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Pet Rescue System Using Computer Vision

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Abstract: ***Animal shelters face challenges in managing lost or abandoned pets due to outdated methods such as paper records or simple databases. These systems limit real-time tracking, accurate identification, and effective health monitoring. This study presents a smart shelter management system that integrates machine learning and computer vision techniques, including facial recognition and object detection. The system addresses three key areas: unique animal identification, health monitoring through image analysis, and integrated digital management of pet records. By reducing manual workload and improving record accuracy, the proposed approach enhances both efficiency and animal care. Unlike earlier models that focused mainly on adoption prediction, this system works in real time, is scalable, and adaptable to shelter growth. Future developments, such as video-based monitoring, can further support disease prevention and collaboration across multiple shelters.***
Keywords: Machine Learning, Computer Vision, Animal Shelter, Pet Identification, Health Monitoring

I. INTRODUCTION

Animal shelters often struggle to identify, track, and care for rescued or abandoned animals due to reliance on paper-based records, manual data entry, and outdated database systems, which can lead to slow processing, missing records, and inaccurate information. With the increasing number of rescued animals, these challenges become more significant. Recent advancements in Artificial Intelligence (AI), particularly Computer Vision (CV) and Machine Learning (ML), provide effective solutions by enabling automated animal identification, image-based health monitoring, and digital tracking of animal movement and behavior. This project proposes a Smart Pet Rescue Shelter Management System that utilizes CV techniques such as facial recognition, object detection, and image-based health analysis to improve shelter operations. The system aims to reduce manual workload, enhance record accuracy, and enable real-time monitoring for better decision-making. It also facilitates early detection of injuries or diseases and centralizes all animal-related information into a unified digital platform for easy access. As a result, the system improves operational efficiency, reliability, and overall animal welfare in rescue shelters [1].

II. LITERATURE REVIEW

[1] T. Milligan (2017) discusses animal rescue in the context of civil disobedience by analyzing both open and covert rescue approaches. The study highlights that non-violent and ethically motivated rescues can be justified as civil disobedience. It further emphasizes the importance of transparency in open rescues, which are generally more socially acceptable. However, the work is primarily theoretical and lacks empirical validation or technological application for real-world animal shelter management systems.

[2] Y. Chen and H. Zhao (2023) investigate the role of digital services in pet adoption within shelter environments. The study identifies key factors influencing adoption decisions, including animal appearance, behavior, personality, and direct interaction with potential adopters. It also highlights that guidance from shelter staff plays a more significant role than static information sources such as cage cards or online listings. Although the study provides useful insights, it is limited to a small sample size of shelters and does not incorporate automation or artificial intelligence techniques.

[3] M. A. Gatmaitan, J. D. A. M. Argao, and M. A. F. C. Garcia (2024) present the design and evaluation of the iPet web-based application aimed at improving the pet adoption process. The system is developed using the Waterfall model and evaluated based on ISO 25010 quality standards. The results demonstrate high performance in functionality, usability, and reliability. However, the system lacks advanced capabilities such as automated pet identification, health monitoring, and mobile platform integration, limiting its scalability and real-world applicability.

[4] A. H. Fine et al. (2025) provide a comprehensive review of the “pet effect,” focusing on the impact of pets on human health, well-being, and social development. The study discusses physical, psychological, and social benefits associated with pet ownership and highlights its influence on public policy and community awareness. Despite its broad scope, the study primarily emphasizes human benefits and provides limited discussion on animal welfare or the integration of technological solutions for improving shelter management systems.

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III.RESEARCH GAP

Most existing studies mainly focus on adoption prediction and rely on small datasets, which limits their real-world usefulness. There are currently no real-time systems designed specifically for pet identification or health monitoring in shelter environments. While computer vision techniques have been widely tested in areas such as livestock management or vehicle detection, they have not been effectively applied to animal shelters. Additionally, there is no integrated platform that combines identification, health assessment, and resource management into a single system. This highlights the need for a scalable, all-in-one solution that can improve operational efficiency and enhance the overall care provided to animals in shelters.

Table 1. Comparison of Existing Studies

No	Paper	Year	Purpose	Methodology	Limitations	Future Scope
	T. Milligan, "Animal rescue as civil disobedience," Essays in Philosophy	2017	Ethical analysis of animal rescue	Conceptual and ethical discussion	No empirical or technical data	Integration of ethical insights with technological solutions
	Y. Chen and H. Zhao, "Research on the strategy of digital services…," ICSSM	2023	Study on digital adoption strategies	Survey and strategy-based research	No automation or AI integration	Incorporation of AI and computer vision for automation
	M. A. Gatmaitan et al., "iPET: The design…," IJCSR	2024	Development of adoption application	Web-based system with usability testing	No pet identification or health monitoring features	Extension with CV-based identification and monitoring
	A. H. Fine et al., "A commentary on perspectives of the pet effect…," IJERPH	2025	Study of human–pet impact	Review and commentary	Focuses on human benefits only	Shift toward animal welfare using technological approaches

IV.METHODOLOGY

The proposed system integrates animal identification, health monitoring, and digital record management into a unified framework. The architecture consists of multiple modules, including an image acquisition module for capturing input images, a preprocessing module for normalization and enhancement, and deep learning-based modules for identification and health monitoring. The system workflow begins with capturing or uploading an animal image, followed by preprocessing steps such as resizing and normalization. The processed image is then passed through convolutional neural network models for feature extraction. The identification module matches extracted features with stored records to recognize individual animals, while the health monitoring module predicts possible diseases based on image analysis. The results are displayed through a user interface and stored in a centralized database for future reference. Transfer learning models such as MobileNet and ResNet are utilized to improve model performance and efficiency. The dataset is divided into training, validation, and testing sets in a ratio of 70%, 15%, and 15%, respectively, to ensure proper evaluation.

