ANIMALX- A Wildlife Conservation

A Project Report

Submitted by:

GIRISH SHARMA (2241019404)

KANAV SHARMA (2241019406)

ANKITA SHARMA (2241019399)

PRATHAM SHARMA (2241019409)

in partial fulfillment for the award of the degree

of

BACHELOR OF TECHONOLOGY

IN

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY
Faculty of Engineering and Technology, Institute of Technical Education and Research
SIKSHA 'O' ANUSANDHAN (DEEMED TO BE) UNIVERSITY
Bhubaneswar, Odisha, India

(June 2024)

ANNEXURE-2

CERTIFICATE

This is to certify that the project report titled "**ANIMALX- A Wildlife Conservation**" being submitted by **(Girish Sharma, Kanav Sharma, Pratham Sharma, Ankita Sharna) O SECTION- 20** to the Institute of Technical Education and Research, Siksha 'O' Anusandhan (Deemed to be) University, Bhubaneswar for the partial fulfillment for the degree of Bachelor of Technology in Computer Science and Information Technology is a record of original confide work carried out by them under my supervision and guidance. The project work, in my opinion, has reached the requisite standard fulfilling the requirements for the degree of Bachelor of Technology.

The results contained in this report have not been submitted in part or full to any other University

or Institute for the award of any degree or diploma.

SUBHADIP BORAL

Department of Computer Science and Information Technology

Faculty of Engineering and Technology;
Institute of Technical Education and Research;
Siksha 'O' Anusandhan (Deemed to be) University

ANNEXURE-3

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to **Subhadip Boral Sir**, our faculty for this subject, for his continuous guidance, encouragement, and valuable suggestions throughout the development of this project. His insightful feedback and support helped us understand the concepts better and successfully complete this work.

We also extend our heartfelt thanks to **Google Teachable Machine** for providing an efficient and user-friendly platform for developing and integrating the machine learning model used in this project. The APIs and tools offered by Google played a significant role in implementing the AI-based animal identification feature.

We are grateful to our **university and department** for providing the necessary infrastructure, technical resources, and a supportive learning environment that enabled us to work effectively on this project.

Place: ITER, Bhubaneswar, Odisha **Signature of students**

Date: 24/01/2026

ANNEXURE-4

DECLARATION

We declare that this written submission represents our ideas in our own words and where other's ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/fact/source in our submission. We understand that any violation of the above will cause for disciplinary action by the University and can also evoke penal action from the sources which have not been properly cited or from whom proper permission has not been taken when needed.

Girish Sharma:

Kanav Sharma:

Ankita Sharma:

Pratham Sharma:

Signature of Students with Registration Numbers

Date:

ANNEXURE-5

REPORT APPROVAL

This project report entitled "**ANIMALX- A Wildlife Conservation**" by **(Girish Sharma, Kanav Sharma, Pratham Sharma, Ankita Sharna)** is approved for the degree of Bachelor of Technology in Computer Science & Information Technology.

Examiners

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Abstract

Wildlife conservation plays a crucial role in preserving ecological balance and protecting endangered species. Traditional methods of animal monitoring and reporting often lack automation, real-time interaction, and accuracy. To address these challenges, this project presents **AnimalX – The Future of Wildlife Conservation**, a web-based platform that combines modern web technologies with artificial intelligence to support wildlife tracking, incident reporting, and species identification.

The main objective of this project is to develop a centralized system that enables efficient monitoring of animals, reporting of health-related incidents, and AI-based identification of species. The platform follows a full-stack architecture, with the frontend developed using **React.js, HTML, CSS, and JavaScript**, and the backend implemented using **Node.js and Express.js**. **PostgreSQL** is used as the database to store animal records, reported incidents, and detection history in a structured manner.

A key feature of AnimalX is the integration of an **AI-powered species identification module** using **Google's Teachable Machine**. Users can identify animals through live webcam input or by uploading images. To ensure reliable results and reduce false detections, a confidence threshold mechanism is applied so that only high-confidence predictions are identified and logged. The system also includes a Safari Animal Tracker for categorized animal visualization, a Health Incident Reporting module, and a Detection History module for maintaining past identification records.

The project demonstrates that AnimalX provides an effective, user-friendly, and scalable solution for wildlife monitoring and conservation. By integrating artificial intelligence with web-based technologies, the system enhances accuracy, data management, and real-time interaction, thereby supporting improved decision-making in wildlife conservation efforts.

