



AI-WILDNET: AN AUTOMATED SYSTEM FOR REAL-TIME WILDLIFE MONITORING AND EARLY WARNING AT ROAD CROSSING

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Abstract: Wildlife crossing the road represent a life-threatening and common problem in many countries worldwide. Traditionally, wildlife monitoring has relied on manual efforts, which can be time-consuming, costly and limited in scope. AI-powered solutions have significantly enhanced wildlife monitoring capabilities, enabling real-time data collection and analysis for more extensive coverage and greater accuracy. The aim of the project is to design and develop AI-powered camera traps can identify and classify species from Video frames making it easier to monitor wildlife and detect rare or endangered species while crossing the roads and sent reliable early warning alert to the ranger and roadways population. AI algorithms Temporal Convolutional Network(TCN) can distinguish between animals and non-target objects.

Keywords: AI-WildNet, Real Time Detection, Early Warning System, AI-Powered Camera Traps, Wildlife Road Crossings, Species Identification, Temporal Convolution Network(TCN), Convolutional Neural Network(CNN).

I. INTRODUCTION

Wild animals are animals that live in forests. These animals are not normally domesticated. The major wild animals of India are elephant, tiger, lion, deer, bear etc. Wild animals are very important in balancing the environment. They provide stability to different natural processes of nature. It can be found in all ecosystems, desert, rain forests, plains and other areas. In India, we can see various wild animals in the forest. Wild animals help to maintain the ecological balance of nature and maintain the food chain. We get useful substances and wild animal products like ivory, leather, honey, tusk etc from these animals. We should protect wild animals. Wildlife animals in India are both rich and varied. More than 5% of India's land is under forest cover- there are more than 100 national parks and 482 wildlife sanctuaries. The country is one of the 12 mega diversity areas in the world, in terms of animals. Some of the most prominent animals, which are part of wildlife in India, are the Indian elephants, Indian Royal Bengal Tiger, the Indian Rhino, and the Asiatic Lion. These animals are majestic in terms of both their size and their royal attitude. The elephants are majorly found in the North-Eastern hilly states of Assam and also in Meghalaya and Arunachal Pradesh. The elephants are also under the threat of extinction, and so they are protected. Apart from this, you can also see the royal Bengal tiger in the Sunderbans National Park, in Corbett, in Kanha, in Bandhavgarh and also in Ranthambhore. It is India's national animal. Along with these, the Asiatic lions also hold a place of prominence for the tourists. At Inside Indian Jungles you just get the best idea about where to get the finest glimpse of the wildlife. You can travel to the wildlife areas in jeeps and make your tour as individuals, or in groups or in a family package.

II. METHODOLOGY

1. Wildlife Defense Web Control Panel

- This module serves as the centralized interface for the entire system, providing essential tools for management and control.
- This module is designed and developed using Python, Flask, MySQL, and Bootstrap to provide an efficient and user-friendly interface for managing and controlling the wildlife monitoring and alert system.
- Admins can configure alert settings, including SMS notifications and audible alarms. The integration ensures seamless communication with the Alert Generator module.

2. End User Interface

2.1. Admin

- Facilitates login and dataset upload.
- Allows training of the WildNet Model.
- Enables the addition and management of forest rangers.

2.2. User

- Accepts input from images, live feeds, or videos.
- Executes predictions regarding animal presence.

3. WildNet Model: Build and Train

- **Import Dataset: Gathers relevant data for training.**
- **Preprocessing:** Conducts tasks such as resizing, grayscale conversion, noise filtering, binarization, and segmentation using RPN.
- **Feature Extraction:** Utilizes Convolution, Activation, and Pooling layers.
- **Classification:** Applies Fully Connected layers.
- **WildNet Model Building and Training:** Deploys Convolutional Neural Network (CNN) for training.
- **Deploy Model:** Integrates the trained model into the Wildlife Defense Web Control Panel.

4. Wild Animal Crossing Predictor

- Accepts input from various sources such as images, live feeds, or videos.
- Utilizes Temporal Convolutional Network (TCN) for accurate predictions.

5. Alert Generator

- **SMS Alert:** Sends real-time alerts via SMS.
- **Alarm:** Raises audible alarms in response to potential threats.
- **Species Image Forwarder:** Forwards images of detected species for further analysis.

