

# Role of Data Mining in the Manufacturing and Service Application

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**Abstract:** In the today scenarios, the manufacturing and service industries are focusing on the highly effective tools which are mainly concentrated over the data mining. Several organisations and researchers have accomplished their efforts in the reviewing of the data mining tools and the surveying the data miners. In this present paper, the notion of machine learning and the data mining in the various manufacturing and service application is introduced. On the result, the idea of building the decision making systems are more clear as the algorithms of the machine learning helps in extracting the knowledge from the databases which are in the diverse form. As in the case where the operational engineering data is based, we can determine the optimal control parameters, faults detection in the equipment. So, the framework is designed which uses constructs such as decision maps, decision tables, etc. for the decision making system that helps in applying and organizing knowledge in the manufacturing and service application.

**Keywords:** Decision making, data mining, knowledge structuring, industrial application, modelling.

## 1. Introduction

There are rise in the amount of enterprise data effecting and presenting many issues which deals with extracting, storing organizing and using the knowledge which is generated from the data sets. As we are aware of that the data is often distributed and heterogeneous so the understanding of the meaning and structure of the stored information is not very easy. There is diverse capacity of complexness in the reality but in spite of this, the decision making is recognized as by the help of decision making tool, the set of previously composed data is processed. The decision would not be relevant if the decision making tool is not properly versed in the current data. There are two types of decision making i.e. stand alone decision making and distributed decision making.

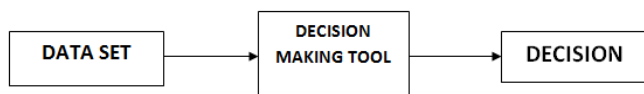


Figure 1: Stand alone decision making

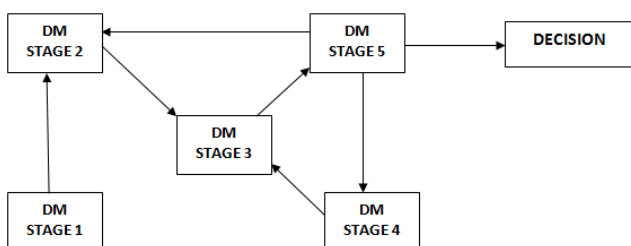


Figure 2: Distributed decision making

The decision making system faced many boundaries which has now eliminated as there are many progresses in the development of networking technology and data analysis tools. The task of extraction of knowledge from the heterogeneous and distributed sources of data is played by the field of data mining. In the distributed data mining the different scenarios are probable to take place. For instance,

- At the single or multiple sites, the extraction of knowledge may be distributed by the intermediate and final decision.
- The cycles may form during the flow of data in spite of being linear.

## 2. Descriptive Data Mining Application

In this paper, the following will explained the descriptive examples of the service and manufacturing application where the data mining have been powerfully accomplish the role.

- Manufacturing of semi conductor  
Nowadays, the main area of the manufacturers of the semi conductor is in the improvement of the wafers quality. At the different various plants which produce the wafer, the manufacturing environment, may be alike; some wafers attain perfect quality and some fail in it. For the desired quality, the data mining is performed to determining the parameters ranges.
- Chemical process and biotechnology industry  
In the field of the bio and chemical industry, the processes uses the data mining and could be well equipped in data collection systems as usually they cannot be effectively modeled by the classical tools.

- Assembly of electronic

Similar to the semi conductor manufacturing industry, the electronic product assembly has facing the problems which deals with the quality of the printed circuit boards. Their components fail the test of quality for the unidentified reasons. So the prevention of the failure is of great interest to the manufacturers, so far this issue the data mining has been applied to identify the process parameter's condition by minimizing the faulty products production. There are many other application where such challenges are faced by the manufacture of different industries and areas of different fields. For instance, DNA manufacturing, energy production, medical applications, pharmaceutical applications.

### 3. Extraction Of Knowledge

On the increasing of the awareness in the era of the data mining has taking the steps to the development of different algorithms which extract rules, knowledge, feature from the large volume of sources. By the machine learning algorithm, these developments in the era of data mining have not been matched the progress in decision making which are based on knowledge extraction. Somehow, the most data mining outputs shown have been developed by the non-engineering community and they mainly have the prime objective in the extraction of knowledge in spite of the decision making.

