International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS)
ISSN : 2581-9925, Impact Factor: 6.882, Volume 04, No. 03(II), July - September, 2022, pp. 50-54

STUDY OF ROUGH SET THEORY AND ITS APPROACHES IN AGRICULTURAL REALMS

Suwrna G. Sabnis*
Vairal Kailas L.**

ABSTRACT

Rough sets are promising tools for expressing granular computer technology, with new investigation to come. Its representation of ability constraint, human thinking in the face of uncertainty, is incomprehensible to classical logic. This article studies eleven varieties of data using rough set theory. Using indiscernibility relation found that, classification definite by the seven sets of attributes is equivalence relation is same as classification definite by four sets attributes. Lower and upper, approximations and boundary region show result of varieties $YV3$, $YV6$ and $YV11$ are excellent by using information system.

Keywords: *Rough Set, Indiscernibility Relation, Varieties, Lower Approximation, Upper Approximation.*

Introduction

Several mathematical models for dealing with various types of vagueness have been created in the last half-century, including FST, Dempster, and Shafer's theory of evidence, RST, interval analysis, imprecise probability, and so on. Imprecise knowledge is recognised in the information and computer sciences, particularly in AI, and it has long been studied by philosophers, logicians, and mathematicians. Because they address different aspects of uncertainty, these models are complementary rather than competitive. "Prof. Zdzislaw I. Pawlak", proposed RST in 1982 [2] as one of them. Rough sets play an essential role in data analysis in these methods, and the majority of real-world rough set applications use of feature minimization and link prediction techniques. Organisation visual information is well acknowledged to be consistent with human cognitive processing. Rough sets are promising tools for expressing granular computer technology, with more research to come. Its representation of ability constraint, human thinking in the face of uncertainty, is incomprehensible to classical logic. Non-classical logics including modal logic, many-valued logic, intuitionistic logic, and paraconsistent logic have been explored and developed since Aristotle's time. Rough set theory is investigated from the perspectives of algebras and non-classical logic. Furthermore, the linkages between non-monotonic reasoning, association rules in conditional logic, and background information were investigated using a granularity- based reasoning framework, which is a wide approach to reasoning with rough sets. It's a variant of (ordinary) set theory in which a slice of a universe is formalised by two sets, the LA and UA. These approximations can be described by two operators on subgroups of the field.

Information System

Here in the given data we define sugarcane varieties Co09002, Co09003, Co09004, Co09005, Co09006, Co09007,CoN09071, CoN09072, Co850004, Co94008, CoC671 as

$YV1$, $YV2$, $YV3$, $YV4$, $YV5$, $YV6$,$V7$, $YV8$,$YV9$, $YV10$, $YV11$ and define criteria is *L*= Low, *M*

---

* Kaveri College of Arts, Science and Commerce, Pune, Maharashtra, India.
** Padmashri Vikhe Patil College of Arts, Science and Commerce, Pravaranagar, Maharashtra, India.

= Moderate, *H* = Highest, and *VH* = Very Highest. We describe the proposed technique naturally, using a simple information system (example) to find data and show it as a table, with columns designated with attributes, rows named with varieties and table entries tagged with attribute values. Information about sugarcane varieties can be found in the table below. The following attributes sugarcane yields (t/ha), CCS yields (t/ha), CCS%, sucrose%, Brix%, Purity%, and 5 cane weights. Information system presented data about sugarcane as shown in Table.

Table 1: Sugarcane Yields (t/ha), CCS Yields (t/ha), and CCS%, Sucrose%, Brix%, Purity %, 5 Cane Weight (kg) at Harvest (12M) from Rough Set