	COURSE OUTCOME
CO1	Apply the acquired technical knowledge and skills to plan, analyze, design, and implement a software project or gather knowledge over the chosen field of research, and design or model solutions to proposed work.
CO2	Apply standard practices and strategies in software project development in designing and implementing a working, medium sized project as a team through simulation and/or experimental studies using modern tools and techniques.
CO3	Identify, analyze, formulate, and solve real-world problems creatively through sustainable critical investigation.
CO4	Demonstrate the ability to work as a team and communicate effectively in speech and writing through presentations and project reports.
CO5	Acquire the skills, diligence, and commitment to excellence needed to engage in lifelong learning.
CO6	Demonstrate an awareness and application of appropriate personal, societal, technical, and professional ethical standards in project development and management.

	Program Outcomes (PO) and Program Specific Outcomes (PSO)
POs	**Description**
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and anengineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societaland environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practice.
PO9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams,and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent andlife-long learning in the broadest context of technological change.
PSO1	**Modelling and Analysis:** An ability to mathematically model and analyze the performance of ElectricalMachines, Control systems, Instrumentation systems, Power systems and Power Electronic systems.
PSO2	**Design and Development:** An ability to design the hardware and software requirements for the developmentof Electric drives Automation and Embedded systems.

ANNEXURE-6

* includes full content from Project Synopsis as per the format given separately.

Table of Contents

CHAPTER 1

1.1 Introduction

Wildlife conservation has become increasingly important due to habitat loss, climate change, and human interference. Efficient monitoring, reporting, and identification of wildlife are essential for protecting biodiversity and ensuring sustainable ecosystems. With advancements in web technologies and artificial intelligence, it is now possible to develop intelligent systems that assist in wildlife management and conservation.

AnimalX – The Future of Wildlife Conservation is a web-based platform designed to track animals, report health-related incidents, identify species using AI, and maintain detection history. The project integrates modern full-stack web development with machine learning models to provide a unified and interactive wildlife conservation solution.

1.1.1 Background

Traditional wildlife monitoring systems largely depend on manual surveys, camera traps, and field observations, which are time-consuming and prone to errors. Reporting injured or sick animals often lacks a centralized digital system, leading to delayed responses. Additionally, species identification requires expert knowledge, making it inaccessible to common users.

With the emergence of AI-based image classification and real-time web applications, automated wildlife tracking and identification systems have become feasible. Platforms like Google Teachable Machine enable non-experts to build image recognition models, making AI adoption easier and more practical.

1.1.2 Literature Review / Related Work

Several existing systems focus on specific aspects of wildlife conservation, such as GPS-based animal tracking, camera trap analysis, or mobile reporting applications. However, most solutions operate independently and lack integration between tracking, reporting, and identification.

Recent studies highlight the effectiveness of convolutional neural networks (CNNs) in animal classification tasks. Web-based dashboards using React and Node.js have also proven efficient

for real-time data visualization. Despite these advancements, there is limited availability of platforms that combine AI-powered identification, incident reporting, and centralized wildlife data management into a single system.

Web-based dashboards developed using React and Node.js have proven efficient for real-time data visualization and user interaction. Google Teachable Machine provides a simplified approach to image classification without requiring deep machine learning expertise. Despite these advancements, an integrated platform combining tracking, reporting, AI identification, and data storage is still limited. AnimalX aims to improve upon existing solutions by combining these features into one unified system.

1.1.3 Problem Definition / Objectives of the Work

Problem Definition

- Absence of a centralized wildlife monitoring platform
- Manual and delayed reporting of animal health incidents
- Difficulty in species identification for non-experts
- Lack of historical tracking and categorized wildlife data

Objectives

- To design and develop a full-stack web-based wildlife conservation system
- To implement AI-based animal and plant species identification
- To enable real-time reporting of injured or sick animals
- To maintain categorized animal records and detection history
- To improve accuracy using confidence-based AI predictions

