© May 2021| IJIRT | Volume 7 Issue 12 | ISSN: 2349-6002

Analysis of Nutrition Model for Adolescent Ladies Using Rough Set Topology

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***Abstract* - Nutrition is the provision to cells and organisms, of the materials necessary in the form of food to support life. Many common health problems can be prevented with a healthy, balanced diet. The purpose of this paper is to apply rough sets topological reduction of attributes in set valued ordered information system in finding the key foods suitable for adolescent girls in order to be healthy.**

I.INTRODUCTION

Rough set philosophy is founded on the assumption that with every object of the universe of discourse some information is associated. Objects characterized by the same information are indiscernible in view of the available information about them. The in-discernibility relation generated in this way is the mathematical basis of rough set theory. Any set of all indiscernible objects is called an elementary set, and forms a basic granule of knowledge about the universe. Any union of some elementary sets is referred to as a crisp set otherwise the set is rough. Each rough set has boundary-line cases, i.e., objects which cannot be with certainty classified, by employing the available knowledge, as members of the set or its complement. Obviously rough sets, in contrast to precise sets, cannot be characterized in terms of information about their elements. With any rough set a pair of precise sets, called the lower and the upper approximation of the rough set, is associated. The lower approximation consists of all objects which surely belong to the set and the upper approximation contains all objects which possibly belong to the set. The difference between the upper and the lower approximation constitutes the boundary region of the rough set.

II.DATA SET: NUTRITION MODELING

A set-valued information system is a quadruple S = (U, A, V, f) where U is a non-empty finite set of objects, A is a finite set of attributes, $V = \cup V_a$ where V_a is a domain of the attribute 'a', f: U->A, P(V) is a function such that for every $x \in U$ and $a \in A$. The attribute set A is divided into two subsets- a set C condition attributes and a decision attribute, d where $C \cap \{d\} = \varphi$.
Consider the following information table giving information about eight adolescents regarding their food habits.

Students	Group I (a_1)	Group II (a_2)	Group III (a_3)	Group IV (a_4)	Group V (a_5)	Decision
S_1	{V, M}	{P, F}	{P}	{C, M}	{P, F}	Unhealthy
S_2	{C, V, M}	{C, P,}	{P, F}	{C, P, M}	{P, F}	Healthy
S_3	{C, M}	{C, P, F}	{F}	{C, P, M}	{F}	Healthy
S_4	{C, V, M}	{C, F}	{P, F}	{P, M}	{P, F}	Unhealthy
S_5	{C, V}	{C, P, F}	{P, F}	{C, M}	{P, F}	Healthy
S_6	{V, M}	{C, P, F}	{P, F}	{C, P, M}	{F}	Healthy
S_7	{V, M}	{P, F}	{P, F}	{C, P}	{P}	Unhealthy
S_8	{V, M}	{C, P, F}	{P, F}	{C, P, M}	{P, F}	Healthy

Table 1

III.ANALYSIS OF NUTRITION MODEL

Given a subset of attribute set $B \subseteq A$, an indiscernible relation IND(B) on the universe U can be defined as follows: IND(B) = $\{(x,y) / (x,y) \in U^2$ for all $b(x) = b(y)\}$. This equivalence relation is an indiscernible relation.
The indiscernible relation for the attribute set C is found and given below,
IND(a_1) ={ {S_1, S_6, S_7, S_8 }, {S_2, S_4}, {S_3}, {S_5} }

$IND(a_2) = \{\{S_1, S_7\}, \{S_2\}, \{S_3, S_5, S_6, S_8\}, \{S_4\}\}$
$IND(a_3) = \{\{S_1\}, \{S_2, S_4, S_5, S_6, S_7, S_8\}, \{S_3\}\}$
$IND(a_4) = \{\{S_1, S_5\}, \{S_2, S_3, S_6, S_8\}, \{S_4\}, \{S_7\}\}$
$IND(a_5) = \{\{S_1, S_2, S_4, S_5, S_8\}, \{S_3, S_6\}, \{S_7\}\}$

Assign the values from 1 starting from the attribute a_1 to the set of objects which are having the same features with respect to that attribute. From $IND(a_1)$, the objects in $\{S_1, S_6, S_7, S_8\}$ will be assigned the value 1 for the attribute a_1 and the objects in $\{S_2, S_4\}$ will be assigned with the value 2 for the attribute a_1 and $\{S_3\}$ will be assigned 3 for the attribute a_1 and $\{S_5\}$ will be assigned with the value of 4 for the attribute a_1.

Similarly, the values for all other objects are assigned. From $IND(a_2)$, the objects $\{S_1, S_7\}$ will be assigned with the value 5 and $\{S_2\}$ is assigned with the value 6 and the objects in $\{S_3, S_5, S_6, S_8\}$ are assigned with the value of 7 and $\{S_4\}$ is assigned with the value 8, all respect with the attribute a_2.

