CHAPTER 1: INTRODUCTION

1.1 Overview

This chapter begins with an introduction of using computer as a problem solving tool. A general introduction on machine learning which includes a simple comparison to reveal how machine learning is better that human learning, basic models of machine learning, learning based program and aims of machine learning research has been discussed. An idea about how forecasting is an indispensible tool in today’s business world is also given. The justification to develop the forecasting system which involves several approaches for predicting uncertain events is also given. Objectives of the research given below are also discussed in this chapter. This chapter has also discussed about the business forecasting. Classification of forecasting models is given in this part. Business forecasting models are classified into qualitative and quantitative methods. Qualitative models are based on human judgment and usually non mathematical in nature e.g. Market Research, Delphi Method and Executive Opinion. Quantitative models are based on mathematical equations. All of our research models are quantitative in nature. Forecasting problems are frequently classified as short term, medium term and long term. The other aspects covered in this chapter are basic principles of forecasting, various steps in forecasting process, importance of forecasting and time horizon of forecasting model.

1.2 Computer as a Problem Solving Tool

Trying to use machines to solve mathematical problems can be traced to the early 17th century [1.1]. Wilhelm Schickhard, Blaise Pascal and Gottfried Leibnitz were among mathematician who
designed and put into practice calculators that were capable of addition, subtraction, multiplication and division. Computers were invented to compute i.e. to solve complex mathematical problems. The computer is mainly a problem solving tool. Once it is suitably provided with a valid program, the computer becomes self-operational, that is, it needs no human interference during processing. Beginning from the Latin, by the mid 17th century the word computer meant a person who solves equations. The computer remained allied with human activity until about the middle of the 20th century when it becomes applied to a programmable electronic device that can store retrieve and process data. Now a day computers are used everywhere. With computers we can calculate, process data, solve problems, communicate with each other and create art. When designing computer programs and applications, one of the key questions is the question of functionality i.e. what can the computer offer to the users and how can it sustain their work? When dealing with decision making problems and tasks, the question is therefore how can computers and IT support people who are faced with difficult decisions, so that they can decide better faster and most effectively [1.2]. Thus, computers are devices capable of carrying out instructions that manipulate information represented in a convenient way. Computer changes information/data according to prearranged set of laws that are structured in an algorithm and executes as a program.

1.3 Learning

Learning is a major trademark of human brainpower and the basic means to obtain knowledge. Various definitions of learning incorporate:
(i) According to Random House Dictionary, “The modification of behavior through practice, training or experiences is called learning”.

(ii) In the words of Harvard Business School psychologist Chris Argyris, Learning is "detection and correction of error" where an error means "any mismatch between our intentions and what actually happens."

(iii) “To acquire knowledge or skill in by study, instruction or experiences”.

(iv) “Learning is a lifelong process of transforming information and experiences into knowledge, skills, behavior and attitude”.

(v) According to Skinner, “Learning can be defined as changes in the behavior of an organism that are the result of regularities in the environment of that organism.

Learning process consists of the attainment of new declarative knowledge, the improvement of motor and cognitive skills through training or practice, the organization of fresh knowledge into general, effective illustrations and the innovation of new facts and theories through observation and testing [1.3]. The capability to learn is possessed by humans, animals, and some machines. In case of machine, we emphasizes on computer. Machine learning techniques aim to automatically learn and recognize patterns in large amounts of data. Machine learning can be viewed as an attempt to automate ‘doing science’. Machine learning is used when, human expertise does not exist or human are unable to explain their expertise or solution changes in time or solution needs to be adapted to particular case.

1.3.1 Learning Based Programming

Learning based programming (LBP) is a programming paradigm that extends conventional programming language by allowing programmer to write programs in which some of the
variables are not explicitly defined in the program. Instead these variables can be named by the programmer that may use language construct to define them as trainable components. The goal of LBP is to develop the programming paradigm and language that can support machine learning centred system. This is a necessary step in facilitating the development of computer programs that interact with and make inference with respect to naturally occurring data. Conventional programming languages on the other hand allow the design and implementation of large scale software systems and relay on a programmer to explicitly define all the concepts and relations involved often hierarchically. In LBP we develop a programming model that supports building large scale system in which some components cannot be explicitly defined by a programmer [1.4]. Specifically an LBP program extends traditional programming in the following way:

(i) Allowing the programmer to name abstractions over domain elements and information source defined implicitly in observed data.