III. SYSTEM ARCHITECTURE

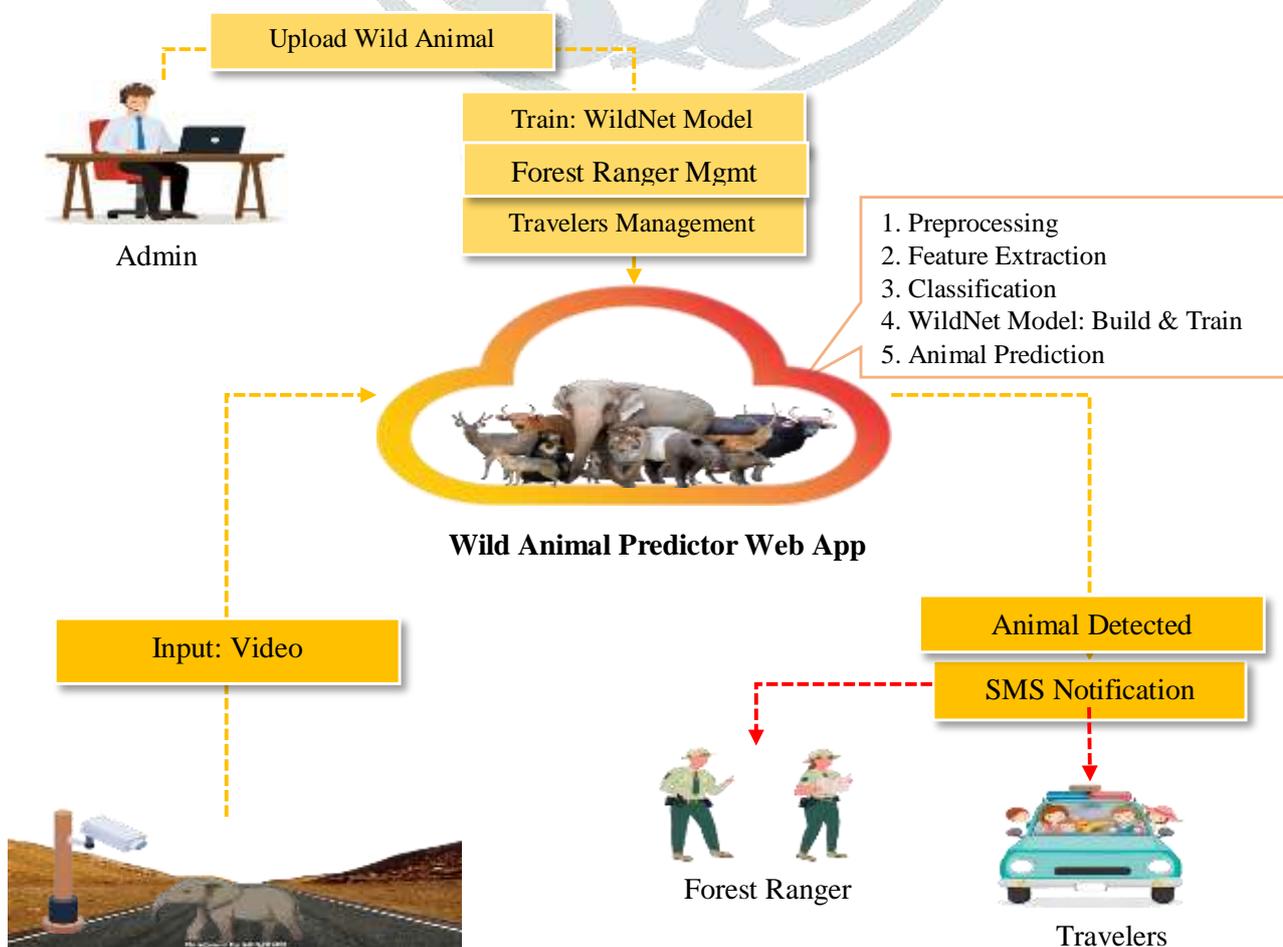


Figure.1. System Architecture

IV. RESULT AND DISCUSSION

1. Result

The AI-powered camera trap system successfully identifies and classifies wildlife species from video frames, significantly improving wildlife monitoring efficiency and accuracy. By using the WildNet Model for classification and Temporal Convolutional Neural Networks for animal identification, the system reduces false positives and ensures real-time, reliable alerts to both rangers and road users. This proactive approach enhances wildlife conservation efforts and public safety by detecting rare or endangered species and preventing wildlife-related accidents.

