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AI Based Wild-Life Recognition System

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Abstract: *The rapid decline in global biodiversity has necessitated innovative approaches to wildlife monitoring and conservation. Traditional methods of species identification, such as manual observation and camera traps, are labor-intensive and prone to errors. This paper proposes an AI-based wildlife recognition system leveraging deep learning techniques to automate species identification. Using the Residual Network (ResNet) architecture, the system achieves high accuracy in classifying wildlife species from image data. The model is trained on a diverse dataset comprising images from various habitats, ensuring robustness in real-world applications. The system's scalability allows for integration with mobile and IoT-based platforms, enabling real-time monitoring and data collection. This research aims to provide conservationists and researchers with a reliable tool for biodiversity assessment and wildlife protection*

Keywords: Wildlife Monitoring; Artificial Intelligence; Deep Learning; ResNet; Biodiversity Conservation; Image Classification

I. INTRODUCTION

The conservation of wildlife is a critical global challenge, with many species facing the threat of extinction due to habitat loss, climate change, and human activities. Effective wildlife monitoring is essential for biodiversity conservation, but traditional methods such as manual observation and camera traps are time-consuming and often inaccurate. Recent advancements in Artificial Intelligence (AI) and deep learning have opened new avenues for automating species identification, enabling more efficient and accurate monitoring.

Deep learning models, particularly Convolutional Neural Networks (CNNs), have demonstrated remarkable success in image classification tasks. Among these, the Residual Network (ResNet) architecture stands out for its ability to train very deep networks without suffering from performance degradation. ResNet's residual learning framework allows it to learn complex features from images, making it highly suitable for wildlife recognition.

This paper presents an AI-based wildlife recognition system using ResNet to classify species from image data. The system aims to address the limitations of traditional methods by providing a scalable, accurate, and real-time solution for wildlife monitoring.

II. PROBLEM STATEMENT

Wildlife conservation efforts are hindered by the lack of efficient and accurate tools for species identification. Traditional methods rely on manual observation, which is labor-intensive, error-prone, and unsuitable for large-scale monitoring. Additionally, existing AI-based solutions often struggle with challenges such as varying lighting conditions, complex backgrounds, and the similarity between species.

The primary challenge lies in developing a robust and scalable system that can accurately classify wildlife species in diverse environments. This research aims to address these challenges by leveraging deep learning techniques to create an automated wildlife recognition system.

III. OBJECTIVE AND SCOPE

The objectives of this research are:

- To develop an AI-based system for automated wildlife species identification.
- To enhance classification accuracy using the ResNet architecture.
- To enable real-time species recognition for efficient wildlife monitoring.

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- To provide a scalable solution that can be integrated with mobile and IoT platforms.

The scope of this research includes:

- Utilizing a diverse dataset of wildlife images for training and testing.
- Implementing ResNet-50 for image classification and evaluating its performance.
- Exploring the integration of the system with drone-based monitoring and cloud platforms.

IV. RESOURCE USED

COMPONENTS	DESCRIPTION
Operating System	Windows 11
Programming Language	Python
Frameworks and Libraries	Resnet, Flask, TensorFlow
Frontend Technologies	HTML, CSS, Javascript
Software	Google Collab, Visual Studio

V. PROPOSED METHODOLOGY

System Architecture

The wildlife identification platform is built on a robust and scalable system architecture designed to deliver accurate and efficient species recognition. At its core, the platform leverages a microservices-based backend orchestrated within a containerized environment, ensuring optimal resource utilization, fault tolerance, and scalability. The image and video processing module, powered by the ResNet-50 deep learning model, forms the heart of the system, enabling precise species identification from user-uploaded media. The platform features intuitive web and mobile interfaces that allow users to upload images, capture real-time photos, or search for species information effortlessly. User inputs undergo data pre-processing (resizing, normalization, and augmentation) before being fed into the trained model for species classification. Results, along with detailed species information, are displayed on the platform's interface, providing a seamless user experience. The architecture also incorporates stringent security measures to protect user data and ensure privacy. By combining advanced AI technologies with user-friendly design, the platform bridges the gap between technology and conservation, empowering users to contribute to wildlife research and preservation efforts.

