

Pet Classification and Feeding Recommendation System Using CNN

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Abstract— This project presents a practical approach for identifying pets from images and suggesting suitable feeding options using a Convolutional Neural Network (CNN). The system allows users to upload image datasets, perform preprocessing, and train a deep learning model to recognize different pet categories. After training, the model can classify new images and provide basic dietary suggestions based on the detected pet type. Features such as dataset handling, training and testing split, and performance evaluation using accuracy, precision, and recall are included. During testing, the model achieved an accuracy of around 93%, which shows its ability to perform reliable predictions. The system is designed in a simple and interactive way so that users can easily upload images and get results. Overall, this work focuses on combining image classification with useful pet care information in a single application.

Keywords—Pet classification, Convolutional Neural Network (CNN), image processing, deep learning, feeding recommendation system, dataset preprocessing, model evaluation, image recognition.

I. INTRODUCTION

In recent years, artificial intelligence and deep learning have been widely used in image recognition tasks [9][10]. Many systems today are capable of identifying objects and patterns from images with good accuracy. One important application of this technology is animal classification, where different species can be recognized based on their visual features [2]. In this project, a Pet Classification and Feeding Recommendation System is developed using a Convolutional Neural Network [9]. The main goal is to identify pets from images and provide simple feeding suggestions based on the result [1][5]. This system is helpful for users who may not be familiar with different pet types. By combining machine

learning with an easy-to-use interface, the application makes the overall process simple and effective. The increasing demand for smart solutions in pet care also makes this system useful in real-world situations [4][7].

The process starts with uploading a dataset that contains images of different pets such as dogs, cats, and birds. Each category includes multiple images to help the model learn properly. Before training, the images are preprocessed by resizing and normalizing them so that they are consistent [3]. The dataset is then divided into training and testing parts, which helps in evaluating the model's performance. A CNN model is used because it can automatically learn important features like shapes and textures from images [9][10]. This reduces the need for manual feature extraction. During training, the model runs through several epochs and improves gradually by reducing errors. This step-by-step learning helps the model perform better when new images are given. After training is completed, the model shows good accuracy in predicting pet categories. Performance is checked using measures such as precision, recall, and F1-score to understand how well the model works. Graphs are also used to observe how accuracy increases and loss decreases during training. These visual results make it easier to understand how the model is learning. The system performs well with test images and is able to recognize pets correctly in most cases. Because of this, it can be used in practical situations where quick identification is required [9][10].

Another useful part of this system is the feeding recommendation feature. Once a pet is identified, the system provides basic information about suitable food for that pet [1][6][7]. This makes the application more helpful, especially for new pet owners. The interface is kept simple so that users can easily upload images and view results without difficulty. Combining classification and feeding suggestions in one system makes it more practical. It connects technical solutions with everyday needs

in a meaningful way [8]. Overall, this project shows how deep learning can be used to solve simple real-life problems [9][10]. By combining image processing and machine learning, the system provides a complete solution for identifying pets and suggesting their diet. The workflow is clear, starting from dataset upload to prediction. With some improvements like larger datasets or advanced models, the system can be made even better in the future.

Overall, the Pet Classification and Feeding Recommendation System demonstrates the potential of deep learning in solving real-world problems [9][10]. By combining image processing, machine learning, and user interaction, the system delivers a comprehensive solution for pet identification and care. The use of CNN ensures accurate predictions, while the structured workflow—from dataset upload to model training and testing—provides a clear and efficient process. The inclusion of performance metrics and visualization tools enhances the system's reliability and usability. Furthermore, the feeding recommendation feature makes the application more practical and beneficial for users. As technology continues to evolve, such intelligent systems can be further improved with larger datasets and advanced models. This project serves as a foundation for developing more sophisticated applications in animal recognition and smart pet care, contributing to the growing field of artificial intelligence and its real-world applications.

II. RELATED WORK

Wayne et al., [2019] [1] developed an Intelligent Food Dispenser system aimed at automating pet feeding processes. Their work focused on reducing human intervention by designing a system capable of dispensing food at scheduled intervals. The system improves convenience for pet owners and ensures pets are fed on time. It highlights the importance of automation in daily pet care activities. However, the model mainly concentrates on feeding mechanisms and does not include any intelligence for pet recognition. The study provides a strong foundation for integrating automation with smart technologies. It emphasizes reliability and efficiency in food dispensing. This work is useful for understanding how automated systems can enhance pet care routines.

