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A Backpropagation Neural Network Model on Precipitation Forecasting in the Philippines

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Abstract

Backpropagation neural networks were used to forecast daily rainfall with minimal error for Metro Manila in order to have an inexpensive way of accurately predicting weather. Calamities brought on by heavy rainfall have caused great economic, infrastructure and human loses. Neural networks have the ability to discern complex patterns in noisy data; this makes it a viable method for weather forecasting.

Daily precipitation, humidity, rain indication, sea level pressure, temperature and maximum sustained wind speed for January 2000 to December 2010 were acquired from the Philippine Atmospheric Geophysical and Astrological Services Administration. The neural network made use of Python 2.7.2 and the backpropagation program by Neil Schemenauer (python.org). It considered different neural network architectures with a total of 2844 data sets for training and 708 data sets for testing. Each neural network's accuracy was measured with a graph of the actual and predicted values, correlation coefficient, and root mean square error.

It was observed that the neural network with architecture 5-8-1 yielded the most accurate results as it had the highest correlation coefficient of 0.48599 and smallest root mean square error of 14.84. It was also observed that the trends of the predicted values followed that of the target values.

This suggests that it is possible to create a neural network with a moderate correlation given daily weather data. It is recommended that further researches make use of hourly data instead of daily data for more accurate results. Other variables, which might affect rainfall, not in this study should also be considered. This research could aid in the anticipation of calamities and the decision making involved in shipping, fishing and aviation industries.

評語

1. The project addresses the practical issue of precipitation forecasting with neural network model. As indicated in the poster, the findings show at best a chance of 0.34 of reaching the observed value. The large deviation may blame on the lack of hourly data. Like the much larger goal of making reliable weather prediction, the dream of having frequently weather data update is becoming a reality as the information highway infrastructure improves. Of course, damages to such infrastructure due to the weather may hamper the ability of prediction itself as shown in recent events. Therefore, the neural network somehow should include a feedback mechanism for adjustments due to weather-caused damage done on the information infrastructure.

2. In any science fair, concreteness is essential. The project focuses on the neutral network. The whole operation is treated as a kind of blackbox. The project needs to make the operation transparent.

3. Computer simulation is essential for this project to handle and to visualize the data for this project.