International Journal of Education, Information Technology and Others (IJEIT), June 2022, 5 (3), 89-101
DOI: https://doi.org/10.5281/zenodo.6930677
p-ISSN: 2654-2528 e-ISSN: 2623-2324
Accredited by Directorate General of Strengthening for Research and Development
Available online at https://jurnal.peneliti.net/index.php/IJEIT

Measuring The Level of Student Satisfaction with Teacher Performance with Algorithmic Method C4.5 (Case Study: SMA Negeri 1 Tanjungpinang)

Nur Apriliana Cahyani[*1], Erza Sofian[2]

[1,2] Sekolah Tinggi Ilmu Manajemen and Ilmu Komputer

Received: 5 Juni 2022
Revised: 10 Juni 2022
Accepted: 14 Juni 2022

Abstract

Satisfaction or dissatisfaction is the conclusion of the interaction between expectations and experiences after using the services or services provided. However, more service satisfaction assessments are done with survey calculations that explain relationships that are difficult to interpretation. Data mining with the C4.5 Algorithm technique can create decision trees that handle discrete type attributes and discrete numeric types, as a result of which the resulting data is easily interpreted and has an acceptable level of accuracy. This study aims to find out and analyze how much student satisfaction levels to teacher performance by using the C4.5 Algorithm method. The data was taken from a sample of SMA Negeri 1 Tanjungpinang students. The results of this study showed that SMA Negeri 1 Tanjungpinang students were satisfied with the services provided with a percentage of student satisfaction rate of 90.4% with tangible (physical evidence) as an influential dimension determining the level of student satisfaction. This research has contributed to enriching problem-solving solutions using the C4.5 Algorithm. It is hoped that the results of this study can be applied to improve teacher performance so that the services provided to students can be better and become a reference to improve student satisfaction.

Keywords: *Satisfaction, Dissatisfaction, Data Mining, Algoritma C4.5*

(*) Corresponding Author: n.apriliana.c@students.esqbs.ac.id , erza.sofian@esqbs.ac.id

How to Cite: Sofian, E., & Cahyani, N. (2022). Measuring The Level of Student Satisfaction with Teacher Performance with Algorithmic Method C4.5. *International Journal of Education, Information Technology, and Others*, *5*(3), 89-101. https://doi.org/10.5281/zenodo.6930677

INTRODUCTION

This Paper measure level of Satisfaction and Dissatisfaction for performance's teachers to serve students at the school. The rapid development of knowledge and technology today has resulted in a high level of competition in the world of education. This makes every school compete in providing quality services to students so that the school can continue to develop along with the development of knowledge and technology. A good school service quality is one that provides quality services in accorandce with student expectations. With the alignment of service quality and expectations, it will be obtained how much the level of student satisfaction. Kotler (2008) in the journal (Yasir et al., 2017) suggests that satisfaction is a person's level of satisfaction after comparing the performance or

perceived results compared to their expectations. So satisfaction or dissatisfaction is the conclusion of the interaction between expectations and experiences after using the services or services provided. The assessment of service satisfaction is mostly done with survey calculations that explain the stimulus or response relationship from the respondents which is used to determine the location of the continuum (Suharta, 2017) which is difficult to interpret. According to (Parasuraman et al., 2015) service quality is measured through five dimensions, namely responsiveness, reliability, tangible, assurance and empathy. Good teacher performance will have an impact on the quality of teaching and learning process services (PBM) and student satisfaction

BACKGROUND

C4.5 Algorithm

According to Larose in (Pambudi et al., 2018) several stages to make a decision tree using the C4.5 algorithm method are as follows:

1. Prepare training data. Training data is usually taken from historical data that has happened before or is called past data and has been grouped into certain classes.
2. Counting the roots of the tree. The root will be taken from the attribute to be selected, by calculating the gain value of each attribute, the highest gain value will be the first root. Before calculating the gain value from the attribute, first calculate the entropy value. Calculate the entropy value used the formula:

   $$Entropy\ (S) = \sum_{i=1}^{n} -pi\ *\log2(pi) \quad (1)$$

   S = Set of Case
   n = Number of partition S
   pi = Proporsi
3. Calculate the Gain Value using euation number 2

   $$Gain(S,\ A) = entropy(S) - \sum_{i=1}^{n} \frac{|si|}{|s|} * Entropy\ (Si) \quad (2)$$

   S = Set of Cases
   A= Featurs
   n = Numbet of attribute Partitions A
   |*Si*| = Proportion of *Si to S*
   |*S*| = Number of cases in *S*

4. Repeat step 2 and step 3 until all records are partitioned

5. The decision tree partitioning process will stop when:
   a. All records in node N have the same class.
   b. There are no attributes in the partitioned record anymore.
   c. There are no records in the empty branch.

