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Drugs Selection Using Automata Based Rule Processing

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ABSTRACT: The fuzzy system approach to healthcare data obtained from insurance companies may be a helpful way of generating information useful for the drugs selection for similar polymorbid patients in medical field. To improve the performance of system, an automata based rule engine is developed to process the huge combination of drugs and to find out the quantitative relation. The results obtained from fuzzy based system is crosschecked with automata based system for comparing the efficiency, memory consumption and volume of results.

KEYWORDS: Fuzzy system, Polymorbid Patients, Automata.

I. INTRODUCTION

In Information Industry, there is huge amount of information is available. This information must be converted to useful information otherwise it has no use. So, it is necessary to analyse this data and extract useful information from it. Data mining involves data cleaning, data integration, data transformation, data mining, pattern evaluation and data presentation. Data mining is used to eliminate available data from any larger original data set. It means using single or extra software to analyse information pattern in huge batches of information. The objective of the information mining procedure is to remove information at the same time as of the information set and change into clear makeup for extra analysis. The real information mining mission is semi-automatic or repeated examination of bulky amounts of information to remove run familiar attractive pattern such as data record groups (cluster analysis), abnormal records (abnormality detection) with dependency (association rule mining, sequential pattern mining). Data mining has applications in many fields such as science and research. Data mining involves effective data collection and storage as well as computer processing. In order to separate the information and assess the possibility of future events, data mining uses complex mathematical algorithms. Data mining is also known as Knowledge discovery in databases process or KDD.

Effective pharmacotherapy is based on the drugs prescribed in relevant medicinal products suitable for the patient's current diagnosis or a combination of diagnoses. The clinical decision support software always involved some type of up-to-date passive electronic drug reference database based on data from drug handbooks, pocket cards, published scientific papers or approved by "Summary of Product Characteristics (SPC)," which described drug indications, contraindications, doses and interactions. However, the above-mentioned sources used for drug databases do not describe the diagnoses in a uniform manner according to the International Statistical Classification of Diseases and Related Health Problems (ICD). Moreover, the approved SPC do not mention drug indications. Besides, some degree of variability may still exist between licensed indications or frequency of drugs side effects of medicinal products produced by several pharmaceutical companies with regard to the same active substance. In this case, the processing and evaluation of drug data is more than problematic.

On the other hand, the knowledge of individual clinicians about clinical effects of applied drugs in everyday practice reaches a statistical significance in time with the number of drug (co-)applications to individual patients.

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Moreover, data are generally statistically significant among the clinicians because the numbers of treated patients and drug application occurrences are high. Although these data are available in healthcare databases of insurance companies, they are not systematically summarized in an available database, so it is not possible to establish rules for any expert system. Moreover, the setting up of such a database is problematic also for unrealistic way to ask each clinician for the reason why she/he decided to apply a selected drug(or drug combination) in a selected case. In this case, the potential of fuzzy logic principles in which the variables in the system are represented and manipulated in a binary manner may be applied. The variables may be defined in discrete terms while the transition between discrete terms can be gradual. A value for a variable might partially belong to a set and have a degree of membership anywhere between 0 and 1. The recommended systems based on fuzzy logic currently present successful solutions to facilitate access for online users to the information fitting their preferences. Collaborative filtering systems can generate recommendations only using users' ratings and without any need for additional information. Collaborative filtering focuses on suggesting to the target user the items that are already preferred by other users with similar preference patterns. The fuzzy approach to analysis of healthcare databases represents a tool for creating information that is useful for final decision-making process of drug selection for defined poly morbid group of patients in medical practice. But the performance of fuzzy system is slow, so to overcome this problem a rule engine based on the concept of automata is used with this fuzzy approach. An automata is a machine that can operate by them itself automatically. Through automata, computer scientists are able to understand how machines compute functions and solve problems and more importantly, what it means for a function to be defined as *computable* or for a question to be described as *decidable*.

