Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 79 (2016) 238 – 243

Procedia Computer Science

7th International Conference on Communication, Computing and Virtualization 2016

Oral-Care Goods Sales Forecasting Using Artificial Neural Network Model

Sangeeta Vhatkar[a], Jessica Dias[b]*

Thakur College of Engineering and Technology, Kandivali(E), Mumbai and 400101, India

Abstract

Supply Chain consists of various components like supplier, manufacturer, factories, warehouses, distribution agents, customers, etc. Supply Chain Management encompasses all the activities from moving goods from sourcing to consumption. Sales forecasting is a part of downstream activity of supply chain and is the process of predicting future sales of the product. It helps in making informed business decisions. In this paper a study of various sales forecasting algorithms is done and results of sales of oral-care products are calculated using Back-Propagation Neural Network Model. The error rate for different products is also calculated.

Peer-review under responsibility of the Organizing Committee of ICCCV 2016

Keywords: Sales forecasting ; ARIMA; Neural Network; Supply Chain; FMCG.

1. Introduction

The supply chain comprises of all the activities associated with moving goods from the raw-materials stage to the end user [1]. A typical supply chain may involve following stages: Customers, Retailers, Wholesalers, Distributors, Manufacturers, and Suppliers. The downstream stage in the supply chain involves processing the materials collected during the upstream stage into a finished product. It also includes the actual sale of that product to other businesses, governments or private individuals [2]. Having accurate demand details and previous sales record, one can easily forecast sales using different forecasting techniques like ARIMA, SVM, ANN, Genetic algorithm,etc.

ARIMA stands for Autoregressive Integrated Moving Average model. These models are fitted to time series data to forecast the future points of data. The model is generally referred to as an ARIMA(p, d, q) model

* Corresponding author. Tel.: +91-7276482175;
E-mail address: dias.jessica29@gmail.com

Peer-review under responsibility of the Organizing Committee of ICCCV 2016
doi:10.1016/j.procs.2016.03.031

where parameters p, d, and q are non-negative integers that indicate the order of the autoregressive, integrated, and moving average parts of the model respectively. ARIMA models form an important part of the Box-Jenkins approach to time-series modelling. When one of the three terms is zero, it is better to drop "AR", "I" or "MA". For example, ARIMA (0, 1, 0) is I (1), and ARIMA (0, 0, 1) is MA (1) [3].

Support Vector Machine (SVM) is a machine learning technique which comes under classification method that is based on the construction of hyper planes in a multidimensional space**.** Support vector machine (SVM) is a useful technique for pattern recognition, object classification, regression analysis and time series prediction [4]. For a given set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that predicts whether a new example falls into one category or the other. SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall on. A linear support vector machine is composed of a set of given support vectors z and a set of weights w. The computation for the output of a given SVM with N support vectors z1, z2, … , zN and weights w1, w2, … , wN is then given by, [5]

$$F(x) = \sum_{i=1}^{n} w_i < z_i, x_i > + b \quad (1)$$

Artificial Neural Networks are models inspired by biological neural networks and are used to estimate or approximate functions that can depend on large number of inputs and are generally unknown. They consist of input layer of nodes, one or more hidden layers and an output layer of nodes. There are different types of neural networks like Feed-forward networks, Feed-backward networks, Radial Basis Functions, Kohonen Self organizing networks, etc. The function of neural network is described as follows:

$$Y_j = f(\sum_i w_{ij} X_{ij}) \quad (2)$$

Where Y_j is the output of node j, f (.) is the transfer function, w_{ij} is the connection weight between the node j and node i in the lower layer and X_{ij} is the input signal from node i in the lower layer to node j [5]. In ANN modelling, the historical data from the given time series would serve as the input data and the output would be the forecasted data [6].

1.1. Back Propagation Neural Network Model

Back Propagation learning algorithms were proposed by Rumelhart et al.[7]. They are common and popular methods of training neural networks. In the learning process, BPLAs use gradient descent method to optimize the whole learning process. The structure of a back-propagation ANN is shown in figure 1.

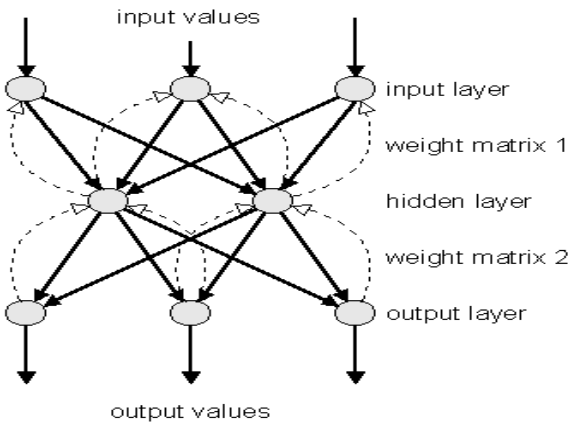

Fig. 1 Back-propagation neural network model [8]