UNIVERSITI TEKNOLOGI MARA

PREDICTION ON WEATHER FORECAST BASED ON CLOUD SHAPES USING CNN

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ABSTRACT

This thesis aims to address the challenges in weather forecasting, particularly the reliance on hardware-intensive methods and the limited coverage of weather stations in inhabited regions by analyzing clouds, with their diverse shapes and colors, serve as vital indicators for predicting atmospheric conditions. Recognizing the impact of cloud shapes on temperature regulation, meteorologists traditionally rely on large computer systems for weather prediction. To overcome the limitations of traditional methods, this research proposes a system utilizing Convolutional Neural Networks (CNN) for accurate weather prediction based on cloud shapes. The CNN model is designed to process visual information, identify cloud patterns, and forecast weather conditions with improved accuracy, speed, and reduced model size. Remote weather stations are recommended to broaden weather monitoring coverage, especially in isolated regions where dependence on inhabited-area stations can lead to delayed or incomplete information, posing risks to agriculture and resource management. The development phase focuses on implementing the CNN algorithm specifically for weather prediction based on cloud shapes. The results demonstrate the model's effectiveness, emphasizing the importance of balancing training and testing datasets with an accuracy of 93.59%. Evaluation results indicate that the Customized Xception Model with Intermediate Dense Layer outperforms the Simplified Xception Model, with an average accuracy of 0.915 compared to 0.88. This notable accuracy difference highlights the superiority of the Customized Xception Model with an Intermediate Dense Layer. Consequently, this model is selected as the system of choice. In conclusion, this project successfully achieves its objectives by proposing a CNN-based approach for accurate weather prediction, addressing the limitations of traditional methods. The research highlights the potential of remote weather stations to enhance coverage and reduce risks associated with incomplete information. While acknowledging limitations, this work serves as a foundation for future system improvements, emphasizing the positive contributions made in advancing weather prediction methodologies.

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