Varieties	***Sugarcane Yields* (t/ha)**	***CCS Yields* (t/ha)**	***CCS %***	***Sucrose %***	***Brix %***	***Purity %***	***5 Cane Weights***	***Quality***
$YV1$	*M*	*H*	*H*	*H*	*H*	*VH*	*H*	*Very Good*
$YV2$	*M*	*H*	*H*	*H*	*VH*	*H*	*H*	*Very Good*
$YV3$	*VH*	*VH*	*VH*	*VH*	*H*	*VH*	*VH*	*Excellent*
$YV4$	*M*	*H*	*H*	*H*	*H*	*H*	*H*	*Very Good*
$YV5$	*H*	*H*	*H*	*H*	*H*	*H*	*L*	*Fair*
$YV6$	*VH*	*VH*	*H*	*H*	*H*	*H*	*VH*	*Excellent*
$YV7$	*L*	*M*	*M*	*M*	*H*	*H*	*H*	*Very Good*
$YV8$	*H*	*H*	*M*	*H*	*H*	*H*	*M*	*Good*
$YV9$	*M*	*H*	*M*	*H*	*H*	*H*	*H*	*Very Good*
$YV10$	*H*	*VH*	*H*	*VH*	*VH*	*H*	*H*	*Very Good*
$YV11$	*H*	*VH*	*VH*	*VH*	*H*	*VH*	*VH*	*Excellent*

Indiscernibility Relation (IR)

A function from rho to product of universe *U* and attributes *S* tends to *V.* The following of important points of indiscernibility relation (IR): *U* and *S* are finite set, *U* = universe discourse, *S* = set of attributes, every attribute s ∈ *S*, set *Vs* = its values designated as the domain of s. The pair *E* = (*U, S*) will be indicated an information system.

Any subset *G* of *S* determines a binary relation *IG* on *U.*

IR is signify as follows: y *IG*r if and only if s (y) = s (r). Final Set**:** We find out as follows

I({CCS Sugarcane Yields, CCS %, Brix%, 5 Cane Weight}) =

{{$YV1$}, {$YV2$}, {$YV3$}, {$YV4$}, {$YV5$}, {$YV6$}, {$YV7$}, {$YV8$}, {$YV9$}, {$YV10$}, {$YV11$}}

Attributes (Dispensable and Indispensable)

Let S = (U, a) be an knowledge system, B ⊆ A and a ∈ B, we say that 'a' is dispensable in B, if I(B) = $INDs$(B – {a})

Otherwise 'a' is indispensable i.e. I(B) ≠ $INDs$(B – {a})

Here, the sugarcane yields, CCS%, Brix%, Purity% and 5 cane weights is indispensable relation. Other relation is dispensable i.e. CCS yields and Sucrose%.

Reduct

If B' is independent and reduct of *B*,

$I(B')$ = $INDs$(*B*)

Here, Reduct is Purity% and 5 cane weights.

Core

Let *B*⊆*A*. The core of *B* is the set of all in dispensable attribute of *B*, Core *B*= ∩ Red (*B*), where Red (*B*) is the set of all reduct of *B*. Core *B*= Attribute is 5 cane weights.

In rough set easily identified partial or total dependencies in data and reducing the original data as follows.

Table 2: Sugarcane Yields (t/ha), and CCS%, Brix%, 5 Cane Weight (kg) at Harvest (12M) from Rough Set

Varieties	CCS *Sugarcane Yields*	*CCS %*	*Brix %*	*5 Cane Weights*	*Quality*
$YV1$	*M*	*H*	*H*	*H*	*Very Good*
$YV2$	*M*	*H*	*VH*	*H*	*Very Good*
$YV3$	*VH*	*VH*	*H*	*VH*	*Excellent*
$YV4$	*M*	*H*	*H*	*H*	*Very Good*
$YV5$	*H*	*H*	*H*	*L*	*Fair*
$YV6$	*VH*	*H*	*H*	*VH*	*Excellent*
$YV7$	*L*	*M*	*H*	*H*	*Very Good*
$YV8$	*H*	*M*	*H*	*M*	*Good*
$YV9$	*M*	*M*	*H*	*H*	*Very Good*
$YV10$	*H*	*H*	*VH*	*H*	*Very Good*
$YV11$	*H*	*VH*	*H*	*VH*	*Excellent*

This means that the classification defined by the seven sets attributes is equivalence relation is same as classification defined by four sets attributes.