Learning algorithms are categorized as follows which mainly become the interest for the industry:

- Decision rule algorithm
- Induction logic program algorithm
- Rough set algorithm
- Decision tree algorithm

#### 3.1 Evaluation of Features

In data mining, this paper fills the gap in the decision making which has been created by the unique progress. The framework for decision making and the algorithm presented for the knowledge extraction use by algorithm of data mining. Numbers of application areas are seen like quality engine, equipment diagnostics, medical diagnosis, planning and forecasting look forward to decision making tools.

The following matrices are used for the data sets and features evaluation:

- Classification Quality
- Gini index
- Upper and lower approximation measures
- Entropy measure

The process of extraction of knowledge leads to the decision rules (IF...THEN rules) which are formulated from the data sets. In spite of making decisions directly with the decision rule, we have also the decision making approaches which are more transparent and structured to the user.

### 4. Decision Making

As the amount of data sets increase , the rules which are desired by the machine learning algorithm for the decision making are also becoming complex. To minimize this strong complexity, the method and approach are built upon which are transparent to the customers by using the new thoughts of decision map, decision atlas and decision table. These are helpful in the management of knowledge and structuring of the different information.

- Decision maps, tables and atlases

A decision map is defined as the decision process model and the collection of decision tables. At any step, the decision map, the actual decision which can be performed by using the content of one or more decision tables. The collection of the knowledge needed to make the decision in a particular area is known as the decision table. The decision maps are merged in an atlas and these multiple atlases create a library. The decision may be accomplish in the various manner based on the decision tables.

- Process modelling and decision making

In the field of data driven decision making, the idea of a process and a modelling methodology plays an important role. For modelling a process, the methodology which is selected may rely on many factors which range from culture of organisation and training to the availability and correctness of the method.

- Decision making algorithms

The main objective is to generate  $(100-\alpha)$  percent accurate decision for  $(100-\beta)$  percent conditions with identified decision. The notion of the orthogonal algorithms P (primary) and C (confirmation) algorithm is presented in this paper which allows  $\alpha$  meeting probably to 0 and  $\beta$  to remains tiny. The decision using the structured knowledge which is derived from the different learning algorithm is generated from the P-algorithm and the same decision using an orthogonal concept like classical algorithm, a distance metric based algorithm is derived C-algorithm.

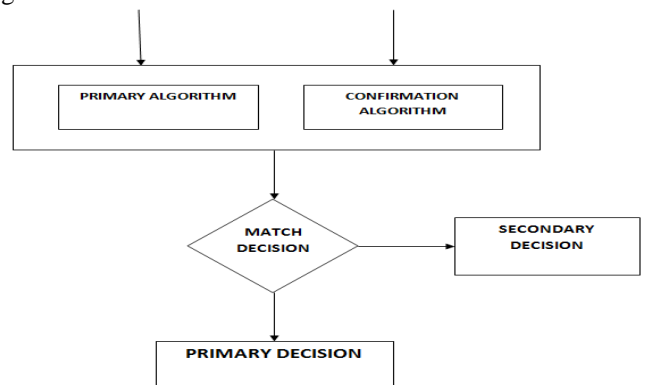


Figure 3: The logic of decision making

Both of the P and C- algorithm are observed as the parallel system component so contributing to the whole system accuracy.

## 5. Data Transformation

The decision making algorithm quality mainly relies on the knowledge extracted from data sets. As these data sets are mined in their raw form so they are needed to be transformed. The aspect of the data transformation is used in manufacturing and service application for transparent, to improve usability and for the decision making accuracy.

## 6. Conclusion

The present study has concluded that the increase in the amount of data in the manufacturing and service industries has been facing some issues which are needed to discover the tool that can create analysis of data and knowledge. Somewhere, the significant progress has taken place in the growth of algorithm for extracting knowledge. The proposed approach for the decision making is likely to be used for the application in many areas of the manufacturing and service industries.

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