An Advanced Analytical Framework for Predicting Future Water Levels

Rebecca Alowo
Lecturer, Department of Civil Engineering Sciences, Faculty of Built Environment, University of Johannesburg, South Africa

Daphine Achiro
Department of Civil Engineering Sciences, Faculty of Built Environment, University of Johannesburg, South Africa

German Nkhonjera
Department of Civil Engineering Technology, Faculty of Built Environment, University of Johannesburg, South Africa

Abstract:
Water scarcity is a growing concern worldwide. Boreholes are a vital water source, especially in regions with scarce surface water. Accurate predictions of the number of boreholes can facilitate better planning and governance. The availability of water resources is a critical factor for sustainable development, and boreholes serve as one of the primary sources of groundwater. Predicting the number of boreholes can aid in planning and resource allocation. This study used random forest models to predict the number of boreholes for the next decade. The evaluation reveals that the models predict a nearly constant number of boreholes, with slight variations. The visualizations for the dataset showed that the Average Water Level had significant fluctuations over the years, the number of boreholes also fluctuated but generally increased over time and the correlation matrix indicated that the features have some degree of correlation with the target variable Average Water Level. In terms of forecasting, the model predicts an average water level of approximately 21.37 for the next 20 years, assuming a constant borehole value. This modeling process highlighted the importance of considering external factors and employing more advanced models.

Keywords:
Water levels, predictions, frameworks.