Evaluation Parameters

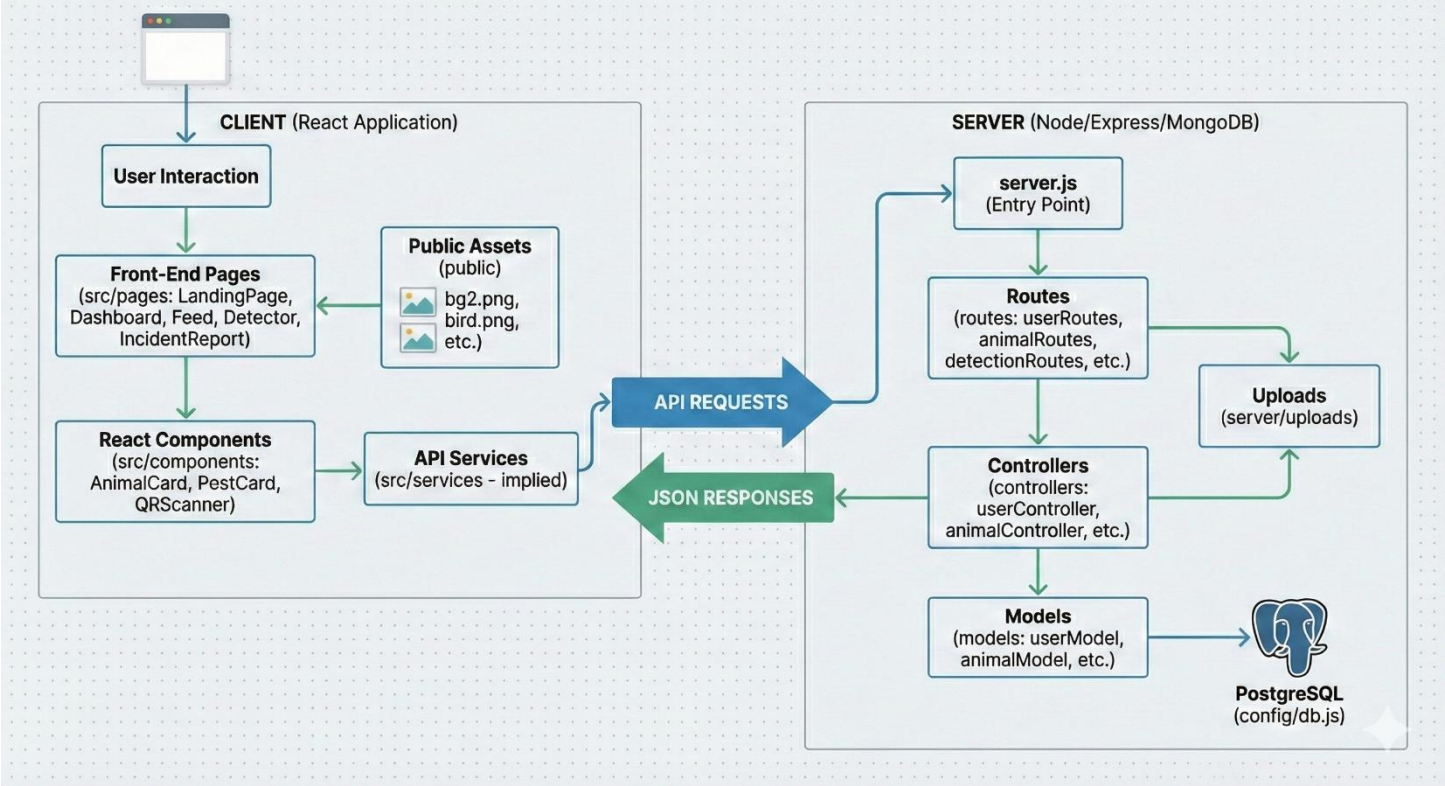
- Accuracy of AI-based identification
- System usability and responsiveness
- Reliability of data storage and retrieval
- Scalability and modularity of the system

1.1.4 Work Plan

The project was executed in the following phases:

1. Requirement analysis and system planning
2. UI/UX design and frontend development
3. Backend API development and database integration
4. AI model training using Google Teachable Machine
5. Integration of AI detection with the web application
6. Testing, debugging, and performance evaluation
7. Documentation and final deployment

Workflow And Layout



CHAPTER 2

DESIGN OF SOFTWARE**

2.1 Alternative Ideas

The following alternative ideas were considered:

1. **Manual Wildlife Reporting System**
   A simple form-based system for reporting animal sightings and incidents without AI support.
2. **Standalone AI Detection System**
   An AI-only system for species identification without backend data storage or reporting features.
3. **Mobile Application-Based System**
   A mobile-only platform with limited backend integration.

