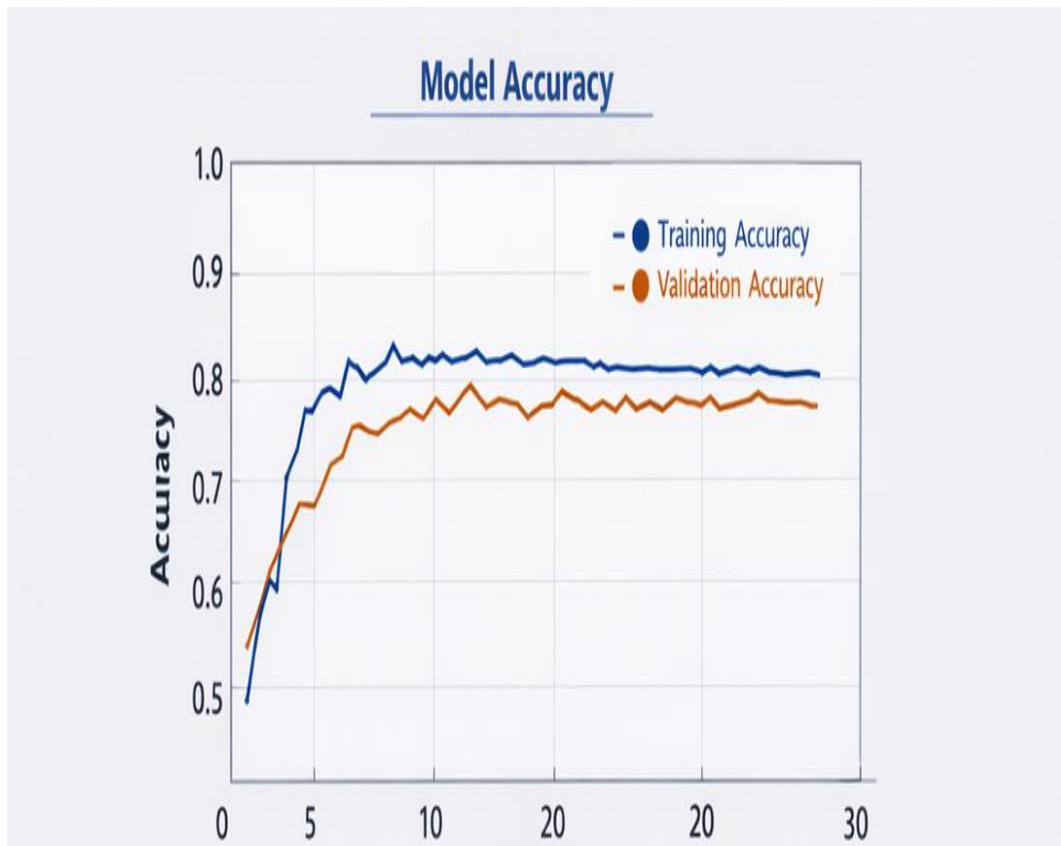
7. RESULTS

7.1 Output Screenshots

- Web page interface
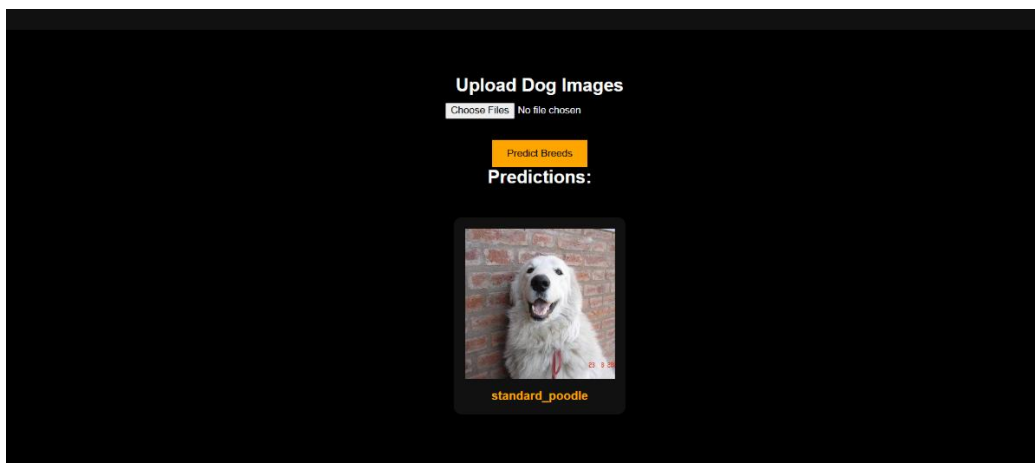- Image upload screen
- Breed prediction result display

8. ADVANTAGES & DISADVANTAGES

Advantages

- High prediction accuracy.

- Fast real-time results.

- Easy-to-use web interface.

- Demonstrates real AI application.

Disadvantages

- Requires good-quality images.

- Limited to trained breeds only.

- Large model size.

9. CONCLUSION

The Dog Breed Identification system successfully demonstrates the use of deep learning and transfer learning for image classification. The trained CNN model integrated with a Flask web application provides accurate and real-time breed predictions, making it a practical AI-based solution.

10. FUTURE SCOPE

- Increase number of supported dog breeds.

- Improve accuracy using advanced architectures (ResNet, EfficientNet).

- Mobile application deployment.

- Cloud-based scalable hosting.

11. APPENDIX

Dataset Link

Dog breed image dataset used for training and testing

https://www.kaggle.com/competitions/dog-breed-identification/data?select=train

GitHub

Repository containing source code and deployed web application link.

https://github.com/pinneboyinasuresh/Breed_Identification_System.git

Project Demo Link

https://drive.google.com/file/d/1ptL1eifuI6fMnKgT1rVe_IJjPjNm-OrU/view?usp=sharing

— End of Project Report —