Machine Learning-Based Rainfall Prediction: Unveiling Insights and Forecasting for Improved Preparedness

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Rainfall prediction is a critical aspect of raising awareness about potential dangers associated with precipitation and empowering individuals to take proactive measures for their safety. This study endeavors to harness the power of machine learning algorithms to accurately forecast rainfall, recognizing its significant impact on both rural and urban life, particularly in the face of scarcity or extreme weather conditions.

The intricate nature of rainfall, influenced by a myriad of atmospheric, oceanic, and geographical factors, poses a formidable challenge for accurate forecasting. This research employs a comprehensive approach encompassing data preprocessing techniques, outlier analysis, correlation analysis, feature selection, and the application of various machine learning algorithms such as Naive Bayes (NB), Decision Tree, Support Vector Machine (SVM), Random Forest, and Logistic Regression.
The primary focus of this study is to develop the most accurate rainfall prediction model by leveraging machine learning and advanced feature selection techniques. Notably, the Artificial Neural Network (ANN) attains a commendable maximum accuracy of 90% and 91% before and after feature selection, respectively. To deepen the analysis, k-means clustering and Principal Component Analysis (PCA) are employed to scrutinize regional rainfall patterns specifically within the context of Australian weather data.
In a bid to make the proposed machine learning model more accessible to the general public, the research culminates in the development of a user-friendly web-based application system using Flask. This not only enhances the usability of the predictive model but also serves as a practical tool for individuals seeking real-time information about impending rainfall.

In conclusion, this research underscores the efficacy of diverse machine learning techniques in accurately predicting rainfall using Australian weather data. By employing advanced methodologies such as feature selection, clustering, and PCA, the study not only enhances prediction accuracy but also sheds light on regional rainfall patterns. The integration of a web-based application further extends the practical applicability of the proposed model, making it a valuable tool for individuals and communities to stay informed and take timely precautions.

References:

[1] Z. He, "Rain prediction in Australia with active learning algo-rithm," in Proc. Int. Conf. Comput. Autom. (CompAuto), Sep. 2021, pp. 14–18.

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Guide - Dr. Kannan K.