(ii) Allowing the programmer to interact with named abstractions.

(iii) Supporting seamless incorporation of trainable components into the program.

(iv) Provide a level of inference over trainable components to support combining source and decisions in way that respect domain’s constraint

(v) A compilation process that turns a data dependent high level program into an explicit program, once data is observed.

LBP paradigm is essential in order to develop large scale system that acquire the mass of their knowledge from raw, real world data and work robustly when offered with new previously unseen situations.
1.4 Machine Learning

One of the presently most active research areas within artificial intelligence is the field of machine learning, which involves the study and development of computational models of learning processes. Recently, a lot of interesting work has been done in the area of applying machine learning algorithms. Machine learning is the elementary way to make the computer intellectual. R.Shank, famous personality from the area of artificial intelligence has said: "If a computer cannot learn, it will not be called intelligent." The main objective of research in this area is to build computer programs or software capable of improving the performance with practice and of acquiring knowledge on their own. The aim of machine learning is to obtain the new knowledge or the skill, organize the knowledge structure, which can make progressive improvement of its own performance. Machine learning is an extremely important part of artificial intelligence [1.5]. Learning and intelligence are closely linked to each other. Learning always has to do with self improvement of future behavior based on past experiences. We require learning in cases where we cannot directly inscribe a computer code to answer a given, but need example data or experience. We would like to have general purpose systems that can adopts to their circumstances rather than explicitly writing different program for each special circumstances. Machine learning is a highly inter-disciplinary field which borrows and builds upon ideas from statistics, computer science, engineering, cognitive science, optimization theory and many other disciplines of science and mathematics [1.6]. By combining all these fields we are able to construct learn model from example data or past experiences. This model may be predictive to make predictions in the future or descriptive to gain knowledge from data or both. Machine learning based on data is a very important in modern intelligent technique; it mainly studies how to get rules that cannot be obtained by theoretic analysis from observed samples, then how to utilize these rules to recognize objects and predict future data or unobserved data. In Simple words Machine learning is an efficient method, whose goal is recognize unfamiliar samples through learning from familiar samples.
1.4.1 Supervised Versus Unsupervised Machine Learning

From a theoretical point of view, supervised and unsupervised learning vary only in the fundamental structure of the model. In supervised learning, the technique receives a dataset as an input and uses it to craft forecasted value. From the data set it infers a mathematical function that maps every element in the input to the output. Thus in simple words we concluded that supervised machine learning algorithms are supported by training data set i.e. these algorithms learn by examples.

Example:

Suppose a basket has some fresh fruits our job is to put the same type fruits at one place. Suppose the fruits are banana, apple, grape, cherry. Since here we already have some fruits in the basket, the shape of each and every fruit acts as training data. Hence it is simple to arrange the similar type of fruits at one place. This type of learning is called as supervised learning.

In unsupervised learning, all the observations are implicitly caused by hidden variables, that is, the observations are assumed to be at the end of the causal chain. In unsupervised learning the dataset does not include a target attribute, or a known outcome. In simple words unsupervised learning algorithms are not based on training data set. Since the target values are not determined a priori, the use of this learning technique is to find resemblance of unknown facts among the groups or some intrinsic clusters within the data[1.7].
Example:
Suppose a basket has some fresh fruits our job is to put the same type fruits at one place. Suppose the fruits are banana, apple, grape, cherry. Here we don't know anything regarding that fruits. This is the first time we are observing these fruits. The problem is how we will arrange the similar type of fruits. What we will do, first we take one fruit and we will select any physical quality of that particular fruit. Suppose we will arrange them based on the color, then the groups will be a little bit like this.

RED COLOR GROUP: cherry & apples.
GREEN COLOR GROUP: grapes & bananas.

so now we will take another physical character as size, so now the groups will be something like this.

RED COLOR AND BIG SIZE: apple.
RED COLOR AND SMALL SIZE: cherry fruits.
GREEN COLOR AND BIG SIZE: bananas.
GREEN COLOR AND SMALL SIZE: grapes.

We are successful in arranging the fruits. Here we didn't know or learn anything before i.e. there was no train data. This type of learning is known unsupervised learning.

