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Smartlofo: Ai Powered Lost And Found Platform

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Abstract- — In the digital era, managing lost and found items efficiently remains a challenge due to reliance on manual methods and unstructured reporting systems. Traditional approaches such as notice boards and text- based communication often result in disorganized data, delayed responses, and low matching accuracy. These limitations highlight the need for an intelligent and automated solution. This paper presents SMARTLOFO: AI Powered Lost and Found Platform, a full- stack web application designed to streamline the process of reporting, tracking, and retrieving lost items. The system is developed using React for the frontend and a Python-based FastAPI backend, with MongoDB/SQLite for data storage. It provides a user-friendly interface along with secure authentication using JWT and bcrypt. A key contribution of the system is the integration of an AI-powered smart matching algorithm. Using Google Gemini, the system performs image analysis to extract item descriptions, categories, and features. These attributes are processed using a scoring-based matching mechanism that evaluates similarity based on category, extracted features, location, and time proximity. Matches exceeding a defined threshold are automatically identified, and users are notified via an email notification system. The platform is deployed on a cloud environment, enabling real-time interaction and accessibility. Despite its advantages, the system depends on user participation and input accuracy. Future enhancements include improving scalability and incorporating advanced machine learning models. Overall, SMARTLOFO demonstrates an intelligent and scalable approach to modernizing lost-and-found systems using artificial intelligence and full-stack technologies.

Keywords: SMARTLOFO, Lost and Found System, Artificial Intelligence (AI), Smart Matching Algorithm, Image Analysis, Google Gemini, Full-Stack Web Application, React, FastAPI, MongoDB, SQLite, JWT Authentication, Bcrypt Security, Cloud Deployment, Email Notification System, Automated Matching, Data Processing, User Interface, Scalability.

I. INTRODUCTION

The rapid advancement of digital technologies has transformed the way information is managed and shared. However, lost-and-found management within institutions still relies on inefficient manual processes such as notice boards and informal communication. These methods often lead to disorganized records, delayed responses, and reduced chances of recovering lost items.

To address these challenges, SMARTLOFO: AI Powered Lost and Found Platform is proposed as an intelligent digital solution. The system aims to simplify the process of reporting, tracking, and retrieving lost and found items through a structured and user-friendly web application. By leveraging modern full-stack technologies, the platform improves accessibility and data organization.

A major challenge in lost-and-found systems is accurately matching lost items with found ones, especially when user-provided details are incomplete. To overcome this, the system integrates an AI- powered smart matching algorithm. Using Google Gemini, the system performs image-based analysis to extract key features and descriptions from uploaded images. These features are then processed using a weighted scoring mechanism that evaluates similarity based on multiple attributes, including category, features, location, and time. This approach ensures more accurate and efficient matching compared to traditional keyword-based methods.

The system is built using React for the frontend and FastAPI for the backend, with MongoDB/SQLite for data storage. It also incorporates secure authentication and real- time communication through RESTful APIs.

This paper presents the design and implementation of SMARTLOFO, demonstrating how artificial intelligence and modern web technologies can significantly improve lost-and-found management systems.

II. LITERATUREREVIEW

With the growth of digital technologies, web-based systems have become essential for efficient data management and communication. However, lost-and-found management systems within institutions still rely on traditional approaches such as manual registers and notice boards, which are inefficient and prone to errors. These methods often result in poor organization and low success rates in recovering lost items.

Existing digital solutions attempt to improve this process by allowing users to report lost or found items through online platforms. However, most of these systems rely on keyword-based searches and manual filtering, which limits their effectiveness when user input is incomplete or inconsistent. As a result, matching accuracy remains low, reducing system reliability.

Recent advancements in artificial intelligence and web technologies have introduced new opportunities for improving such systems. AI-based image recognition and feature extraction techniques enable automatic analysis of item characteristics, while modern full-stack architectures provide scalable and interactive platforms. Additionally, scoring-based matching algorithms have been explored to enhance similarity detection and improve data retrieval.

