Efficient Water Quality Analysis and Prediction using Machine Learning

Literature Survey:

1.Efficient Water Quality Prediction Using Supervised Machine Learning [2019] - Umair Ahmed Et al.

The proposed methodology has parameters: temperature, turbidity, pH and total dissolved solids.The proposed methodology achieves reasonable accuracy using a minimal number of parameters to validate the possibility of its use. This showed that polynomial regression with a degree of 2, and gradient boosting, with a learning rate of 0.1, outperformed other regression algorithms by predicting WQI most efficiently, while MLP with a configuration of (3, 7) outperformed other classification algorithms by classifying WQC most efficiently.

2. Prediction of Water Classification using Machine Learning [2015] - Wahab Et al.

Decision-tree-based models are more favorable to short-term prediction and may have a quicker calculation.Decision-tree-based ensemble models have their data, not being sensitive to missing values and being highly efficient when compared to other ML models.Based on the comparison among the five different decision tree classifiers, which are Logistic Model Tree (LMT), J48, Hoeffding tree, Random Forest and Decision Stump. They found that J48 showed the highest accuracy of 94%, while Decision Stump showed the lowest accuracy.

3. Machine learning algorithms for efficient water quality prediction [2021] - Mourade Et al.

We take the advantages of machine learning algorithms to develop a model that is capable of predicting the water quality index and then the water quality class. 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 water quality index. In addition, the adoption of the artificial neural network provides the most highly efficient way to classify the water quality.

4. A Review of the application of machine learning in water quality evaluation [2022] - Mengyuan Zhu Et al.

Machine learning is widely used in water quality monitoring and prediction.The performance of 45 machine learning algorithms is evaluated and discussed.More advanced sensors,including soft sensors are developed and applied in water quality.The feasibility and reliability of the algorithms and models are developed with an accuracy of over 90%.

5. Predicting and Analyzing Water Quality using Machine Learning: A Comprehensive Model [2016] - Yafra Khan Et al.

This paper proposes the artificial neural network model to predict the quality of the water and also time series analysis is used. Data used for this model comes in the category of continuous-time time series, as it consists of the values of water quality factors observed with the time-interval of 6 minutes. ANN is used to interpret non-linear relationships of the data, the time series model used in this paper is Non-linear Autoregressive (NAR) model. After training the model, the evaluation parameters of Regression(R), Mean Squared Error (MSE) and Root Mean Squared Error (RMSE) have been calculated.The graphs for regression analysis demonstrate how well the training, testing, and validation sets of data match the function. The better the function fits, and as a result, the closer the value of Regression is to 1, the more accurate the prediction.

6. Water Quality Prediction Using Artificial Intelligence Algorithms[2020] - Theyazn H. H Aldhyani Et al.

In this paper, advanced artificial intelligence (AI) algorithms are developed to predict water quality index (WQI) and water quality classification (WQC). For the WQI prediction, artificial neural network models, namely nonlinear autoregressive neural networks (NARNET) and long short-term memory (LSTM) deep learning algorithm, have been used.. In addition, three machine learning algorithms, namely, support vector machine (SVM), -nearest neighbor (K-NN), and Naive Bayes, have been used for the WQC forecasting. Prediction results show that the NARNET model performed slightly better than the LSTM for the prediction of the WQI values and the SVM algorithm has achieved the highest accuracy (97.01%) for the WQC prediction. Furthermore, the NARNET and LSTM models have achieved similar accuracy for the testing phase with a slight difference in the regression coefficient(RNARNET = 96.17% and LSTM = 94.21%).

7.Performance of machine learning methods in predicting water quality index based on irregular data set: application on Illizi region (Algerian southeast) [2021] - Saber Kouadri Et al.

The Directorate of Water Resources (DRE) of the State of Illizi provided the water analysis results that were used to construct this paper. The 114 samples from 57 exploited wells of 6 different layers that made up the submitted data set were examined.In order to produce WQI predictions in the Illizi region of southeast Algeria, 8 artificial intelligence algorithms, including multilinear regression (MLR), random forest (RF), M5P tree (M5P), random subspace (RSS), additive regression (AR), artificial neural network (ANN), support vector regression (SVR), and locally weighted linear regression (LWLR), were used.Correlation coefficient (R), mean absolute error (MAE), root mean square error (RMSE), relative absolute error (RAE), and root relative square error were some of the

statistical measures used to evaluate the models (RRSE). The findings show that the main factors affecting WQI in the study area are TDS and TH.

8. Machine learning methods for better water quality prediction.[2019] - AliNajah Ahmed Et al.

In this paper, Radial Basis Function Neural Networks (RBF-ANN), Multi-Layer Perceptron Neural Networks, and Adaptive Neuro-Fuzzy Inference System (ANFIS) are a few of the several modeling strategies that have been used (MLP-ANN). Artificial intelligence (AI) implementation produces a flexible mathematical structure with the ability to recognise complicated and non-linear correlations between input and output data.Three evaluation strategies or assessment processes have been utilized to evaluate the model. The WDT-ANFIS model performed better than all the other models and showed a notable improvement in forecasting accuracy for all the water quality parameter. After the suggested model was validated, it was discovered that it accurately predicted all of the water quality characteristics.

9. Prediction of irrigation water quality parameters using machine learning models in a semi-arid environment [2020] - AliEl Bilali Et al.

Irrigation water quality (IWQ) parameters, including the sodium absorption ratio (SAR), adjusted SARa, exchangeable sodium percentage (ESP), and percentage of sodium, have been predicted using machine learning (ML) models including the Artificial Neural Network (ANN), Multiple Linear Regression (MLR), Decision Tree, Random Forest (RF), Support Vector Regression (SVR), k-Nearest Neighbour (kNN), Stochastic Gradient Descent (SGD), and Adaptive Boost. According to the findings of the generalisation attempt, the ML models for the Cherrate watershed's TDS, SAR, and SARa parameters as well as the Nfifikh watershed's TDS, chloride, ESP, and %Na parameter are fairly generalised. The findings of this study also show that machine learning models are effective tools for precisely forecasting the quality of irrigation water by only using the characteristics that can be measured directly in a short amount of time.

10. Implementation of data intelligence models coupled with ensemble machine learning for prediction of water quality index [2020] - Sani Isah Abba Et al.

In this paper, the ensemble method was proposed in order to increase the performance accuracy of the single models like support vector regression(SVR) and one multilinear regression. Several statistical criteria were used to assess the models performance. The collected results demonstrated that the data intelligence models could successfully predict the WQI using the superior modelling output of the NNE(Neural network ensemble).