

# INTELLIGENT PET RECOGNITION AND FEEDING SYSTEM USING IMAGE PROCESSING TECHNIQUES

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## ABSTRACT:

The increasing integration of AI and ML into daily life has created new opportunities for sophisticated pet care solutions. This project presents an automated and customizable pet feeding system using image processing technology. The device employs image recognition algorithms and a camera module to recognize certain dogs and dispense the appropriate amount of food based on their individual nutritional requirements. Particularly in households with several dogs, this prevents food theft or excessive consumption. The system utilizes image processing techniques and machine learning classification models, such as convolutional neural networks, for accurate pet identification. The feeding mechanism engages to mechanically dispense food upon the recognition and verification of a pet. This contactless approach to pet care enhances hygiene, efficiency, and functionality. We record feeding schedules and behaviors, together with any acquired images, to track pet feeding times. Integrating the system with a web application may improve accessibility. This will enable users to remotely modify feeding schedules, get notifications, and track feeding records. The ideal approach for pet health management and efficient feeding is an intelligent, automated, and tailored system.

**Keywords:** Artificial Intelligence (AI), Machine Learning (ML), Image Processing, Pet Feeding System, Convolutional Neural Network (CNN), Pet Recognition, Automated Feeding.

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## I. INTRODUCTION

Daily obligations are more arduous in today's fast-paced economy, and pet owners have extra challenges as they must remember to feed their dogs at proper times and in exact amounts. Manual feeding and simple timer-based dispensers are the core of traditional pet feeding systems; however, these approaches do not

cater to the unique nutritional requirements of individual dogs. In multi-pet families, traditional methods often fall short in resolving problems including food theft, irregular feeding times, and overfeeding. As a result, there is a growing need for improved, tailored pet care products and services. Recent developments in artificial intelligence, machine learning, and image processing have enabled the

establishment of intelligent automation systems for household use. Artificial intelligence-driven computer systems may study images, recognize patterns, and reply based on their learned knowledge. The incorporation of these technologies into pet care has made automated feeding systems capable of recognizing pets and administering food according to their individual dietary needs a concrete reality. The suggested AI and ML-driven pet feeding system utilizes a camera module and machine learning algorithms to automate and customize the feeding process. Classification methods, including Convolutional Neural Networks (CNNs), are used on real-time video data to distinguish between certain dog breeds. Following pet identification and verification, a microcontroller (e.g., Raspberry Pi or Arduino) initiates a feeding mechanism to dispense the specified amount of food according to established feeding schedules and nutritional guidelines. This strategy primarily addresses prevalent concerns in families with many pets. Theft or inequitable food distribution may occur because traditional automated feeders cannot differentiate between animals. The suggested method guarantees that each pet is provided with the correct quantity of food according to its specific nutritional needs using image-based pet identification. This improves pet health management and decreases the need for owner intervention. The system is enhanced by sophisticated features like as automatic feeding, cloud connection, picture logging, data storage for feedings, and interface with online or mobile applications. These features allow pet owners to monitor their dogs' eating habits over time, get alerts for feeding schedules, and study their routines from a distance. Weight sensors, smart collars, and cloud analytics are components of the Internet of Things (IoT) that may enhance monitoring capabilities and enable the early identification of health-related concerns. The suggested intelligent pet feeding system signifies a substantial progression in pet care via the amalgamation of artificial intelligence, machine learning, image processing, and the Internet of Things. It provides a sanitary, effective, and customized solution for pet feeding, enhancing the comfort of pet owners and safeguarding the welfare of dogs.

## II.LITERATURE REVIEW

Drs. P. Venkatesh, A. Gupta, and R. Bansal created an intelligent pet feeder. It used a camera to ascertain the existence of pets. The gadget can identify pet activity near the feeder by motion detection and fundamental image processing methods. They incorporated IoT technology by using the Blynk app for remote monitoring and control. The system's limited customization choices arose from its absence of solid Machine Learning (ML) models capable of recognizing and distinguishing individual dogs, despite its remote accessibility and automation features.

N. Sharma and R. Patel created a pet feeding system using OpenCV and Haar Cascade classifiers. Upon the system's successful identification of a pet's face, it would activate the feeding mechanism based on the recognized facial features. The idea included a servo motor-controlled food dispenser and a real-time video feed. The research indicated that vision-based feeding automation is efficient; however, it can only serve one pet at a time and cannot handle several pets inside a home.

