

International Islamic University Chittagong



LAB REPORT

AI-Integrated Water Quality and Crisis Management System

Team Members

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Course Code & Name

CSE-3532(Tools and Technologies)

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Individual Contribution

Team Member's ID	Team Member's Name	Contributions in words
C223201	Samiha Muntaha Mahin	Full Stack
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Project Overview:

This project involves the development of a web-based application that combines real-time water quality monitoring with AI-powered predictive alerts to address water-related challenges. The system is designed to help households, farmers, industries, and local governments track water quality, receive early warnings about contamination or shortages, and take preventive actions. It provides a user-friendly interface that visualizes water data, highlights crisis-prone areas, and offers actionable recommendations.

Key Features:

- **Real-Time Monitoring:** Tracks critical water metrics like pH, turbidity, and contaminants using sensor data.
- **Predictive Crisis Alerts:** AI analyzes trends to forecast water scarcity or contamination.
- **Historical and Regional Insights:** Allows users to explore long-term trends and assess regional risks via interactive maps.
- **AI-Driven Recommendations:** Suggests purification techniques and water conservation practices based on risk level.

Technical Stack:

- **Frontend:** React.js – Used to build an interactive dashboard, real-time notifications, and dynamic map visualizations.
- **Backend:** Node.js & MongoDB – Manages user data, sensor inputs, and integrates APIs.
- **AI Integration:** Gemini AI API – Used for anomaly detection, time-series prediction, and intelligent recommendations.

Machine Learning Techniques:

- **Supervised Learning:** For classifying water contamination levels.
- **Time-Series Forecasting:** To predict water availability issues.
- **Anomaly Detection:** To identify unusual patterns in water quality.

Languages Used:

- **JavaScript (React, Node.js)** for frontend and backend development.
- **Python** (indirectly via Gemini API integration for AI/ML modeling and predictions).

Impact:

The system enhances access to clean water, reduces operational costs, and contributes to sustainable water usage. It supports smart city initiatives, provides valuable data for policy-making, and empowers users with real-time and predictive tools for effective water management.