Each idea was analysed based on usability, scalability, cost, and effectiveness.

After evaluation, a **full-stack web-based AI-integrated platform** was selected as it offers scalability, accessibility, and centralized data management.

2.2 Design and Comparison Criteria

The system design was evaluated based on:

- Usability and user experience
- Scalability and modularity
- Accuracy of AI-based detection
- Database efficiency and data consistency
- Ease of maintenance and future expansion

2.3 Evaluation and Selection of Best Design

The selected architecture uses:

- **React.js** for dynamic and responsive frontend
- **Node.js with Express.js** for backend APIs
- **PostgreSQL** for relational data storage

- **Google Teachable Machine** for AI-based image classification

This design ensures separation of concerns, better performance, and ease of integration.

2.4 Detailed System Design

AnimalX follows a client-server architecture.

Steps Involved

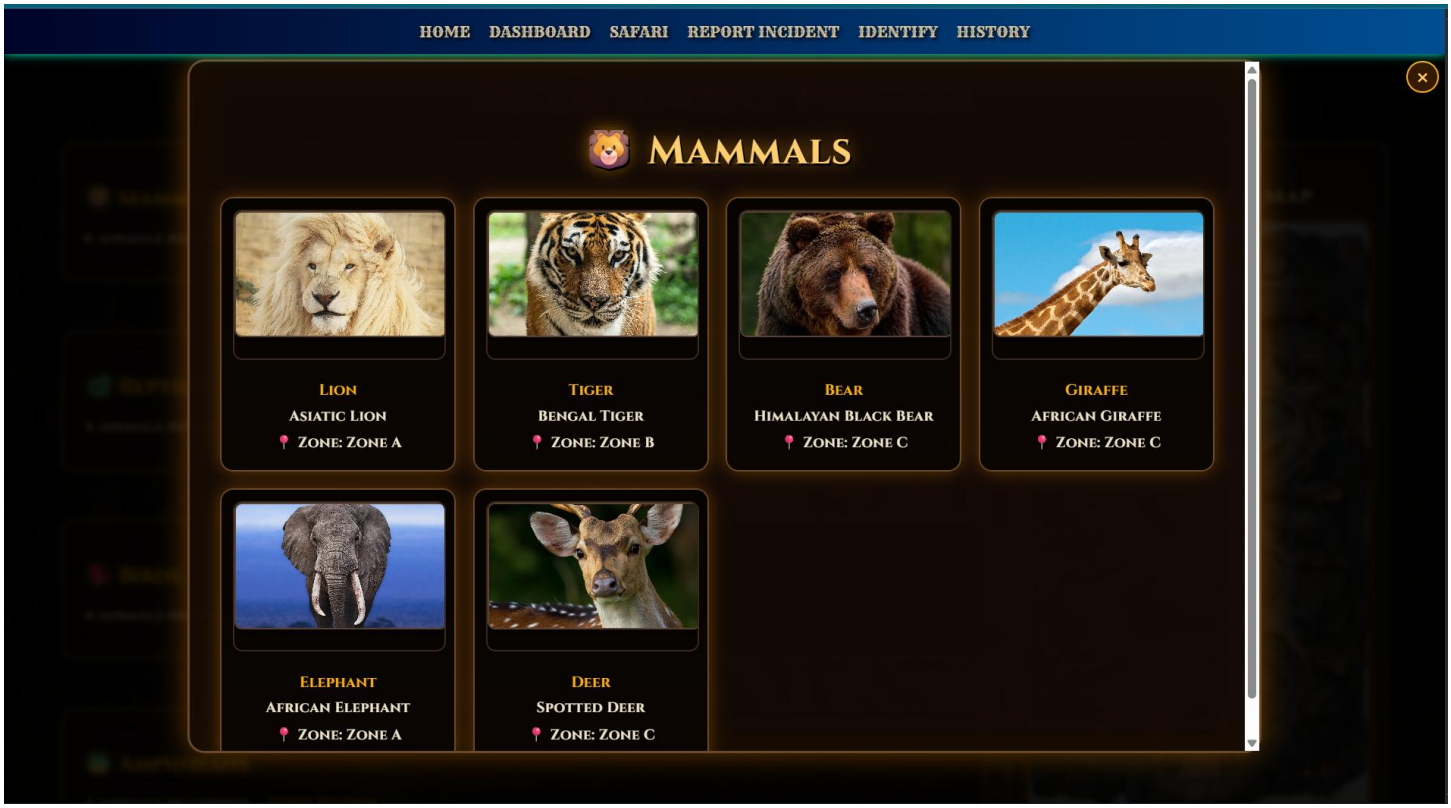
1. User interacts with the frontend (React.js)
2. Requests are sent to backend APIs (Node.js + Express.js)
3. Backend communicates with PostgreSQL database
4. AI model processes image input for species identification
5. Results are displayed and logged based on confidence threshold