Depending on the problem and the data accessibility, the algorithm required can be either a supervised or unsupervised. In this research, the goal is to perform business forecasting by choosing datasets from various domains. Since the future direction becomes identified after each instance, the training set is continually growing with labeled data as time passes. This needs a supervised learning technique. Various supervised machine learning algorithms that are considered in this research includes Naïve Bayesian regression, K-Nearest Neighbor Algorithm and Artificial Neural Network.

1.4.2 Goals of Machine Learning
The goal of machine learning is to comprehend the nature of learning, and to build that learning abilities in computers. To be more specific, Following are five aspects of the goals of Machine Learning [1.8].

(1) To make the computers smarter, more intelligent.

(2) To build up computational models of human learning procedure and carry out computer simulations. The learning in this aspect is also called cognitive modeling.

(3) To search new learning methods and develop general learning algorithms independent of applications.

(4) To match real-world induction problems with appropriate techniques for solving them.

(5) Learning algorithms should also be as general purpose as possible. Algorithms that can be simply applied to a wide class of learning problems are looked for.

It is obvious that the goals of machine learning are essential and enviable. The present day computer programs in general cannot accurate their own errors or improve from past mistakes, or learn to perform a new task by analogy to a previously seen task. Machine learning will produce smarter computers capable of all the above intelligent behavior. The understanding of human learning and its computational aspect is a precious scientific goal. It is clear that vital to our intelligence is our talent to learn. Thus a thorough understanding of human learning process is essential to understand human intelligence. Machine learning will provide us the insight into the fundamental principles of human learning that may lead to the invention of more efficient learning techniques. It will also contribute to the design of machine learning systems.

1.4.3 How Machine learning is better than Human Learning

Machine learning is the understanding of nature of learning, and to build learning capability in computers. Machine learning makes the computers smarter and more intelligence. The more
direct objective in this aspect is to develop systems (programs) for specific practical learning task in application domains. Machine learning also develops computational models of human learning process and performs computer simulations. Machine learning also involves to explores new learning methods and develop general learning algorithm independent of applications. Present day computer applications require the representation of huge amount of complex knowledge and data in programs and thus require tremendous amount of work. Our ability to code the computers falls short of the demand for applications. If the computers are endowed with the learning ability, then our burden of coding the machine is eased (or at least reduced). This is particularly true for developing expert systems where the "bottle-neck" is to extract the expert’s knowledge and feed the knowledge to computers. Machine learning will produce smarter computers capable of all the above intelligent behaviour. Following table illustrate the comparison between human learning and machine learning [1.9].

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Human Learning</th>
<th>Machine Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed</strong></td>
<td>time-consuming process</td>
<td>Currently Slow but hope to find tricks for machine to learn quick</td>
</tr>
<tr>
<td><strong>Ability to transfer</strong></td>
<td>There is no mean to copy human intelligence</td>
<td>simple to copy</td>
</tr>
<tr>
<td><strong>Require repetition</strong></td>
<td>Yes</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>
Analysis of the Performance Evaluation of Machine Learning Techniques in Business Forecasting

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Error-prone</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Noise-tolerant</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>When amount of data is very large</strong></td>
<td>Not Efficiently</td>
<td>Efficiently handle large amount of data</td>
</tr>
</tbody>
</table>

Table 1.1 : Comparison between Human learning and machine learning

Thus any development in the field of machine learning, will improve the capability of computers, thus have an impact on human civilization.

1.5 **Business Forecasting**

Business forecasting is the process of studying historical performance for the purpose of using the knowledge gained to forecast future business conditions so that business policies are framed accordingly to achieve goals. Recent advances in computing and developments in technology have facilitated the routine collection and storage of business data that can be used to support business related decisions. In recent years no business function grew as rapidly as the forecasting function. Business forecasting is preparatory designed to help decision making and planning in an organization. It gives power to people to identify crucial parameters and variables which can be controlled in advance so that results in future are management oriented[1.10]. In simple words business forecasting is a process used to estimate or predict future patterns using business data. Forecasting in today’s business world is becoming increasingly important as firms focus on increasing customer satisfaction while reducing the cost of providing products and services. When a man assumes the responsibility of running a business, he automatically takes the
responsibility for attempting to forecast the future and to a very large extents, his success or failure would depend upon the ability to forecast successfully the future course of events. Forecasting aims at reducing the areas of uncertainty that surrounded management decision making with respect to cost, profit, sales, production, pricing and so forth. Business forecasting is the analysis based on data, which will enable and execute to take advantages of predicted future conditions to greater extent than he could do without them. In many respect the future tends to move like the past. This is good perception, since without some elements of continuity between past, present and future; there would be little possibility of successful prediction. While forecasting one should note that it is impossible to forecast the future precisely, there always must be some range of errors allowed for in forecasting. Forecasting is essential to all businesses, whatever the size. It is a powerful tool that can be used in every functional area of business [1.11]. There are many times when we need to anticipate future developments, both short-term and longer-term. Forecasts should not be one-off paper exercises, but a dynamic part of your business strategy. It is used to determine the future development or success of a business in regards to its sales, profits, and expenses. It is sometimes difficult to create an accurate business forecast for the coming year. Business forecasting is often done poorly and is frequently confused with planning and goals. They are three different things.