J. Li and K. Zhou concentrated on animal categorization with convolutional neural networks (CNNs). A collection of pet photos was used to teach the algorithm to distinguish between certain animals. Utilizing MobileNet and transfer learning, they attained exceptional classification accuracy, illustrating the effectiveness of deep learning methodologies for pet identification in images. Research indicates that CNN-based methodologies may improve the precision and dependability of pet identification in intelligent pet care systems.

S. Banerjee and T. Kumar investigated the incorporation of intelligent pet feeding inside home automation systems. Their research underscored the need of artificial intelligence (AI) in identifying pet behavior, managing food, and overseeing health. The research further suggested integration with smart home systems, remote control capabilities, and cloud-based data analysis. This study improved our comprehension of the incorporation of smart pet feeders inside larger smart home systems facilitated by the Internet of Things.

A. Fernandez and M. Das created an automated

pet feeding system. It is contingent upon motion detection and acoustic signal processing. Their aim was to economically automate feeding, excluding the use of machine learning or image recognition in their design. The system provided basic automation; however, it lacked customization and intelligence for pet recognition. Their findings is illuminating as it contrasts with more sophisticated AI-driven pet feeding systems that demonstrate more flexibility and accuracy.

### III.EXISTING SYSTEM

The predominant types of modern automated pet feeders are mechanical or timer-operated. Irrespective of the pet's location or identity, these devices will independently distribute food at designated times according to a predetermined amount. They do little physical labor and provide limited automation, although they are devoid of intellect and flexibility. They are unable to distinguish among different dogs, determine if food has been ingested, or modify portion amounts according to specific nutritional needs.

The feeder may be configured to activate upon a pet's approach, using motion or weight sensors included in some sophisticated models. Complications arise in families with several pets, since these systems cannot identify the specific pet present; for example, one pet may unintentionally devour another's food. Numerous gadgets demonstrate a considerable inadequacy in remote monitoring and administration functionalities. Recent advancements have used IoT technology to provide remote scheduling and monitoring via cloud platforms or mobile apps. These devices augment the ease of feeding schedules for pet owners by facilitating remote management from any location. Most current systems, however, are inadequate in delivering customized feeding solutions for pets, since they do not use image processing or machine learning methods for pet identification.

### DISADVANTAGES

- Since they are not highly intelligent or automated, they cannot give specialized pet care.
- Feeders with timers operate at predetermined periods and do not detect when the pet is there.

### IV.PROPOSED SYSTEM

This suggested intelligent pet feeding system utilizes artificial intelligence and machine learning, using image processing to identify individual pets and then dispense food in a regulated and customized way. The use of AI, automation, and flexibility in pet care rectifies the shortcomings of conventional feeding methods.

The camera module of the device can take photographs of pets in real time as they approach. Accurate pet identification is achieved by processing these photos with a trained machine learning model, such as a convolutional neural network (CNN). Upon identification and verification of the pet, the system engages a feeding mechanism, such as a servo motor-operated dispenser, to release the requisite quantity of food according to the pet's defined nutritional needs.

Each pet may have a unique feeding schedule, portion size, and food choice, and this approach may fit all of them. Homeowners with several pets or dogs with particular nutritional needs may find this product quite advantageous. The system authenticates each pet's identification before distributing food to avoid overfeeding or food theft.

Additionally, the suggested system enables remote control and monitoring via a web or mobile application. Remote access to feeding data, alerts, pet profiles, and scheduling allows pet owners to oversee their pets' nutritional needs. You may upload images of your pet along with their food history to the cloud for future reference and health tracking.

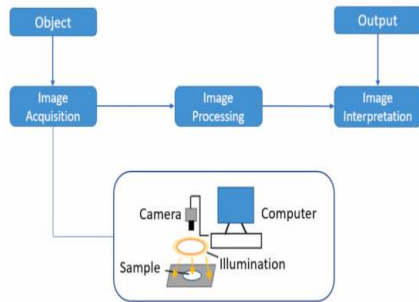
In summary, the suggested system is an intelligent, automated, user-friendly, and economical solution designed to enhance the efficiency of pet feeding and care. It integrates artificial intelligence, machine learning, image processing, automation, and the Internet of Things.

### ADVANTAGES

- AI-driven picture analysis guarantees tailored feeding by precisely recognizing individual dogs.

- Facilitates automated pet feeding via real-time identification.
- Optimal nutrition and consistent feeding are essential for a healthy pet.

