AN IMPROVED RAINFALL PREDICTION MODEL FOR MINIMIZING THE NEGATIVE IMPACT OF INCREASED RAINFALL DAYS IN MINNA, NIGERIA USING ARTIFICIAL NEURAL NETWORK.

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ABSTRACT

This research aims at predicting the rainfall of Minna metropolis of Niger State, Nigeria using binary classification method of Artificial Neural Network (ANN). In this approach, four atmospheric parameters comprising those of rainfall, relative humidity, minimum temperature and maximum temperature spanning from January 2010 to December 2019 were acquired from the Geography Department of the Federal University of Technology, Minna. The default threshold classification method of ANN was investigated. The result revealed that: for the default threshold of 0.5, a prediction accuracy of 69%, sensitivity of 63%, specificity of 84% an error value of 1.3% and a total of 66 rainfall days were predicted as against 32 rainfall days in the data set. The implication of this result is that more rainfall days were anticipated in the metropolis which could lead to flooding in long run. It was recommended that for more accurate rainfall prediction, more robust data be used for network training.

Keywords: Rainfall prediction Model, Artificial Neural Network (ANN).

INTRODUCTION

Rainfall is a natural phenomenon whose prediction is challenging and demanding as the world continues to witness an ever-changing climate condition. Its forecast plays an important role in water resource management and therefore, it is of particular relevance to the agricultural sector, which contributes significantly to the economy of any nation Abdulkadir *et al.* (2012). The effect of rainfall on human civilisation is colossal. Rainfall means crops; and crop means life. Additionally, rainfall has a strong influence on the operation of dams and reservoirs, sewage systems, traffic and other human activities. Previous studies have shown that among the entire climate elements, rainfall is the most variable element both temporally and spatially which can have significant impact on economic activities (Pepin, 2017; Umar, 2012). Accurate and timely rainfall prediction can be very helpful for effective security measures for planning water resources management, issuance of early flood warning, construction activities, transportation activities, agricultural tasks, managing the flight operations and flood situation. Heavy rainfall can lead to numerous hazards, for example: flooding, including risk to human life, loss of crops and livestock, landslides which can threaten human life (Ifabiyi and Ashaolu, 2013).

In machine learning, classification can be referred to as task that requires the use of machine learning algorithms that learn how to assign a class label to examples from the problem domain. Weather data consists of various atmospheric features such as wind, precipitation, humidity, pressure, and temperature among others. These parameters are related to one another in one form or the other and as such can serve as inputs for the prediction of a parameter of interest using data mining technique. Data mining techniques such as ANN can effectively predict rainfall by extracting the hidden patterns among available features of past weather data (Aftab and Ahmad, 2018). In classification prediction, the classifiers are used to find the class to which an unknown data belongs based on the information available from a set of data whose class is already known (Abisoye & Jimoh, 2018). Classification refers to a predictive modelling problem where a class label is predicted for a given sample of input data (Brownlee, 2020). From a modelling