From $IND(a_3)$, $\{S_1\}$ is assigned with the value 9 and the objects in $\{S_2, S_4, S_5, S_6, S_7, S_8\}$ are assigned with the value 10 and $\{S_3\}$ is assigned with 11 with respect to the attribute a_3.

$IND(a_4)$, the objects in $\{S_1, S_5\}$ are assigned with the value 12 and the objects in $\{S_2, S_3, S_6, S_8\}$ are assigned with the value 13 and $\{S_4\}$ is assigned with the value 14 and $\{S_7\}$ is assigned with the value 15 with respect to the attribute a_4.

$IND(a_5)$, the objects in $\{S_1, S_2, S_4, S_5, S_8\}$ are assigned with the value 16 and the objects in $\{S_3, S_6\}$ are assigned with the value 17 and $\{S_7\}$ is assigned with the value 18 with respect to the attribute a_5.

The following table is formed with the values assigned to each of the objects with respect to each attributes.

Student	a_1	a_2	a_3	a_4	a_5
S_1	1	5	9	12	16
S_2	2	6	10	13	16
S_3	3	7	11	13	17
S_4	2	8	10	14	16
S_5	4	7	10	12	16
S_6	1	7	10	13	17
S_7	1	5	10	15	18
S_8	1	7	10	13	16

Table 2

The indiscernible relation for the above table is
$IND(R) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6\}, \{S_7\}, \{S_8\}\}$.

Now, in order to find the reducts and core of the table 5.2, the concepts of rough sets have been used. The reducts and core are found to identify the key foods stuffs which are necessary for an adolescent girl to be healthy. The following steps are followed to find the reducts and core.

Step 1: To find the dispensable attributes.
An attribute a_i is said to be dispensable if $IND(R) = IND(R - \{a_i\})$ for i=1,2,3,4,5.
$IND(R - \{a_1\}) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6\}, \{S_7\}, \{S_8\}\}$
Since $IND(R) = IND(R - \{a_1\})$, a_1 is a dispensable attribute.
Similarly, we find for the attributes a_2, a_3, a_4 and a_5.
$IND(R - \{a_2\}) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6\}, \{S_7\}, \{S_8\}\}$
Since $IND(R) = IND(R - \{a_2\})$, a_2 is a dispensable attribute.
$IND(R - \{a_3\}) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6, S_8\}, \{S_7\}\}$
Since $IND(R) \neq IND(R - \{a_3\})$, a_1 is an indispensable attribute.
$IND(R - \{a_4\}) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6\}, \{S_7\}, \{S_8\}\}$
Since $IND(R) = IND(R - \{a_4\})$, a_4 is a dispensable attribute.
$IND(R - \{a_5\}) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6, S_8\}, \{S_7\}\}$
Since $IND(R) = IND(R - \{a_5\})$, a_5 is an indispensable attribute.
Therefore, here a_1, a_2, a_4 are dispensable attributes. a_3 and a_5 are indispensable attributes, we cannot remove it directly. So, we combine it with the dispensable attributes.

Step 2: To find the reducts of family R.
First we combine a_3 with a_1, a_2 and a_4, and a_5 with a_1, a_2, a_4.
For $\{a_1, a_2, a_3, a_4\}$, $IND(\{a_1, a_2, a_3, a_4\}) = \{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6, S_8\}, \{S_7\}\}$.
$IND(a_1) = \{\{S_1, S_6, S_7, S_8\}, \{S_2, S_4\}, \{S_3\}, \{S_5\}\}$
$IND(\{a_1, a_2, a_3, a_4\}) \neq IND(a_1)$, a_1 is an independent attribute.
$IND(a_2) = \{\{S_1, S_7\}, \{S_2\}, \{S_3, S_5, S_6, S_8\}, \{S_4\}\}$
$IND(\{a_1, a_2, a_3, a_4\}) \neq IND(a_2)$, a_2 is an independent attribute.
$IND(a_3) = \{\{S_1\}, \{S_2, S_4, S_5, S_6, S_7, S_8\}, \{S_3\}\}$

IND $(\{a_1, a_2, a_3, a_4\}) \neq$ IND(a_3) , a_3 is an independent attribute.

IND(a_4) =$\{\{S_1, S_5\}, \{S_2, S_3, S_6, S_8\}, \{S_4\}, \{S_7\}\}$

IND $(\{a_1, a_2, a_3, a_4\}) \neq$ IND(a_4) , a_4 is an independent attribute.

Therefore, $\{a_1, a_2, a_3, a_4\}$ is a reduct of R.

Next, For $\{a_1, a_2, a_4, a_5\}$, IND $(\{a_1, a_2, a_4, a_5\})$ = $\{\{S_1\}, \{S_2\}, \{S_3\}, \{S_4\}, \{S_5\}, \{S_6\}, \{S_7\}, \{S_8\}\}$.