**Forecasting** is about predicting the future as accurately as possible, given all the information available including historical data and knowledge of any future events that might impact the forecasts.

**Goals** are what you would like to happen. Goals should be linked to forecasts and plans, but this does not always occur. Too often, goals are set without any plan for how to achieve them, and no forecasts for whether they are realistic.

**Planning** is a response to forecasts and goals. Planning involves determining the appropriate actions that are required to make your forecasts match your goals[1.12].
Business forecasting is both art and science. Today, firms have a wide range of forecasting methodologies at their disposal. They range from intuitive forecasting to highly sophisticated quantitative methods. Each of these methods has its merit and limitations. To use them appropriately is an art. The science of forecasting is embedded in the scientific principles of model building. As in any scientific field, scientists begin with using the simplest approach to explain a phenomenon. If the model is a good representation of the real world conditions, and its results do conform to observed phenomenon, it is usually accepted as an appropriate tool to predict the future. If, on the other hand, the simple model is not able to capture or explain the observed phenomenon in detail, scientists use more complex models.

1.5.1 Classification of forecasting models

Forecasting Methods are classified into two groups viz. Qualitative Methods and Quantitative methods. Qualitative methods are based on human judgment and opinions. They are subjective and non-mathematical in nature. These methods are not capable to incorporate latest changes in the environment. They can bias the forecast and reduce forecast accuracy. On the other hand Quantitative methods are based on mathematics. These methods are consistent and objective in nature. They are able to consider much information and data at one time. These methods are as good as the data on which they are based.

Three most common types of Qualitative methods for business forecasting include:

1. **Executive Opinion**: In this approach a group of managers meet and come up with a forecast. This method is good for strategic or new product forecasting. The disadvantage of this method is that, one person’s opinion can dominate the forecast.
2. **Market Research:** In this method of forecasting a lot of surveys and interview conducts in order to identify customer preferences. The main difficulty in this approach is the development of a good questionnaire.

3. **Delphi method:** This scheme seeks to develop a consensus among a group of experts. It is an excellent approach for forecasting long term product demand. The main intricacy is its development is time consuming.

Quantitative forecasting methods use historical data to predict the future, so a lot of data must be available. These quantitative forecasting techniques can be further categorized into either time series or casual methods. Time series forecasting methods only use the time series data itself and not any other data to build the forecasting model. There are various time series techniques ranging from basic moving average, exponential smoothing and trend analysis, to the statistically sophisticated Box-Jenkins (ARIMA) model. Casual methods use a set of explanatory variables, possibly also including time series components, which are believed to influence the forecasted variable [1.13]. Some casual methods includes Regression, Econometric, Input-output, Disaggregated etc.

### 1.5.2 Basic Principles of Forecasting

Before attempting any forecasting we need to be clear about several things.

(i) **Variables:** Which one or which ones are the variable(s) on which the predictions are to be based.

(ii) **Time Frame:** What is the time frame on which the prediction is going to be made?

(iii) **What information we have available:** We may have a rich database or quite the opposite, a
very poor one which may hinder us from making an adequate forecast.

(iv) Clean Forecast: To be prepared to make a ‘clean’ forecast. The forecast must be free of political or corporate interest.

