

Application of the rough set method to the level of customer satisfaction on service quality

Fricles Ariwisanto Sianturi¹⁾* Petti Indrayati Sijabat²⁾, Amran Sitohang³⁾
¹⁾²⁾³⁾STMIK Pelita Nusantara, Medan, Indonesia

¹⁾sianturifricle@gmail.com, ²⁾petti.jabat@gmail.com, ³⁾amranryan89@gmail.com

Submitted: Feb 2, 2021 | **Accepted:** Apr 5, 2021 | **Published:** Apr 5, 2021

Abstract: It is difficult to predict to do a random sampling technique with the consideration that the existing population is very large, so it is not possible to study the existing population. Thus, in the form of a population representative, this research is part of the total customers who stay at Graha Buana Hotel Medan. The decisions taken must consider well based on the data that is held, especially those that are closely related to the hotel service system. The stages of research carried out in research are to conduct interviews by direct questioning to the section related to research, direct observation of events that occur at the research site, analyzing and designing and making applications and testing applications. The Rough Set method is one of the methods above that allows us to make decisions in hotel services because in this method there are formulations or stages of problem mechanics and there is a result (decision) from a possible combination of the above criteria. From the results (decisions) that come from the processed data mining, it can be used as a reference for decision making. The results obtained in this study are finding a rule with the rough set method used to obtain the results of each criterion for service satisfaction results. The results obtained in this study are finding a rule with the rough set method used to obtain the results of each criterion for service satisfaction results.

Keywords: Data Mining, Prediction, Rough Set, Rosetta, Visitor Satisfaction

INTRODUCTION

With conditions of increasingly high competition between companies, each company is racing to expand the market. The hope of a direct market expansion is an increase in sales so that the company will have more consumers. However, there are several things that must be understood by the company as a producer, that the more consumers the company will find it more difficult to recognize its consumers carefully, especially about whether consumers like the goods or services offered and the reasons for it.

Companies that are able to compete in the market are companies that can provide quality products or services. Companies are required to continue to make improvements, especially in the quality of their services. Because consumers in choosing goods and services are based on motivation which later affects the types and tastes of the goods and services they buy (Han et al., 2012). In analyzing the foregoing, one solution that can be used is data mining regarding certain criteria at the consumer level. With the increasing amount of data and the need for accurate data analysis, the right data analysis method is needed. Data mining is a technique that combines traditional data analysis techniques with algorithms for processing very large amounts of data (Han et al., 2012).

Own facilities (Purba et al., 2019) are all things that constitute the main and supporting facilities for the convenience and comfort which the bank deliberately provides for the guest to use, utilize, enjoy during his stay at the bank. In running its business, PT. BPR Perbaungan Hombar Makmur tries to find out what the needs and desires of consumers are, including understanding consumer behavior and things that can provide a level of satisfaction to consumers. The competitors faced by Bank PT. BPR Perbaungan Hombar Makmur not only consist of companies that have the same facilities and services, but also from companies that have culinary facilities for tourist purposes. The number of customers has a very large effect on the survival of companies engaged in the sale of services, because for the customer service company is a source of income. The more

* name of corresponding author



customers the company has, the more revenue the company can achieve. (Fahmi & Sianturi, 2019) Basically, data mining is closely related to data analysis and software to look for patterns and similarities in a set of data.

Based on the monitoring, there is often a form of service to consumers at PT. BPR found complaints from several consumers about the form of service carried out at PT. BPR Perbaungan, of course with things like this it is very influential on the level of performance of the company being run, based on this it is necessary to conduct a study to measure the level of service satisfaction at PT. BPR Hombar Makmur towards consumers, so this research is necessary.

Therefore (Sianturi, 2018) data mining can be used to perform data analysis and find important patterns in data. In simple terms, data mining or data mining can be defined as the process of selecting and modeling large amounts of data to find patterns or trends that are usually not aware of their existence. (Suyanto, 2017) In data mining, data is stored electronically and is processed automatically by a computer using certain techniques and calculations. (Sulastris & Gufroni, 2017) Data mining processing can be done with several techniques, including the Rough Set Method, Fuzzy and others. One measure or indication of the progress of a society is the availability of supporting facilities for the community itself. The supporting facilities that are intended, must be able to facilitate the needs that exist in society in accordance with the developments and demands of the times

The Rough Set method is one of the methods above that allows making decisions in increasing the level of consumer satisfaction (Manalu et al., 2017). Because in this method there are formulations or stages of the problem and there is a result (decision) from possible combinations of the above criteria. The Rough Set method is a metematic technique that was developed since 1980. This technique is used to deal with problems (AI). The Rough Set offers two forms of data representation, namely Information Systems (IS) and Decition System (DS). The application (software) that applies the Rough Set Method is Rosetta.

