Literature Survey

Efficient Water Quality Analysis & Prediction using Machine Learning

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ABSTRACT

The growing worldwide emphasis on dealing with water quality is giving rise to a widespread research and expanding market for novel and astute monitoring systems.

In the recent years water quality has been threatened by various pollutants. Rapid urbanization and industrialization have led to a deterioration of water quality at an alarming rate, resulting in harrowing diseases.

The deteriorating quality of natural water resources like lakes, streams and estuaries, is one of the direst and most worrisome issues faced by humanity and it has a direct impact on public health and the environment.

Therefore, modeling and predicting water quality have become very important in controlling water pollution. The effects of water contamination can be tackled efficiently if data is analyzed and water quality is predicted beforehand.

This technique is to develop a water quality prediction model with the help of water quality factors using Artificial Neural Network (ANN) and time-series analysis. We present the last four years trends of water quality related parameters along with month-wise as well as source-wise parametric satisfactory analysis

The proposed methodology achieves reasonable accuracy using a minimal number of parameters to validate the possibility of its use in real time water quality detection systems.

S.NO	TITLE	PROPOSED WORK	TOOLS USED / ALGORITHM	TECHNOLOGY	ADVANTAGES / DISADVANTAGES
1.	WaterNet: A Network for Monitoring and Assessing Water Quality for Drinking and Irrigation Purposes	WaterNet is being proposed for monitoring water parameters in Cape Town, a city in the Western Cape province of South Africa.The purpose of WaterNet is to gather data on water parameters from dams across the city. These parameters are then used to assess the quality of water with regards ‘‘fitness for use’’ for drinking and irrigation purposes.	Cyber physical system, LoRa,Machine Learning, Random Forest,SVM	Applied Data Science,Water monitoring network	pH, and total hardness were the least influential parameters in drinking water, while SSP was the least for irrigation water

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2.	Quality Risk Analysis for Sustainable Smart Water Supply Using Data Perception	The eventual aim of this work is to predict water quality risk. In order to find the risk model, we have investigated with researchers from water quality control.The models need to be evolved with both domain knowledge data set growing. The scalability of our method can serve as a very powerful tool for practical water quality early warning	Adaptive Frequency Analysis (Adp-FA), Cycle detection	water quality control, risk evaluation, frequency analysis	This method is difficult to use for the data sets which do not have significant frequency effects. Some water indicators in our urban supply system do not have the meaningful frequencies, the predictions for those have shown high accuracy errors.

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3.	Empirical Comparison of Approaches for Mitigating Effects of Class Imbalances in Water Quality Anomaly Detection	We conduct an exploratory study to compare the performance of select MV, data-level ICD and ensemble approaches previously proposed in the literature on different classifiers.	Resampling method, ensemble classification method, Multiplie classifier ensemble	Applied Data Science,Water monitoring network	The empirical evidence based on the argument that a combination of missing value and resampling methods can improve the performance of classifiers

S.NO	TITLE	PROPOSED WORK	TOOLS USED / ALGORITHM	TECHNOLOGY	ADVANTAGES / DISADVANTAGES
4.	Connected Sensors, Innovative Sensor Deployment, and Intelligent Data Analysis for Online Water Quality Monitoring	This paper presents a comprehensive review of the sensors, deployment, and analysis technologies for WQM. A network of networked water bodies could enhance the global data intercomparability and enable WQM at a global scale to address global challenges related to food,drinking water, and health	robotics, sensor deployment, water quality monitoring (WQM)	Internet of Things (IoT), Intelligent data analysis	The WQM sector will hugely benefit from the sensor networks and techniques that being developed for IoT. Such methods have already advanced the monitoring activities in areas such as healthcare, agriculture and environment monitoring etc.

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5.	Monitoring Water Quality Parameters of Taihu Lake Based on Remote Sensing Images and LSTM-RNN	An LSTM network model with two hidden layers is established to retrieve the water quality parameters of Taihu Lake. Taking the inversion model of DO content (mg/L) as an example, we set a total of 7 nodes in the input layer, which are spectral reflectance of 6 bands and DO value in the same water at the previous week respectively	Remote sensing, water quality parameters, water quality monitoring, LSTM network.ty parameters, water quality monitoring, LSTM network.	RNN,Machine Learning	The LSTM network model is chosen to retrieve water quality parameters and the results are highly accurate, the model is robust and performs well, and has the ability to meet the basic requirements of actual water quality monitoring.

