Water Quality Analysis

Phase 2: Innovation

Abstract:

Water quality analysis is to measure the required parameters of water, following standard methods, to check whether they are in accordance with the standard.

Water quality parameters are of three types – physical, chemical and biological – and are tested or monitored according to the desired water parameters. Water quality parameters often sampled or monitored include pH, ORP, conductivity, dissolved oxygen, chlorine, salinity, ozone, and corrosion rate.

Planning and set up:

* **Water Quality Parameters:**

Monitoring of drinking water quality is an important component of water management, while data analysis is necessary for the identification and characterization of water quality problems. Assessment is the process by which water quality data is transformed into information. The information gained from monitoring is essential for analysing water quality.

* **Procedure and Necessary Equipment:**

The assessment of water quality is done in various ways. A very powerful tool for this purpose is the Water Quality Index (WQI). A water quality index is a means to summarize large amounts of water quality data into simple terms (e.g., good, bad) for reporting to management and the public in a consistent manner. Researchers use different types of indices.

* **Physical, physical-chemical and bacteriological analysis:**

Analyses are performed taking into account requirements (testing methods, sampling frequencies, precision and required accuracy, the maximum allowed value -MAA of parameters) for drinking water .To assess the quality of drinking water physical, physical, chemical and bacteriological parameters are measured .

2.Data Collection:

We obtain the provided water quality data containing parameters like pH, Hardness, Solids, etc.

The collection of data includes collecting the raw data and then gathering and analysing the data collected from various sources like Water Quality Portal.

* Online database:

The databases are collected from various sources Numerous online databases provides a wide range of secondary data about the water quality. It includes research articles, statistical information, graphs and surveys.

* Public availability of data:

Government and Institutional Records: Government agencies, research institutions, and organizations often maintain databases or records that can be used for research purposes.

3.Quality testing:

For drinking water Total Coliform Bacteria, Nitrate nitrogen, pH, Iron, Hardness CaCO3, Sulphates, Chlorides and specific conductance are the tests used commonly. The 5 commonly used tests are dissolved oxygen, pH, temperature, salinity and nutrients (nitrogen and phosphorus) are the 5 water quality tests.

3. Water Quality Parameters:

The water quality index (WQI) model is a popular tool for evaluating surface water quality. WQI models involve four consecutive stages; these are (1) selection of the water quality parameters, (2) generation of sub-indices for each parameter (3) calculation of the parameter weighting values, and (4) aggregation of sub-indices to compute the overall water quality index. The attempt was supported by the National Sanitation Foundation (NSF) and therefore as NSFWQI in order to calculate WQI of various water bodies critically polluted. The proposed method for comparing the water quality of various water sources is based upon nine water quality parameters such as temperature, pH, turbidity, faecal coliform, dissolved oxygen, biochemical oxygen demand, total phosphates, nitrates and total solids [28, 36].

* Selection of the water quality parameters: one or more water quality parameters are selected for inclusion in the assessment
* Generation of the parameter sub-indices: parameter concentrations are converted to unit less sub-indices

* Assignment of the parameter weight values: parameters are assigned weightings depending on their significance to the assessment

* Computation of the water quality index using an aggregation function: the individual parameter sub-indices are combined using the weightings to give a single overall index. A rating scale is usually used to categorise/classify the water quality based on the overall index value.

4.Generating report**:**

Generating Report is designed to allow you to obtain report data in a number of formats. The formats available include chart reports with companion table reports and list reports for detailed information.

Use digital dashboards. The first step should always be to think about the best medium in terms of usability and presentation.

5.Data fusion:

Integrating data from various sources, including satellite imagery, weather data and social media can provide a holistic view of water quality and potential pollution sources.

The data fusion system has been designed to streamline the entire modelling process, starting from downloading of the observation data and their harmonization, followed by the data fusion computation and subsequent storage and visualization of the final data sets. Its interface is aimed at expert users, who can conveniently carry out data fusion, validation and calibration, estimate the status of water bodies, design operational services and optimize the use of measurement resources.

The processing steps include (1) model variable definition, (2) definition of model domain and computational grid, (3) data download and harmonization, (4) data fusion calculation and (5) data export and visualization.

6. Public Engagement:

Data analytics can be used to create user friendly apps and platforms that allows the public to access and contribute to the water quality data, fostering community involvement in monitoring efforts.

7.Early Warning systems:

Data analytics can power early warning systems that alert authorities and the public about potential water quality threats such as harmful algal blooms or industrial spills.

The development process for the early warning and forecasting system of water quality safety included system framework building, system construction, system function analysis, and system debugging.

An EWS is an integrated system consisting of in situ autonomous sensors for continuous rapid monitoring. The measured data are analysed and interpreted for the purpose of forecasting changes in water quality by the system.

8. Feedback and Iteration:

* Gather Feedback:

Collect feedback from various users regarding the usability of the monitoring system and the relevance of the data collected.

* Iterate and Improve:

Use the feedback to make necessary adjustments to the monitoring system. This may involve refining data collection protocols or updating equipment.

This project focused on analysing water quality data to assess the suitability of water for specific purposes, such as drinking. This study investigated the machine learning performance of approaches as a result of XGB, RF, SVC, ADA, and Decision Trees in predicting the components of a water quality dataset. For this objective, variables in the most well-known datasets, such as pH, hardness, solids, EC, and turbidity, were acquired.