

## FORECAST OF SALES OF A STORE

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**Abstract** - Many times, it is not easy for retailers to understand the market condition. The organization of retail store network has to understand the market conditions to boost up their goods to be bought and sold, so that numerous customers get attracted in that direction. Business forecast helps the retailers to visualize a picture by forecasting their sales. By forecasting, we get a general idea about sales of upcoming days or years. If any changes are required then those changes are to be made in the retail store's objective. Then in this way a retail store can be successful with some good profits. This will also make the customers feel happy by providing their desired products in the desired time, when the customers feel happy then automatically they prefer the store that provides all the resources they need to their satisfaction by this the sales in the particular store in which the customers purchase more items increases causing more profit. The forecasting of sales helps to know the retailers the demand for the product.

**Key Words:** forecasting, Keras, Tensorflow, LSTM cell, Neural network, Deep Learning.

### 1. INTRODUCTION

Good forecasts play a key role in many fields of scientific, industrial, commercial and economic activity. In today's business sector's consumer-centric environment, companies looking for good sales performance often need to maintain a balance between meeting customer demand and controlling cost of inventory. Carrying a bigger inventory enables client demand to be satisfied at all times, but it may result in over-stocking, leading to issues such as tied-up capital, written down inventory, and lower profit margins. In comparison, lower inventory concentrations may decrease inventory expenses, but may result in cost of chance resulting from missed selling possibilities, lower customer satisfaction, and other issues. Sales forecasting is the process of determining future sales and the forecasts can be used to maintain the necessary

amount of inventory to prevent the under or over-stocking issues.

Sales forecasting [1] can affect corporate financial planning, marketing, customer management, and other company fields. Consequently, improving the precision of sales forecasts has become a significant element of a company operation. Sales forecasting is a more traditional but still very compelling application of time series forecasting. Time series forecasting is being used as the foundation for the functioning of any process over the time based on the past data. Forecasts are determined by using the data from the past and by considering the known factors in the future. Much effort is dedicated over the past decades for the development and improvement of various forecasting models. The characteristics of time series are essentially noisy, non-stationary, non-linear, unstructured along with the many influencing factors of political, economic and psychological identity made many applications related to exchange rate as difficult applications of financial forecasting techniques.

Sales forecasting plays a major role in financial planning and conducting business for any organization to assess the statistics of the past and current sales and to forecast future performance. Altogether, precise sales forecasting helps the company to run more productively and efficiently, to save money on the approaches to make forecasts or predictions described as Statistical Modelling, Machine learning [2]. However, machine learning has in the last decade grown to become a field with broad application potential and has gradually gained ground in the food industry, among other areas. To predict outcomes of a future event a machine learning model is exposed to data from which it learns patterns that are used to predict the outcome. There are several methods for this purpose and studies have shown promising results

for the use of, *Multilayer Perceptron* (MLPs) [3] and various network architectural models such as *Radial Basis Function Networks* (RBFNs) and *Support Vector Machines* (SVMs).

MLP is a concept that is extensively used for sales prediction because of its capability of learning non-linear trends. A commonly used MLP is the Backpropagation Neural Network which has shown to outperform conventional statistical methods in sales prediction. Moreover, RBFNs shares the capability of learning nonlinear trends and has also been applied to various problems in the food industry. The method has also shown promising results as a tool for sales prediction. In addition, SVMs is another popular machine learning algorithm. It is used to solve both classification- and regression problems and, like the network architecture models mentioned above, it has also been used as a method to predict sales in the food industry.

In order to be competent enough and to generate higher revenue, business organizations are constantly in search of a better model or technique for data mining and maintenance of critical data. Business industry faces severe challenges to identify an accurate data mining technique and effective predication strategy due to the exponential growth of huge volume of data used in e-commerce transactions. Sales data analysis faces lot of issues and major aspects of sales functions are identification of product attribute, price fixation, net sales realization and launch of new product. Various prediction methods and sales forecasting strategies.

An accurate forecasting model can increase the sales revenue and is of high importance in a company in order to improve the ordering of supplies and to better understand how to schedule personnel.

### 1.1 LITERATURE SURVEY

**Sales Forecasting** [1] is the projection of customer demand for the goods and services over a period of time. In other words, it is the process that involves the estimation of sales in a physical unit that a company expects within a plan period.

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### 1.2 CHALLENGES AND MOTIVATIONS

There are so many challenges in the retail store network planning system, some of them are retailers fail in the evaluation of the potential of the market. Retailers ignore the seasonal changeability. The supply chain inefficiencies when the products have great demand then they are unavailable. The human resources are inefficient the employees are not available whenever necessary. The retailers face the difficulties in inventory management system; sometimes the retailers ignore the competition in the market.

Retailers develop the few plans that promotes the success and the highly target plan. The plans should be such that they help to obtain the maximum profit. The new product lines should be developed or they should be purchased with confidence. The supply chain mechanism should be efficient.

## 2. IMPLEMENTATION OF SALES FORECASTING

### 2.1 Architecture

Architecture is the most important aspect of any system. Fig.1 represents the architecture.

