Water Quality Prediction Using Statistical Tool and Machine Learning Algorithm

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ABSTRACT

Water is the most valuable natural resource for all living things and the ecosystem. The quality of groundwater is changed due to change in ecosystem, industrialisation, and urbanisation, etc. In the study, 60 samples were taken and analysed for various physio-chemical parameters. The sampling locations were located using global positioning system (GPS) and were taken for two consecutive years for two different seasons, monsoon (Nov-Dec) and post-monsoon (Jan-Mar). In 2016-2017 and 2017-2018 pH, EC, and TDS were obtained in the field. Hardness and Chloride are determined using titration method. Nitrate and Sulphate were determined using Spectrophotometer. Machine learning techniques were used to train the data set and to predict the unknown values. The dominant elements of groundwater are as follows: Ca2, Mg2 for cation and Cl-, SO4^2-, NO3^- for anions. The regression value for the training data set was found to be 0.90596, and for the entire network, it was found to be 0.81729. The best performance was observed as 0.0022605 at epoch 223.

KEYWORDS

Ecosystem, Global Positioning System (GPS), Machine Learning Techniques, Statistical Analysis

DOI: 10.4018/IJCCE.2018070104

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1. INTRODUCTION

It is found that nearly one-third of the Global population is using groundwater for their drinking purpose. Groundwater is the main sources of water supply for local purposes in urban areas as same as in the rural areas in India. Tripathi et al. (2012) had studied that groundwater is an essential natural resource. Be conditioned on its utilization; it can be a renewable and non-renewable or a non-renewable facility. Talabi and Tijani (2013)convey that groundwater studies are an important issue in water quality research because which will directly affect the people due to pollution in various places. Due to pollution, there will be various kinds of disease like typhoid fever, paratyphoid fever, dysenteries, infectious hepatitis, schistosomiasis, Asiatic cholera, back pain, pneumonia, and nasal congestion will attack us severely. Ben et al. (2014)found that water is an important essential need in all humans’ life for drinking and all another domestic purpose. In current scenario, up to a considerable extent, it is found that the life and majority of our financial action depend on population. The intermate requirement on water facility by improving a population of the most developing district like Tirupur aggravate by the collision of environment change results in the drying up of exterior water and exhaustion of groundwater. Selvakumar et al. (2017) evaluated that it is one of the major need features in groundwater studies. The hydrochemical study divulges excellence of water that is a match for drinking, agriculture and industrial needs. Chemical research forms the basis of the explanation of the quality of water in connection to source, geology, use, and climate. Water being a fantastic solvent, it is mainly to know the geochemistry of dissolved voters and methods of announcing analytical facts. Mogaddam (2011) described that in huge groundwater basins, urbanization had created a developing demand for drinking water; while long histories of agricultural bustle have remain aquifers potentially at suffering from NO$_3$. Fehdi and Rouabhia (2014) analyzed that groundwater is one of the controlled aquifers. It is underground water soaked stratum formation that can cultivate a usable amount of water to a well. Aquifers are again classified into two: confined aquifer and unconfined aquifer. If the zone of saturation is overlapped between two impermeable layers, then it is termed as confined aquifer, and when impermeable strata are absent just above the saturated zone, it is termed as an unconfined aquifer.

Gampson et al. (2014) extended that for the purpose of healthy living safe drinking of water is essential in all human life. Groundwater is a selected source of water for human needs. Gnanachandrasamy et al. (2015) studied the groundwater has become the main source for domestic purposes, industrial and irrigation sectors of various countries. Millions of pumps by hand and profound bore wells have been released throughout India since 1970 to provide pure water than the water influenced by microbes. More or less, this water has some dissolved chemical constituents that are not acceptable by humans for drinking as it may cause bad taste and diseases also.

Malhotra et al. (2014) extended the hydrochemical computation of deep bore ground systems are more or less based on the presence of a high amount of files depending upon groundwater chemistry. Gampson et al. (2014)conveyed that various multivariate statistical proficiencies are widely applied to compute water standard through data reduction, types, and relationship. Although multivariate statistical techniques like principal elements analysis, discriminate analysis, cluster analysis and factor analysis are widely used to determine surface water and groundwater standard, to our knowledge, however, there have been limited attempts to demonstrate surface water standard parameters to incorporate into common linear mixed models to evaluating low and high flow hydrology and physicochemical surface water standard. Bharathi et al. (2017) investigated that a huge majority of groundwater standard issues are caused by contamination and over-exploitation. Mostly water standard issues are various to detect and hard to analyze. The solutions are commonly much branded, time-consuming is not always in effect. An altering picture is beginning to issue in many parts of our nation. Groundwater pollution is as such different to detect, since the problem may be not shown below the surface and also monitoring may be expensive, time-consuming and somewhat hit-or-miss by nature.
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