

WATER QUALITY PREDICTION SYSTEM

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Abstract - This project aims to predict the quality of water using machine learning and Internet of Things. Water quality is a critical factor in determining the suitability of water for various purposes, such as drinking, agriculture, and industrial use. Traditional methods of water quality monitoring can be time-consuming, expensive, and may not provide accurate results. Therefore, this project proposes a machine learning-based approach that can predict water quality based on various factors, such as pH, Hardness, Solids, Chloramines, Sulphates, Conductivity, Organic Carbon, Trihalomethanes and turbidity. The project will use supervised learning algorithms such as decision trees, random forests, Extreme Gradient Boosting and support vector machines to train the model on a dataset of water quality measurements. The model will then be tested on a separate dataset to evaluate its accuracy and effectiveness. The outcome of this project could be valuable in improving water quality management and ensuring the safe and efficient use of water resources. The proposed system has been tested on real-world water quality data, and the results demonstrate its effectiveness in predicting water quality parameters. The system has potential applications in various fields, including water resource management, environmental monitoring, and public health.

Key Words: Water Quality, machine learning, sensors, Extreme Gradient boosting, random forest

1.INTRODUCTION

Water is one of the most valuable resources on earth, as it is essential for the survival of all living organisms, including humans. However, the quality of water is being threatened by the increasing levels of pollution caused by various human activities. According to the United Nations world water development report 2017, around 80% of the world's wastewater is discharged back into the environment, mainly untreated, causing severe damage to rivers, lakes, and seas. Water pollution is a significant environmental and public health concern, and if not addressed, the problem will only worsen, especially with the projected increase in global freshwater demand by 2050. To ensure the safety of water resources and human health, water quality monitoring and prediction have become essential. Traditional methods of water quality monitoring, such as manual analysis, are inefficient and time-consuming, requiring the collection of water samples and subsequent laboratory analysis. As a result, there is a growing need for an improved system to monitor and predict water quality in real-time. With the advent of the Internet of Things (IoT) and machine learning (ML) technologies, it is now possible to develop an accurate and efficient water quality prediction system. The proposed system integrates IoT sensors to collect real-time data from water. The data is then processed

using ML algorithms, including support vector machine (SVM), random forest (RF), support vector classifier (SVC), and extreme gradient boosting (XG Boost) to predict water quality using the parameters pH, solids, hardness, chloramines, trihalomethanes, organic carbon, sulfates, conductivity and turbidity. The proposed water quality prediction system offers an accurate, efficient, and real-time monitoring and prediction platform that can be used by environmentalists, water resource managers, and policymakers to make informed decisions about water resource management. The system's potential impact is immense, as it has the potential to revolutionize water quality monitoring and prediction, leading to better water resource management, environmental sustainability and improved public health care.

2.SYSTEM IMPLEMENTATION

EXISTING SYSTEM: The water quality prediction system using IoT is a software system that utilizes IoT sensors to predict the water quality in a given area. The system is designed to provide accurate and timely information to help water management authorities make informed decisions. The system consists of a network of IoT sensors that are placed at different locations throughout the water supply network. The sensors collect various parameters such as temperature, pH, dissolved oxygen, and conductivity. The data is transmitted to a cloud-based server, where it is analyzed and processed. The system uses a database to store the collected data. The data model includes tables for sensor information, location, and measured parameters. The system provides a web-based user interface for water management authorities to view real-time data and predicted water quality. The user interface includes charts, graphs, and maps to provide a clear and easy-to-understand view of the water quality in different areas.

PROPOSED SYSTEM: The proposed project aims to develop a water quality using IoT sensors and machine learning algorithms. The system is able to monitor water quality parameters such as pH, temperature, turbidity in real-time. The data collected from the sensors will be analyzed using machine learning algorithms to predict water quality and detect any abnormalities. The system will be useful for water treatment plants, environmental agencies, and other organizations that require accurate and timely water quality monitoring. The system is consisting of following modules.

IoT SENSOR MODULE

An IoT sensor module is a compact device that includes sensors, microprocessors, and wireless communication capabilities. It is designed to measure physical or environmental conditions, such as temperature, humidity, air quality, and motion, and transmit the data to a cloud server or a local device. The sensor module can be integrated into various

applications, including home automation, industrial automation, and environmental monitoring. The advantages of IoT sensor modules include low power consumption, ease of deployment, and real-time data monitoring. They have become a critical component of the Internet of Things (IoT) ecosystem, enabling the development of smart and connected devices that can improve efficiency, productivity, and safety.

DATA ACQUISITION AND TRANSMISSION MODULE

A data acquisition and transmission module are a device that collects data from sensors and sends it to a cloud server or local device. It interfaces with sensors and can monitor physical or environmental conditions such as temperature or pressure. These modules are used in various applications and enable real-time monitoring and remote data collection for analysis.

DATA STORAGE AND MANAGEMENT MODULE

This module is responsible for storing the collected data in a database or cloud-based platform, which can be accessed by the machine learning module for analysis and prediction.

WATER QUALITY PREDICTION MODULE

This module would use the data from the IoT sensors and the trained machine learning models to predict when equipment maintenance is needed. This would include developing appropriate algorithms to predict equipment failures based on historical data, and generating alerts or work orders when maintenance is predicted.

USER INTERFACE MODULE

This module would use the data from the IoT sensors and the trained machine learning models to predict when equipment maintenance is needed. This would include developing appropriate algorithms to predict equipment failures based on historical data, and generating alerts or work orders when maintenance is predicted.

3.CONCLUSION

A water quality prediction system that utilizes the Internet of Things (IoT) and machine learning can provide valuable insights into the safety and sustainability of our water resources. By collecting and analyzing data from various sensors and sources, such a system can predict changes in water quality and identify potential issues before they become major problems. The integration of IoT devices, such as pH sensors and turbidity sensors, can provide continuous monitoring of water quality in real-time. Machine learning algorithms can then be used to analyze this data and predict future trends or issues. This can help water treatment facilities and environmental agencies make informed decisions about water management and ensure the safety of our water resources. Overall, a water quality prediction system using IoT and machine learning has the potential to revolutionize the way we manage and protect our water resources. It can help to ensure the sustainability of our water supply, protect the health of aquatic life, and promote the overall well-being of our communities.

FUTURE ENHANCEMENT

The system could be expanded to include additional sensors for detecting other water quality parameters such as dissolved oxygen, conductivity, and total dissolved solids. The data collected by the system could be stored in the cloud, allowing for easier access and analysis of the data by water management professionals and researchers.

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