EFFICIENT WATER QUALITY ANALYSIS AND PREDICTION USING MACHIINE LEARNING

LITERATURE SURVEY

1. **WATER QUALITY PREDICTION USING ARTIFICIAL INTELLIGENCE ALGORITHM**

   Publisher: Applied Bionics and Biomechanics, 2020.

   AUTHORS: Theyazn H. H Aldhyani, Mohammed Al-Yaari, Hasan Alkahtani and Mashael Maashi.

   EXPLANATION: Advanced AI algorithms are developed to predict the Water Quality Index (WQI) and water Quality Classification (WQC). For WQI prediction, Artificial Neural Network models, namely Nonlinear Autoregressive Neural Network (NARNET) and Long Short Term Memory (LSTM) deep learning algorithm have been developed. In addition, three machine learning algorithms namely Support Vector Machine (SVM), K-nearest neighbor and Naive Bayes have been used for WQC forecasting. The dataset consists of 7 significant parameters. The result revealed that the proposed models can accurately predict WQI and classify the water quality according to superior robustness. The predicted result demonstrated that the NARNET model performed slightly better than the LSTM for the prediction of WQI values and the SVM algorithm has achieved the highest accuracy (97.01%) for the WQC prediction. This research can contribute significantly to water management. `

2. **EFFICIENT WATER QUALITY PREDICTION FOR INDIAN RIVERS USING MACHINE LEARNING**

Publisher: Asian Journal of Applied Science and Technology, Volume 5, 2021.

AUTHORS: Yogalakshmi S and Mahalakshmi A.

EXPLANATION: A framework is proposed to check the water quality. Various boundaries are considered and utilized for foreseeing when to clean the water. Accompanying boundaries like pH, turbidity, DO, conductivity and so forth are utilized. The information got from the Kaggle store for investigation. The AI calculation is utilized for anticipating the outcome. Results can be seen with the assistance of the site. This encourages the client to think previously about the defilement of water in their private tanks from streams. This procedure can in addition to the fact that limited be up to private tanks can be utilized in water treatment plants. The examination plans to give the best model forecast of water quality in river water utilizing various boundaries and water quality index (WQI). A notable AI calculation like Gradient Descent, Naive Bayes, Decision Tree and Deep learning algorithms were used for data interpretation and analysis. The principle objective of this investigation is to give genuinely exact expectations to variable information. The proposed strategy accomplishes sensible precision utilizing an insignificant number of boundaries to approve the chance of its utilization of continuously water quality discover.

3. **PREDICTIVE ANALYSIS OF WATER QUALITY PARAMETERS USING DEEP LEARNING**

Publisher: International Journal of Computer Applications, Volume 125, 2015.

AUTHORS: Archana Solanki, Himanshu Agarwal and Kanchana Khare.

EXPLANATION: Water collected in reservoirs can be used in drought situation. Unfortunately, these important reservoirs are being polluted and the quality of water is being influenced by numerous factors. Water quality monitoring of reservoirs is essential in exploitation of aquatic resources conservation. Contaminated water can lead to some waterborne diseases and also influences child morality. In order to reduce this effect, it is essential to assess different aspects of water quality. Predicting water quality parameters a few steps ahead can be a beneficial to achieve this. The main objective of this study is to provide fairly accurate prediction for variable data. The research was carried out by using secondary data collected from a third party for Chaskaman River located near Nasik, Maharashtra, India on WEKA tool. The study shows that deep learning techniques which use unsupervised learning to provide accurate results as compared to the techniques based on supervised learning. The comparison of results show that robustness can be achieve by denoising autoencoder and deep belief network and also successfully handle the variability in the data. Merits of the unsupervised learning algorithm are evaluated on the basis of metrics such as mean absolute error and mean square error to examine the error of prediction.

4. MACHINE LEARNING ALGORITHMS FOR EFFICIENT WATER QUALITY PREDICTION

Publisher: Modeling Earth Systems and Environment, 2022.

AUTHORS: Mourade Azrour, Jamal Mabrouki, Ghizlane Fattah, Azedine Guezzaz and Faissal Aziz.