Mohanty et al., [2019] [2] proposed a system for animal recognition using image processing techniques. Their approach focused on identifying animals based on extracted visual features such as

shape and texture. The system demonstrated the capability of recognizing different animals with reasonable accuracy. It highlights the role of image processing in classification tasks. However, traditional methods used in the study may not perform well with complex datasets. The research shows the limitations of conventional techniques compared to deep learning models. It provides insights into feature extraction and classification processes. This work serves as a base for developing advanced recognition systems using modern approaches.

Ravikumar et al., [2019] [3] presented a quick review of digital image processing concepts and techniques. The study covers essential operations such as image enhancement, filtering, and segmentation. It explains how images can be processed to extract meaningful information. The paper highlights the importance of preprocessing in improving system performance. It also discusses various algorithms used in image analysis. The review provides a strong theoretical background for image-based applications. It is useful for beginners to understand fundamental concepts. This work supports the development of systems that rely on image data for decision-making.

Chauhan et al., [2018] [9] explored the application of Convolutional Neural Networks in image detection and recognition. Their study demonstrates how CNN models automatically extract features from images without manual effort. The approach significantly improves classification accuracy compared to traditional methods. The paper explains different layers of CNN, including convolution and pooling. It highlights the effectiveness of deep learning in handling complex image data. The research also discusses training techniques and performance evaluation. This work is important for understanding modern image recognition systems. It forms the core foundation for implementing deep learning-based classification models.

Jmour et al., [2018] [10] discussed the use of Convolutional Neural Networks for image classification in their IEEE publication. The study focuses on applying CNN architectures to achieve high accuracy in classification tasks. It explains how deep learning models learn patterns from large datasets. The research highlights the advantages of CNN over traditional machine learning methods. It also addresses challenges such as overfitting and computational complexity. The paper provides insights into model optimization techniques. This work is valuable for designing efficient image

classification systems. It supports the adoption of deep learning in real-world applications.

III. DATASET DETAILS

The dataset used in this project consists of a collection of pet images representing multiple categories such as different dog breeds, cat breeds, and birds. Each category contains a sufficient number of images to ensure proper learning during the training phase. The images are gathered in a structured folder format where each folder corresponds to a specific pet class. This arrangement helps in easy labeling and efficient data handling during model training. The dataset includes around 2250 images, out of which 1800 images are used for training and 450 images are reserved for testing. The images vary in size, background, lighting, and orientation, making the dataset more realistic and suitable for building a robust model. Such diversity helps the model learn different patterns and improves its ability to generalize well when new images are provided during testing or real-time usage.

Before feeding the dataset into the model, several preprocessing steps are applied to improve performance and consistency. All images are resized to a uniform dimension to match the input requirements of the Convolutional Neural Network. The pixel values are normalized to bring them within a standard range, which helps in faster and more stable training. Additionally, the dataset is shuffled to remove any ordering bias and ensure that the model does not learn patterns based on sequence. The system also performs a train-test split to evaluate how well the model performs on unseen data. During preprocessing, irrelevant noise is minimized while preserving important features such as shapes and textures. These steps play a crucial role in improving accuracy and reducing overfitting. Overall, the dataset preparation process ensures that the model receives high-quality input for effective learning and reliable prediction.

IV. PROPOSED METHODOLOGY

The proposed system follows a structured approach to classify pets using image data and provide feeding recommendations. Initially, the dataset is uploaded and organized into different categories based on pet types. The images are then pre-processed by resizing, normalizing, and shuffling to ensure uniformity and remove bias. After preprocessing, the dataset is divided into training and testing sets to evaluate model performance effectively. A Convolutional Neural Network (CNN) is then applied to extract important features

from images and learn patterns. The model is trained over multiple epochs to improve accuracy and reduce error during prediction.

Once the training process is completed, the model is tested using unseen images to measure its performance through metrics such as accuracy, precision, and recall. The system also generates graphical representations of training and validation performance to monitor learning progress. After successful training, users can upload a new image for classification. The system predicts the pet category and displays the result along with suitable feeding information. This integration of classification and recommendation makes the system practical and user-friendly. The methodology ensures efficient learning, accurate prediction, and real-time usability for pet identification and care.

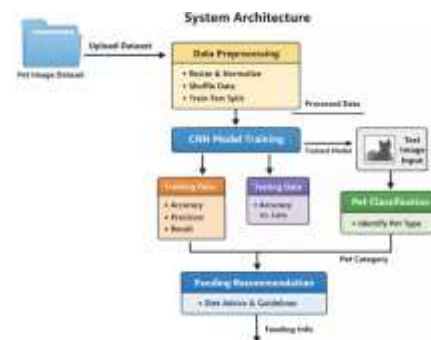


Figure [1] : Pet Image Classification and Feeding Recommendation System Architecture

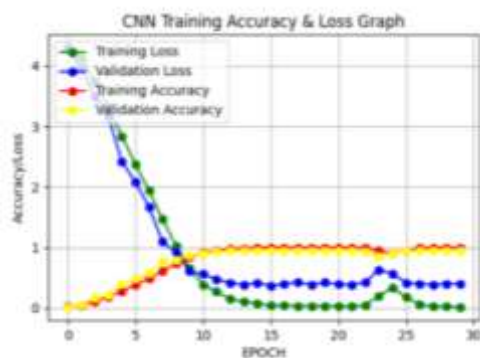
Figure[1] This system processes a pet image dataset through preprocessing steps like resizing, normalization, and data splitting. A CNN model is trained using the processed data to learn patterns and classify different pet types. The trained model predicts the category of a pet from a test image input.

