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CLASSIFICATION OF HOMEOPATHIC PATIENTS IN RESPECTIVE CLASSES/GROUPS WITH THE APPLICATION OF ROUGH SET THEORY

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Abstract:
Human beings are associated with different characteristics and are distinct from each other. Classification is done based on these characters which forms the important step in remedial diagnosis of homoepathy medicines.Technology has made tremendous advancements in the process of disesase diagnosis. Remedial diagnosis is a tedious task, it can be made easy and accurate by applying Reduct – an important concept of Rough Set Theory. With reduct, useful patterns residing in data can be discovered and decision rules can be generated. Rough Set Exploration System is a tool used for the reduct and rule generation. Data preprocessing is carried out by WEKA. This paper presents concept of Rough Set Theory and identifies valuable attributes for the correct classification of patient. The reduct is validated by expert Homoepaths.A model is generated and accuracy of the model is tested with help of confusion matrix.

Keywords: Rough Set Theory, Reduct, Classification, Rses, Homoepathy.

1. Introduction:

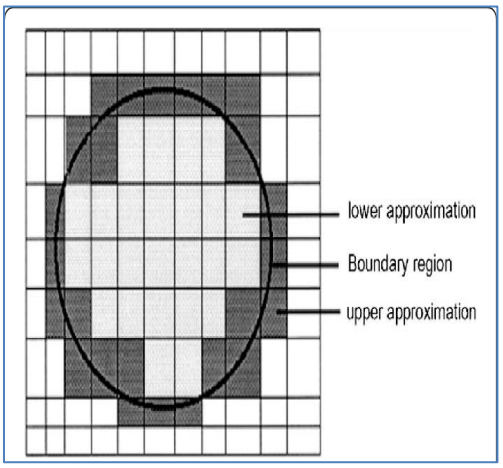
Rough Set Theory proposed by Pawlak in 1982 is a mathematical tool which deals with approximations. It offers mathematical tool to discover hidden patterns in data. It can be used for feature selection, decision rule generation and pattern extraction. Rough set theory that handles ambiguous, incomplete and vague data has proved to be effective in the field of medical science Reduct and rule generation is one of the important features wherein the datasets can be reduced without affecting the end result. The features in the RST have proved to be quiet helpful in the medical field. Not only in the disease diagnosis but also in the traditional medical systems like homeopathy, RST can be successfully implemented. in presents still another attempt to this problem. The theory has attracted attention of many researchers and practitioners all over the world, who contributed

essentially to its development and applications. Rough set theory has a close connections with many other theories. Despite of its connections with other theories, the rough set theory may be considered as own independent discipline. Rough sets have been proposed for a very wide variety of applications. In particular, the rough set approach seems to be important for Artificial Intelligence and cognitive sciences, especially in machine learning, knowledge discovery, data mining, expert systems, approximate reasoning and pattern recognition.

Rough Set is always with a boundary line while crisp set has no boundary line elements. This further gives rise to concepts of lower approximation and upper approximation.

Lower approximation (L): a subset characterised by objects that will definitely form part of an interest subset. Upper approximation (U): a subset characterised by objects that will possibly form part of an interest subset.

Boundary region (B): a difference between upper and lower approximation is boundary region i.e. a subset of elements neither in L and nor in U is boundary (B)Homeopathy is a system of natural medicine introduced and developed by a German physician, Samuel Hahnemann, at the end of the 18th century. Recognizing that the whole person-mind, body, spirit-is affected when there is illness, homeopathy seeks to treat that whole person. The focus is not the diseased part or the sickness, rather the totality of the individual. Homeopathic medicines, or 'remedies', stimulate the body's self-regulating mechanisms to initiate the healing process. Classification is yet another feature which is quiet significant in this study. Classification is the process of recognition, understanding, and grouping of objects and ideas into preset categories. Classification also plays a vital role during the process of finding a remedy in homeopathy. There are certain advantages of classifying the patient in their respective groups **:**



- Simplifies burdensome data in Materia medica for study selection of homoeopathic remedy.
- Extrapolate remedy relationship (of the particular group of remedy)
- Enrichment of Materia medica.
- Verification of results and data
- Savestime
- Helps in understanding of psychosomatic concept of disease

2. Review of Literature:

The diagnosis process has become so difficult, due to variety of symptoms, found in the disease. Though the process of diagnosis is tough computer science has always helped with many theories, algorithms and techniques to make this process easy and accurate, which makes the physicians job more comfortable. Medical science is not an exact science ,it is based on many probablilities and uncertainties where process cannot be easily analysed

and modeled as said by Puntip Pattaraintakorn et al.[1]Expert doctors are finding it difficult to reach at a correct diagnosis.