In this context, SMARTLOFO: AI Powered Lost and Found Platform is proposed to address the limitations of existing systems. The platform integrates AI-based image analysis using Google Gemini along with a smart matching algorithm that evaluates multiple attributes such as category, features, location, and time. By combining artificial intelligence with modern web technologies, the system significantly improves matching accuracy, efficiency, and user experience.

III. PROPOSED SYSTEM

The proposed system, SMARTLOFO: AI Powered Lost and Found Platform, is a full- stack web application designed to modernize and automate the process of managing lost and found items. The system leverages artificial intelligence, real-time data processing, and cloud-based deployment to provide an efficient and user-friendly solution. It is built using a client-server architecture with React for the frontend and FastAPI for the backend, ensuring scalability, performance, and seamless interaction.

System Architecture
The architecture of SMARTLOFO is divided into two main components:

- **Client-Side Application:** Handles user interaction, item submission, and display of results through an intuitive interface.

- **Server-Side Application:** Manages business logic, authentication, AI processing, and smart matching operations.

Core Modules

- **User Authentication Module:**
- This module ensures secure access to the system using JWT-based authentication and bcrypt password hashing. It allows users to register, log in, and manage their profiles securely.

- **Item Management Module:**
- This module enables users to report lost or found items by submitting details such as item name, category, description, location, and images. The data is stored in a structured database for efficient retrieval.

- **AI Image Processing Module:**
- This module integrates Google Gemini to analyse uploaded images. It extracts key features such as item type, color, and visual characteristics, which are used to enhance matching accuracy.

- **Smart Matching Engine:**
- This is the core component of the system. It uses a scoring-based algorithm to compare lost and found items based on multiple attributes such as category, description, extracted features, location, and time. Each attribute is assigned a weight, and a similarity score is calculated. Matches exceeding a predefined threshold are considered relevant.

Notification Module:
This module sends automated email notifications to users when a potential match is found, improving response time and user engagement.

Database Module:
The system uses MongoDB/SQLite to store user data, item details, and matching results, ensuring efficient data management.

Workflow and Functionality

User Registration and Login: The process begins with the user registering a new account or logging into the system using secure authentication mechanisms. The server validates the credentials and grants access to the platform.

Item Submission:
Once authenticated, the user can report a lost or found item by filling out a structured form that includes details such as item name, category, description, location, and an image. The submitted data is sent to the server and stored in the database.
AI-Based Image Processing: After submission, the uploaded image is processed using the AI module integrated with Google Gemini. The system analyses the image and extracts relevant features such as object type, color, and visual characteristics.

Feature Extraction and Storage: The extracted features, along with user- provided details, are stored in the database. This structured data forms the basis for intelligent matching.

Smart Matching Process: The system then compares the newly uploaded item with existing records using a smart matching algorithm. It evaluates multiple attributes, including category, description, extracted features, location, and time.

Matching Score Calculation: A similarity score is calculated using a weighted scoring mechanism. Each attribute contributes to the final score based on its importance.

Match Identification:
If the calculated score exceeds a predefined threshold, the system identifies it as a potential match and links the corresponding lost and found items.

Notification System:
Once a match is detected, the system automatically sends notifications (via email) to the respective users, enabling them to take further action.

Key Features
AI-based image analysis for improved accuracy Smart matching using weighted scoring algorithm Secure authentication and data handling Real-time notifications for matched items User-friendly and responsive interface Cloud deployment for accessibility Technological Innovation SMARTLOFO introduces innovation through the integration of AI-based image analysis with a smart matching algorithm. Instead of relying only on text-based search, the system uses feature extraction and similarity scoring to improve matching accuracy. This hybrid approach significantly enhances efficiency and reliability compared to traditional systems. Use Case Scenarios

Scenario 1: Student Lost Item A student uploads details of a lost item with an image. The system analyses the image and finds a matching item reported by another user, notifying both parties instantly.