2. Discussion

The AI-powered camera trap system provides a significant advancement in wildlife monitoring by automating species identification and classification, reducing reliance on manual efforts. By utilizing transfer learning techniques and Temporal Convolutional Neural Networks, the system effectively minimizes false positives and enhances real-time detection accuracy, improving safety for both wildlife and road users. This approach not only contributes to the conservation of endangered species but also offers a scalable, efficient solution for monitoring wildlife crossings on a larger scale, benefiting both ecosystems and communities.

V. CONCLUSION

In conclusion, the AI-WildNet project represents a significant advancement in wildlife monitoring and early warning systems, leveraging cutting-edge artificial intelligence technologies to address the challenges of wildlife crossings. Through the development and implementation of the AI-powered camera traps and the WildNet model, the project has demonstrated remarkable success in enhancing the efficiency, accuracy, and real-time capabilities of wildlife monitoring at road crossings. The project's objectives, including the design and development of the AI-powered camera traps, the WildNet model for species identification, and the early warning system, have been successfully achieved. The system's ability to detect, classify, and predict wildlife activities in real-time has been validated through rigorous testing and evaluation. The results and discussions highlight the tangible benefits of the AI-WildNet system, including its contribution to reducing wildlife-vehicle collisions, enhancing road safety, and informing conservation efforts. The system's scalability, adaptability, and cost-effectiveness have been demonstrated, paving the way for broader implementation and adoption in diverse regions worldwide. Furthermore, the project has fostered public awareness and engagement, empowering users, travelers, and tourists to actively participate in wildlife conservation efforts. The collaborative approach between stakeholders, including administrators, users, forest rangers, and the public, has been instrumental in the success of the AI-WildNet system. Looking ahead, the project opens up avenues for further research and development, including continuous optimization of the system, exploration of advanced AI algorithms, and integration with emerging technologies for enhanced performance and sustainability. Ethical considerations remain paramount, and efforts to ensure responsible data usage and privacy protection will continue to be prioritized. In conclusion, the AI-WildNet project represents a pioneering initiative in leveraging artificial intelligence for wildlife conservation and road safety. With its successful implementation and demonstrated impact, the project sets a precedent for future endeavors in leveraging technology for the protection of wildlife and the environment.

VI. REFERENCE

1. S. Giordano, I. Seitanidis, M. Ojo, D. Adami, and F. Vignoli, "IoT solutions for crop protection against wild animal attacks," in Proc. IEEE Int. Conf. Environ. Eng. (EE), Mar. 2018, pp. 1-5.
2. J. H. Muribø, "Locating sheep with YOLOv3," M.S. thesis, Fac. Inf. Technol. Elect. Eng., Dept. Comput. Sci., NTNU, Trondheim, Norway, 2019.
3. R. Y. Aburasain, E. A. Edirisinghe, and A. Albatay, "Drone-based cattle detection using deep neural networks," in Intelligent Systems and Applications, K. Arai, S. Kapoor, and R. Bhatia, Eds. Cham, Switzerland: Springer, 2021, pp. 598-611.
4. E. S. Kalhagen and Ø. L. Olsen, "Hierarchical species detection in real-time video using YOLO," M.S thesis, Fac. Eng. Sci., Dept. Inf Commun. Technol., Univ. Agder, Kristiansand, Norway, 2020.
5. A. Roihan, M. Hasanudin, and E. Sunandar, "Evaluation methods of bird repellent devices in optimizing crop production in agriculture," J. Phys. Conf. Ser., vol. 1477, Mar. 2020, Art. no. 032012.
6. K. Garg, K. Verma, K. Patidar, and N. Tejra, "Convolutional neural network based virtual exam controller," in 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS). IEEE, 2020, pp. 895–899.
7. ProctoredU, "Conduct credible online tests anywhere, anytime." <https://www.proctoredU.com/>, accessed October 04, 2020.
8. Comprobo, "Online automated invigilation or proctoring," <https://comprobo.co.uk>, accessed October 04, 2020.
9. M. Ghizlane, B. Hicham and F. H. Reda, "A New Model of Automatic and Continuous Online Exam Monitoring", 2019 Int. Conf. Syst. Collab. Big Data Internet Things & Secur., pp. 1-5, 2019.
10. H. S. G. Asep and Y. Bandung, "A Design of Continuous User Verification for Online Exam Proctoring on M-Learning", Proc. Int. Conf. Electr. Eng. Informatics, vol. 2019-July, no. July, pp. 284-289, 2019.