Medical treatment and diagnosis has become too much expensive. expensive tests is yet another important concern which shall be considered ,nowadays its getting beyond the reach of common people. According to available literature Rough set theory is upcoming theory with good results in handling uncertainties to overcome this S.Udhaya kumar et al.suggest Cost of disease prediction and diagnosis can be reduced by applying machine learning and data mining methods. Data handling of continuous datasets with RST ,computation cost becomes very high to overcome this problem several extensions of RST were introduced such as fuzzy rough set model , probabilistic rough sets , similarity rough set,tolerance relation rough set, decision-theoretic rough sets, covering rough set , dominance approximation [2] According to the literature study Rough Set Theory is a mathematical tool which deals with imprecise ,inconsistent ,incomplete information and knowledge. This is a certain mathematical tool to solve uncertain problems as suggested by Qinghua Zhang et al.[3] they also suggests that the rough set model is simple, and it is easy to be calculated; By rough set model, minimum expression (the simplest reduction, the attribute core, etc.) of the knowledge can be obtained, and an approximate description for an uncertain concept can be described .

There are some fatal diseases like Cancer,HIV,Heart Disease were early detection is very important. Classification as a retrieval technique Rough Sets Theory (RST) is applied followed by two different classifiers to improve the classification accuracy of the medical data. The author Kareem Kamal A.Ghany et al.[4] show mathematically how elements/objects within medical dataset can be easily stored and organized as well as classified by using the rough set theory (RST) as a case-based reasoning technique with 96% of accuracy.Another aspect was chosing the classification algorithm which provides accurate results and computation time many traditional algorithms like Naïve bayes , KNN, C 4.5 algorithm, J 48 are compared and concluded which one was a better classifier for diseases like heart diseae,cancer,HIV,blood bank sector ,tuberculosis etc comparision classification algorithms [5] D.Usha Rani Data mining algorithms applied in healthcare sector play a significant role in prediction and diagnosis of the diseasesas studied by Ravleen Singh et al.[6]

Thus it was noticed that people have done much work in the algorithms of datamining medical field. Comparision of classification algorithms is also done as found in the literature review . However as I do not find much instances of research being done in the medical field using Rough Set Theory especially in the field of homoepathy. Homeopathy is a popular choice of treatment worldwide with more and more people choosing it for holistic and individualized treatment. According to Raj K Manchanda there are 200 million users of homeopathy worldwide. In this issue RCT is published to assess the effectiveness of a homeopathic constitutional remedy.[7] In an observational study carried out by Dr. Shiva Rami Reddy. E it was found that homeopathic medicine was effective in the treatment of rheumatoid arthritis. The research shows that homoeopathic medicine plays an important role in the treatment of rheumatoid arthritis. The study depicts that 86.67 % of patients got improved from the homeopathy medicines. Homeopathic medicines used

with holistic approach are very effective in treating the cases of rheumatoid arthritis. [8]There are combination of theories with Rough Set to get the accurate diagnosis. Kalaivani.R et.al[9] have put forth several advantages of RST like:

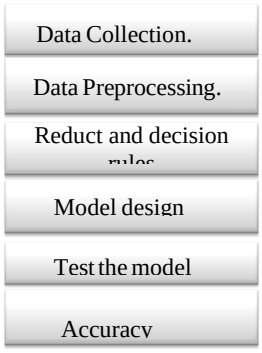
- It does not need any preliminary or additional information about data.
- It allows to reduce original data, i.e. to find minimal sets of data with the same knowledge as in the original data. It is easy to understand.
- Including imprecise, incomplete and fuzzy data, various types of data can be processed by rough set model

Taking into account these advantages of the rough set it would give better results if it can be applied on the medical science like homoepathy where lies many uncertainties during case taking. There is quiet good probability that I can apply concept of REDUCT ,to find minimal dataset without affecting the decision.