Literature Review

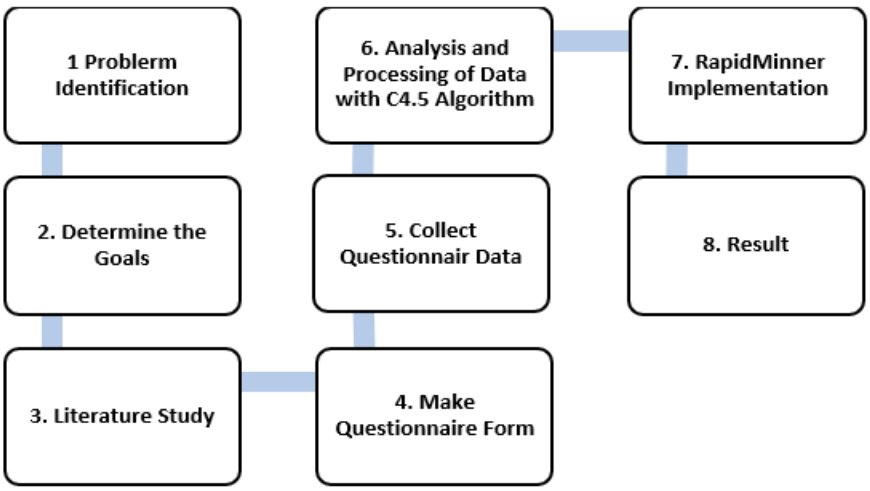
Table.1 Previous Research

Research objective number	Author and Year	Title	Research Purpose	Result
1	(Fadillah et al., 2020)	Implementasi Data Mining C4.5 dalam Mengukur Tingkat KeSatisfieand Mahasiswa Terhadap Kinerja Asisten Laboratorium Komputer	Knowing the effect of laboratory assistant services on student satisfaction so that students do not feel disappointed with services related to the performance of computer laboratory assistants	-The effect of computer laboratory assistant performance services on student satisfaction is the reliability of a computer laboratory assistant -Decision trees can be a reference for universities to improve the performance of laboratory assistants in supporting and assisting students during the process of practicum activities ITTP e-learning users who feel satisfied are 46 respondents and 27 respondents are dissatisfied. And the flexibility of the ITTP e-learning system is the main indicator in user satisfaction followed by response time.
2	(Supriyadi & Safitri, 2020)	The Application of C4.5 Algorithm to Classify the User Satisfaction of Online Learning System	Determine user satisfaction of ITTP e-learning	
	(Yucel et al., 2020)	Classification of the Temperature-Dependent Gain of an Erbium-Doped Fiber Amplifier by Using Data Mining Methods	Knowing the most suitable algorithm used to help designers of erbium-doped fiber amplifier (EDFA) systems in developing applications	the decision tree classification technique is the C4.5 algorithm which gets the best results and is close to the experimental results, namely at the level of 98.39%. Compared to these 6 algorithms *(ZeroR Algorithm, OneR Algorithm, Naive Bayes Algorithm, C4.5 algorithm,*

				Logistic Regression Analysis, and K-Nearest Neighbor Algorithm)
3	(Anggia Dasa Putri, 2019)	Data Mining Menggunakan Algoritma C4.5 Untuk Memprediksi KeSatisfieand Mahasiswa Terhadap Kinerja Dosen Di Kota Batam	Determining the level of student satisfaction that is influenced by lecturer performance in lectures with data mining techniques using the C4.5 algorithm where the variables used include reliability, responsiveness, appearance, empathy and assurance.	The decision tree by manual calculation of the C4.5 algorithm is the same as the decision tree produced by Weka software with an accuracy of 94.12%.
4	(Bayu Febriyanto, 2018)	Implementasi Algoritma C4.5 Untuk Klasifikasi Tingkat KeSatisfieand Pembeli Online Shop	Knowing the level of consumer satisfaction in the online shop	The level of customer satisfaction at the online shop with an accuracy rate of 91%, with a precision value of 66.67% for satisfied predictions and 33.3% of dissatisfied predictions.