LITERATURE REVIEW

Data Mining

Data mining is the most important and interesting extraction of information or patterns from the data in the data warehouse (Sianturi et al., 2018) The existence of data mining is marked by the emergence of data problems at that time, many companies have collected data for years, such as data on purchases and sales data. In scientific journals, data mining is also known as knowledge discovery in database (KDD).

The reasons for data mining are (Sianturi, 2018) :

1. The large amount of data that exists and the amount of data will continue to increase.
2. The need to interpret data.

Data Mining Process

Data Mining is an important step in the knowledge discovery process. The process of knowledge discovery in databases / KDD is the whole process of finding and identifying patterns in data (patern data).

The terms Data Mining and Knowledge Discovery in Database (KDD) are often used interchangeably to describe the process of extracting hidden information in a large database. The Knowledge Discovery in Database (KDD) process can be broadly explained as follows:

1. Data Cleaning (eliminates noise and inconsistent data)
2. Data Integration (combining data from various data sources)
3. Data Selection
4. Data Mining (Doing the mining process to extract data)
5. Knowledge Presentation

Artificial Intelligence

Artificial Intelligence (Sulastris & Gufroni, 2017) is a sub-part of computer science which is a software technique, where the programming emphasis is in symbolic form to represent data, processing and completion problem. Problems in symbolic form are problems that are often encountered in everyday life. (Minarni & Fadhillah, 2017) Artificial intelligence tries to make computers appear to be able to think intelligently like humans based on given facts. (Setyaputri & Fadlil, 2018) *Artificial Intelligence* learn how to make computers do something on an event / event as well as humans do. (Harijanto & Latif, 2016) *Artificial Intelligence* is a process by which mechanical equipment can carry out events using human-like thinking or intelligence. (Aji et al., 2018) *Artificial Intelligence* can be viewed from two approaches:

Rough Set

According to (Fricles A Sianturi, Hasugian, Paska Marto, Simangunsong Agustina, 2019) The rough set approach to data analysis has many major advantages. Among others are:

1. Provides efficient algorithms for finding hidden patterns in data.



2. Find the minimum set of data (data reduction).
3. Evaluating the significance of the data.
4. Generate a set decision rule from data.
5. Offers a direct interpretation of the results obtained.
6. Most of the algorithms based on the rough set theory are well suited for parallel processing.
7. Easy to understand.

The data transformation algorithm by means of this interval function algorithm is in the steps as described in the following algorithm:

Determine the value of largest (Xmax), smallest (Xmin)

Determine the range of values

$$(Xrange = Xmax - Xmin) \quad (1)$$

Determine the number of classes,

$$k = 1 + 3,3 \log (n) \quad (2)$$

Specify the interval value,

$$\text{Interval} = \{Xmax - Xmin\} \quad (3)$$

Transform data by:

$$\{ | Xmin |, | Xmin + int |, \dots | Xmin + n (int) | \} \quad (4)$$

METHOD

To solve the problem in this research, it is necessary to take steps to solve the problem with several steps in the research method as follows:

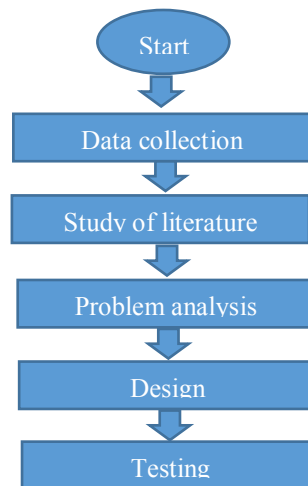


Fig 1. Research Stages

Description of Research Stages:

1. Field Research (data collection)
One of method collection data conducted directly on the object of research to collect the data needed in this study.
2. Study of literature
Researchers conducted a literature study on the application of descriptive methods in analyzing service satisfaction at PT. BPR Hombar Makmur Perbaungan.
3. Problem analysis
Analyze where problems occur in the service process of employees to consumers at PT. BPR Hombar Makmur Perbaungan.
4. Design
This research was conducted by collecting consumer complaint data, the data is in the form of ten questions made by researchers and distributed to consumers then the data is processed using descriptive methods.
5. Test
The system testing stage is the stage for studying and analyzing the problem under study to make problem solving for existing developments.

