Chapter One

Introduction

1.1 Background

Recent advances in computer technology and its wide application in various disciplines has enabled the collection, storage, and analysis of data of huge sizes, large dimensions, and various formats. Time series forecasting (TSF) plays a key role in making better social, organizational, economical and individual strategic decision under uncertainty. For example, accurate bankruptcy prediction and credit scoring (Lin et al., 2012) assist financial institutions to avoid financial crisis, forecasting electricity load (Raza and Khosravi, 2015; Behera et al., 2010) helps in better power system planning and in achieving the concept of next generation power system such as smart grid, forecasting electricity price (Weron, 2014) assist energy companies to avoid over/under contracting and then selling/buying power in the balancing market, forecasting internet traffic (Meade and Islam, 2015) helps service providers to enhance their service, forecasting call volumes (Meade and Islam, 2015) in a call center assists scheduling staff, forecasting natural physical phenomena like whether (Maqsood et al., 2004), earthquake (Reyes et al., 2013) assist mankind to be prepared by taking necessary precautions. Latest review papers provide a summary of application of forecasting in several areas (Lin et al., 2012; Raza and Khosravi, 2015; Weron, 2014; Meade and Islam, 2015; Donkor et al., 2014; Fagiani et al., 2015; Chandra et al., 2013; Zhang, 2003). Future of most of these phenomena usually captures true relationships existing in the past observations. Therefore, future of a phenomenon can be predicted by systematically analyzing the past observations and such a process is known as time series forecasting. The past observations are recorded sequentially through time to form a time series which is represented by a vector. Based on the number of time series used in forecasting, the TSF method may be multivariate or univariate. In multivariate methods, in addition to the prediction variable or time series, forecasts depend on values of one or more additional time series, called predictor or explanatory variables. However, in univariate methods, an appropriate model is developed by carefully analyzing a single time series and then the model is used to predict the future values of the series. The univariate TSF method is particularly useful when little knowledge is available on the underlying data generating process or when there is no

satisfactory explanatory model that relates prediction variable to other explanatory variables (Zhang, 2003). In this paper, an attempt has been made to develop a hybrid forecasting model using univariate forecasting method.

Atmospheric water vapor is a mixed meteorological element. It is a fundamental material in the climate system as the most significant greenhouse gas and a key driver of many atmospheric processes. Water vapor and its transport around the atmosphere is a fundamental material of the hydrological cycle. The vapor plays a vital role in determining the dynamic and radiative properties of the climate system. Humidity is the amount of water vapor in the air, and relative humidity considers the ratio of the actual vapor pressure of the air to the saturated vapor pressure which is usually expressed in percentage. Dhaka is one of the most climate vulnerable city in Bangladesh. Due to high impact of climate change, climate information is highly demandable. As functional data analysis is an advance analysis tool to forecast evaluation of the amount of relative humidity of Dhaka city.

1.2 Motivation of the study

Accurate prediction of weather parameters is a difficult task due to the dynamic nature of the atmosphere. Using Hybrid ETS-ANN model, we compare two or more sets of data with respect to certain types of variation, where two sets of data can contain different sets of replicates of the same function or different functions for a common set of replicates. In this report, we are interested to work with monthly relative humidity were examined and Hybrid ETS-ANN model was fitted for forecasting the monthly relative humidity of Dhaka city from January 1953-November 2021.

1.3 Objectives of the study

- To represent the monthly relative humidity of Dhaka city in a functional data format.
- To analysis the functional data, others factors and variables related to the relative humidity.
- To fit a Hybrid ETS-ANN time series model for the monthly relative humidity of Dhaka city.

- To forecast the monthly relative humidity of Dhaka city using ETS-ANN model.

1.4 Computational issues

we will use Microsoft Excel to edit the data, forecasting using Functional data analysis will be implemented by the programing codes in R .

1.5 Outline of the study

In this report our study concerns with selected functional time series data and Hybrid model. Our report is a complete opinion that we will get the results and compare to prove that our required result is better than others. In our report, the whole study is completed in various chapter. We have prepared the chapter as follows

Chapter Two reveals the literature review about the ETS and Neural network model which is all about the methodologies that we have used in our report.

Chapter Three explains the analysis of result which is the main part of our report to make better than others.

A summary with concluding remarks and some suggestion for further research is contained is the final chapter.