S.NO	TITLE	PROPOSED WORK	TOOLS USED / ALGORITHM	TECHNOLOGY	ADVANTAGES / DISADVANTAGES
6.	A Biological Sensor System Using Computer Vision for Water Quality Monitoring.	The model combined with the machine learning theory can be optimized by continuous learning and has better classification effect. Therefore, we combine neural networks with traditional model to achieve multi-state classification. Since the LSTM neural network solves the gradient disappearance problem of RNN by introducing the core storage unit, we build a model based on LSTM for water quality classification.	Neural network, RNN, LSTM Neural network	Water quality monitoring,	The use of LSTM neural network for water quality classification improves the detection accuracy and real-time performance of the water quality monitoring system.

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7.	Internet of Water Things: A Remote Raw Water Monitoring and Control System	This work developed and tested architecture for IoT systems for efficient and scalable monitoring of water. For validation purposes, we used the architecture validation methods and developed an algorithm that simulates the data sent to test the architecture prototype. This has been tested in various scenarios.	Automation and control, piezoelectric level sensor	IoTW (Internet of Things of Water)	The simulated number of sensors for the presented context was sufficient, it would not be sufficient to monitor the measurement of a treated water supply system in a city with millions of inhabitants

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8.	A Novel Spatiotemporal Data Model for River Water Quality Visualization and Analysis	A spatial point with both spatial and attribute information is exploited as the basic unit of river spaces to efficiently visualize the spatial-temporal distribution of RWQ data.	water quality prediction	River water quality (RWQ)	Spatial points are arranged at equal intervals in the proposed data model so that the whole river space can be filled up conveniently and entirely.

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9.	Real-Time Prediction of the Water Accumulation Process of Urban Stormy Accumulation Points Based on Deep Learning	The first step involves data processing and preparation,and the data are split, reorganized and used to calculate the index value of the collected rainfall and water accumulation process data. The second step is to input the sample data into GBDT model for training test data into the trained model to output the model prediction results.The third step is to evaluate the performance of the model.	Gradient boosting decision tree (GBDT), real-time prediction	Deep learning	A water accumulation process prediction model should be constructed for the entire city to achieve real-time prediction of water accumulation processes.

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10.	Enhanced Sea Surface Salinity Estimates Using Machine-Learning Algorithm With SMAP and High-Resolution Buoy Data	To improve the accuracy of satellite SSS measurements, several machine learning algorithms have been developed. These algorithms employ techniques such as random forests and support vector regressions to estimate.	Artificial Neural Network (ANN), Generalized Regression Neural Network (GRNN), random forest	Machine-Learning, ensemble learning	It improvements in SMAP SSS measurements, which will lead to a better understanding of the large-scale SSS variability in open-ocean regions and high-frequency small-scale SSS variability in shallow shelf regions.

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11.	A Real Time Water Quality Monitoring Using Machine Learning Algorithm	The system effectually assist to screen the water quality parameter and analyse the quality of water at long distance without loss of data to avoid its life-threatening effects on Human beings, and on Animals. With the help of IoT, we can have a continuous water quality monitoring system on various water parameters.	Raspberry Pi4, Arduino UNO, Support Vector Machine.	IoT, Machine Learning	The water quality can be watched consequently with no human interference. The proposed system can be extended further by water retreatment mechanism.

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12.	Efficient Water Quality Prediction Using Supervised Machine Learning	A series of representative supervised prediction (classification and regression) algorithms were tested on the dataset worked here. The complete methodology is proposed in the context of water quality numerical analysis.	Supervised machine learning, gradient boosting, multi-layer perceptron	Water Quality Prediction	The paper explored an alternative method of machine learning to predict water quality using minimal and easily available water quality parameters.

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13.	Using Machine Learning Models for Predicting the Water Quality	The Water Quality Index provides quantitatively meaningful information to decision makers and planners for water resources management.	Decision Tree-Based Algorithms, Artificial Neural Network (ANN),	Machine Learning Models,surface water quality	The fact that each ML algorithms will respond in a different way to different input variables and data patterns.

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14.	A Review on Machine Learning, Artificial Intelligence, and Smart Technology in Water Treatment and Monitoring	The process seeks to identify the true significance of a variable. This can be achieved by reweighting samples, thereby removing linkages between variables and specific training data.	Monitoring, water treatment, Hydroponics,	Artificial intelligence,IOT	It has provided a cross-section and analysis of common ML models, with some AI techniques and smart technologies that have been employed in water-based applications.

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15.	A Biological Sensor System Using Computer Vision for Water Quality Monitoring	Provided more accurate results in in the case of multi-level classification in compared to shallow neural network.	machine vision, moving target detection, water quality monitoring.	Neural network, Classification model	Explanation to the progress of applicability, accuracy and reliability of the systems approach is not given.

Thank you!