RESULT

In a rough set, a dataset is represented as a table, where rows in the table represent objects and columns represent the attributes of those objects. The table is called the information system which can be described as follows:

$$S = (U, A) \tag{5}$$

Where U is a non-empty set of objects called universe and A set so that it is not empty of the attribute where:

$$A: U \rightarrow V \tag{6}$$

For each $\alpha \in A$.

From the results obtained, the data transformation process is carried out for complete data, as follows:

1. For Consumers:

$$\begin{aligned} \text{Largest value (Xmax)} &= 112 \\ \text{Minimum value (Xmin)} &= 8 \\ \text{Value Range (Xrange)} &= 112 - 8 = 104 \\ \text{Number of Classes (k)} &= 1 + 3.3 \log(4) \\ &= 1 + (0.52) = 1.52 \\ \text{Interval Value (Int)} &= 104 / 1.52 = 68.5 \end{aligned}$$

Data Transformation [Xmin + Int]:

The range between 30 - 62 is transformed into number = 1
The range between 34 - 44 is transformed into a number = 2

2. For Age Group:

$$\begin{aligned} \text{Largest value (Xmax)} &= \text{Over 40 years} \\ \text{Minimum value (Xmin)} &= \text{Less than 20 years} \\ \text{Value Range (Xrange)} &= 40 - 20 = 20 \\ \text{Number of Classes (k)} &= 1 + 3.3 \log(4) \\ &= 1 + (0.52) = 1.52 \\ \text{Interval Value (Int)} &= 20 / 1.52 = 13.2 \end{aligned}$$

Data Transformation [Xmin + Int]:

The range between 20 - 111 is transformed into a number = 1
The range between 112 - 187 is transformed into numbers = 2

Table 1
Data with transformation techniques

No.	Visitor Name	January	February	April	May	Decision
1	A	1	2	2	1	Satisfied
2	B	1	1	3	1	Not satisfied
3	C	2	1	1	1	Not satisfied
4	D	3	2	1	2	Satisfied
5	E	2	2	1	3	Satisfied

From the transformation data obtained in table 1, a knowledge search process can be carried out such as these steps:

1. *Discernibility Matrix*

In the Discernibility Matrix, the condition variables consist of Consumers, Number, Age and Occupation,

And the decision variables consist of:

$$\begin{aligned} \text{Satisfied} &= 1 \\ \text{Not satisfied} &= 2 \end{aligned}$$

Then each name in the group in the form of an equivalence class is simplified to be EC1, EC2, EC3, EC4 and EC5, so that the results can be seen as in Table 2 below.

Table 5
Reduct

Class	CNF of Boolean Function	Implicant	Reduct
EC1	$(B \vee C) \wedge (B \vee C)$	(D)	(D)
EC2	$(B \vee C) \wedge (D) \wedge (A)$	$(B \vee D) \wedge (C \vee D) \wedge (A)$	{B, C},
EC3	$(D) \wedge (A) \wedge (D) \wedge (D)$	(D \vee A)	{D, A}
EC4	(D)	(D)	{D}

From the results of the reducts obtained, a rules / knowledge can be obtained. Like the example above, the rules it gets are:

Rules :

D1 E1
B1, C1 E2, D1A2 E2
D2, A1 E2
A2, D1 E1
B1, C1 E2, D1, A1 E2
D1 E1

EC1 : **IF** D = 1 Then E = 1
IF Consumer = 30 Then Decision = Satisfied

EC2 : **IF** B = 1, C = 1 Then E = 2, D = 1, A = 1 Then E = 2
IF Age = 65 & Consumers = 53
Then Decision = Not Satisfied
IF Age = 38 & Occupation = 40
Then Decision = Not Satisfied

EC3 : **IF** D = 2, A = 1 Then E = 2
IF Occupation = 50
Then Decision = Not Satisfied

EC4 : **IF** D = 2 Then E = 2
IF Occupation = 65
Then decision = Not satisfied

EC5 : **IF** A = 2, D = 1 Then E = 2
Consumer IF = 120, = 50
Then Decision = Satisfied

Based on the rule value obtained, the results obtained are, consumers aged 30 get satisfied service, but if consumers aged 61 do not get service with satisfaction and consumers aged 65 also do not get good service, thus in the future a service that does not see is needed. in terms of age, but equalized in the form of service.

