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## IoT-based smart water quality monitoring system

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Water is essential for human survival. Most infectious diseases are transmitted through contaminated water, resulting in millions of deaths annually. Thus, it is necessary to establish a monitoring system to assess if the water quality is adequate for the intended purposes. This study describes the design and development of a portable real-time water quality monitoring system based on Machine Learning and the Internet of Things (IoT). Moreover, the system consists of multiple sensors for detecting physical and chemical properties of water, including pH, Total Dissolved Solids (TDS), Turbidity, Electric Conductivity (EC), and Temperature. The ESP32 microcontroller processes the measured values from the sensors, and it interacts with the cloud-based interface. In this regard, this system was formed through supervised machine learning while utilizing a binary classification method. Consequently, the data set was split into two categories with one thousand data points. The algorithms were tested with following accuracies; Random Forest - 95%, Decision Tree - 91%, Navie Bayes - 88%, and K-Nearest Neighbors - 87%. The random forest algorithm was chosen to minimize human interference. Therefore, the developed system provides an online platform for real-time monitoring and analysis of water quality parameters, accessible from anywhere through the website. Examination of a water sample from this system displays whether water requires treatment or whether its quality is acceptable based on the parametric values.

**Keywords:** Water quality monitoring, physical and chemical properties of water, Machine learning, IoT

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