



Estimating the Number of Air Passengers using Neural Networks

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ABSTRACT

Nowadays, because of the relationship among various nations and growing human needs to travel around the world and daily difficulties most people face the time shortage and need to have speedy means of transportation such as planes. Therefore, the airline companies are searching for more profits and they really don't know the renting time from giant airline companies that it leads to the most benefits that's why in this essay we want to investigate the airline companies and the effects of a decision support system on them.

We want to explain how a neural network and a gain chart can guide us when to charter a plane by using exact data in various situations which leads to benefits for airline companies and the most advantages for them. We intend to represent explanations about data mining and decision support systems (DSS), and neural networks.

General Terms

Expert system

Keywords

Decision Support System, DSS, Neural Networks, and Data Mining

1. INTRODUCTION

It's been a growing attention to usage of artificial intelligence techniques in the field of working and trade. In this field excellent systems have occupied a particular place. In the past decades, tow items, neural networks and genetic algorithms have been attracted by a lot of university students. These two have been known as strong means in solving the problems which have not been solvable by traditional methods [1, 7].

Nowadays, using them has accelerated to our social life as long as their usage has had a vital role in making decisions. An artificial neural network is a scientific method for learning different functions like functions with real and separated amounts [8].

In this paper first we explained about data mining, decision support systems (DSS), and artificial neural networks the most important part of the discussion on new applications as well as the science of using data mining to estimate the number of passengers is described, We want to explain how a neural network and a gain chart can guide us when to charter a plane by using exact data in various situations which leads to benefits for airline companies and the most advantages for them.

2. DATA MINING METHODOLOGY

Data mining is a process to extract reliable information and keep track of the massive data set. Data mining discovers

patterns and trends in the data. The model and methods can be together and be defined as a search model. Provide a data Mining model and the dynamic and repeatable process. Exploring the creation model is a part of a larger process that is defined in the receiver to run the model in the workplace [1].

2.1 Some Definitions of Data Mining

Data mining is: Discovering the methods and patterns in large databases to guide decisions about future activities. It is expected that data mining tools to get the model with minimal input from the user to recognize. The model presented can be useful to understand the unexpected and provide an analysis of data followed by other tools to put decision-making are examined and it ultimately leads to strategic decisions and business intelligence. The simplest word for knowledge extraction and exploration of volume data is very high and the more appropriate name for this term is "Exploring the knowledge of database". A database is knowledge of discovery process. This process includes the preparation and interpretation of results. The Gartner Group consultancy for data mining "the process of extracting meaningful new correlation pattern by an inspection methods and exploring the large volumes of data are stored in the data warehouse [2, 3, 4, and 5].

2.2 The Main Factors for Data Mining

Rapid and dramatic growth of data collected and stored in their databases, many of the human ability to perceive and understand it is not possible without powerful tools. Gather data in the database data to the tomb has become. The outcome of important decisions based on the rich information stored in databases and decision-makers have the tools to extract knowledge hidden in databases were not huge. The amount of data doubles every 5 years are available and capable organization that is able to manage less than 7 percent of its data. Data mining is a major concern because the information industry in recent years and is located in a high volume of data and work across a wide and decision makers in information-rich resource utilization are unable to make real decisions and the availability of data in commercial trade are lack of knowledge. [6, 7, and 17]

It is clear that large amounts of data are aggregate. However, what these data can be achieved. In early 1984 we've been drowning in data while we are hungry for knowledge. In fact, in most areas are awash in data and the problem is that analysts do not have enough skill and experience necessary to have knowledge in the translation. [5]

Significant growth in data mining and knowledge extraction from a confluence of factors has been the strength of various factors:



1. Exponential growth of aggregate data to be produced and the availability of large volumes of data.
2. Data storage and analysis of a data warehouse and analysis database and on-line analytical processing technology development.
3. Increase the amount of data and internet access.
4. The dramatic growth of computing power and storage space.
5. Development of data mining software products and software that are readily available in commercial data mining and data mining applications, user interfaces are standard.

Rising competition in the global economy and the stock market manage the client's interest [8, 4, and 7].

3. DECISION SUPPORT SYSTEM (DSS) DEFINITIONS

clever use of data and information is needs of managers in management decisions especially in large organizations. Given the competitive environment prevailing market the importance of responding to the need for managers and organizations so growing up, in recent decade tools and information technology systems played an important role in responding to the needs of managers.

DSS as an important tool in this area has shown its fundamental role in these organizations [9, 10].

3.1 The Main Factors for DSS

the Main Factors of DSS for Using in the Computer are:

1. Assist managers in decision-making process for semi-structured tasks.
2. Support the best judgments of the replacement.
3. Improve the effectiveness of decision making rather than its performance.
4. Enable rapid response to situations which not expected to provide.
5. The time saving

Also it has other applications [9, 11].

3.2 The Challenges of Decision Support System

Although experts are care for decision support systems to support and improve decision-making process but unlike increasing development of DSS and its acceptance by middle managers provide effective decision support for strategic decision not to much success coincided. [9]

4. NEURAL NETWORK DEFINITIONS

According to Researches done, the neural network Is defined as:

1. A method of calculation which is based on the connection of multiple interconnected processing.

2. Neural networks consist of any number of nodes or units or cells, or neurons which they related input to output.
3. Practical method of artificial neural network to learn the various functions as discrete functions and vector functions [12, 13].

