A Support Vector Machine Learning Prediction Model of Evapotranspiration Using Real-Time Sensor Node Data

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Abstract : The research paper presents a unique approach to evapotranspiration (ET) prediction using a Support Vector Machine (SVM) learning algorithm. The study leverages real-time sensor node data to develop an accurate and adaptable prediction model, addressing the inherent challenges of traditional ET estimation methods. The integration of the SVM algorithm with real-time sensor node data offers great potential to improve spatial and temporal resolution in ET predictions. In the model development, key input features are measured and computed using mathematical equations such as Penman-Monteith (FAO56) and soil water balance (SWB), which include soil-environmental parameters such as; solar radiation (Rs), air temperature (T), atmospheric pressure (P), relative humidity (RH), wind speed (u2), rain (R), deep percolation (DP), soil temperature (ST), and change in soil moisture (ΔSM). The one-year field data are split into combinations of three proportions i.e. train, test, and validation sets. While kernel functions with tuning hyperparameters have been used to train and improve the accuracy of the prediction model with multiple iterations. This paper also outlines the existing methods and the machine learning techniques to determine Evapotranspiration, data collection and preprocessing, model construction, and evaluation metrics, highlighting the significance of SVM in advancing the field of ET prediction. The results demonstrate the robustness and high predictability of the developed model on the basis of performance evaluation metrics (R2, RMSE, MAE). The effectiveness of the proposed model in capturing complex relationships within soil and environmental parameters provide insights into its potential applications for water resource management and hydrological ecosystem.

Keywords : evapotranspiration, FAO56, KNIME, machine learning, RStudio, SVM, sensors
Conference Title : ICMLMEES 2024 : International Conference on Machine Learning Methods in Ecological and Environmental Sciences
Conference Location : Rome, Italy
Conference Dates : September 12-13, 2024