Artificial Neural Network Flood Prediction for Sungai Isap Residence

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***Abstract*— A flood is an extremely dangerous disaster that can wipe away an entire city, coastline, and rural area. The flood can cause wide destrotion to property and life that has the supreme corrosive force and can be highly damaging. In order to decrease the damages caused by the flood, an Artificial Neural Network (ANN) model has been established to predict flood in Sungai Isap, Kuantan, Pahang, Malaysia. This model is able to initiate the same brain thinking process and avoid the influence of the predict judgment. In this paper, presentation and comparison that using Bayesian Regularization (BR) back-propagation, Levenberg-Marquardt (LM) back-propagation and Gradient Descent (GD) back-propagation algorithms will be organized and carry out the result flood prediction. The predicted result of the Bayesian Regularization indicates a satisfactory performance. The conclusions also indicate that Bayesian Regularization is more versatile than Levenberg-Marquart and Gradient Descent with that can be backup or a practical tool for flood prediction. Temperature, precipitation, dew point, humidity, sea level pressure, visibility, wind, and river level data collected from January 2013 until May 2015 in the city of Sungai Isap, Kuantan is used for training, validation, and testing of the network model. The comparison is shown on the basis of mean square error (MSE) and regression (R). The prediction by training function Bayesian Regularization back-propagation found to be more suitable to predict flood model.**

***Key Words*— extremely dangerous disaster, flood, highly damaging, supreme corrosive force, Artificial Neural Network**

I. INTRODUCTION

Floods mostly caused by heavy raining, sea level pressure, wind, and river overflow in seacoast and the lower land area. The floods hit Malaysia in 2014, that causes 21 dead and 200,000 residents is affected by this flood and has been described as the worst floods in these decades. The floods can have been devastating consequences and can have an effect in the economy, environment and people. The flood effect can be divided into two types, there are primary effects and secondary long-term effect [1]. The primary effect of flooding included loss of life, damage on building and structures, damage of power generation, loss of clean drinking water treatment and water supply, and raise the risk of waterborne diseases. Secondary long-term effect is that affect on the economic problems causes by lasting in the limit period of time in decrease in tourism sector, reconstruction costs, and insufficient food after the big impact of flood.

In the last decades, Artificial Neural Network (ANN) has been widely used for flood prediction. ANN can be used for predicting because of having the capability of examining and determining the historical data used for prediction [2]. In recent years, several types of ANN models have been developed for flood prediction in Malaysia, result from the paper [3], exploit using Geographic Information System (GIS) and ANN method to modeling and simulate in Johor. In [4], is about compare the prediction between Non Linear Autoregressive with Exogenous Input (NARX) and Extended Kalman Filter (EKF) in flood water lever prediction. From the [5], is proposed Back-Propagation Neural Network (BPN) with to improve the prediction with extended Kalman filter is apply in output of BPN to predict the flood water level at downstream station. Result from [6], proposed an Improvement Elman Neural Network (ENN) for predict water level at Kelang River station located at Petaling Bridge, Kuala Lumpur. Previous work has been supportive of the neural networks for flood prediction at other country, India [7], show a Time Lagged Recurrent Neural Network and General Recurrent Neural Network to predict the rainfall model for upper area of Fardha River in India with the methodologies and techniques is compare of the short term runoff prediction results between both neural network. In China [8], the Optimal Subset Regression (OSR) and Back-Propagation Neural Network (BPNN) have been combined. Training and testing errors are for measure and to decide the best condition to stop training and make a prediction. In Greece [9], comparing made between the performance of Feed-Forward back-propagation ANN, Adaptive Linear Neuron Network (ADALINE), and Elman network in an attempt to assess the relative performance of existing models at the river Pinios (Greece). In Italy [10], for this model is compare the Black-Box Type Runoff Simulation Model and the Real-Time Improvement of the Discharge Forecast to rainfall-runoff model aimed at the real-time forecasting of flood events, based on integrating ANN. In Poland [11], using Radial-Basis Function Neural Networks and Multi-Layer Perceptron, extended with Linear Regression and Nearest Neighbor Approach for flood forecasting in Nysa Klodzka River.