Machine learning is an innovative method that can potentially improve forecasting models and assist management decision making. Machine learning refers to computer-based method that can extract pattern or knowledge from data and perform optimization task with minimum human intervention. Most of these methods have their roots in artificial intelligence and dynamic programming. In short we can say that machine learning algorithms learns from data. Data mining is used to extracting patterns from data and machine learning used extracted pattern to do prediction. Thus, outside of traditional statistical modeling, an enormous amount of forecasting is done using data mining methods. Most of these methods have no formal statistical model, prediction intervals are not computed, and there is limited model checking. But some of the data-mining methods have proven powerful predictors in some contexts, especially when there is a vast quantity of available data. Predictive methods include artificial neural networks, Naïve Bayesian regression and K nearest neighbor [1.12].

1.5.3 Business Forecasting Through Computers

Information Technology has played a very significant role in taking business to new heights. Before the advent of computers and relevant technology, business was totally done using manual resources. Initially computers were used for batch processing jobs, where one does not require the immediate response from the computer. Gradually computers are put to use in real time applications like at the sale computer, to prepare pay bills, and personal records, in banking operations and data storage, in various type of life insurance business as an aid to management.
Business forecasting model can be built with or without computers. Without computer, a model takes longer to build and is limited in number of scenarios that can be run- using a computer and spreadsheet-based software to construct a model is preferred for financial planning and forecasting [1.14]. The advantages of using microcomputer based models and spreadsheet based software for forecasting includes:

(i) The ease of construction and ability to revise the model.

(ii) The speed and flexibility to prepare “What if” scenarios.

(iii) The relative low cost of computer and software.

(iv) Computational model has potential to improve understanding of relationships among variables.

1.5.4 Steps in forecasting process

In spite of the method used to forecast, the following steps are followed:

Step1: Delineate purpose and the strategy to be achieved i.e. what are trying to obtain by the use of the forecast. The purpose of forecasting is to make use of the best available present information to guide further activities towards organization’s objective.

Step 2: Select the variables of interest such as sale, exchange rate, which are to be forecast.

Step3: Determine the time horizon i.e. short, medium or long term of the forecast in order to predict changes which will probably follow the present level of activities.
Step 4: Select an appropriate forecasting model to make projections of the future in accordance to the reason of past changes which have taken place.

Step 5. Collect the relevant data needed to make the forecast.

Step 6. Make the forecast and implement the result.

These steps present a systematic way of initiating, designing and implementing a forecasting system [1.15].

If a particular system is used regularly to generate forecasts then data should be collected in a routine manner so that computations used to make the forecast can be done automatically using a computer.

1.5.5 Importance of Forecasting

Forecasting is an important gizmo used by businessmen, economists, government and to the society as a whole because of the following grounds:

When talking about business, forecasting is an important tool. Businessman frequently take important decision on future demand of the items, purchasing power of the consumers, supply of raw materials, quantity of production, condition of export –import, issue of stock and debentures to meet the long term financial requirements etc. which are based on present indications of future condition. A businessman has to forecast the future level of prices and the extent of demand.

Forecasting is also helpful in controlling business cycle. Business forecasting reduces the risk associated with business (trade) cycle. Business cycle is related with depression and boom periods in industry, trade etc. The knowledge of depression and booms in advance is very useful for businessmen, industrialist and economist.
Business forecasting is equally useful to the society as a whole. Trade cycle does not affect the businessman only but they affect the consumers, workers and thus whole society. Business forecasting is helpful in controlling the bad effects of trade cycles and thus useful to society.

Forecasting is also very useful for government. Government is using business forecasts for making budgets, economic policies etc [1.16].

1.5.6 Time Horizon of Forecasting Model

Forecasting problems are often classified as short term, medium term and long term. This is called time horizon of the forecasting model. Short term forecasting problems involve predicting events only a few time periods (days, weeks, months) into the future. Medium term forecasts extend from one to two years into the future. Long term forecasting problems can extend beyond that (medium term) by many years. Short and medium term forecasts are required for activities that range from operations management to budgeting and selecting new research and development projects. Long term forecasts impact issues such as strategic planning. Short and medium term forecasting is typically based on identifying, modeling, and extrapolating the pattern found in historical data. Because these historical data usually exhibit inertia and do not change dramatically very quickly, statistical methods are very useful for short and medium term forecasting [1.16].

1.5.7 Advantages of Business Forecasting

1. Helps to predict the future. Forecasting does not provide you with a crystal ball to see exactly what will happen to the market and your company over the coming years, but it will help give you a general idea.