V. CONCLUSION

This project presents a smart shelter management system that utilizes computer vision techniques to enhance the identification, monitoring, and care of rescued and abandoned animals. By integrating facial recognition, object detection, and image-based health analysis, the system improves accuracy, reduces manual effort, and enables real-time tracking along with early health detection. The scalable design supports efficient shelter operations and contributes to improved animal welfare. The proposed system demonstrates the potential of intelligent technologies to transform traditional shelter management into a more efficient and data-driven process.

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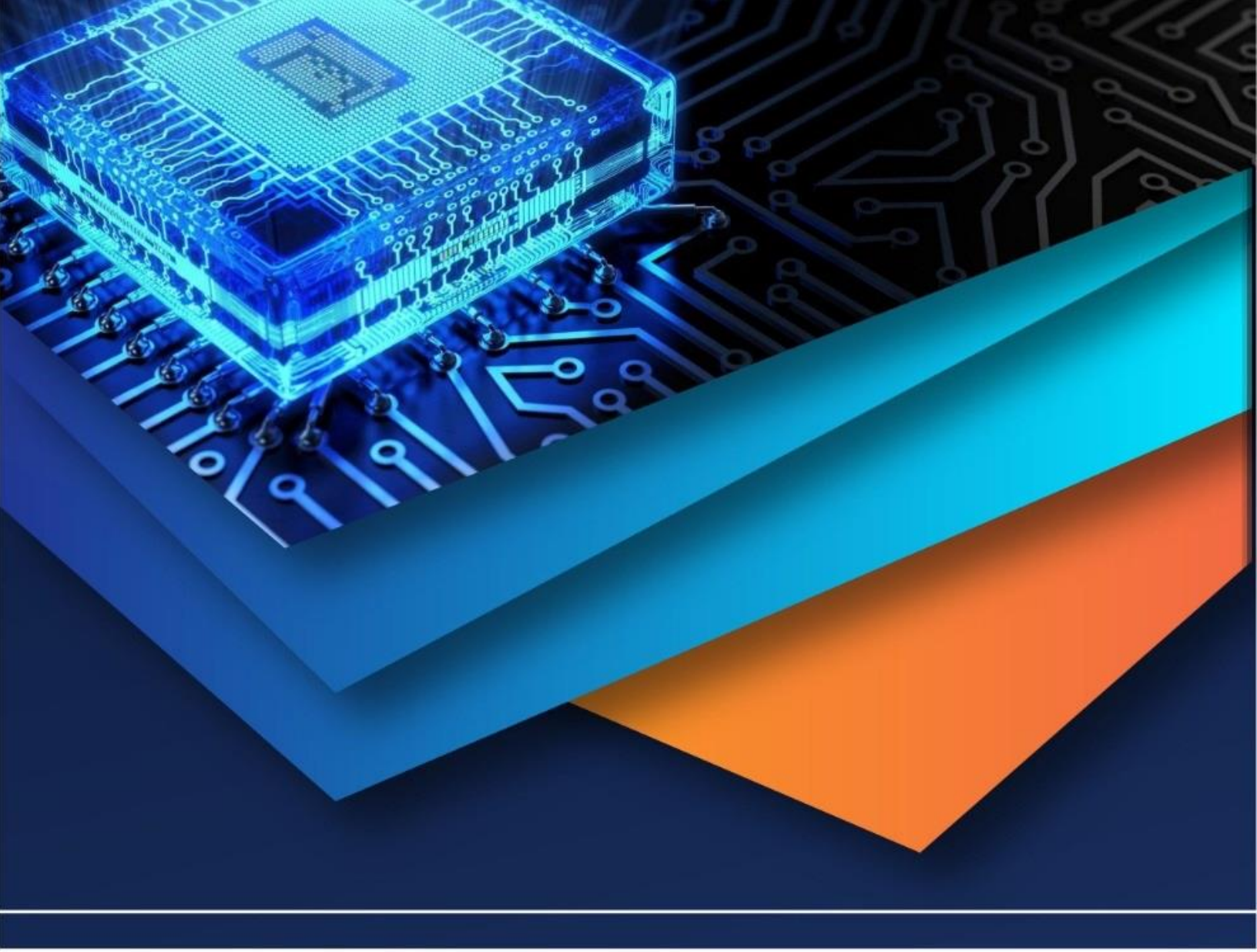
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