

LITERATURE SURVEY ON EFFICIENT WATER QUALITY ANALYSIS AND PREDICTION USING MACHINE LEARNING

DOMAIN: Applied Data Science

TEAM ID: PNT2022TMID29641

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Paper 1 : Machine Learning Algorithms for Efficient Water Quality Prediction

- **Publication Year:** 26 August 2021
- **Author:** Mourade Azrour, Jamal Mabrouki, Ghizlane Fattah, Azedine Guezzaz & Faissal Aziz
- **Journal Name:** Original Article
- **Summary:** Water is an essential resource for human existence. In fact, more than 60% of the human body is made up of water. In recent years, water pollution has become a serious problem affecting water quality. Therefore, to design a model that predicts water quality which is very important to control water pollution, as well as to alert users in case of poor quality detection. This method is based on four water parameters: temperature, pH, turbidity and coliforms. The use of the multiple regression algorithms has proven to be important and effective in predicting the water quality index.

Paper 2 : Water Quality Factor Prediction Using Supervised Machine Learning

- **Publication Year:** 2018
- **Author:** Kathleen Joslyn
- **Journal Name:** Research Experiences for Undergraduates on Computational Modeling Serving the City
- **Summary:** This method is used to explore prediction accuracy of water quality factors, with techniques and algorithms in machine learning consisting of a variation of support vector machines - Support Vector Regression (SVR) and the gradient boosting algorithm Extreme Gradient Boosting (XGBoost). Both the XGBoost and SVR algorithms were used to predict nine different factors with success rates ranging from 79% to 99%. Parameters of these algorithms were also explored to test the prediction accuracy levels of individual water quality factors.

Paper 3 : Predicting and Analyzing Water Quality using Machine Learning

- **Publication Year:** 2016
- **Author:** Yafra Khan, Chai Soo See
- **Journal Name:** IEEE
- **Summary:** Water is the most important thing for human being. The effects of un-clean water are leads to many health issues and impacting every aspect of life. Therefore, management of water resources is very crucial in order to optimize the quality of water. The effects of water contamination can be tackled efficiently if data is analyzed and water quality is predicted beforehand. The goal of this method is to develop a water quality prediction model with the help of water quality factors using Artificial Neural Network (ANN) and time-series analysis.

Paper 4 : Efficient Prediction of Water Quality Index (WQI) Using Machine Learning Algorithms

- **Publication year:** 2021
- **Author:** Md. Mehedi Hassan, Laboni Akter, Mushfiqur Rahman
- **Journal name:** Research Article
- **Summary:** The quality of water has a direct influence on both human health and the environment. Water is utilized for a variety of purposes, including drinking, agriculture, and industrial use. The water quality index (WQI) is a critical indication for proper water management. The purpose of this method is to use machine learning techniques such as RF, NN, MLR, SVM, and BTM to categorize a dataset of water quality in various places across India. Water quality is obtained by features such as dissolved oxygen (DO), total coliform (TC), biological oxygen demand (BOD), Nitrate, pH, and electric conductivity (EC). These features are handled in five steps: data pre-processing using min-max normalization and missing data management using RF, feature correlation, applied machine learning classification, and model's feature importance.

Paper 5 : Water Quality Prediction using Machine Learning Method

- **Publication Year:** 19 January 2018
- **Author:** Ali Heidar Nasrolahi, Amir Hamze Haghiabi
- **Journal Name:** Water Quality Research Journal
- **Summary:** This method investigates the performance of artificial intelligence techniques including artificial neural network (ANN), group method of data handling (GMDH) and support vector machine (SVM) for predicting water quality components. To develop the ANN and SVM, different types of transfer and kernel functions were tested, respectively. The evaluation of the accuracy of the applied models according to the error indexes declared that SVM was the most accurate model.

Paper 6 : Ground Water Quality Prediction using Machine Learning Algorithms

- **Publication year:** 25 January 2019
- **Author:** S. Vijay & Dr. K. Kamaraj
- **Journal Name:** International Journal of Research and Analytical Reviews
- **Summary:** Water plays a dominant role in the growth of the country's economy and essential for all the activities. The present study deals with the physio-chemical characteristics of ground water quality. The bore well from which the samples were collected are extensively used for drinking purpose. The water quality parameters such as PH, TDC, EC, chloride, sulphate, nitrate, carbonate, bicarbonate, metal ions etc. This method focused on predicting water quality by using Machine learning classifier algorithm C5.0.