IND(a_1) =$\{\{S_1, S_6, S_7, S_8\}, \{S_2, S_4\}, \{S_3\}, \{S_5\}\}$

IND $(\{a_1, a_2, a_3, a_4\}) \neq$ IND(a_1), a_1 is an independent attribute.

IND(a_2) =$\{\{S_1, S_7\}, \{S_2\}, \{S_3, S_5, S_6, S_8\}, \{S_4\}\}$

IND $(\{a_1, a_2, a_3, a_4\}) \neq$ IND(a_3) , a_3 is an independent attribute.

IND(a_4) =$\{\{S_1, S_5\}, \{S_2, S_3, S_6, S_8\}, \{S_4\}, \{S_7\}\}$

IND $(\{a_1, a_2, a_4, a_5\}) \neq$ IND(a_4) , a_4 is an independent attribute.

IND(a_5) =$\{\{S_1, S_2, S_4, S_5, S_8\}, \{S_3, S_6\}, \{S_7\}\}$

IND $(\{a_1, a_2, a_4, a_5\}) \neq$ IND(a_5) , a_5 is an independent attribute.

Therefore, $\{a_1, a_2, a_4, a_5\}$ is a reduct of R.

RED(R) = $\{a_1, a_2, a_3, a_4\}$ and $\{a_1, a_2, a_4, a_5\}$.

Step 3: To find the CORE(R).

CORE(R) = ∩ RED(R).

$\{a_1, a_2, a_3, a_4\} \cap \{a_1, a_2, a_4, a_5\} = \{a_1, a_2, a_4\}$.

CORE(R) = $\{a_1, a_2, a_4\}$.

Hence from the CORE(R), a_1, a_2, a_4, that is Group I, Group II and Group IV foods (vegetables and fruits; milk and milk products; pulses and cereals) are the key food stuffs that provide the necessary nutrients for an adolescent girl to be healthy.

IV.CONCLUSION

Rough Set theory represents a promising technique to handle imperfect knowledge, which has found interesting extensions and various applications. In this paper a set valued information system is applied to attribute reduction using the rough set topological concepts to find the key food stuffs which are necessary for an adolescent girl to be healthy.

REFERENCES

[1] Changzhong Wanga, Congxin Wua, Degang Chenb, Qinghua Huc and Cong Wud, 2008. Communicating between information systems, Information Sciences, 178: 3228-3239.

[2] Duntsch. I and Gediga. G, 1338. Uncertainty measures of rough set prediction, Artificial Intelligence, 106: 109-137.

[3] Jensen. R and Shen. Q, 2007. Fuzzy-rough sets assisted attribute selection, IEEE Transactions on Fuzzy Systems, 15: 73-89.

[4] Lashin. E. F and Medhat. T, 2005. Topological reduction of information systems, Chaos, Solitons and Fractals, 25: 277-286.

[5] Li. T, Nguyen. H. S and Wang. G. Y, 2012. Rough sets and knowledge technology. Springer Berlin Heidelberg.

[6] Pawlak. Z, 1982. Rough sets, International Journal of Computer and Information Sciences 11: 341-356.

[7] Pawlak. Z, 1991. Rough sets: Theoretical Aspects of Reasoning about Data[J], Kluwer Academic Publishers, Boston.

[8] Pawlak. Z, 2002. Rough sets and intelligent data analysis. Information Sciences, 147(1–4):1-12.

[9] Pawlak. Z, Skowron. A, 2006. Rough sets: some extensions, Information Sciences, 177: 28-40.

[10] Pawlak. Z and Skowron. A, 2007. Rudiments of rough sets, Information Sciences, 177: 3-27.

[11] Qian. Y. H and Liang. J. Y, 2006. Combination entropy and combination granulation in incomplete information systems, Lecture Notes in Artificial Intelligence, 4062: 184-190.

[12] Qian. Y. H, Liang. J. Y, Li. D. Y, Zhang. H. Y and Dang. C. Y, 2008. Measures for evaluating the decision performance of a decision table in rough set theory, Information Sciences, 178:181-202.

[13] Saleem. D. M. A, Acharjya. D. P and Kannan. A, 2012. An intelligent knowledge mining model for kidney cancer using rough set theory. International journal of bioinformatics research and applications, 8(5-6): 417-435.

[14] Tripathy. B. K, Acharjya. D. P and Cynthya. V, 2011. A Framework for Intelligent Medical Diagnosis using Rough Set with Formal Concept Analysis. International Journal of Artificial Intelligence & Applications, 2(2).

[15] Varma. P. R. K, Kumari. V. V and Kumar. S. S, 2015. A novel rough set attribute reduction based on ant colony optimisation. International Journal of Intelligent Systems Technologies and Applications, 14(3-4):330-353.