Scenario 2: Found Item Reporting A user finds an item and uploads its details.

The system automatically matches it with previously reported lost items and alerts the respective users.

Ethical Considerations
Privacy: User data is securely stored and protected.

Data Security: Authentication and encryption ensure safe access.

Content Control: Only relevant item data is processed and stored.

Future Enhancements
Integration of advanced machine learning models Mobile application development Improved image recognition accuracy Real-time chat between users Expansion to public and city-level usage

IV. METHODOLOGY

The methodological framework adopted for the development of SMARTLOFO: AI Powered Lost and Found Platform is based on a combination of agile software development and intelligent system design. The project was implemented in iterative phases, focusing on building, testing, and refining core functionalities such as authentication, item management, AI processing, and smart matching.

Requirements Gathering
The foundation of SMARTLOFO was established through:

Comparative Analysis: Existing lost-and-found systems and web applications were analysed to identify their limitations, particularly in terms of manual processes, poor organization, and low matching accuracy due to reliance on keyword-based search.

User Feedback:
Discussions with potential users (students and staff) helped identify key requirements such as ease of reporting items, accurate matching, real-time notifications, and a user-friendly interface.

System Design
Based on the gathered requirements, the system was designed with a focus on scalability, performance, and accuracy.

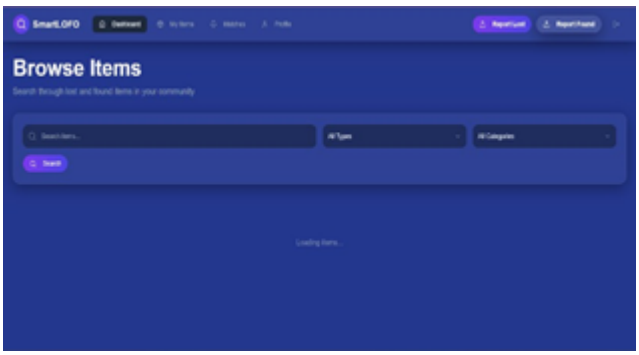
Client-Server Model:
A clear separation of concerns was implemented. The frontend (React) handles user interaction, while the backend (FastAPI) processes business logic, AI operations, and matching, ensuring a centralized and reliable system.

Technology Stack Selection
- Frontend: React with Tailwind CSS
- Backend: Python (FastAPI)
- Database: MongoDB / SQLite
- AI Integration: Google Gemini
- Authentication: JWT and bcrypt

Implementation
Development was carried out in iterative phases using agile practices.

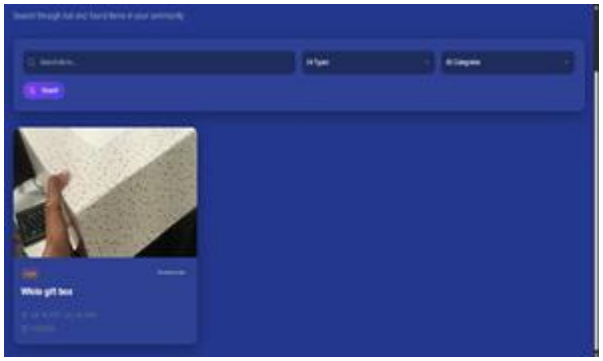
AI Image Processing: Google Gemini was integrated to analyse uploaded images and extract meaningful features such as item type, color, and visual attributes.

Smart Matching Algorithm: A scoring-based algorithm was implemented to compare items. The similarity score is calculated as:
Score = (W_1 × Category) + (W_2 × Description) + (W_3 × Features) + (W_4 × Location) + (W_5 × Time)
where W_1–W_5 represent weights assigned to each attribute. Matches exceeding a predefined threshold are considered valid.
Backend Development: FastAPI was used to build RESTful APIs for handling requests, authentication, and data processing.
User Interface:
A responsive and intuitive interface was developed using React, enabling smooth interaction and efficient navigation.



Evaluation Strategy
A structured evaluation approach was used to assess system performance and usability.

