

Prediction of soil macronutrient (nitrate and phosphorus) using near-infrared (NIR) spectroscopy and machine learning

Abstract

Determination of basic soil macronutrients such as nitrogen (N), phosphorus (P) and potassium (K) that dissolve from organic matter (OM) prior to the plantation of fruit and vegetable crops is one of the important process of soil preparation towards precision farming. In this paper comparative analysis is performed for detection algorithm on OM, (N) and (P) sample using near infrared spectroscopy (NIRS) spectrometer in reflective mode with an effective range of 900nm to 1700nm. In pre-processing we execute data dimension reduction by combining multiple feature selection such as data normalization, permutation feature importance, principle component analysis, fisher linear discriminant and filter-based feature selection. Pre-processing able to reduce 50% data dimension. For prediction model development we combine with multiple classification algorithm such as multiclass decision jungle, decision forest, logistic regression and neural network to come out with highest accuracy of N and P detection. We conclude that near infrared spectroscopy combines with feature selection and multiclass classification able to determine nitrogen and phosphorus.