2. In order to keep your customers satisfied we need to provide them with the product they want when they want it. This advantage of forecasting in business will help predict product demand so that enough products is available to full-fill customer orders.
3. Looking at what has happened in the past can help companies predict what will happen in the future. This makes the company stronger and most likely more profitable.

4. One of the advantages of forecasting in business is that it allows companies to predict how much product will need to be produced to meet customer demand. From here a company can use this data to accurately determine how many employees they will need to have on hand to meet the required level of production. Thus it saves staffing cost.

5. Forecasting helps predict how much inventory should be on hand at any given time. By having the right amount of inventory, your company will be able to save on warehouse and transportation costs.

6. By forecasting on a regular basis, it forces companies to continually think about their future and where their company is headed. This will allow them to foresee changing market trends and keep up with the competition [1.17].

1.5.8 Limitations of forecasting

Though forecasting is essential for planning, it suffers from certain limitations.

1. Forecasting is based on assumptions. If assumptions are wrong, the estimates are also wrong.
2. Overemphasis on forecasting may be misleading due to the dynamic nature of the environment. Future may not be a copy/extension of the past.
3. It does not provide absolute truth. It merely indicates projected trend.
4. It involves considerable time.
5. It suffers from personal bias. Objectivity is always doubtful.
6. For a new business, Forecasting is difficult because current and historical data are not available.

7. Forecasting may restrict vision of management.

8. Long horizon implies large errors

9. Forecasting models are mathematical and statistical in nature. These methods cannot claim to be able to make uncertain future certain.

10. The business forecasting does not evaluate risks.

11. Forecasting is not a continuous process while to be effective it requires continuous attention [1.18].

1.5.9 Applications Areas

Various application areas where machine learning based business forecasting is currently applicable [1.19]

(i) Natural gas load forecasting (ii) Stock return prediction

(iii) Customer churn prediction (iv) Capital flow risks prediction

(v) Bankruptcy prediction (vi) Profitability prediction

(vii) Sales forecasting (viii) Gross domestic product forecasting

(ix) Demand forecasting (x) Fuel consumption prediction of aircraft

(xi) Manpower forecasting (xii) Text mining of business news

(xiii) Tourism demand forecasting (xiv) Cash forecasting

(xv) Product forecasting (xvi) Inflation forecasting
1.6 Hypothesis of the research

In the proposed research, researcher is aimed to design an experimental setup for business forecasting using machine learning techniques. The hypothesis of this research is “Machine learning techniques are more efficient, accurate and faster than traditional statistical techniques in business forecasting”. The researcher also aims to conduct an analysis of the performance evaluation of machine learning techniques, in order to determine the efficient one among the famous forecasting techniques.

1.7 Justification for this research

A business organization needs to develop a forecasting system that includes several approaches to predicting uncertain events. Typically, business use relatively simple forecasting methods that are often not based on statistical modelling. Today, since it includes a number of advanced statistical methods for regression and classification, which finds applications in a wide variety of fields including, credit card fraud detection, analysis of the stock market (business) and so on. In certain applications it is sufficient to directly predict the dependent variable without focusing on the underlying relationships between variables. In other cases, the underlying relationships can be very complex and the mathematical form of the dependencies unknown. For such cases, machine learning techniques emulate human cognition and learn from training examples to predict future events. Business forecasting is important for several reasons.

1. It enables management to change operations at the right time in order to reap the greatest benefit.

2. It also helps the company to prevent losses by making the proper decisions based on relevant information.
3. Forecasting is also important when it comes to develop new products or new product lines. It helps management to decide, whether the product or product line will be successful.

4. Forecasting prevents the company from spending time and money developing, manufacturing and marketing a product that may fail.

Moreover During review of literature researcher found machine learning models have established themselves in the last decade as serious contender to classical statistical models in econometric problems. It is also found that large scale studies for comparing machine learning models have focused almost exclusively on the classification problems. There is no extensive study for Regression problems using Artificial Neural Network, Naïve Bayesian Regression, KNN [1.20].

1.8 Objectives of the research

1. To justify that the machine learning techniques does more accurate business forecasting as compared to traditional statistical approaches.

2. To evaluate the prediction capability of various machine learning algorithms applied on the business forecasting datasets.

3. To provide a framework for the implementation and appropriate use of various machine learning techniques in business forecasting.

4. The last but not least objective of this research is to present the finding and facts in the form of a book as thesis for the completion of research work.