CHAPTER 3

METHODOLOGY

3.1 ARTIFICIAL NEURAL NETWORK

Artificial neural network is modelling of mathematical or computational that has similarities of biological neural network (19 Aleksey Gladkov). In a study on the teaching and learning of Artificial Neural Network (Prodipto Das and Abhijit Paul, 2008) state that ANNs was a human perception based on mathematical model that can be used for performing a stated task based on availability of empirical data. Inspiration ANNs models came from motivation desire to produce artificial systems capable of sophisticated, perhaps "intelligent", computations similar to those that the human brain routinely performs, and thereby possibly to enhance our understanding of the human brain (Sucharita Gopal, 1998).

Figure 3.1: ANN Neuron Model
Generally, ANNs was inspired by natural neuron from a system of interconnected nodes that can give outcome based on the input data such as in figure 1 (Mahmoud Nasr and Hoda Farouk Zahran, 2014).

The input layer receives the data from different sources. Hence, the number of neurons in the input layer depends on the number of input data sources. The neural network will learn through example by data classification and pattern recognition through system and configured for specific function or application. Specialize of neural network are capable to learn complex nonlinear input-output relationship by following the procedure and adapt themselves to the data. (Jayanta Kumar Basu, Debnath Bhattacharyya, Tai-hoon Kim, 2010).

### 3.2 EFFECT OF ANN

We can say that neural network approaches differ from old statistical techniques in many ways and the differences can be exploited by the application developer. It is a powerful for decision-making tools data are multivariate with a high degree of interdependence between factors data are incomplete, when many hypotheses are to be pursued and high computational rates are required (Irfan Y. Khan, P.H. Zope, S.R. Suralkar, 2013).

#### 3.2.1 Advantages

The advantages in the utilization of a neural network can perform tasks that a linear program cannot and when an element of the neural network fails, it can continue without any problem (Xu Jian-Hao, 2011). The capability of the network to analyzing the data even if the data is incomplete or distorted and would possess the ability to conduct an analysis with data in non-linear fashion was one of the advantages of this method (James Cannady). The only real requirements for the ANN model are for sufficient data for flood modelling events, and the specification of appropriate neural network parameters values to be used.
Neural network models automatically handle variable interactions if they exist and are able to learn any complex non-linear mapping / approximate any continuous function and can handle non-linearity’s implicitly (Irfan Y. Khan, P.H. Zope, S.R. Suralkar, 2013).

3.2.2 Disadvantages

The neural network needs training to operate same like biological neural network train. Adjustable parameters to produce desired output by adjust the strength (weight) connection between the neuron needs involvement of training by compared the target and output values (D.J Livingstone, D.T. Manallack and I.V. Tetko, 1996). Unlike expert systems, analyses and estimation of information provides probability the data matches or not with the characteristic that has been trained to recognize. The dependent on accurate training of the systems, training data, and the training methods that are used are critical (James Cannady). Process of training is an important aspect, and the performance of an ANN is crucially dependent on successful training (ASCE Task Committee, 2010).

ANNs requires high processing time for large neural networks. The training routine requires a very large amount of data to ensure that the results are statistically accurate (James Cannady). Larger neural networks may require high processing time for training to operate (Ramapulana Nkoana, 2011).