DISCUSSIONS

The previously generated information was unclear, so far it only displayed the number of visitors in the visitor data report and resulted in rising and falling conditions. By only looking at the results of hotel visitors without detailing the number or number of points, parameters or other attributes that affect the decision process, it is unclear what decision to take. By designing this decision system, the resulting report form becomes more complete and produces rules / knowledge for decision making, namely by carrying out the process:

1. To complete the data, a system is designed that uses remove incomplete data from cleaning, so that a complete data set is obtained.
2. In order for the information generated to be easily understood by interested parties, the system is designed to also use transformation data, namely data that has been completely transformed using algorithms from data transformation.
3. Information that has been transformed so that it becomes simple, is processed again in generating rules, so as to produce rules / knowledges that can be used in decision making. From the results of the transformation data processing, rules / knowledge are obtained. To test the correctness of the results of manual data processing, a rough set application software can be used.

1. The complete data is made first

Table 6
Number of Visitors of PT. BPR Makmur

Month	Foreign Visitors	Local Visitors	amount	Decision
April	4	50	54	Ride
May	2	44	46	Ride
June	3	38	41	Ride
July	2	25	27	Down
August	1	34	34	Ride
September	1	10	11	Down

2. Run the Rosetta software, after the Rosetta screen appears, then click the File menu New, so that the following screen appears:

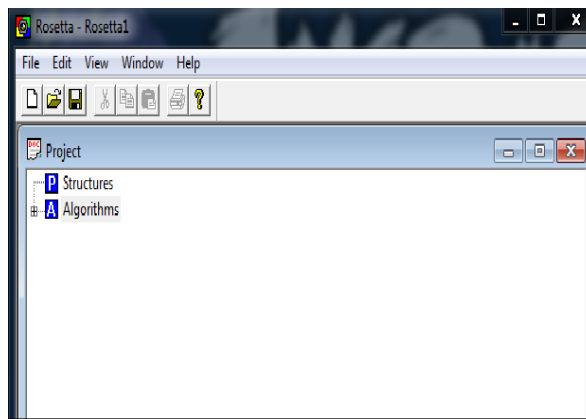


Figure 1 Rosetta Initial Menu

3. Then the Select Data Source screen appears, as shown in Figure 2

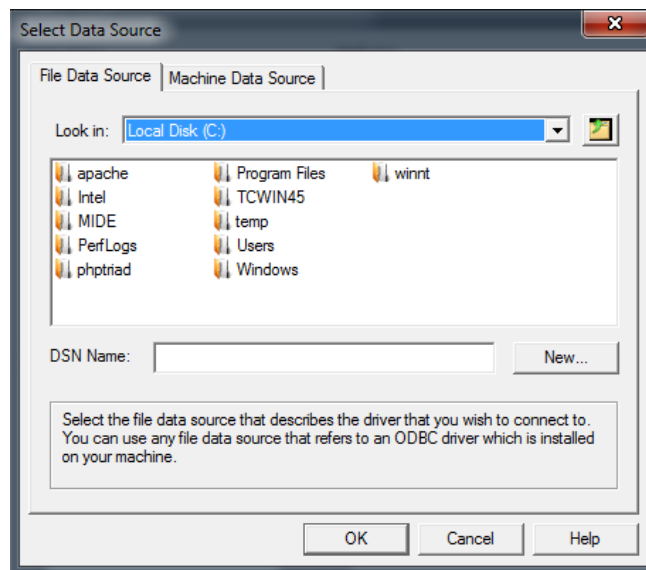


Figure 2 Select Data Source Screen Display

4. Click the OK button, call the distribution file 1, xls that was created in Microsoft Excel as shown in figure 53

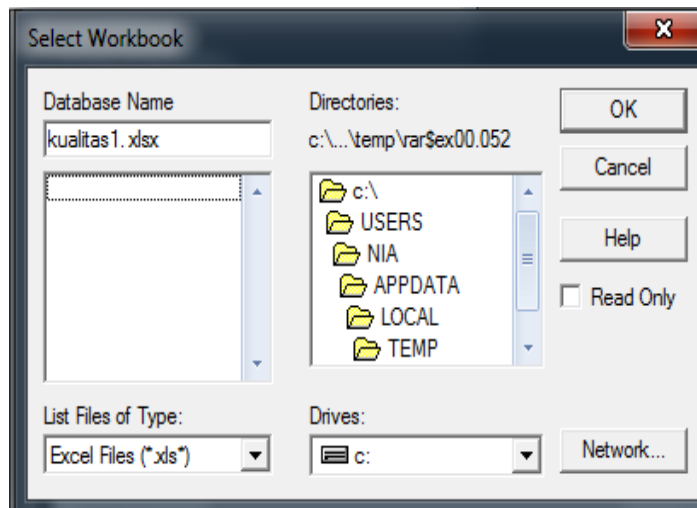


Figure 3: Select Microsoft Excel File Workbook Display.