3. Objectives of Research:

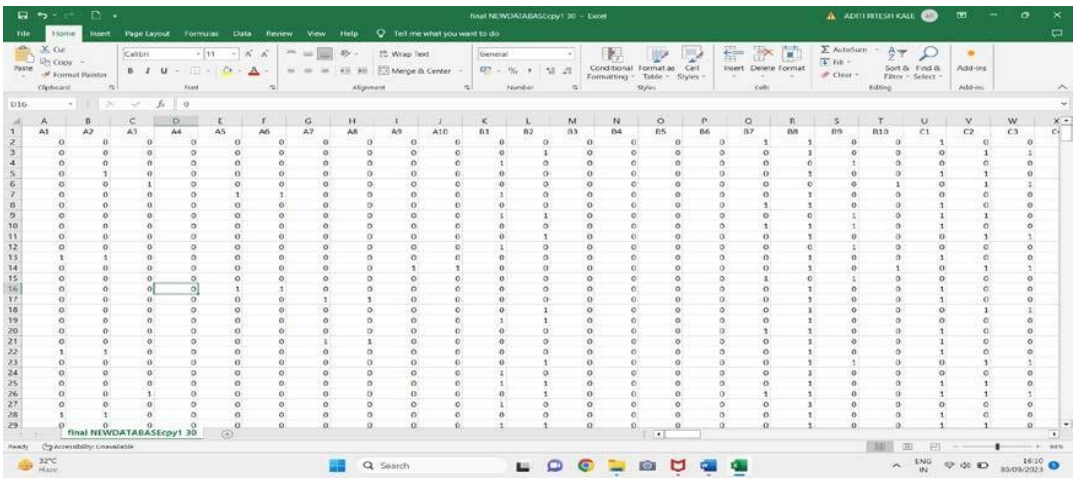
1. To classify the patients and provide a reliable and more accurate solutionfor remedy / group of disease using homeopathy
2. To design a system / algorithm for automation of classification based onrough sets.
3. To test the system with training and test data and validate this model withreal life data in Homeopathy.
4. To find out most important or valuable attributes which can help thehomeopath to come to an accurate remedy group.

4. Research Methodology:



Classification is one of the important features of data mining. Classification techniques were developed as an important component of machine learning algorithms for extraction of rules and patterns for prediction. Classification techniques can be divided into categories - binary classification and multi-class classification. Binary classification assigns labels to instances into two classes, such as fraudulent or non-fraudulent. Multi-class classification assigns labels into more than two classes, such as happy, neutral, or sad.

4.1 Data Collection: In this study the data collected was the secondary data. Case history of the patients is studied in the form of interview. This collected data is organised in the tabular form. These tables contain various information regarding the pathology and related data, patient as person means physical characters of the person ,types of dreams,food habits,and mental state.The mental state plays a very important role in classification .the patient is classified by the characters found in the personality of the patient. This information is representated in the form of a information table .



Information table

4.2 Data preprocessing: Raw, real-world data in the form of text, images, video, etc., is messy. It not only contains errors and inconsistencies, but it is often incomplete, and does not have aregular, uniform design. The data collected is preprocessed so that it becomes easy to work on that data. WEKA is a machine learning tool written in JAVA since it is fully implemented in the Java programming language and thus runs on almost any modern computing platform.

4.3 Reduct and decision rule generation : The tool chosen for the finding of reduct as well as decision rules was Rough Set Exploration system (RSES). The same or indiscernible objects may be represented several times. Some of the attributes may be superfluous or redundant. We should keep only those attributes that preserve the indiscernibility relation and consequently set approximation. The reduct generated is validated ;fo this a questionnaire is prepared and circulated in a group of expert doctors. RSES is a tool that is based only on the classical rough set theory.The decision rules are generated which can be later be useful in model generation.

4.4 Model Design: For model generation the data is divided into a training and testing data with a ratio of 60:40. The rules and reduct generated is used in the system development and the system developed is tested using the test data. The accuracy of model is checked by applying the concept of confusion matrix.

5. Research Outcome:

1. A detailed review of the type of medical systems and detail study of history of the homeopathic medical system.
2. A detail study of the available literature with respect to rough set theory and implementation of RST in the medical science for disease diagnosis.
3. Classification of patients in the respective groups and thus provide an accurate solution to the homeopaths.
4. A system is designed for the automation of classification of patients based on rough set theory(RST)
5. The system was tested with the real life data i.e. the live case histories of the patient and then the same was validated by different homeopath experts from different parts of Maharashtra (Satara, Pune, Khamgaon, Aurangabad, Kalyan)

6. Most important and valuable attributes were found out which will help the homeopath to come to an accurate group classification
7. It is proved that Rough Set Theory is an effective tool when used independently it can give better results as compared to other theories.

In this study we presented a rough set methodology determining decision rulesand reduct helpful for the correct classification of patient in his respective class/ group. The study shows that 191 instances were correctly classified with the overall accuracy of 95.5% This system will help homeopaths reach to a correct remedy once the patient's group is correctly identified. The model reduces the time and skip the unnecessary data or redundant data which is unimportant for class-identification. The core attributes (S4, H3, Q9, C6, E4) are found the average frequency of the core attributes is 2.2. For this study 4 major groups are chosen which commonly appear in the population; other groups can be considered as the further scope of study.

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