Paper 7 : A Real Time Water Quality Monitoring Using Machine Learning Algorithm

- **Publication Year:** 2020
- **Author:** S. Angel Vergina, Dr. S. Kayalvizhi, Dr. R.M. Bhavadharini
- **Journal Name:** European Journal of Molecular & Clinical Medicine
- **Summary:** Water quality parameter is of much importance in our day to day lives. Prediction of water quality will help to reduce water pollution and guard our human health. An intelligent process of monitoring the quality of water automatically detects the condition of water through IoT by processing sensors data and instantly provides notification to water analyst, when the quality of water is abnormal. With the initiation of Machine to Machine Communication analyzing and communicating the data becomes simple and efficient. This work has advanced an "Intelligent IoT based water quality monitoring system" pertaining to lakes is being used in rural areas. The structure uses pH, Turbidity and Conductivity sensors for determining the water quality parameters about hydrogen ion and total dissolved solvents in the water. This model safeguards standard quality water to the rural people using low prices embedded devices like Arduino Uno and Raspberry P.

Paper 8 : Water Quality Monitoring System Using IoT and Machine Learning

- **Publication Year:** 2018
- **Author:** Nikhil Kumar Koditala, Purnendu Shekar Pandey
- **Journal name:** IEEE
- **Summary:** World Economic Forum ranked drinking water crisis as one of the global risk, due to which around 200 children are dying per day. Drinking unsafe water alone causes around 3.4 million deaths per year. Despite the advancements in technology, sufficient quality measures are not present to measure the quality of drinking water. By focusing on the above issue, this method proposes a low-cost water quality monitoring system using emerging technologies such as IoT, Machine Learning and Cloud Computing which can replace traditional way of quality monitoring. This helps in saving people of rural areas from various dangerous diseases such as fluorosis, bone deformities etc. This method also has a capacity to control temperature of water and adjusts it so as to suit environment temperature.

Paper 9 : Prediction of water quality parameters using machine learning models

- **Publication Year:** 03 June 2021
- **Author:** Atefeh Nouraki , Mohammad Alavi, Mona Golabi
- **Journal Name:** Environmental Science and Pollution Research
- **Summary:** Accurate water quality predicting has an essential role in improving water management and pollution control. The machine learning models have been successfully implemented for modelling total dissolved solids (TDS), sodium absorption ratio (SAR) and total hardness (TH) content in aquatic ecosystems with insufficient data. However, due to multiple pollution sources and complex behaviors of pollutants, this method is used to predict the TDS, SAR, and TH levels in water.

Paper 10 : Smart IoT and Machine Learning-based Framework for Water Quality Assessment and Device Component Monitoring

- **Publication Year:** 14 February 2022
- **Author:** Akashdeep Bhardwaj, Vishal Dagar, Muhammad Owais Khan
- **Journal Name:** Research Gate
- **Summary:** Water is the most important natural element present on earth for humans, yet the availability of pure water is becoming scarce and decreasing. An increase in population and rise in temperatures are two major factors contributing to the water crisis worldwide. Sensors, embedded and smart devices in water plants require proactive monitoring for optimal performance. This methods presents an IoT-based real-time framework to perform water quality management, monitor, and alert for taking actions based on contamination and toxic parameter levels, device and application performance as the first part of the proposed work. Machine learning models analyze water quality trends and device monitoring and management architecture.

Paper 11 : WATER QUALITY PREDICTION USING MACHINE LEARNING

- **Publication Year:** 05 May 2022
- **Author:** Sai Sreeja Kurra, Sambangi Geethika Naidu
- **Journal Name:** International Research Journal of Modernization in Engineering Technology and Science
- **Summary:** The major goal of this method is to use machine learning techniques to measure water quality. The following water quality parameters were utilised to assess the overall water quality in terms of pH, Hardness, Solids, Chloramines, Sulfate, Conductivity, Organic Carbon, Trihalomethanes, Turbidity. To estimate the water quality class, the method used two types of classification algorithms: Decision Tree (DT)and K- Nearest Neighbor (KNN).

Paper 12 : Machine Learning Methods for Better Water Quality Prediction

- **Publication Year:** November 2019
- **Author:** Ali Najah Ahmed, Faridah Binti Othman
- **Journal Name:** Journal of Hydrology
- **Summary:** In any aquatic system analysis, the modelling water quality parameters are of considerable significance. The traditional modelling methodologies are dependent on datasets that involve large amount of unknown or unspecified input data and generally consist of time consuming processes. Therefore, setting up of a water quality prediction model for better water resource management is of critical importance and will serve as a powerful tool. The different modelling approaches that have been implemented include: Adaptive Neuro-Fuzzy Inference System (ANFIS), Radial Basis Function Neural Networks (RBF-ANN), and Multi-Layer Perceptron Neural Networks (MLP-ANN). In the domain of interests, the water quality parameters primarily include ammoniacal nitrogen (AN), suspended solid (SS) and pH. In order to evaluate the impacts on the model, three evaluation techniques or assessment processes have been used.