CONCLUSION

The conclusion contains a summary of what is learned from the results obtained, what needs to be improved

Based on research conducted on customer satisfaction with the quality of hotel services, it can be concluded that a decision support system that is supported by a Rough Set method will be useful again in making a decision. Based on the analysis and discussion carried out on the decision support system, it can be concluded that the decision-making system that runs at the Graha Buana Hotel Medan is less than optimal, the facilities and facilities at the Graha Buana Hotel do not meet the needs of visitors staying at hotels, the use of the Rough Set method is very helpful. In estimating consumer needs and satisfaction that must be fulfilled in the coming period, the use of the Rosetta application can help in making decisions for product allocation to every hotel visitor.

REFERENCES

- Ariwisanto Sianturi, F., Manurung, J., & Siahaan, R. (2020). LOYALTY ASSESSMENT OF COMPANY COSTUMER WITH CLASSIFICATION METHOD. *INFOCUM*, 9 (1), 21-30. Retrieved from <http://infor.seaninstitute.org/index.php/infokum/article/view/70>
- Aji, AH, Furqon, MT, & Widodo, AW (2018). Expert System for Diagnosing Pregnant Women Diseases Using the Certainty Factor (CF) Method. *Journal of Information Technology and Computer Science Development*, 2 (5), 2127-2134. <http://j-ptiik.ub.ac.id/index.php/j-ptiik/article/view/1556>
- Fahmi, M., & Sianturi, FA (2019). APRIORIC ALGORITHM ANALYSIS ON CONSUMER ORDER AT CAFÉ THE L. COFFE COFFEE. *SAINTEK (Journal of Science and Technology)*, 1 (1), 52-57.
- Fricles A Sianturi, Hasugian, Paska Marto, Simangunsong Agustina, NB (2019). Data Mining | Weka Theory and Applications. In -: Vol. (Issue).
- Han, J., Kamber, M., & Pei, J. (2012). Data Mining: Concepts and Techniques. In *Data Mining: Concepts and Techniques*. <https://doi.org/10.1016/C2009-0-61819-5>
- Hariyanto, B., & Latif, RA (2016). EXPERT SYSTEM FOR CAT DISEASE DIAGNOSIS USING ANDROID BASED BAYES THEOREME METHOD. *Journal of Polinema Informatics*. <https://doi.org/10.33795/jip.v2i4.79>
- Manalu, E., Sianturi, FA, & Manalu, MR (2017). Application of the Naive Bayes Algorithm to Predict the Total Production of Goods Based on Inventory Data and the Number of Orders at Cv. Pap and Mama Pastries. *Mantik Pennusa*, 1 (2), 16-21. <http://e-jurnal.pelitanusantara.ac.id/index.php/mantik/article/view/257>
- MS Fricles Ariwisanto Sianturi, "COMBINATION OF THE IMPORT DITIVEWEIGHTING (SAW) METHOD WITH NEAREST NEIGHBOR ALGORITHM FOR EMPLOYEE RECRUITMENT," *Mantik Penusa*, vol. 3, no. 2, pp. 1-9, 2019.
- Minarni, & Fadhillah, A. (2017). Expert System in Detecting Rice Plant Diseases. *Journal of Dynamics*, 2 (1), 11-15. <https://doi.org/10.22216/JoD.2017.V2.11-15>
- Purba, W., Siawin, W., & Hardih. (2019). Implementation of Data Mining for Grouping and Predicting Employees with Potential Layoffs with the K-Means Clustering Algorithm. *Journal of Information Systems Computer Science Prima (JUSIKOM PRIMA)*, 2 (2), 85-90.
- Setyaputri, KE, & Fadlil, A. (2018). Analysis of the Certainty Factor Method in the Expert System for ENT Disease Diagnosis. *Journal of Electrical Engineering*, 10 (1), 30-35.

-
- Sianturi, FA (2018). Decision Tree Analysis in Student Data Processing. MEANS (Media Information Analysis and Systems), 3 (2), 166–172. http://ejournal.ust.ac.id/index.php/Jurnal_Means/
- Sianturi, FA, Informatics, T., & Utara, S. (2018). Application of the Apriori Algorithm for Level Determination. Mantik Pennusa, 2 (1), 50–57. <http://e-jurnal.pelitanusantara.ac.id/index.php/mantik/article/view/330>
- Sulastri, H., & Gufroni, AI (2017). Application of Data Mining in Grouping Thalassemia Patients. Journal of Technology and Information Systems, 03 (02), 299–305. <https://doi.org/10.25077/TEKNOSI.v3i2.2017.299-305>
- Suyanto. (2017). Data mining for data classification and clustering. SpringerReference.

