Approach 1 :

**Evaluation of water quality based on a machine learning algorithm and water quality index (**[**Link**](https://www.nature.com/articles/s41598-017-12853-y)**) code (**[**Link**](https://colab.research.google.com/drive/1-OHIXZ2m9CKgwWj_xgKSFgb4G1OSR8zF#scrollTo=DpF_xL0eQ3sn&uniqifier=1)**)**

**Model:**

1. Model for WQI and other water quality parameters
2. Model for estimation WQI with indices - difference index, DI; ratio index, RI; and normalized difference index, NDI) through fractional derivatives methods
3. WQI common models and their review ([link](https://www.sciencedirect.com/science/article/pii/S1470160X20311572))
4. Steps involved:

Commonly, 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.

Results on (Asian\_site\_ard2 – 0.7-0.3 split):

|  | **Horton WQI (MAE-10.88 & R2-0.51 with SVR)** |  | **Dojildo WQI (MAE- 2.16 & R2-0.551 with SVR)** |  | **MAE (Ideal)** |
| --- | --- | --- | --- | --- | --- |
| Parameter | MAE (Test) | R2 (Test) | MAE (Test) | R2 (Test) |  |
| pH | 0.17 (LR) | 0.7 (LR) | 0.26 (LR) | 0.36 (LR) | 0.1 |
| Salinity | 1.12 (LR) | 0.96 (LR) | 3.32 (LR) | 0.75(LR) | 2 |
| Ammonia | 0.021 (RF) | -0.29 (RF) | 0.017 (RF) | 0.23 (RF) | 0.01 |
| Mg +2 |  |  |  |  | <=100 |
| Ca +2 |  |  |  |  | <=100 |
| Hardness |  |  |  |  | <=500 |
| Carbonate |  |  |  |  | <=5 |
| Bi Carbonate |  |  |  |  | <=10 |
| Alkalinity |  |  |  |  | <=10 |

Problem is not able get good model for WQI estimates.

The correlation with PH, SAL, AMM is good with WQI except AMM. So prediction with WQI to AMM is not good.

Possible solution is can have two model for WQI for AMM and other which are not giving good correlation with existing WQI model

Used WQA model: horton model, Dojildo model (not sure the reason)

Solution

Performance analysis of the water quality index model for predicting water state using machine learning techniques Paper used([Link](https://www.sciencedirect.com/science/article/pii/S0957582022010473)) weighted quadratic mean (WQM) and unweighted root mean square (RMS) WQI models

Paper has mentioned to do band math in terms of derivative for better estimation of WQI([Link](https://www.mdpi.com/2073-4441/13/22/3250))