RESEARCH METHODELOGY

Research Framework



Pic.1 Research framwork

Problem Identification

In this first stage, the researcher made observations by reading several journal articles about customer satisfaction and service quality

Determine the Goal

In this step, determine the title that fits the research objectives and the model that will be used to make decisions about student satisfaction with teacher performance.

Literature Study

Make Questionnaire Form

At this stage the author look for journals or references related to indicators of service quality variables that will be used in making questionnaires. After the references were obtained, the authors began compiling a list of questionnaires to be distributed to high school students. Questionnaire created online.

Collect Questionnaire Data

At this stage the author has made a list of questionnaire statements. The questionnaire will be distributed to the students of Public High School 1 Tanjungpinang and the results of the questionnaire will be entered into a Google Spread sheet because this research questionnaire is an online questionnaire. The questionnaire data collection will first be processed manually by the author.

Analysis and Processing of Data with C4.5 Algorithm

At this stage the author begins to analyze the questionnaire data and processed using calculations manually using the C4.5 Algorithm. Determine the root, gain and entropy of the data that has been collected. The results of manual data processing will be used as a reference for implementing it into the RapidMiner application

Research Metode

In accorandce with the problem formulation and research objectives, the research method is used in the Decision Tree Algorithm C4.5.

The stages of making a decision tree with the C4.5 algorithm method, namely:

Prepare Training Data

Table 2. Calculation Data

Responsiveness	Assurance	Tangibl	Empathy	Reliability	Satisfied
SB	B	STB	B	SB	YES
SB	B	SB	B	SB	YES
STB	B	SB	B	STB	NO
B	SB	B	STB	B	YES
B	STB	B	SB	B	YES
B	STB	B	SB	STB	NO
STB	STB	SB	B	B	NO

SB	SB	SB	B	SB	YES
SB	STB	B	B	SB	YES
B	SB	STB	SB	SB	YES
SB	SB	STB	STB	B	NO
STB	SB	B	STB	B	NO
STB	B	SB	B	B	YES
B	SB	B	SB	STB	YES
B	SB	STB	B	B	YES

Table Description : SB = Sangat Baik (The Best)
B = Baik (Good)
STB = Sangat UnBaik (The Worst)

It is known that there are a total of 15 cases consisting of 10 satisfied cases and 5 dissatisfied cases.

Calculating the root of the tree (root node)

by calculating the gain value of each attribute, the highest gain value will be the first root. Before calculating the gain value from the attribute, first calculate the entropy value.

To calculate the entropy value used the formula:

$$Entropy\ (S) = \sum_{i=1}^{n} -pi\ *\log2(pi)$$

(1)

$$Entropy(total) = \left(-\frac{5}{15} * log_2\left(\frac{5}{15}\right)\right) + \left(-\frac{10}{15} * log_2\left(\frac{10}{15}\right)\right) = 0.9182958341$$

1. **Calculating the value of Gain**

The formula for calculating the Gain value:

$$Gain(S, A) = entropy(S) - \sum_{i=1}^{n} \frac{|si|}{|s|} * Entropy\ (Si)$$

(2)

$$\text{Gain(total, responsiveness)} = 0.91829 - \left(\left(\frac{5}{15} * 0.72192\right) + \left(\frac{6}{15} * 0.65002\right) + \left(\frac{4}{15} * 0.81127\right)\right) = 0.2013033333$$

$$\text{Gain(total, assurance)} = 0.91829 - \left(\left(\frac{7}{15} * 0.86312\right) + \left(\frac{4}{15} * 0.81127\right) + \left(\frac{4}{15} * 1\right)\right) = 0.03249533333$$