- **Usability Testing:**
- The application was tested with multiple users to evaluate ease of use, interface clarity, and overall experience.
- **Performance Testing:**
- System performance was analysed based on
- response time, matching speed, and API efficiency under different loads.
- **Accuracy Evaluation:**
- The effectiveness of the smart matching algorithm was measured by comparing predicted matches with actual results, achieving improved accuracy over traditional methods.



V. RESULT

The development and testing of SMARTLOFO: AI Powered Lost and Found Platform produced positive results, validating its effectiveness as an intelligent and efficient solution for managing lost and found items. The system successfully demonstrated improved matching accuracy, faster data retrieval, and enhanced user experience compared to traditional methods.

Quantitative Performance Metrics
A pilot evaluation was conducted with multiple users over a testing period, where users actively reported lost and found items and interacted with the system.

Matching Accuracy: The smart matching algorithm achieved an estimated accuracy of 80–90%, significantly higher than traditional keyword-based systems (65– 70%).

Response Time: The system processed item submissions and generated matching results within 2–3 seconds on average.

Search Efficiency: Optimized filtering and sorting enabled faster retrieval of relevant items.

System Performance: The backend handled multiple simultaneous requests efficiently without noticeable delays during testing.

User Experience and Satisfaction
User feedback was collected to evaluate usability and system effectiveness.

- **Ease of Use:** Most users found the platform easy to navigate and interact with.
- **Interface Clarity:** The UI was rated intuitive, with clearly structured forms for item submission and search.
- **Matching Effectiveness:** Users appreciated the accuracy of suggested matches and the usefulness of automated notifications.

Qualitative Feedback

User responses highlighted the following key points:
"Faster and Smarter System" – Users observed that the platform provides quicker and more relevant results compared to manual methods.

"Helpful Notifications" – Email alerts for matches were considered highly useful. "Improved Organization" – The structured format made item tracking easier.

Comparative Analysis
Compared to traditional lost-and-found systems, SMARTLOFO provides:

Higher matching accuracy through AI- based feature extraction Better organization of data using structured databases Faster response and retrieval time Automated notifications instead of manual follow-ups Limitations Observed During Testing Despite its effectiveness, some limitations were identified:

- User Dependency: The system relies on active participation for better results.
- Input Accuracy: Incorrect or incomplete user input may affect matching performance.
- Image Quality: Poor-quality images can reduce AI analysis accuracy.

VI. CONCLUSIONS

The development and evaluation of SMARTLOFO: AI Powered Lost and Found Platform represent a significant step toward modernizing traditional lost-and- found systems. By leveraging modern web technologies and artificial intelligence, the project demonstrates how manual and inefficient processes can be transformed into a structured, intelligent, and user-friendly digital solution.

The system integrates a full-stack architecture with React for the frontend and FastAPI for the backend, combined with a database for efficient data management. The inclusion of AI-based image analysis using Google Gemini and a smart matching algorithm enhances the accuracy and efficiency of identifying potential matches between lost and found items.

This approach significantly improves performance compared to conventional keyword-based systems.

Through its modular design, intuitive interface, and intelligent matching mechanism, SMARTLOFO effectively addresses key challenges such as disorganized data, delayed responses, and low recovery rates. The results obtained during testing, including improved matching accuracy (80–90%) and positive user feedback, validate the effectiveness of the system in providing a reliable and efficient solution.

The project also emphasizes the importance of combining user-centered design with intelligent processing techniques. By simplifying the reporting process and automating matching and notification mechanisms, the platform enhances user experience and reduces manual effort.

Future work will focus on addressing current limitations by improving scalability, enhancing AI capabilities, and expanding accessibility. This includes integrating advanced machine learning models, developing a mobile application, and enabling real-time communication features between users.

In conclusion, SMARTLOFO demonstrates the potential of combining artificial intelligence and modern web technologies to build efficient, scalable, and impactful solutions for real-world problems, paving the way for smarter digital management systems.

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