GAMBELLA UNIVERSITY

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weather forecasting abstract

Weather Forecasting Project abstract

Group Assignment

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Introduction

Weather forecasting plays a crucial role in various fields such as agriculture, transportation, and disaster management by providing valuable insights into future weather conditions. Accurate prediction of rainfall is particularly important as it helps in planning and decision-making processes. In this project, we investigate the effectiveness of three machine learning algorithms, namely Decision Tree, Random Forest, and Support Vector Machine (SVM), for predicting whether it will rain tomorrow based on meteorological data.

Objective

The main objective of this project is to compare the performance of Decision Tree, Random Forest, and SVM algorithms in forecasting rainfall as well as to perform data preprocessing tasks. Specifically, we aim to evaluate the predictive accuracy of these algorithms using a dataset containing various weather-related features after we perform some common data-preprocessing tasks to make the dataset ready for these algorithms to work correctly.

Methodology

We have downloaded dataset from kaggle.com and the dataset contain daily weather-related features of Australia. And it contains 8761 records and 24 features. We utilize a dataset comprising meteorological variables such as minimum temperature, maximum temperature, rainfall, evaporation, sunshine duration, wind speed and direction, humidity, atmospheric pressure, cloud cover, and temperature at different times of the day. We preprocess the dataset by handling **missing values and outliers, encoding categorical variables**, **Normalizing independent variables (scaling)**, **Removing duplicates, and Correlation analysis among features, Feature Selections** and **splitting it into training and testing sets**. Subsequently, we train Decision Tree, Random Forest, and SVM models on the training set and evaluate their performance on the testing set using standard evaluation **metrics**.

Results

Our experimental results indicate that all three algorithms exhibit promising performance in predicting whether it will rain tomorrow.

The accuracy of SVM and Random forest is almost similar which 88.5% is whereas the accuracy of Decision Tree is 83%. In general, all three algorithms perform higher accuracy even if there is little variation each time the algorithms get executed but **SVM and Random Forest models are much better at predicting**. Feature importance analysis reveals that variables such as Wind Dir, humidity, and wind speed, pressure significantly influence rainfall prediction.

Conclusion

In conclusion, this project highlights the effectiveness of Decision Tree, Random Forest, and SVM algorithms for weather forecasting tasks, particularly in predicting rainfall. The findings contribute to the ongoing efforts to improve rainfall prediction models and have practical implications for various sectors reliant on accurate weather forecasts. Further research can explore ensemble methods and deep learning techniques to enhance predictive performance and robustness in weather forecasting applications.