Major Modules

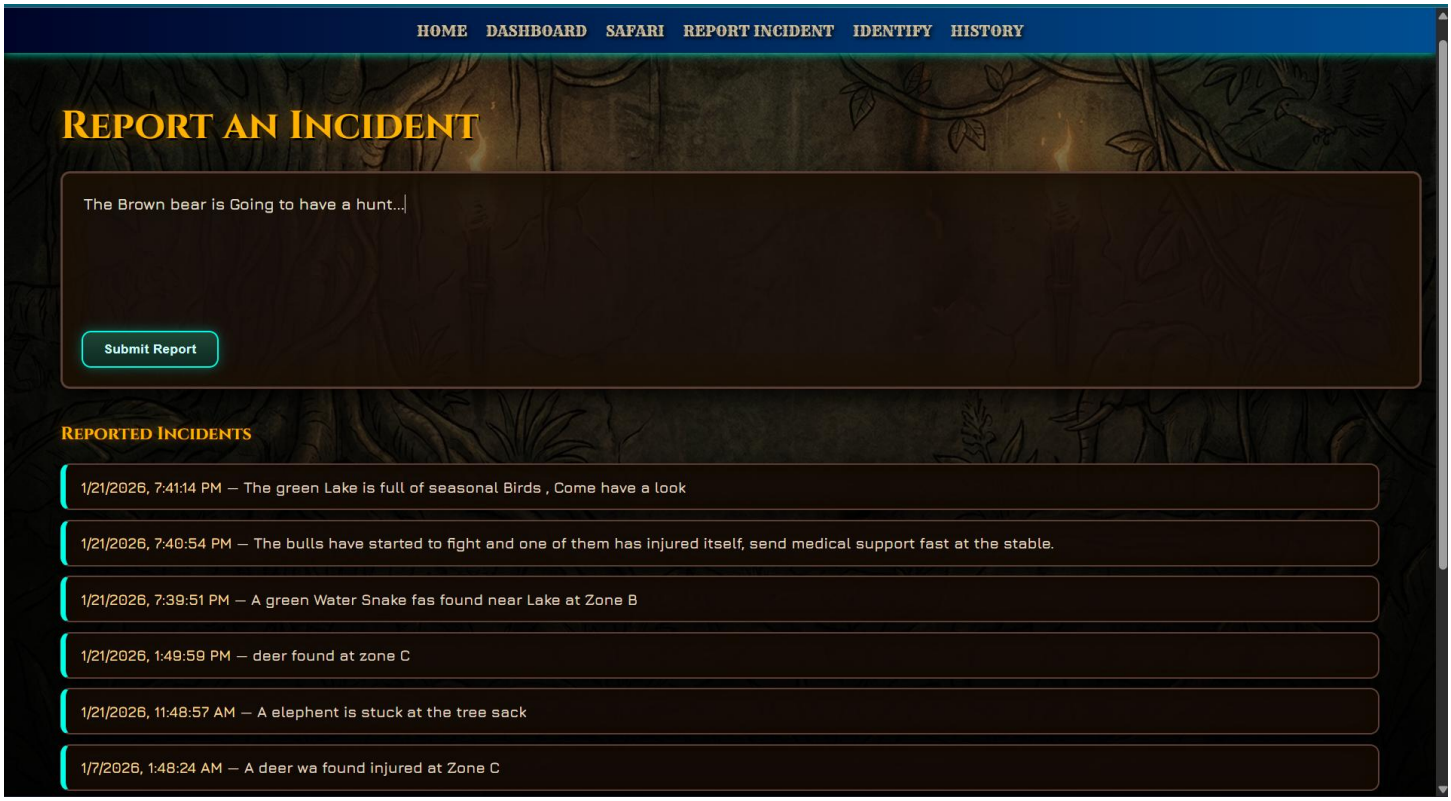
- Safari Animal Tracker
- Health Incident Reporting
- AI Detection (Camera + Upload)
- Detection History

Front Page UI-X With Integrated DASHBOARD

The Safari Page, With All the details of available animals.



