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Using pattern mining to determine fine climatic parameters for maize yield in Benin

Souand Peace Gloria TAHI

University of Abom ey-Calavi, Benin

This paper explores links between climatic parameters and maize yield in Benin to establish an accurate yield prediction rule using association rule algorithms. The datasets used contain climate and maize yield data over 26 years (1995 to 2020) in 5 districts with synoptic weather stations in two agro-climatic zones (Sudanian and Sudano Guinean). To determine the association rules, climate variables were aggregated with yield using "year" and "districts". Support vector machine, K nearest neighbour, Artificial Neural Network, Decision Tree, and Recurrent Neural Network were first employed to find the relationship between weather parameters and maize yields. The decision tree provided the highest accuracy ($R2 = 0.998$, $MSE = 0.021$, $MAE = 0.0008$). However, this model is not easily interpretable. It was then used to augment the dataset to ease the identification of the rules with the frequent pattern growth algorithm. Results showed that high maize yields are observed in the Sudano-Guinean zone for medium values of minimum and maximum temperature, rainfall, evapotranspiration, and humidity. In the Sudanian zone, high maize yield is observed for medium values of minimum and maximum temperature, and maximum humidity. The identified association rules demonstrated a reliable and promising approach to optimize maize yield.

Biography

Souand Peace Gloria TAHI is a doctoral researcher at the Laboratory of Applied Ecology (LA B E F), University of Abom ey-Calavi, Benin, specializing in biostatistics and data science applications for agriculture and the environment. She has extensive experience in data analysis, statistical modeling, and machine learning, particularly for crop yield prediction and environmental im pact assessment. Passionate about applied research, she aim s to contribute to the scientific development of her country and the region while addressing real-world challenges in agriculture, public health, and environmental sustainability.