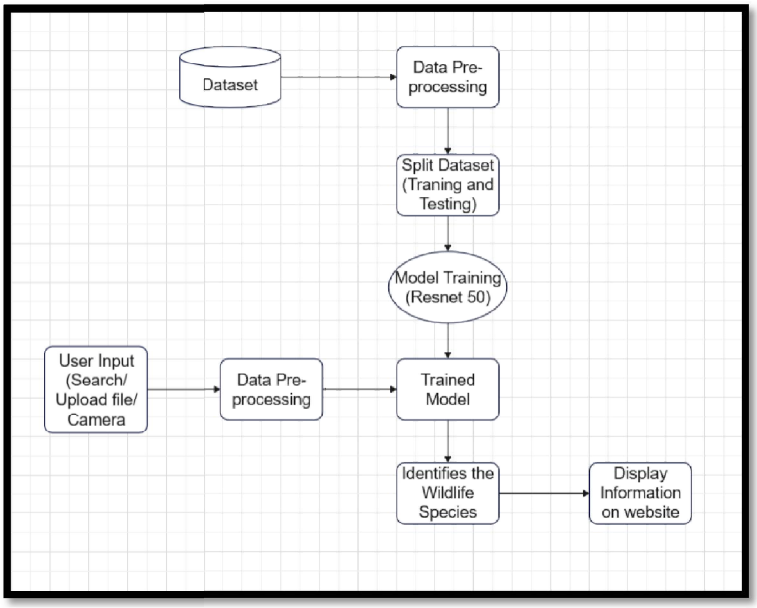

Figure 1 System Architecture of the project

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Dataset Collection

A large collection of labelled images of different wildlife species is gathered. These images serve as the foundation for training the machine learning model. The dataset must include a variety of species to ensure the model learns to differentiate between them accurately.

Data Pre-processing

Before training the model, the raw images from the dataset are pre-processed to make them suitable for input into the neural network. Common steps include:

- **Resizing** all images to a consistent size (e.g., 224x224 pixels).
- **Normalizing** pixel values to ensure consistent scale.
- **Label encoding** to convert species names into numerical form.
- **Augmentation** techniques (like rotation, flipping) to improve model generalization.

Splitting the Dataset

The dataset is split into two parts:

- **Training Set**: Used by the model to learn patterns.
- **Testing Set**: Used to evaluate how well the model performs on unseen data. This ensures the model is both trained and tested effectively.

Model Training (ResNet-50)

The core of the system is a **Convolutional Neural Network (CNN)** model called **ResNet-50**. It is a pre-trained deep learning model that is fine-tuned using the training dataset. During training, the model learns to identify key features in wildlife images and associate them with the correct species label.

Trained Model

After training, the ResNet-50 model becomes capable of recognizing different wildlife species. The trained model is saved and ready to be used in real-time prediction scenarios.

User Input

Users can interact with the system in three ways:

- **Upload** an image from their device.
- **Capture** an image using a camera.
- **Search** for an image using the website interface.

This allows flexible interaction and broad use across devices.

Data Pre-processing (User Input)

Just like the training images, the user's input image is also pre-processed to match the format the model expects. This ensures the model can analyze the new image accurately.

Wildlife Species Identification

The pre-processed image is passed into the **trained ResNet-50 model**, which predicts the most likely wildlife species based on learned features. The model's output is a class label (e.g., "Leopard" or "Peacock").

Display Information on Website

Once the species is identified, the system fetches relevant details (like habitat, behavior, diet, etc.) and displays it to the user on the website. This turns a simple prediction into an informative experience for the user.