Based on the identified pet type, the system provides appropriate feeding recommendations and diet guidelines.

V. RESULT AND DISCUSSION

The developed system achieved strong performance in classifying different pet categories using the Convolutional Neural Network model. After training on 1800 images and testing on 450 images, the model reached an overall accuracy of approximately 93%, indicating its effectiveness in recognizing various pets. The evaluation metrics such as precision, recall, and F1-score also showed consistent results across most categories, with

values ranging between 80% and 100%. This demonstrates that the model performs well not only in overall accuracy but also in correctly identifying individual classes. The training process showed a steady decrease in loss and a corresponding increase in accuracy over multiple epochs, confirming proper learning behaviour. Additionally, the system successfully predicted pet types such as Dachshund, Abyssinian, Egyptian Mau, and birds from uploaded test images. The results highlight that the model can generalize well to unseen data. Overall, the system provides reliable predictions and demonstrates the effectiveness of deep learning in image-based classification tasks.



Figure[2] : CNN Training Accuracy and Loss Performance Graph

The Figure[2] shows the training and validation accuracy and loss over multiple epochs. Training loss decreases steadily while accuracy improves, indicating effective learning. Validation metrics follow a similar trend, showing good generalization of the model. Overall, the graph demonstrates that the CNN model achieves high accuracy with minimal overfitting.



Figure [3] : Pet Image Upload for Classification and Feeding Recommendation

Figure[3] allows users to select and upload pet images from the dataset folder. The uploaded

image serves as input for the trained CNN model. It enables the system to identify the type of pet based on visual features. This step is essential for generating accurate classification and feeding suggestions.



Figure [4]: Pet Classification Result – Identified as Dachshund

The system successfully classifies the uploaded image as a Dachshund using the trained CNN model. It analyzes visual features such as body shape, size, and fur pattern for accurate prediction. The result confirms the effectiveness of the model in identifying pet breeds. This classification is further used to generate appropriate feeding recommendations.

DISCUSSION

The performance of the system indicates that Convolutional Neural Networks are highly suitable for image classification problems, especially in identifying pet categories. The high accuracy achieved can be attributed to proper dataset preparation, including preprocessing techniques such as normalization and shuffling. The balanced train-test split also contributed to fair evaluation and reduced overfitting. However, slight variations in precision and recall among certain classes suggest that some categories may require more training data for improved consistency. The system performs well under controlled conditions but may face challenges with highly complex backgrounds or low-quality images. The inclusion of a training graph helped in understanding the learning pattern, showing that the model improves steadily with each epoch. Furthermore, integrating feeding recommendations enhances the practical value of the system beyond simple classification. Future improvements could include using larger datasets, advanced architectures, and real-time image processing. Overall, the system proves to be

efficient, user-friendly, and applicable for real-world pet care assistance.

with GSM technology for remote operation.

VI. CONCLUSION

The Pet Classification and Feeding Recommendation System successfully demonstrates how deep learning can be applied to solve real-world problems in pet care. By using a Convolutional Neural Network, the system is able to accurately identify different types of pets from images and provide useful feeding information based on the prediction. The structured process of dataset preparation, preprocessing, model training, and evaluation ensures reliable performance. The achieved accuracy and evaluation metrics indicate that the model is effective in handling image classification tasks. In addition to classification, the system adds practical value by offering feeding suggestions, making it more beneficial for users. The user-friendly interface allows easy interaction, enabling users to upload images and receive results quickly. Although the system performs well, it can be further improved by using larger datasets and more advanced models. Overall, the project highlights the importance of integrating artificial intelligence with everyday applications, providing a simple and efficient solution for pet identification and care.

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International Journal of DATA SCIENCE AND IOT MANAGEMENT SYSTEM

Peer Reviewed, Referred & Indexed Journal

ISSN: 3068-272X

www.ijdim.com

Original Research Paper

- ADVANCE AND FUTURE RESEARCH, 1(4).
<https://doi.org/10.56975/jafr.v1i4.50163>
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