Set Approximations

Let *L = (U, A), and B* ⊆ *A, X* ⊆ *U*. Calculate X based solely on the information in B as

B-Lower approximation $B_\star$(x) and *B*-Upper approximation $B^\star$(x) of *X* as

Lower Approximation

$B_\star$(x) = {x |[x] ⊆*X*}

Upper Approximation

$B^\star$(x) = {x |[x] ∩ $X \neq \emptyset$} **Boundary region of estimate *B* - Boundary region of *X*:**

BNB(X)= $B^\star$(x) - $B_\star$(x)

B* - outside of the region of *X:

U **-** $B^\star$(x)

Example

Using Table No.2, to find LA, UA boundary region, and exterior the region of X following cases:

$X1$ = {X | $Quality\ of$ Varieties $is\ Excellents$} and Attributes =

{$CCS\ Sugarecane\ yields$, CCS%, $Brix$%, 5 $Cane\ weights$}

Solutions

Final Set as follows:

I({CCS Sugarcane Yields, CCS %, Brix%, 5 Cane Weight}) =

{{$YV1$}, {$YV2$}, {$YV3$}, {$YV4$}, {$YV5$}, {$YV6$}, {$YV7$}, {$YV8$}, {$YV9$}, {$YV10$}, {$YV11$}}

Lower Approximation

Using information system,

$B_\star$(x) = {$YV3$, $YV6$, $YV11$}, since varieties $YV3$, $YV6$ and $YV11$ is excellent

Upper Approximation

Using information system,

$B^\star$(x) = {$YV3$, $YV6$, $YV11$}

Boundary Region of Approximation Using information System we get **Boundary region of *X*:**

BNB(X) = $B^\star$(x) - $B_\star$(x) = ∅.

U **-** $B^\star$(x) = {$YV1$, $YV2$, $YV4$, $YV5$, $YV7$, $YV8$, $YV9$, $YV10$}

The varieties $YV1$, $YV2$, $YV4$, $YV5$, $YV7$, $YV8$, $YV9$ and $YV10$ is not excellent