II. RELATED WORK

Selection in Medical Practice Monika Fedorová, Daniela Perduková, ZdenkoPirnik, ViliamFedák, OndrejSukel,AndPadmanabanSanjeevikumar [1] proposed a fuzzy system approach to the analysis of healthcare databases for clinicians in their routine daily practice. The fuzzy system approach to healthcare data obtained from insurance companies may be a helpful way of generating information useful for the drugs selection for similar polymorbid patients in medical field.The concept of this system is given below:Experiences and knowledge of clinicians (“know - how”) were expressed in their decisions for prescription of drugs combination for a certain patient diagnosis.A quantitative relation exists between a certain combination of diagnoses and the suitability of a particular drug application for its treatment.With the concurrent application of two or more drugs there was a relation between the suitability of combination of their diagnoses, and this relation quantitatively defines the suitability of application of their mutual combination.The more frequently a certain combinations of drugs occurred in the prescriptions for a certain combination of diagnoses, the more it was preferred for their treatment by clinicians.

III. PROPOSED SYSTEM

The title of the proposed system is “Drugs Selection Using Automata Based Rule Processing”. The proposed system is the medical application to assist healthcare professionals. The system maintains a knowledge database handling multiple diagnostic records and the drugs prescribed. A fuzzy based drug recommendation framework is developed to suggest medications. The performance of fuzzy system are slow, which can be overcome by adopting a rule based engine. A rule engine is based on the concept of automata, which can handled multiple rule conditions with optimal performance. In the proposed system, there are admin, hospitals, doctors, patients are the 4 modules. The admin is the superintendent of the medical field. This admin can approve the hospitals, approve the doctors and also the processing the algorithms and evaluation part. The hospitals are registered through registration process and provide login credentials to the hospital admins. The doctors in hospitals are registered through registration process and provides the login credentials to the doctors. The doctors diagnoses the patients at the time of consultancy and gives proper medicines. The patients are registered through registration process. This patients can view the drugs that doctors prescribed to them and also check the relation of drugs.

In the proposed system the confidence value can be taken using fp-growth tree algorithm. The FP-Growth Algorithm is an alternative algorithm of Apriori algorithm used to find frequent itemsets in the given dataset. **FP-tree** is used to encode the data set and then extract the frequent itemsets from the tree. An FP-tree [2] is a compact data

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structure that represents the data set in tree form. To calculate the confidence of a rule $\{A, B\} \Rightarrow \{C\}$ (where $\{A, B\}$ is called the rule antecedent and $\{C\}$ is called the rule consequent), one must use the following formula:

$$\begin{aligned} a &= \text{rule. antecedent} \\ c &= \text{rule. consequent} \\ f &= a \text{ UNION } c = \text{frequent itemset} \\ \text{confidence}(a \Rightarrow c) &= \frac{\text{support}(a \text{ UNION } c)}{\text{support}(a)} \\ &= \frac{\text{support}(f)}{\text{support}(a)} \end{aligned} \quad \text{-----1}$$

The feature selection is done by using random forest algorithm. Random forest algorithm is a supervised classification algorithm. Information gain Feature selection technique [3] is used to calculate the information gain. Calculate the information gain for each attribute for the output variable. Entry values vary from 0 (no information) to 1 (maximum information). Using Weka tool, feature selection happens through information gain using the InfoGainAttributeEval Attribute Evaluator. Ranker Search Method must be used. This method measures the significance of attribute by the measure of information gain calculated with respect to target class. It can be calculated by the formula,

$$\text{InfoGain}(\text{Class}, \text{Attribute}) = H(\text{Class}) - H(\text{Class} | \text{Attribute}) \quad \text{-----2}$$

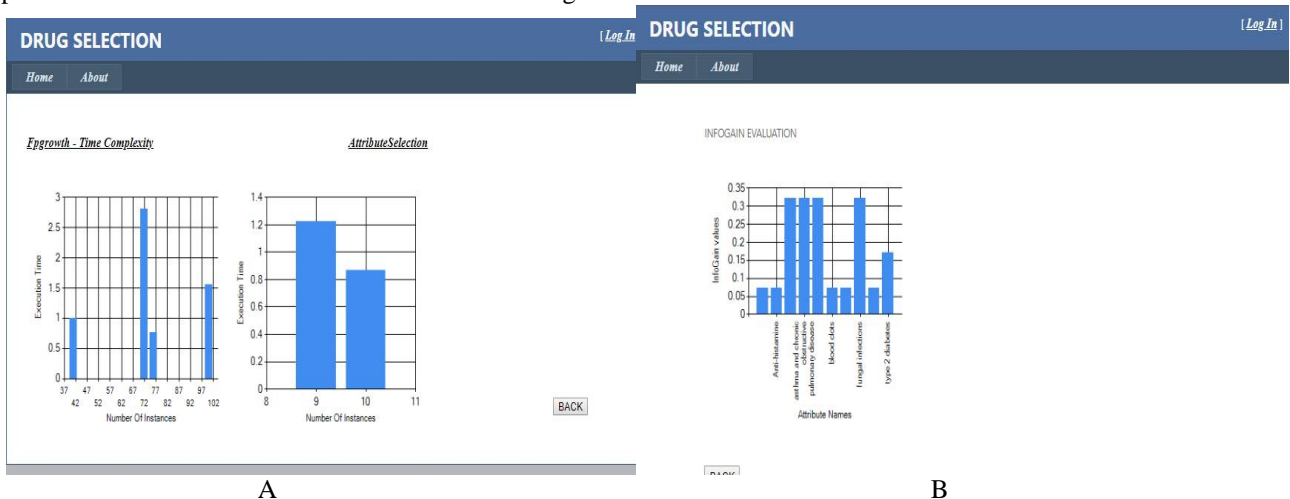
Where H represents the Entropy.

