

A four hybrid combination have been applied for the previous models as following; RF-XGB, RF-SVR, XGB-SVR, and RF-XGB-SVR. Additionally, the optimization accuracy requirement is defined, after which the model estimates GWFP and computes the corresponding error. The role of this function taken in the XGB is to improve the majority vote value in RF and at the same time help in improving the formation of individual tree in the process of bagging methods in RF. Hybrid of RF-XGB helps in improving the RF model in reducing the errors of MBE, MSE, MAE values which eventually increased the accuracy value in the model. The proposed method sought to improve the basic RF model's efficiency for GWFP simulation by employing a meta-heuristic algorithm to train the parameters of the membership functions and weights between layers of this model. The SVR hyper-parameters with the highest fitness are returned, thereby achieving the objective of optimizing the SVR model and improving the accuracy of GWFP estimation. To enhance computational efficiency, convergence accuracy and estimation precision, it was necessary to normalize the input variables of the model due to their different dimensions. The aim of applying hybrid models was to increase the accuracy of the results and reduce the error in estimating the green water footprint of the sugarcane crop. The boosting continue to update the weights of training set based on previous weaker learner to improve the importance of data which are classified wrongly. If the desired target is not achieved, the model proceeds to the third part, which involves optimizing the hyper-parameters of the XGB model using the SVR algorithm. In the proposed method, a SVR was coupled with a RF, resulting in a hybrid RF-SVR model wherein the SVR served to optimize the RF parameters. Subsequently, input data for the RF model are selected based on variable importance