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Design and Implementation

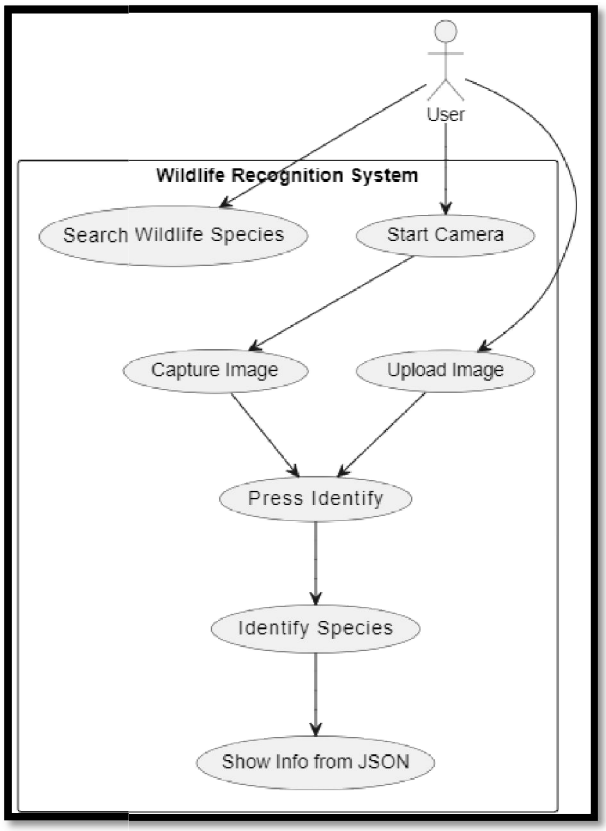

Figure 2 Activity Diagram

This activity as shown in Figure 2 will show the features of applications with activities such as:

- **User:** The user interacts with the system through a web or mobile interface.
- **Search Wildlife Species:** Users can search for specific species in the database.
- **Start Camera:** Users can activate their device camera to capture real-time images of wildlife.
- **Capture Image:** The system captures an image using the device camera.
- **Upload Image:** Users can upload an existing image from their device.
- **Press Identify:** After capturing or uploading an image, users initiate the species identification process.
- **Identify Species:** The system processes the image using the trained ResNet-50 model to identify the species.
- **Show Info:** The system retrieves detailed information about the identified species

Result of the proposed System

The proposed Wildlife Recognition System represents a ground-breaking advancement in wildlife recognition technology, revolutionizing how users interact with and understand the natural world. This system empowers users with a range of options, allowing them to seamlessly activate their device camera, upload images, or search for specific wildlife species—all with just a few clicks. When users press the "Identify" button, the system's sophisticated ResNet-50 model analyzes the provided data to accurately identify the species. The system retrieves detailed information about the identified species, including habitat preferences, behavioral traits, population dynamics, and ecological significance. By combining state-of-the-art technology with comprehensive wildlife insights, the system offers users an immersive journey into the intricate web of biodiversity, fostering greater understanding, admiration, and stewardship of our

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natural environment. This innovative approach reflects the core of your project, showcasing your contributions in developing a user-friendly, accurate, and impactful wildlife recognition platform.

