SOLAR IRRADIANCE FORECASTING MODEL USING ARTIFICIAL NEURAL NETWORK (ANN)

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ABSTRACT

This thesis presents the Artificial Neural Network (ANN) model for predicting solar irradiance. The inputs of the ANN are the solar irradiance values for previous five one-minute intervals while the output of the ANN is the solar irradiance of the sixth-minute interval. The solar irradiance data were obtained from a weather monitoring station at Green Energy Research Centre (GERC) at Universiti Teknologi MARA, Malaysia. During testing, the ANN produced a low mean absolute percentage error (MAPE) of 10.5796% and high coefficient of determination, R^2 of 0.8925. The results obtained also show that low MAPE value and high R^2 value had shown that the ANN model has a good predictive performance and was useful in predicting solar irradiance.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Solar irradiance is the portion of the sun's radiation which available at the earth's surface. Solar irradiance also known as a kind of popular renewable energy compared with other energy, like geothermal and tidal [1]. Indeed, this energy useful for many applications, such as increasing the temperature of the water or exciting electrons in a photovoltaic cell. Moreover, it also supplies energy to natural processes like photosynthesis. Solar energy is free, clean and available on the earth throughout the year [2]. In this study, the outputs from a Grid-Connected Photovoltaic (GCPV) system are the data that used as input parameters to predict the solar irradiance.

Artificial Neural Network (ANN) is the one of the popular prediction technique which has the capacity to learn, memorize and create relationships among data [3]. Feed-forward and feedback networks are two major categories of ANN. Feed-forward networks have signals travel one way only which is signaled from input to output [4]. Signals that travel in both directions are known as feedback networks. In this study, the feed-forward network was used.