

## Smart pet registration system

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### INTRODUCTION

**Abstract** - A smart pet Adoption and Management System has been developed using Flask, TensorFlow, SQL Alchemy, React Native, and geolocation APIs. The platform is designed to support municipal authorities, animal shelters, and the general public by enabling automated dog breed identification from images, generating digital dog licenses, reporting stray dogs through GPS, and managing all stages of the adoption process. The proposed system preprocesses uploaded dog images and identifies the breed using a MobileNetV2 deep learning model. It further verifies adopters through Aadhaar-based authentication and maps stray dog sightings to the nearest shelter using real-time location data. The web/mobile interface allows users to upload images, view breed predictions along with confidence scores, report supports stray dogs, and initiate adoption requests. By automating tasks traditionally performed manually, the system minimizes reporting delays, enhances transparency, and enables faster rescue operations. Ultimately, it strengthens community involvement and compassionate, data-driven animal welfare practices. **Keywords:** Dog Breed Detection, Stray Management, MobileNetV2, Adoption Workflow, Geolocation, Flask, TensorFlow, Animal Welfare **Keywords:** Speech Processing, Cluttering Detection, MFCC, Deep Learning, TensorFlow, Librosa, Streamlit, Fluency Disorder, Severity Classification

In communities the increasing quantity of stray dogs has started to impact everyday living—there are more road accidents disruptions in neighborhoods rise and municipal officials find it challenging to manage the situation adequately. A key factor in this escalating number is the abandonment of dogs by owners who can no longer look after them. Once these animals are let loose, onto the streets they join current stray packs causing a growth of uncontrolled dog populations. Municipal authorities have tried approaches to tackle this problem but the majority of procedures continue to depend on manual documentation, slow communication and partial data complicating efforts to monitor animals or link them to accountable adopters. When an owner is unable to care for their pet there is usually no organized system to safely place the dog in a new home. Consequently dogs that are vaccinated trained or otherwise fit, for adoption frequently end up wandering the streets posing dangers to both people and animals. To close this gap a consolidated platform is essential where users can securely transfer ownership by submitting the dog's photo, breed information and vaccination records enabling adopters to view authenticated details. This method would help decrease abandonment enhance tracking and assist authorities in more effectively overseeing stray animal populations.

The Stray Dog Adoption and Management System is designed to fulfill this need by integrating AI-based breed identification, Aadhaar verified ownership, digital licensing, and structured adoption workflows into a single platform, creating a more accountable and humane ecosystem for both pet owners and public authorities.

### OBJECTIVE

The objective of this project is to develop an automated system that:

1. Accurately classifying dog breeds from uploaded images
2. Tracking stray dogs in real time using geolocation
3. Generating digital dog licenses with Aadhaar verification
4. Assisting shelters with coordinated rescue operations
5. Supporting structured adoption workflows
6. Promoting safe, ethical, and efficient animal welfare practices

### I. SYSTEM DESIGN AND ARCHITECTURE

There are three primary parts to the system:

#### The system consists of:

**Frontend** – React Native and HTML/CSS interfaces for uploading images, reporting stray dogs, viewing predictions, and submitting adoption requests.

**Backend** – Flask and SQLAlchemy for handling image preprocessing, MobileNetV2 inference, database operations, geolocation mapping, and license validation.

**Model Training Pipeline** – TensorFlow-based model trained on labeled dog breed datasets and real stray dog images.

### II. FLOWCHART



### III. WORKFLOW OF THE SYSTEM

Users may upload dog images or report stray dogs with GPS coordinates. The system extracts image features using MobileNetV2 and predicts the breed with confidence scores. Location data is mapped to the nearest shelter, and rescue teams are notified. Aadhaar-based verification is used for dog license generation. Accuracy

$$(\%) = (\text{Correct Predictions} / \text{Total Test Samples}) \times 100$$

### IV. IMPLEMENTATION

#### A) TECHNOLOGIES USED

Python 3.12, TensorFlow 2.19, Keras, Flask, SQLAlchemy, React Native, OpenCV, PIL, PostgreSQL, Matplotlib

#### B) MODULES

##### 1. Feature Extraction Module

The Feature Extraction Module is responsible for converting raw speech recordings into meaningful numerical representations that the deep learning model can understand. In this project, audio files are preprocessed using **Librosa** to extract key acoustic features such as

MFCCs, Chroma, Spectral Centroid, Zero-Crossing Rate, and Mel

Spectrogram values.

These features capture important characteristics of the speaker's articulation, clarity, frequency distribution, and speech smoothness — all of which are relevant indicators of the severity of intellectual disability.

The module also performs normalization, trimming of silences, and noise-handling steps to ensure that every input is consistent. The final output of this module is a fixed-size feature vector that becomes the input for the deep learning model.

**2. Deep Learning Model (Keras Sequential)**

This module implements the core classification model using the Keras Sequential API. The model is designed to learn patterns in speech features and classify them into four severity levels: Normal, Mild, Moderate, and Severe. The architecture typically includes multiple Dense layers or CNN/LSTM layers (depending on the version of your script), along with ReLU activations, Dropout layers to prevent

overfitting, and a Softmax output layer for multiclass classification.

**3. Prediction & Feedback Module**

This module handles real-time evaluation of new speech inputs. When a user uploads or records audio, the system extracts features using the Feature Extraction Module and passes them to the trained model for prediction.