The Report Age with all the current animal and other Updates



2.4.2 Module Description

Safari Animal Tracker

Displays animals categorized into mammals, reptiles, birds, amphibians, and protected flora using visual cards and a conservation map.

Health Incident Reporting

Allows users to report injured or sick animals with timestamps, enabling quick response by authorities.

AI Detection Module

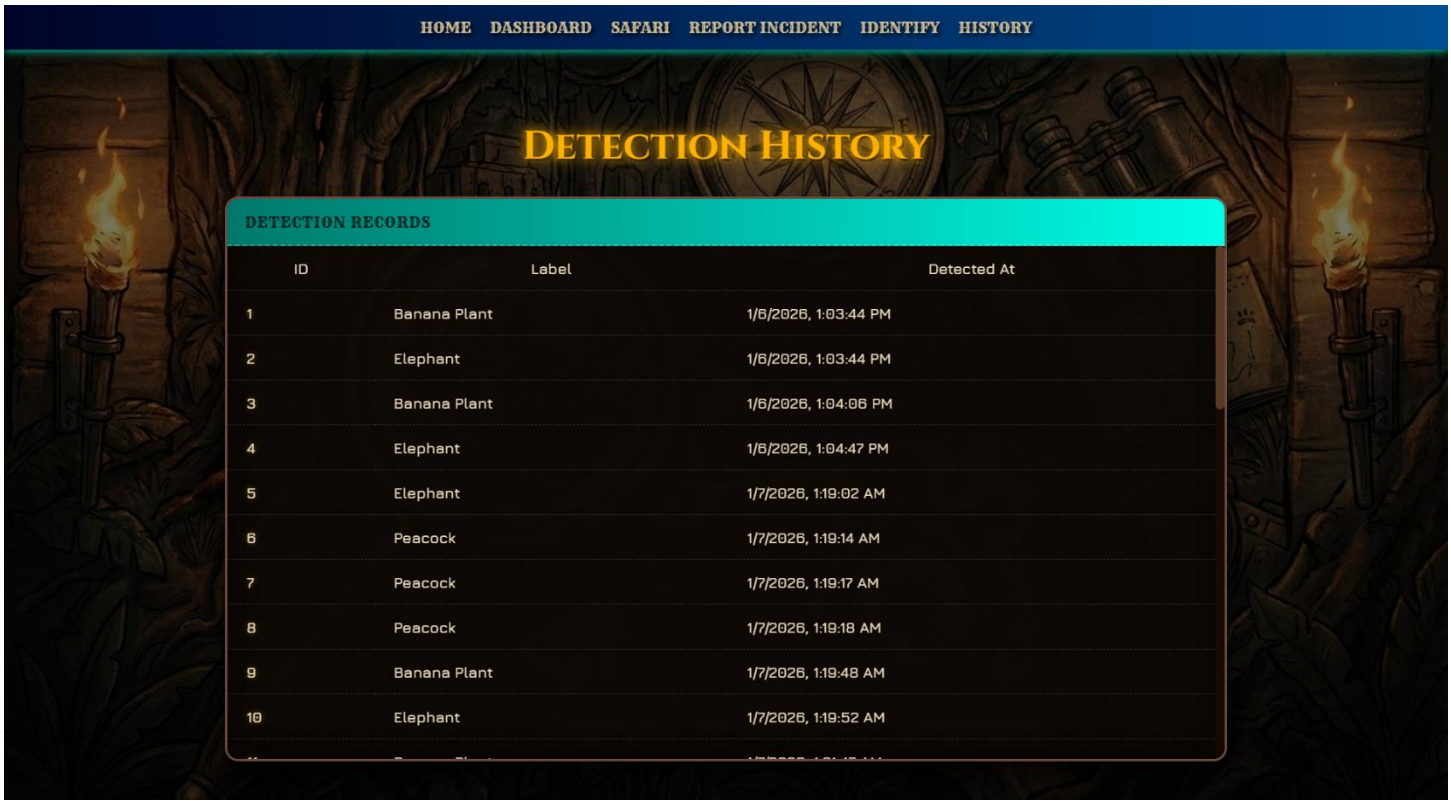
Uses webcam or image upload to identify animals and plants using a trained machine learning model.

