ABSTRACT

In this work, introduce a novel approach for predicting soil fertility using a bidirectional Gated Recurrent Unit (BiGRU) model. Soil fertility prediction is crucial for optimizing agricultural productivity and environmental sustainability. The BiGRU model is trained on a dataset comprising various soil parameters, including pH, electrical conductivity (EC), organic carbon (OC), organic matter (OM), nutrient concentrations (N, P, K, Zn, Fe, Cu, Mn), soil texture components (sand, silt, clay), and calcium carbonate (CaCO3) content. Additionally, cation exchange capacity (CEC) is included, indicating soil's ability to retain and supply nutrients to plants. By leveraging the bidirectional nature of the BiGRU architecture, our model captures both forward and backward dependencies among soil features, enhancing prediction accuracy. The BiGRU model's capacity to learn from temporal sequences enables it to discern complex relationships between soil properties and fertility. Our findings suggest that the proposed BiGRU model holds promise for accurate soil fertility prediction, providing valuable insights for precision agriculture and sustainable soil management practices.