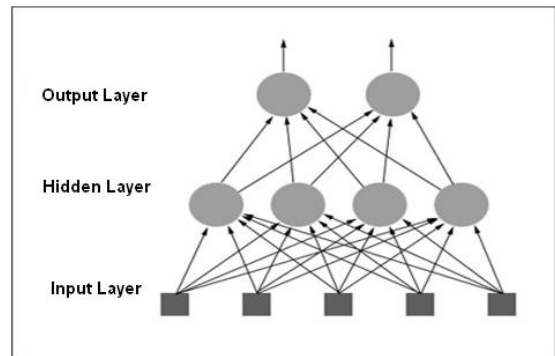


FIG 1: Neural networks are consisting of nodes which related input to output [12].

4.1 Capabilities of Neural Network

Based on gathered resources, the capabilities of neural network are:

1. Compute a known function.
2. Approximate an unknown function.
3. Pattern recognition
4. Signal processing
5. learning to perform the above [16]

4.2 Appropriate Issues for Neural Network Learning

According to researchers' definitions appropriate issues for neural network learning are:

1. When objective function values are consistently.
2. There is enough time to learn because this method in compare with other methods such as decision trees need to have more time for learning
3. When There is error in the data training[14,16]

4.3 Learning Methods OF Neural Networks

The main idea was in 1940 by Walter Pitts, Waren Mc Culloch with the example of the model of neurons in the human brain. Important assumptions in artificial neural networks are:

1. Data processing takes place in neurons
2. Data communication between neurons via their



- Each of these relationships have their own weight(w)which they multiplied in the amount of information that exchange with other neurons and over time the weights are adjusted.
- Each neuron has an operational function to calculate its output.
- Each neuron will be achieved in the output if the operational functions be higher than threshold [12, 13, 14, and 16].

5. SENSITIVITY ANALYSIS

Sensitivity analysis for a system deals to investigate the effect of various parameters on the output of the system. Sensitivity analysis of machine learning is to investigate the characteristics of the input on output that is called the importance of variable. Calculate the importance of variables can affect the choosing of properties thus reducing the computational complexity and lead the costs, also calculate the importance of variables can help for better understanding of system [10].

6. TEST AND EXPERIMENT

selected samples in this study is 500 which is collected weekly and from 2008 to 2011.in this study 70% of data's are to teach learning models and, remaining 30% are for testing models. After data collection some of influencing parameters on travel to this city from city of origin were studied. Now with data obtained and parameters studied we have tried to estimate the number of travelers for years to come. The effective parameters for estimate are:

- University vacations
- Goods shortage
- New Year holidays
- Summer celebrity
- Winter celebrity

Figure 2 shows the gain chart of the modeling.

Also in this study for measuring the importance of variables used from sensitivity analysis and the results are shown in Figure 3. Based on this chart the effective parameters obviously can be shown. In this chart obviously the property of winter celebrity is the most effective property and after that goods shortage. One of the advantages of sensitivity analysis is less important features can be eliminated that will be reduces the computational complexity without loss of accuracy in diagnosis [12].

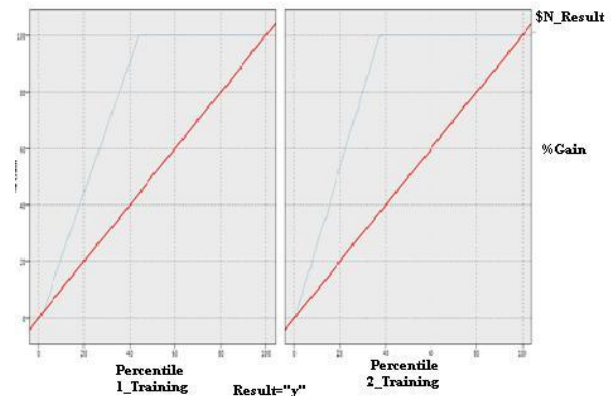


FIG 2: Gain chart

7. CONCLUSION

Given the importance of estimating the number of passengers, provide a simple and low cost method for a correct diagnosis is important. In this study one of the most common machine learning methods have been used for use in a commercial decision support system. Till by using this method the company achieves to the highest possible profit and not to be faced with a shortage of tickets (or excessive tickets and lack of passengers). The results of experiments in this study to estimate the number of passengers in the coming years from specific origin to specific destination shows that with using neural network precision in the estimates for chartering flight (buy all tickets) during the experiments is about 97 percent with dynamic, also with use of sensitivity analysis the effect of important parameters (which is shown in FIG 3) in correctly estimate are compared..

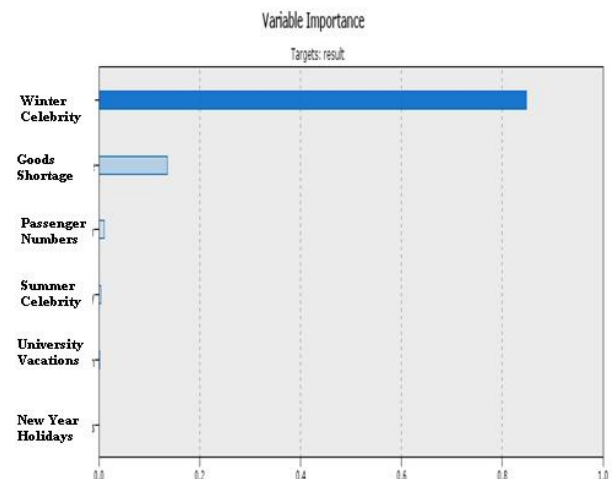


FIG 3: The importance of parameters in estimating process of number of the passengers.

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