Detection History

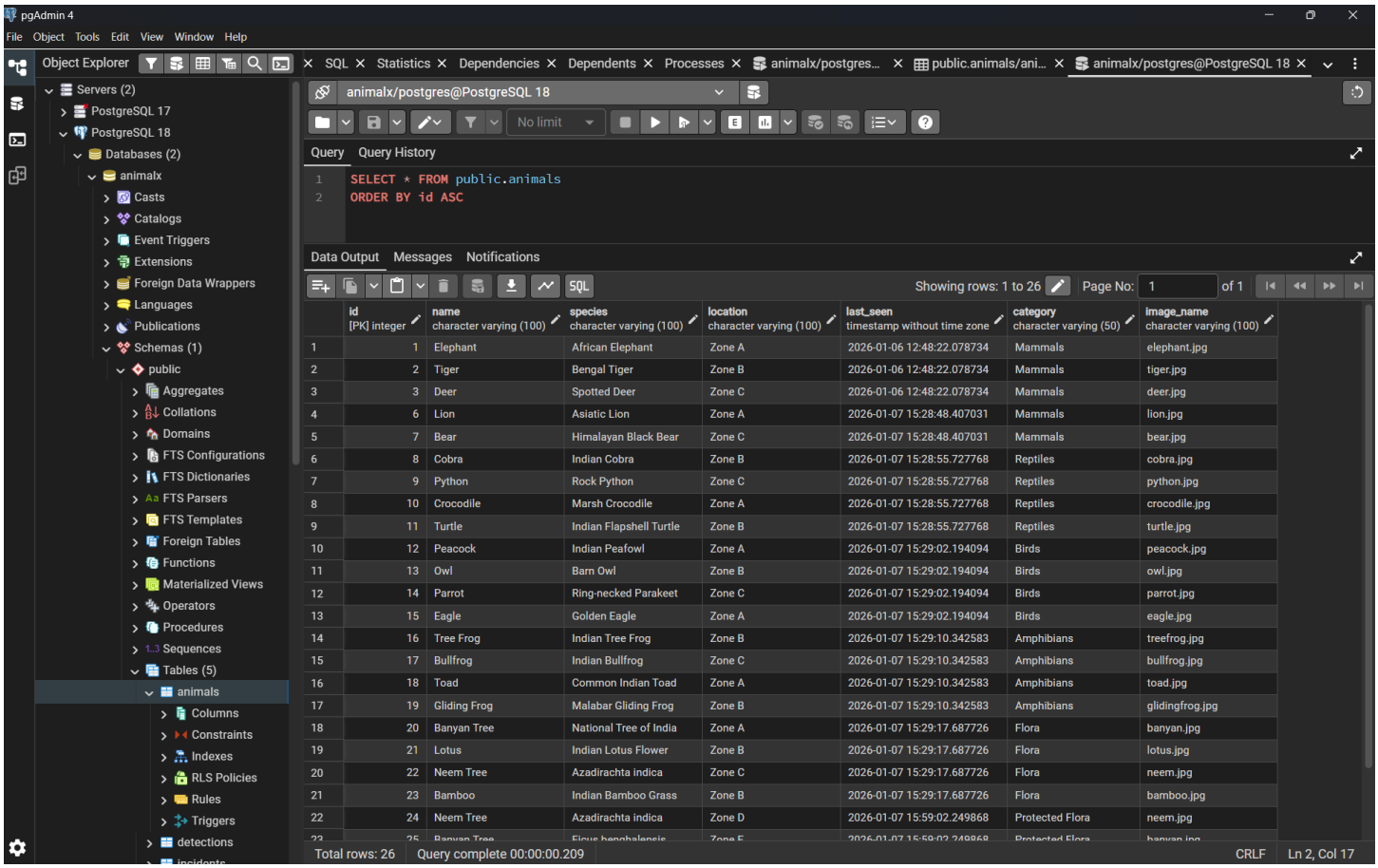
Stores and displays past detections with date and time for tracking and analysis.

Animal Identification Page, Can Be Operated Using Camera Also.

Animal Detection History Page.



Animal Database Page, Referred Postgres SQL



CHAPTER 3

RESULTS AND DISCUSSION**

- **Overall System Performance:**
AnimalX successfully delivers all its intended functionalities through a stable and well-integrated software system.