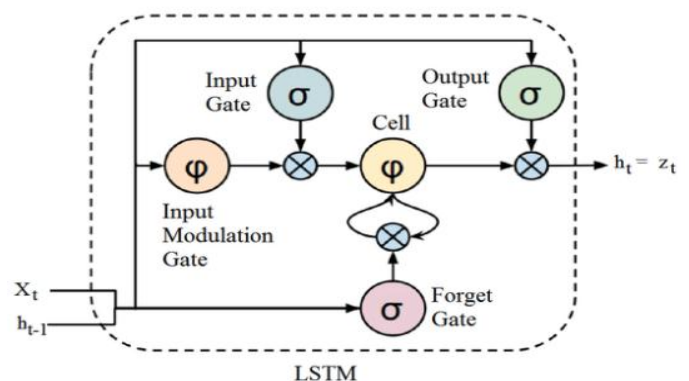


Fig.1

## 2.2 The Forecasting Process

Below are the steps of the forecasting process

1. Understand Business Objective
2. Define Modeling Goals
3. Select/Get Sales data
4. Prepare Sales data
5. Analyze and Transform Variables. Random Sampling
6. Model Selection and Develop Models (Training)
7. Validate Models (Testing), Optimize and Profitability.

These are all steps are been involved in order to forecast the sales. Fig2 represents the forecasting process.

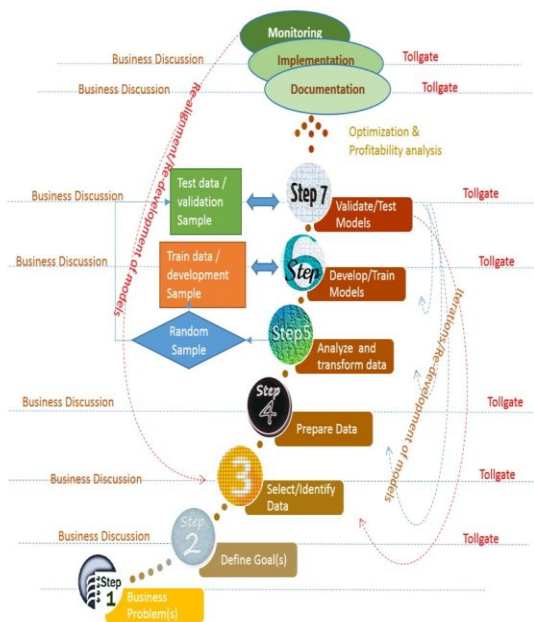


Fig.2 Forecasting process steps

## 2.3 METHODOLOGY

In this project, we will focus on *Long Short-term Memory (LSTM)* [4] method, which is a quite popular one if you want to use Deep Learning. We will use Keras in our project to implement LSTM.

Where, Long Short-Term Memory (LSTM) networks are a type of recurrent neural network capable of learning order dependence in sequence prediction problems. LSTM are a complex area of deep learning. It can be hard to get your hands around what LSTMs are,

and how terms like bidirectional and sequence-to-sequence relate to the field.

*Keras* [5] is an Open Source Neural Network library written in Python that runs on top of Theano or TensorFlow. It is designed to be modular, fast and easy to use. Keras doesn't handle low-level computation. Instead, it uses another library to do it, called the Backend. So Keras is high-level API wrapper for the low-level API, capable of running on top of TensorFlow, CNTK, or Theano. Keras High-Level API handles the way we make models, defining layers, or set up multiple input-output models. In this level, Keras also compiles our model with loss and optimizer functions, training process with fit function. Keras doesn't handle Low-Level API such as making the computational graph, making tensors or other variables because it has been handled by the "backend" engine.

*TensorFlow* [6] is an end-to-end open source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries and community resources that lets researchers push the state-of-the-art in ML and developers easily build and deploy ML powered applications.

## 2.4 Representation

There are several representations of LSTM units. A common architecture is composed of a cell (the memory part of the LSTM unit) and three "regulators", usually called gates, of the flow of information inside the LSTM unit: an input gate, an output gate and a forget gate. Some variations of the LSTM unit do not have one or more of these gates or maybe have other gates. Intuitively, the *cell* is responsible for keeping track of the dependencies between the elements in the input sequence. The input gate controls the extent to which a new value flows into the cell, the forget gate controls the extent to which a value remains in the cell and the output gate controls the extent to which the value in the cell is used to compute the output activation of the LSTM unit. The activation function of the LSTM gates is often the logistic sigmoid function. There are connections into and out of the LSTM gates, a few of which are recurrent. The weights of these connections, which need to be learned during training, determine how the gates operate.

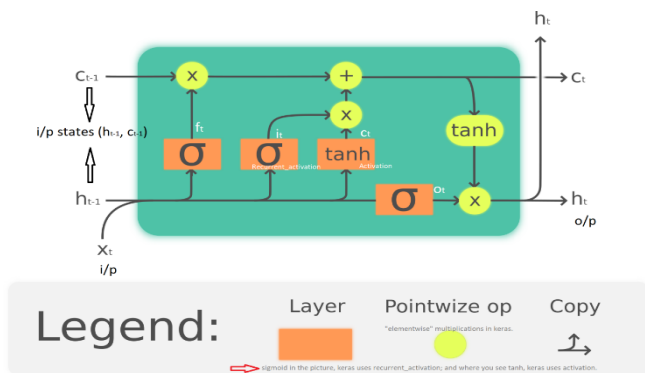


Fig 4: Keras LSTM Cell Architecture

### 3. CONCLUSIONS

When the products as per the requirement of the customers then it can make possible maximum profit, the retailers can also make the changes in the operations, their objectives of the store that cause loss and efficient methods can be applied to gain more profit by observing the previous data the existing stores a clear idea of sales can be known.

Most of the shopping malls / shopping centers plan to attract the customers to the store and make profit to the maximum extent by them. Once the customers enter the stores, they are attracted then definitely they shop more by the special offers and obtain the desired items which are available in the favorable cost and satisfy them. The advantage of forecasting is to know the number of employees should be appointed to meet the production level. Sales drop is bad thing forecasting sales helps to analyze it and it can overcome through the sales drop to remain in the competition forecast plays a vital role.

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