AI-POWERED WATER MANAGEMENT AND ISSUE PREDICTION SYSTEM

Project Reference No.: *49S_BE_3047*

College : REVA University, Bengaluru
Branch : Department of Computer Science and Engineering
Guide : Dr. Sanju V
Student(s) : Mr. Hemanth G K
Ms. Indhushree M S
Mr. Jeevan H S
Ms. Jhahnavi K P

Keywords:

Artificial Intelligence, Water Management, CNN, Machine Learning, Smart Monitoring

Introduction:

1. Water management is a critical challenge due to increasing population, urbanization, and inefficient monitoring systems. Issues such as water leakage, contamination, and wastage often go unnoticed or are reported late, leading to resource loss and environmental impact. Traditional systems rely on manual inspection, which is time-consuming and less efficient.
2. To address these challenges, this project proposes an AI-Powered Water Management and Issue Prediction System that uses image processing and machine learning techniques. Users can upload images of water-related issues along with location details through a web application. A Convolutional Neural Network (CNN) is used to classify issues such as leakage, contamination, and wastage.
3. The system also uses machine learning techniques to predict high-risk areas and provides dashboards, notifications, and officer assignment for efficient monitoring and faster response. This solution supports smart city applications and improves water conservation.

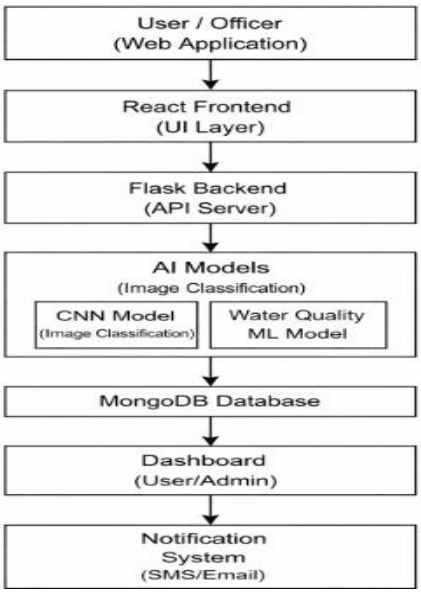

Figure 1: System Architecture of AI-Powered Water Management and Issue Prediction System

Objectives:

1. To develop an AI-based system for detecting water-related issues using image classification.
2. To design a web-based platform for users to upload water issue images with location details.
3. To implement a Convolutional Neural Network (CNN) model for automatic classification of water problems.
4. To predict high-risk areas and improve water management using machine learning techniques.

Methodology:

1. The project follows a structured approach combining data collection, machine learning, and web application development. Initially, a dataset of water-related issues is collected and preprocessed for training.
2. A Convolutional Neural Network (CNN) model is developed to classify images into different categories such as leakage and contamination. In addition, a machine learning model is used to predict high-risk areas based on historical and geospatial data.
3. The system is implemented using ReactJS for frontend and Flask for backend, connected through REST APIs. MongoDB is used as the database to store user details, reports, and prediction results. The system also includes notification and officer assignment modules for efficient response.
4. Finally, the system is integrated and tested to ensure proper functionality and performance.

Result and Conclusion:

1. In conclusion, the proposed system successfully demonstrates the use of Artificial Intelligence for detecting water-related issues such as leakage, contamination, and wastage. The CNN model provides accurate classification of uploaded images, and the system efficiently stores and manages data using MongoDB.
2. The integration of frontend, backend, and AI models ensures smooth functionality, while the dashboard and notification system improve monitoring and response time. The project proves to be an effective and scalable solution for smart water management.

References:

[1] M. Forhad, M. Uddin, and M. Rahman, “Real-time water quality monitoring using cloud-based data analytics,” *International Journal of Environmental Monitoring and Analysis*, vol. 12, no. 3, pp. 145–153, Mar. 2024.

[2] S. G. Venkatesh, R. Patel, and A. Kumar, “Deep learning-based water leakage detection using images,” *IEEE Access*, vol. 9, pp. 101233–101245, 2021.

[3] J. Wang, H. Li, and Y. Chen, “CNN-based environmental monitoring using image data,” *IEEE Sensors Journal*, vol. 21, no. 14, pp. 15903–15914, 2021.

Future Scope:

The future scope of this project includes:

1. Integration with IoT sensors for real-time water monitoring and data collection.
2. Integration with smart city infrastructure for large-scale deployment.
3. Implementation of advanced predictive analytics for better decision making.