- **Safari Animal Tracker:**
The Safari Tracker accurately displays categorized animal data retrieved from the database, providing a clear and interactive representation of wildlife information.

- **AI Detection Module:**
The AI-based detection module identifies animal species using image input with high accuracy. To improve reliability, detections are logged only when the confidence level exceeds a predefined threshold, reducing false identifications.

- **Health Incident Reporting:**
The Health Incident Reporting module enables real-time submission and retrieval of reports related to injured or sick animals, supporting timely monitoring and response.

- **Detection History:**
Detection history maintains accurate, timestamped logs of confirmed detections, allowing systematic tracking and future reference.

- **Environmental Impact:**
AnimalX supports wildlife conservation by enabling early detection of wildlife issues, reducing human–wildlife conflict, and promoting data-driven decision-making.

- **Reduced Human Disturbance:**
By minimizing dependence on manual field surveys, the system helps reduce human interference in natural habitats.

- **Overall Outcome:**
The results indicate that AnimalX is an efficient, user-friendly, and environmentally beneficial software solution. The integration of artificial intelligence with modern web technologies enhances accuracy, accessibility, and sustainability in wildlife conservation practices.

Features Covered

- Software functionality
- Working methodology
- Capability and performance
- Applicability in real-world conservation

CHAPTER 4

CONCLUSIONS AND FUTURE SCOPE**

4.1 Conclusions

The objectives of the project were successfully achieved. AnimalX provides a centralized, AI-enabled wildlife conservation platform that improves monitoring, reporting, and species identification. The system effectively integrates frontend, backend, database, and AI components.

Objective Mapping

- Centralized tracking → Safari Tracker
- Incident reporting → Report Incident Module
- Species identification → AI Detection Module
- Historical data → Detection History

4.2 Future Scope

- Integration of GPS-based live animal tracking
- Development of a mobile application
- Advanced AI models for higher accuracy
- Role-based access for authorities
- Cloud deployment for large-scale usage

APPENDICES

Appendix 1: System Architecture and Workflow Diagrams

This appendix contains detailed diagrams illustrating the overall system architecture of AnimalX, including the client–server interaction, API workflow, database integration, and AI detection pipeline.

Appendix 2: Database Schema and Table Structures

This appendix includes the schema design of the PostgreSQL database used in the project, detailing tables such as animals, detections, incidents, users, and rewards along with their relationships.

Appendix 3: Key Source Code Snapshots

Relevant source code excerpts from the frontend (React.js) and backend (Node.js & Express.js) are provided to demonstrate implementation of major modules such as Safari Tracker, AI Detection, Incident Reporting, and Detection History.

Appendix 4: User Interface Screenshots

This appendix presents screenshots of important application screens including the Dashboard, Safari Animal Tracker, AI Detection (Camera & Upload), Incident Reporting, and Detection History modules.

Appendix 5: Similarity Report

The **similarity report of the project**, generated using **Turnitin similarity measurement software** (available at the Central Library), is included here.
The similarity index of the project report is **below 16%**, which is within the permissible limit as per university norms.

REFERENCES

[1] Brambilla, M., Pellin, A., & Rizzoli, A. (2021). *AI-based wildlife monitoring and conservation: A review*. Journal of Environmental Informatics, 37(2), 85–98.

[2] Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press, Cambridge, MA.

[3] Google. (2023). *Teachable Machine: Train machine learning models for everyone*. Retrieved from https://teachablemachine.withgoogle.com

[4] Brown, T., Mann, B., Ryder, N., et al. (2020). *Artificial intelligence for image classification and recognition*. IEEE Transactions on Pattern Analysis and Machine Intelligence, 42(7), 1734–1749.

[5] PostgreSQL Global Development Group. (2024). *PostgreSQL Documentation*. Retrieved from https://www.postgresql.org/docs/

[6] Tilkov, S., & Vinoski, S. (2010). *Node.js: Using JavaScript to build high-performance network programs*. IEEE Internet Computing, 14(6), 80–83.

[7] Facebook Open Source. (2023). *React – A JavaScript library for building user interfaces*. Retrieved from https://reactjs.org

[8] Fielding, R. T. (2000). *Architectural styles and the design of network-based software architectures*. Doctoral dissertation, University of California, Irvine.

[9] Kays, R., Crofoot, M. C., Jetz, W., & Wikelski, M. (2015). *Terrestrial animal tracking as an eye on life*. Science, 348(6240), aaa2478.