ABSTRACT

Groundwater refers to the water present in subsurface formations composed of porous rocks and soils. This underground water resource is characterized by its versatile, reliable, and resilient nature, making it of utmost importance for the sustenance of human societies, ecosystems, and the overall environment. Groundwater quality is a critical environmental concern as it directly impacts human health and ecosystems. Groundwater quality assessment plays a crucial role in water resource management and environmental monitoring. This study aims to identify the best machine learning algorithm for groundwater quality prediction and develop a custom tool based on the selected algorithm. Three prominent algorithms, namely Random Forest (RF), Support Vector Classifier (SVC), and K-Nearest Neighbours (KNN), were evaluated using evaluation metrics such as F1_score, R2_score, and mean squared error (MSE). The RF algorithm emerged as the most accurate and reliable for groundwater quality prediction, demonstrating its ability to capture complex relationships between groundwater quality parameters. Leveraging the scikit-learn library and ArcGIS arcpy package, a custom tool was developed, enabling users to predict groundwater quality based on input data and visualizing the results through spatial analysis operations. The tool incorporates functionalities such as point data creation, IDW interpolation, and raster layer rendering. This research contributes to the field of water resource management by providing a valuable tool for informed decision-making and sustainable groundwater management. Future research may explore optimization techniques and the integration of real-time data sources for enhanced prediction accuracy and timeliness.