**V.SYSTEM MODEL**



**Fig 1.System Model**

**VI.MODULES**

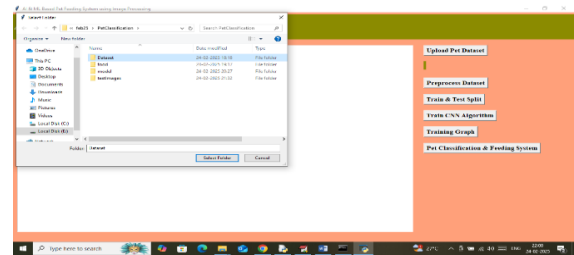
The following modules have been delineated:

- **Upload Pet Dataset:**This module enables the upload of pet datasets to the program.
- **Pre-process Dataset:**The program analyzes the photos of each pet and extracts information to generate a training array.Subsequently, we shuffle and normalize all pixel values of the imported training features. -
- **Train & Test Split:** The processed data is divided into a training array and a testing array. The application allocates 80% of the sample for training and 20% for testing.
- **Train CNN Algorithm:** The CNN method will use 80% of the training data to develop a model, then evaluating its accuracy on the remaining 20% of the data.
- **Training Graph:** This module enables users to graph the accuracy of convolutional neural networks (CNNs) during training and validation phases.
- **Pet Classification & Feeding System:** Users may submit a test image to train CNNs

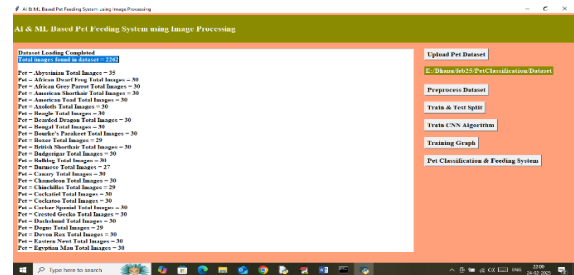
for pet identification, after which the module will suggest nutritious food options and warn against harmful things.

**VII.SCREENSHOTS**

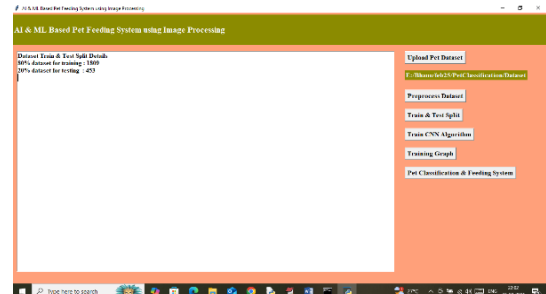
Click the 'Upload Pet Dataset' button at the top of the screen to load the dataset, after which the next page will be shown.



Select the whole dataset folder shown above, then click the 'Select Folder' button to load the dataset, which will bring you to the subsequent screen illustrated below.



The screen displays the overall number of photographs imported from the dataset, along with the various pets included and the corresponding image count for each pet. Click the 'Pre-process Images' button to randomize and normalize image properties; the subsequent page will then be shown.



The screen above shows the program using 1,800 photos for training and 450 images for evaluation. Choose 'Train CNN Algorithm' to begin model training, after which the following page will be shown.



The suggested method signifies a substantial improvement in smart pet care technology by augmenting feeding precision, enhancing animal wellbeing, and providing pet owners with more control and convenience.

## IX.FUTURE ENHANCEMENTS

The Present effectively recognizes pets and automates feeding, however it may exhibit more intelligence and adaptability with little adjustments. An enhancement might include monitoring individuals' dietary choices and physical activity via behavioral analysis using sophisticated computer vision methodologies. This may assist veterinarians and pet owners in promptly identifying difficulties such as changes in appetite or other health concerns, enabling swift intervention. Integrating voice recognition and interface functionalities is another potential enhancement. This would enable owners to control the feeder with voice commands and improve the system's accessibility. Smart collars, RFID tags, and weight sensors exemplify multi-modal sensors that might enhance pet identification precision and facilitate novel verification methods. To enhance real-time processing and decision-making, the system may use hybrid cloud architectures and edge computing to improve speed and scalability. Integration with extensive smart home ecosystems may provide automated routines in a high-tech pet care environment, linking with other devices. Ultimately, the system may be improved to accommodate a broader range of pets, including not just dogs and cats but also exotic and special-needs animals. Future applications may see significant enhancements in identification accuracy, system flexibility, and overall performance as AI models are further refined using sophisticated learning methodologies such as online learning and reinforcement learning.

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