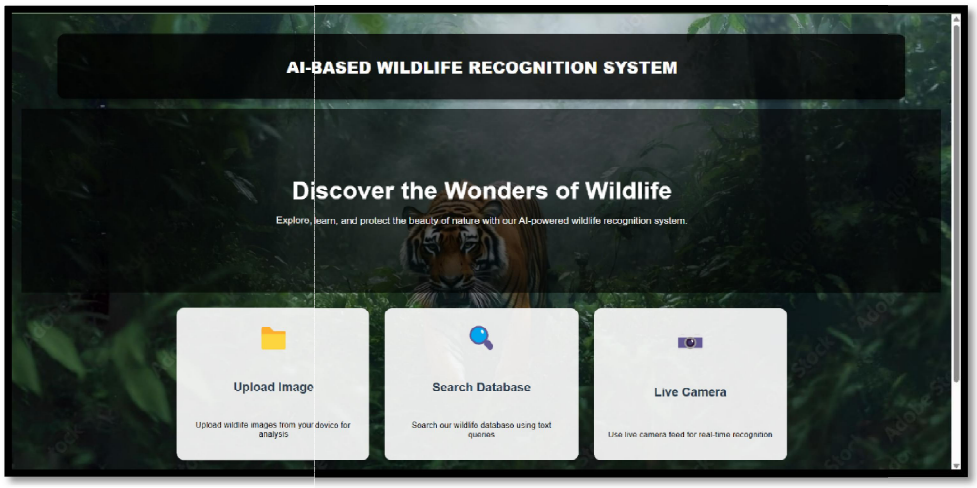
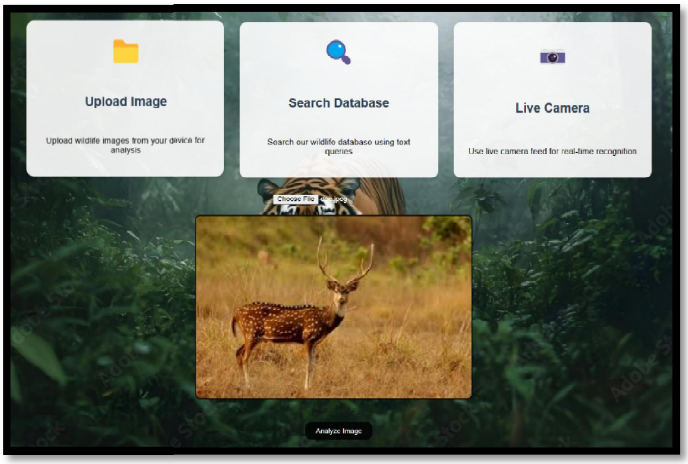