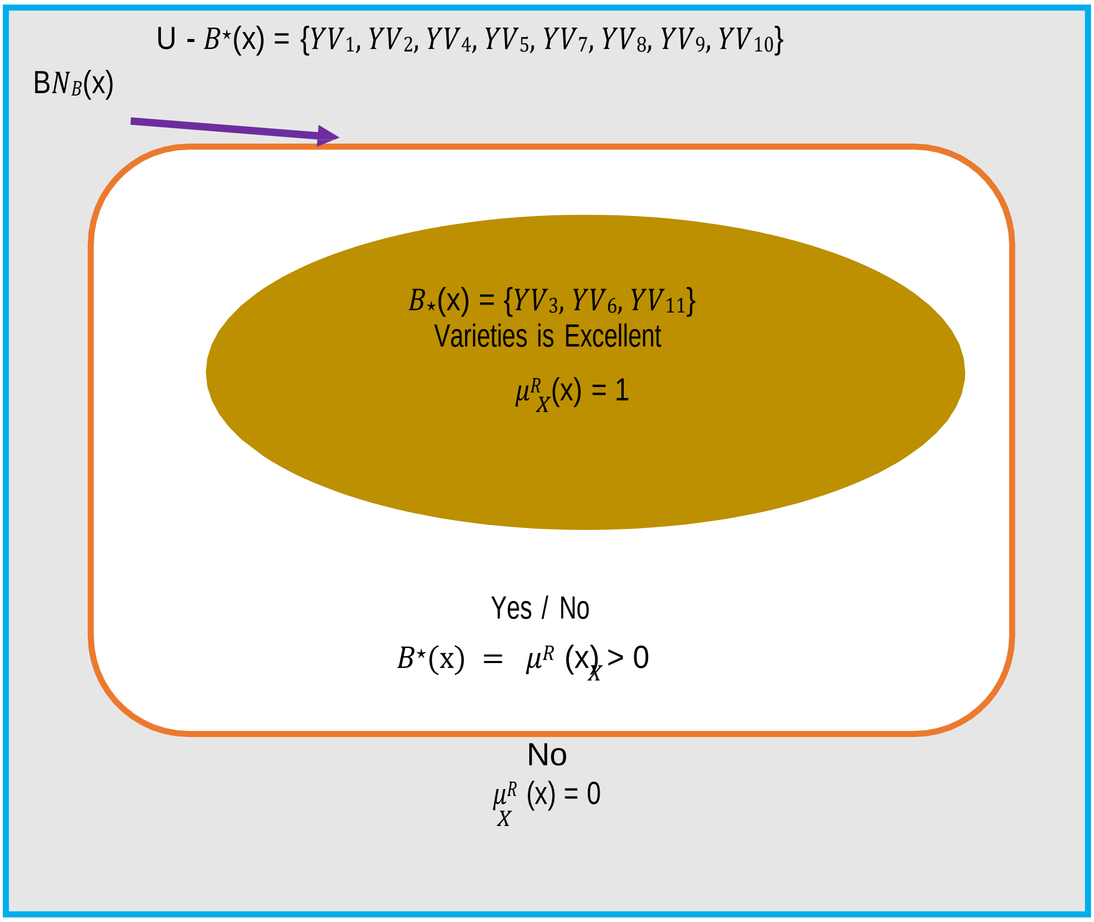

Figure: Lower and Upper Approximation and Boundary Region

Conclusion

Rough sets representation of ability constraint, human thinking in the face of uncertainty, is incomprehensible to classical logic. The present task we studied indiscernibility relation (IR), approximations, dispensable and indispensable relation, reduct and core. Using Table No. 1 we shown result that the classification defined by the seven sets attributes is an equivalence relation is same as classification defined by four sets attributes. We found varieties $YV3$, $YV6$ and $YV11$ are excellent varieties by using information system. Rough sets play an important role in data analysis, and the majority of real-world rough set application used in feature minimization and link prediction technique.

References

1. Pawlak, P. (1981). Information systems: theoretical foundations. *Inf. Syst*, 6: 205– 218.
2. Pawlak, Z. (1982). Rough sets, *International Journal of Computer and Information Sciences*.11: 341-356.
3. Pawlak, Z. (1991). Rough sets-Theoretical aspects of reasoning about data.
4. *Boston: Dordrecht: Kluwer Publishers*.
5. Pawlak, Z. (2004). Some issues on rough sets. *Lecture Notes in Computer Science*. 3100:1-58.
6. Pawlak, Z. (2005). Flow graphs and data mining. *Lecture Notes in Computer Science*. 3400:1-36.
7. Pawlak, Z. & Skowron, A. (2007a). Rudiments of rough sets. *Sciences*. 177:3-27.
8. Pawlak, Z. & Skowron, A. (2007b). Rough sets: Some extensions. *Sciences*. 177:28-40.
9. Pawlak, Z. & Skowron, A. (2007c). Rough sets and Boolean reasoning. *Sciences*. 177:41-73.

10. Toshinori Munakata & Zdzislaw Pawlak. (1996). Rough Control Application of Rough Set Theory to Control, Fourth European Congress on Intelligent Techniques and Soft Computing, Aachen, Germany, Proceedings. 1:209-218.
11. Yao, Y.Y. (1998a). Generalized rough set models In L. Polkowski & A. Skowron (Eds.), *Rough sets in Knowledge discovery. Heidelberg: Physica-Verlag*.286- 318.
12. Yao, Y.Y. (1998b). On generalizing Pawlak approximation operators. In Proceedings of 1st International Conference on Rough Sets and Current Trends in Computing (RSCTC'98). 298-307.
13. Yao, Y.Y. (2004b). A comparative study of formal concept analysis and rough set theory in data analysis. In W. Zakowski (Ed.), Proceedings of 3rd International Conference on Rough Sets and Current Trends in Computing (RSCTC'04). 59- 68.
14. Yao, Y.Y. (2004c). Concept lattices in rough set theory. In Proceedings of 23rd International Meeting of the North American Fuzzy Information Processing Society (NAFIPS'04).796-801.
15. Yao, Y.Y., & Chen, Y.H. (2006). Rough set approximations in formal concept analysis. *Journal of Transactions on Rough Sets*, V, LNCS 4100. 285-305.
16. Yao, Y.Y., Zhao, Y., & Wang, J. (2006). On reduct construction algorithms. In Proceedings of 1stInternational Conference on Rough Sets and Knowledge Technology (RSKT'06).297-304.
17. Z., Pawlak. (1998). Rough Set Theory and its Applications to data Analysis,
18. *Cybernetics and Systems: An International Journal*. 29: 661-688.
19. Z., Pawlak. (2002). Rough Set Theory and its Applications, *Journal of Telecommunications and information Technology*. 7-10.

❖◆❖