IV. EXPERIMENTAL RESULTS

This section discusses the experimental results of the online drug recommendation systems. The system that uses the operating system for windows 10 and windows platforms here is c#.net. And the database created is a SQL server. The proposed system uses healthcare databases.

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In the proposed system, there are admin, hospitals, doctors, patients are the 4 modules. The admin is the superintendent of the medical field. This admin can approve the hospitals, approve the doctors and also the processing the algorithms and evaluation part. Here for finding confidence value, fp-tree algorithm is used and for feature selection, random forest algorithm is used. The hospitals are registered through registration process and provide login credentials to the hospital admins. The doctors in hospitals are registered through registration process and provides the login credentials to the doctors. The doctors diagnoses the patients at the time of consultancy and gives proper medicines. The patients are registered through registration process. This patients can view the drugs that doctors prescribed to them and also check the relation of drugs.



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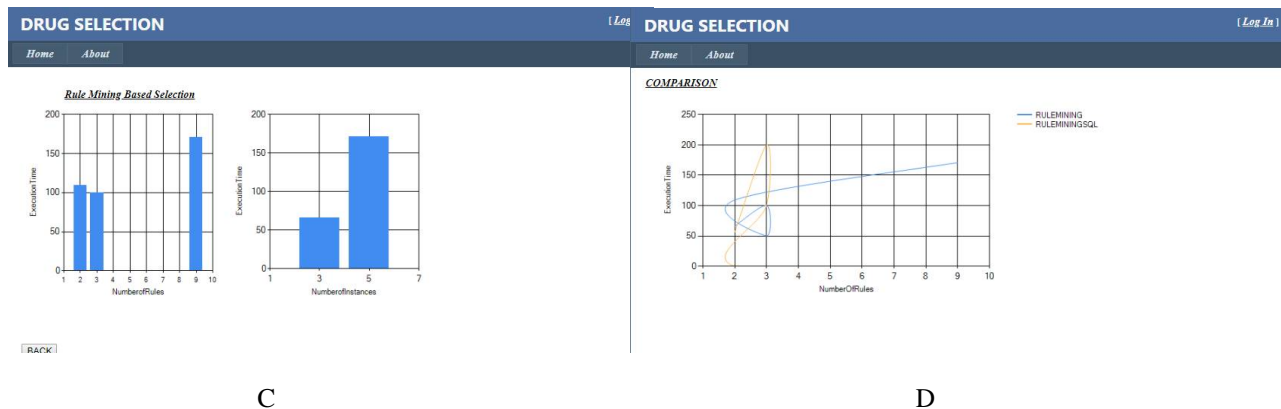


Fig.1. A) Time Complexity Of FP-Growth Algorithm And Attribute Selection B) Time Complexity for Info Gain Evaluation C) Time Complexity For Rule Mining Based Selection D) Time Complexity Comparison Of Rule Mining and Rule Mining Sql.

V. CONCLUSION

The fuzzy system approach to healthcare data obtained from insurance companies may be a helpful way of generating information useful for the drugs selection for similar polymorbid patients in medical field. To improve the performance of system, an automata based rule engine is developed to process the huge combination of drugs and to find out the quantitative relation. The results obtained from fuzzy based system is crosschecked with automata based system for comparing the efficiency, memory consumption and volume of results.

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