Figure 3 Home Page



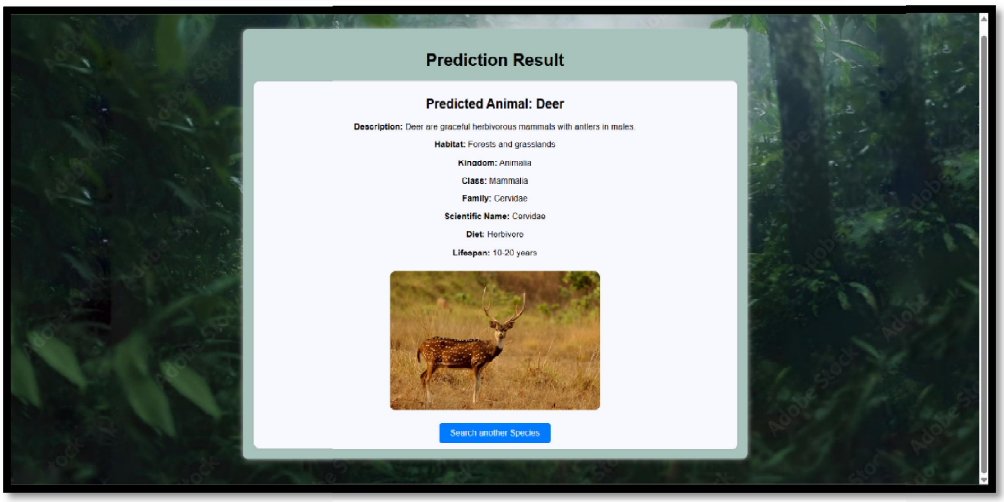


Figure 4,5 Output using Upload file option

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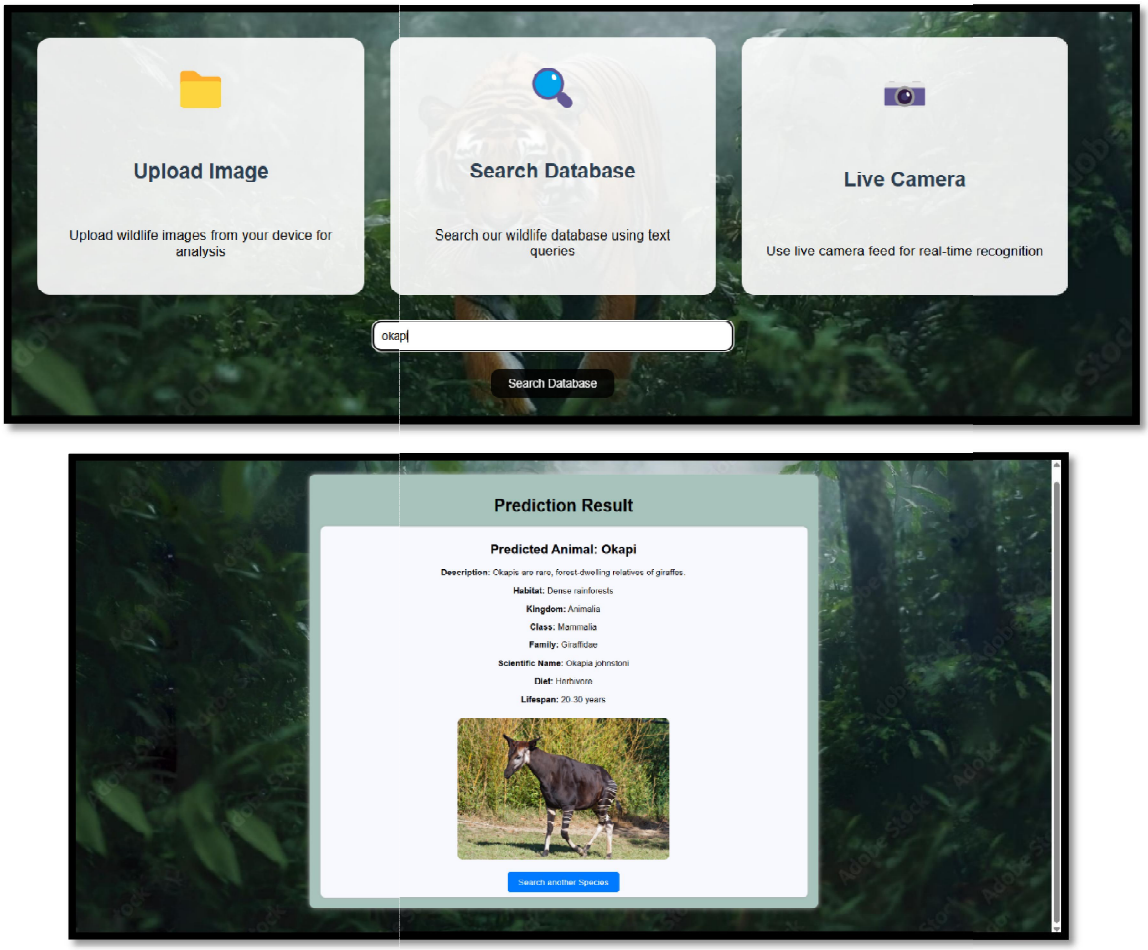
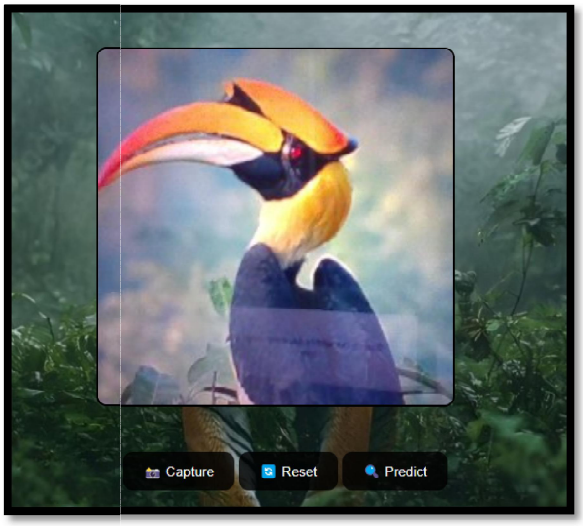


