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DATA MINING: A SYSTEMS APPROACH

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ABSTRACT :

There are many different types of analysis that can be done in order to retrieve information from big data. Each type of analysis will have a different impact or result. Which type of data mining technique you should use really depends on the type of business problem that you are trying to solve. Data mining is a buzzword that often is used to describe the entire range of big data analytics, including collection, extraction, analysis and statistics. This however, is too broad as data mining especially refers to the discovery of previously unknown interesting patterns, unusual records or dependencies, in this paper am trying to explore various techniques available in data mining.

KEY WORDS: Data Mining, Business problems, Techniques of data mining

I. INTRODUCTION :

Data mining is the process of analyzing data from different perspectives and summarizing it into useful information - information that can be used to increase revenue, cuts costs, or both. Data mining software is one of a number of analytical tools for analyzing data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. Aside from the raw analysis step, it involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating.

II CRUCIAL CONCEPTS IN DATA MINING

Bagging (Voting, Averaging)

The concept of bagging (voting for classification, averaging for regression-type problems with continuous dependent variables of interest) applies to the area of predictive data mining, to combine the predicted classifications (prediction) from multiple models, or from the same type of model for different learning data. It is also used to address the inherent instability of results when applying complex models to relatively small data sets.

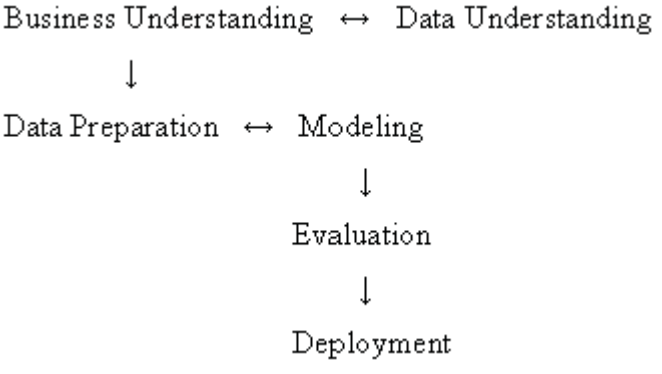
Boosting

The concept of boosting applies to the area of predictive data mining, to generate multiple models or classifiers (for prediction or classification), and to derive weights to combine the predictions from those models into a single prediction or predicted classification.

III MODELS FOR DATA MINING

In the business environment, complex data mining projects may require the coordinate efforts of various experts, stakeholders, or departments throughout an entire organization. In the data mining literature, various "general frameworks" have been proposed to serve as blueprints for how to organize the process of gathering data, analyzing data, disseminating results, implementing results, and monitoring improvements.

One such model, CRISP (Cross-Industry Standard Process for data mining) was proposed in the mid-1990s by a European consortium of companies to serve as a non-proprietary standard process model for data mining. This general approach postulates the following (perhaps not particularly controversial) general sequence of steps for data mining projects:



Another approach - the Six Sigma methodology - is a well-structured, data-driven methodology for eliminating defects, waste, or quality control problems of all kinds in manufacturing, service delivery, management, and other business activities. This model has recently become very popular (due to its successful implementations) in various American industries, and it appears to gain favor worldwide. It postulated a sequence of, so-called, DMAIC steps -

Define → Measure → Analyze → Improve → Control

- that grew up from the manufacturing, quality improvement, and process control traditions and is particularly well suited to production environments (including "production of services," i.e., service industries).

Another framework of this kind (actually somewhat similar to Six Sigma) is the approach proposed by SAS Institute called SEMMA -

$$\text{Sample} \rightarrow \text{Explore} \rightarrow \text{Modify} \rightarrow \text{Model} \rightarrow \text{Assess}$$

IV. CLASSICAL TECHNIQUES:

The Classics

These two sections have been broken up based on when the data mining technique was developed and when it became technically mature enough to be used for business, especially for aiding in the optimization of customer relationship management systems. Thus this section contains descriptions of techniques that have classically been used for decades the next section represents techniques that have only been widely used since the early 1980s.

This section should help the user to understand the rough differences in the techniques and at least enough information to be dangerous and well armed enough to not be baffled by the vendors of different data mining tools.

The main techniques that we will discuss here are the ones that are used 99.9% of the time on existing business problems. There are certainly many other ones as well as proprietary techniques from particular vendors - but in general the industry is converging to those techniques that work consistently and are understandable and explainable.

Statistics

By strict definition "statistics" or statistical techniques are not data mining. They were being used long before the term data mining was coined to apply to business applications. However, statistical techniques are driven by the data and are used to discover patterns and build predictive models. And from the users perspective you will be faced with a conscious choice when solving a "data mining" problem as to whether you wish to attack it with statistical methods or other data mining techniques. For this reason it is important to have some idea of how statistical techniques work and how they can be applied.

Clustering

Clustering can be said as identification of similar classes of objects. By using clustering techniques we can further identify dense and sparse regions in object space and can discover overall distribution pattern and correlations among data attributes. Classification approach can also be used for effective means of distinguishing groups or classes of object but it becomes costly so clustering can be used as preprocessing approach for attribute subset selection and classification. For example, to form group of customers based on purchasing patterns, to categories genes with similar functionality.

Types of clustering methods

- Partitioning Methods
- Hierarchical Agglomerative (divisive) methods
- Density based methods
- Grid-based methods
- Model-based methods

Predication

Regression technique can be adapted for predication. Regression analysis can be used to model the relationship between one or more independent variables and dependent variables. In data mining independent variables are attributes already known and response variables are what we want to predict. Unfortunately, many real-world problems are not simply prediction. For instance, sales volumes, stock prices, and product failure rates are all very difficult to predict because they may depend on complex interactions of multiple predictor variables. Therefore, more complex techniques (e.g., logistic regression, decision trees, or neural nets) may be necessary to forecast future values. The same model types can often be used for both regression and classification. For example, the CART (Classification and Regression Trees) decision tree algorithm can be used to build both classification trees (to classify categorical response variables) and regression trees (to forecast continuous response variables). Neural networks too can create both classification and regression models.

Types of regression methods

- Linear Regression
- Multivariate Linear Regression
- Nonlinear Regression
- Multivariate Nonlinear Regression

ASSOCIATION

Association is one of the best known data mining technique. In association, a pattern is discovered based on a relationship between items in the same transaction. That's is the reason why association technique is also known as relation technique. The association technique is used in market basket analysis to identify a set of products that customers frequently purchase together.

DECISION TREES

Decision tree is one of the most used data mining techniques because its model is easy to understand for users. In decision tree technique, the root of the decision tree is a simple question or condition that has multiple answers. Each answer then leads to a set of questions or conditions that help us determine the data so that we can make the final decision based on it.

V. CONCLUSIONS

Data mining has wide application domain almost in every industry where the data is generated that's why data mining is considered one of the most important frontiers in database and information systems and one of the most promising interdisciplinary developments in Information Technology.

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