EXPLANATION: In recent years, water pollution has become a very serious problem affecting water quality. Therefore, to design a model that predicts water quality is nowadays very important to control water pollution, as well as to alert users in case of poor quality detection. Motivated by these reasons, in this study, we take the advantages of machine learning algorithms to develop a model that is capable of predicting the Water Quality Index (WQI) and the Water Quality Class (WQC). The method we propose 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 WQI. In addition, the adoption of the Artificial Neural Network (ANN) provides the most highly efficient way to classify the water quality.

5. WATER QUALITY PREDICTION METHOD BASED ON IGRA AND LSTM

Publisher: Multidisciplinary Digital Publishing Institute (MDPI), 2018.

AUTHORS: Jian Zhou, Yuanyuan Wang, Fu Xiao, Yunyun Wang and Lijuan Sun.

EXPLANATION: Water quality prediction has great significance for water environment protection. A water quality prediction method based on the Improved Grey Relational Analysis (IGRA) algorithm and a Long-Short Term Memory (LSTM) neural network is proposed in this paper. Firstly, considering the multivariate correlation of water quality information, IGRA, in terms of similarity and proximity, is proposed to make feature selection for water quality information. Secondly, considering the time sequence of water quality information, the water quality prediction model based on LSTM, whose inputs are the features obtained by IGRA is established. Finally, the proposed method is applied in two actual water quality datasets: Tai Lake and Victoria Bay. Experimental results demonstrate that the proposed method can take full advantage of the multivariate correlations and time sequence of water quality information to achieve better performance on water quality prediction compared with the single feature or non-sequential prediction methods.

6. **ARTIFICIAL INTELLIGENCE APPROACH TO PREDICTING RIVER WATER QUALITY**

Publisher: Journal of Environmental Treatment Techniques, Volume 8, 2020.

AUTHORS: Ariani Dwi Astuti, Azmi Aris, Mohd Razman Salim, Shamila Azman, Salmiati and Mohd Ismid Md Said.

EXPLANATION: This prediction may reveal the proclivity of the characteristic water quality according to the most recent water quality, shifting and transformation rule of the pollutant in the watershed. The predictive capability of traditional methods is constrained to variability, complexity, uncertainty and non-linear interactions of the water quality parameters. Since middle of the 20^{th} century, AI approaches have been found efficient in bridging gaps, simulating, complementing deficiencies and improving precision of the predictive models in terms of multiple evaluation measures for better planning, design, deployment and handling of multiple engineering systems. This article discuss the state-of-the-art implementation of AI in water quality prediction, the type of AI approaches, the techniques adopted include the knowledge-based system as well as literature and their potential future implementation in water quality modeling and prediction. The study also discuss and presents several possibilities for future research.

7. SMART WATER QUALITY MONITORING SYSTEM

Publisher: International Journal of Innovations in Engineering and Science, Volume 3, 2018.

AUTHORS: Vaishnavi V, Varshitha R C, Tejaswini M, Needhu Rebeeea Biju and Kumar K.

EXPLANATION: A water monitoring system is necessary to observe the water quality in a large area such as lake, river and aquaculture. As per the current world situation, Internet of Things (IoT) and remote sensing techniques are used in heterogeneous areas of research for supervising, congregate and analyzing data from the remote locations. In this paper, the suggested system is a minimal price real time water quality monitoring system in IoT environment. This system comprise of numerous sensors for assessing the physical and chemical parameter. The factors of water that can be assessed using these sensors are pH, turbidity, conductivity and dissolved oxygen. Using this system the real time quality of water bodies can be determined and the data uploaded over the internet are analyzed.

8. **WATER QUALITY MONITORING USING IoT AND MACHINE LEARNING**

Publisher: IST-Africa Conference, 2022.

AUTHORS: Andrew Omambia, Benard Maake and Anthony Wambua.

EXPLANATION: Safe water access is fundamental form of human survival and it is presented as a fundamental human right. As consumers use water, primarily sourced from pipes and springs located around towns, contamination, leakages and pilferage happen. IoT and Machine Learning offer a promising solution to address these challenges. Premised on these technologies, the authors propose a system that monitors water quality and pilferage and wastage that uses machine learning algorithms for decision making.