Figure 6,7 Output using Search bar option



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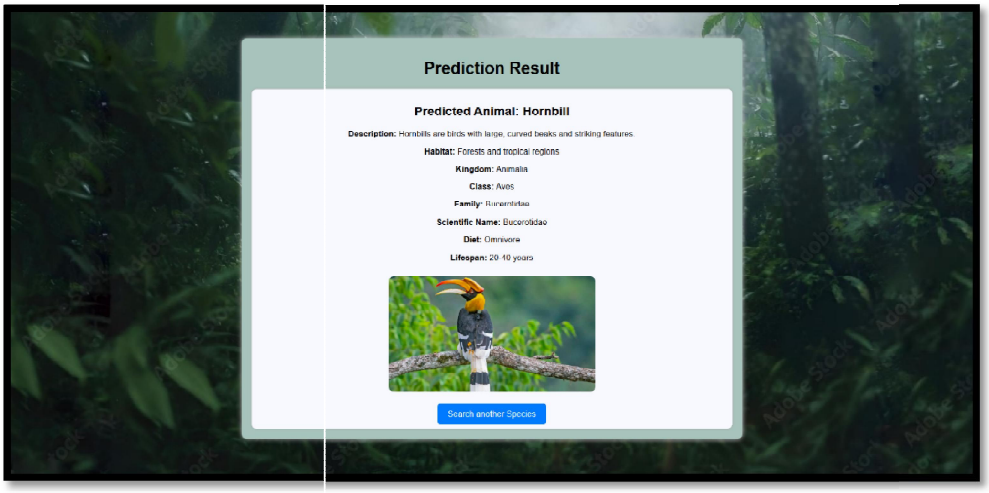

Figure 8,9 Output using Live Camera option

VI. FUTURE SCOPE

- **Real-Time Video Processing**: Extend the system to support real-time video analysis from camera traps or drones, enabling dynamic wildlife monitoring and behavior tracking.
- **Mobile and Offline Support:** Develop a lightweight version of the model for mobile devices, allowing users to identify species offline in remote areas with limited internet connectivity.
- **Expansion of Dataset**: Train the model on a more diverse dataset, including rare and endangered species, to improve accuracy and adaptability across different ecosystems.
- **Behavioural Analysis:** Integrate advanced AI techniques to analyze animal behavior (e.g., migration patterns, feeding habits), providing deeper insights for researchers and conservationists.
- **Community Engagement:** Add a crowdsourcing feature to allow users to contribute images and data, helping to expand the dataset and improve the model's performance over time.
- **Integration with Conservation Platforms:** Collaborate with existing wildlife conservation platforms to enable seamless data sharing and collaboration among researchers, NGOs, and government agencies.

VII. ACKNOWLEDGMENT

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REFERENCES

[1] Hao, X., Yang, G., Ye, Q., & Lin, D. (2019).*Rare Animal Image Recognition Based on Convolutional Neural Networks.* 12th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI). IEEE.
[2] Perera, T. A. S. A., & Collins, J. (2015).*Imaged Based Species Recognition System.* Ninth International Conference on Sensing Technology. IEEE.

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[3] Reddy, B. K., Kommineni, R., Bano, S., Reddy, G. G., & Reddy, P. Y. (2021).*Convolutional Network based Animal Recognition using YOLO and Darknet.* Sixth International Conference on Inventive Computation Technologies (ICICT). IEEE.

[4] Manohar N, Subrahmanya S, Bharathi R K, Sharath Kumar Y H, Hemantha Kumar G. (2016). "Recognition and Classification of Animals based on Texture Features through Parallel Computing." *2016 Second International Conference on Cognitive Computing and Information Processing (CCIP)*, IEEE