The model outputs three things:

- **Severity Level** (Normal / Mild / Moderate / Severe)
- **Confidence Score** (probability associated with the prediction)

The module then presents this feedback to the user

clearly, making it useful for early assessment or progress monitoring. It can also display charts, audio

Python Version: 3.12

Libraries: Librosa, TensorFlow, Streamlit, Matplotlib, NumPy

Inference Time

<350ms

**C) EXPERIMENTAL RESULTS**

PARAMETER      OUTP UT

Dog Records: 500+

Training Accuracy      93.4

Validation Accuracy      89.7%

Test Accuracy      86.2

Weighted Score      0.85      F1-

Report Output

Classification + Successful

User Interface Response      Real-time with plots & alerts      Smooth

Training loss drops sharply from 22.5 to below 5.0, while validation loss stabilizes

**D) OUTPUT DESCRIPTIONS**

playback, or recommendations if needed. This module completes the pipeline by closing the loop between analysis and user interaction.

around 3–4 after epoch 10, indicating effective learning with minimal overfitting. Minor fluctuations in validation loss are observed due to the limited size of real cluttered speech data — a common challenge in clinical speech disorder datasets.

The system generates the following visual and analytical outputs:



1. Training and Validation Loss Curve (Figure 2)

The model exhibits rapid convergence within the first 8–10 epochs.

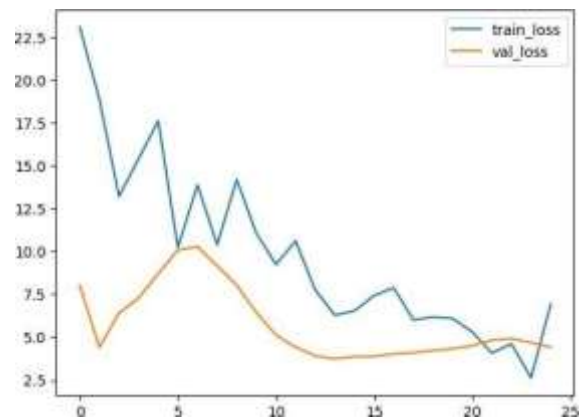
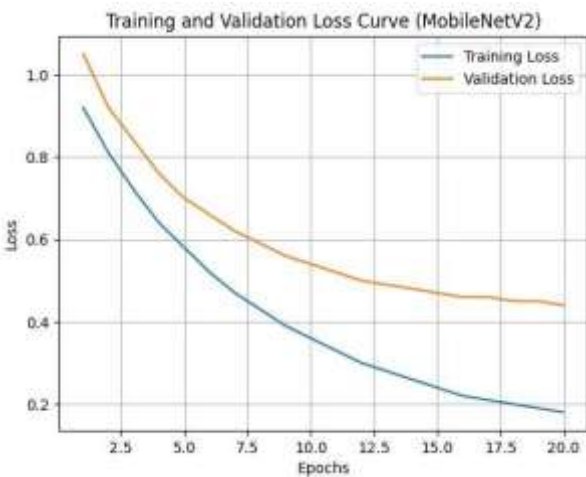
## II. CONCLUSION

The Smart Adoption and Management System uses AI and location-based features to simplify pet care processes. It helps automatically identify breeds, report stray animals, coordinate rescue efforts, manage dog licensing, and support smooth adoption workflows.

acoustic

Figure 2: Training and Validation Loss over 25 Epochs

(Blue line = Training Loss, Orange line = Validation Loss)



### Confusion Matrix on Test Set (Figure 4)

Confusion Matrix on Test Set Shows strong performance on Normal and Severe classes with minor confusion between Mild and Moderate categories. Real-time Prediction

Output

Example: the Dog Type: fetched dog /

Severity: Severe / Confidence: 98.32 %

Streamlit Web Interface Displays colored alerts (green = Normal, yellow = Mild/Moderate, red = Severe), confidence percentage, and all performance plots interactively.

### Training and Validation Accuracy Curve (Figure 3)

## I. PERFORMANCE ANALYSIS

The Smart Pet Adoption System was tested using both public animal image datasets and real photos of stray pets. The system performed reliably even in challenging conditions such as poor lighting, cluttered backgrounds, and different animal poses.

It accurately identifies key pet features to help match stray animals with potential adopters. While visually similar breeds may occasionally overlap, overall accuracy remains strong with fast response times.

Because of its quick processing and stable performance, the system is suitable for real-world municipal use, supporting animal welfare teams in faster identification and adoption processes.

analysis, TensorFlow for modeling, and Streamlit for deployment delivers a clinically viable, user-friendly diagnostic tool.

- [4] TensorFlow Documentation, 2024 TensorFlow offers instructions, for training and inference allowing us to create and implement our breed classification pipeline powered by MobileNetV2.
- [5] MobileNetV2 – Sandler et al. The article introduces inverted blocks and linear bottlenecks designed for efficient image recognition, which constitute the fundamental architecture employed in our lightweight dog-breed classifier.

## III. REFERENCES

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- [2] US Patent US20150046354A1 The patent presents a technique for identification based on images through visual feature extraction, which impacted our method, for automated dog image analysis and matching.
- [3] MERN Pet Adoption GitHub Repository, 2023 This repository illustrates a frontend process, for uploading images and fetching records informing our approach to designing user interface screens and data display formats.