$$\text{Gain}(\text{total, tangible}) = 0.91829 - \left(\left(\frac{5}{15} * 0.97095\right) + \left(\frac{6}{15} * 0.91829\right) + \left(\frac{4}{15} * 0.81127\right)\right) = 0.01098533333$$

$$\text{Gain}(\text{total, emphaty}) = 0.91829 - \left(\left(\frac{5}{15} * 0.97095\right) + \left(\frac{7}{15} * 0.59167\right) + \left(\frac{3}{15} * 0.91829\right)\right) = 0.134869333$$

$$\text{Gain}(\text{total, reliability}) = 0.91829 - \left(\left(\frac{5}{15} * 0\right) + \left(\frac{7}{15} * 0.98522\right) + \left(\frac{3}{15} * 0.91829\right)\right) = 0.2748626667$$

1. **Repeat step 2 and step 3 until all records are partitioned get result at below**

Responsiveness

$Entropy(SB) = \left(-\frac{1}{5} * log_2\left(\frac{1}{5}\right)\right) + \left(-\frac{4}{5} * log_2\left(\frac{4}{5}\right)\right) =$ 0.7219280949

$Entropy(B) = \left(-\frac{1}{6} * log_2\left(\frac{1}{6}\right)\right) + \left(-\frac{5}{6} * log_2\left(\frac{5}{6}\right)\right) =$ 0.6500224216

$Entropy(STB) = \left(-\frac{3}{4} * log_2\left(\frac{3}{4}\right)\right) + \left(-\frac{1}{4} * log_2\left(\frac{1}{4}\right)\right) =$ 0.8112781245

Assurance

$Entropy(SB) = \left(-\frac{2}{7} * log_2\left(\frac{2}{7}\right)\right) + \left(-\frac{5}{7} * log_2\left(\frac{5}{7}\right)\right) =$ 0.8631205686

$Entropy(B) = \left(-\frac{1}{4} * log_2\left(\frac{1}{4}\right)\right) + \left(-\frac{3}{4} * log_2\left(\frac{3}{4}\right)\right) =$ 0.8112781245

$Entropy(STB) = \left(-\frac{2}{4} * log_2\left(\frac{2}{4}\right)\right) + \left(-\frac{2}{4} * log_2\left(\frac{2}{4}\right)\right) = 1$

Tangible

$Entropy(SB) = \left(-\frac{2}{5} * log_2\left(\frac{2}{5}\right)\right) + \left(-\frac{3}{5} * log_2\left(\frac{3}{5}\right)\right) =$ 0.9709505945

$Entropy(B) = \left(-\frac{2}{6} * log_2\left(\frac{2}{6}\right)\right) + \left(-\frac{4}{6} * log_2\left(\frac{4}{6}\right)\right) =$ 0.9182958341

$$Entropy(STB) = \left(-\frac{1}{4} * log_2\left(\frac{1}{4}\right)\right) + \left(-\frac{3}{4} * log_2\left(\frac{3}{4}\right)\right) = 0.8112781245$$

Emphaty

$$Entropy(SB) = \left(-\frac{2}{5} * log_2\left(\frac{2}{5}\right)\right) + \left(-\frac{3}{5} * log_2\left(\frac{3}{5}\right)\right) = 0.9709505945$$

$$Entropy(B) = \left(-\frac{1}{7} * log_2\left(\frac{1}{7}\right)\right) + \left(-\frac{6}{7} * log_2\left(\frac{6}{7}\right)\right) = 0.5916727786$$

$$Entropy(STB) = \left(-\frac{2}{3} * log_2\left(\frac{2}{3}\right)\right) + \left(-\frac{1}{3} * log_2\left(\frac{1}{3}\right)\right) = 0.9182958341$$

Reliability

$$Entropy(SB) = \left(-\frac{0}{5} * log_2\left(\frac{0}{5}\right)\right) + \left(-\frac{5}{5} * log_2\left(\frac{5}{5}\right)\right) = 0$$

$$Entropy(B) = \left(-\frac{3}{7} * log_2\left(\frac{3}{7}\right)\right) + \left(-\frac{4}{7} * log_2\left(\frac{4}{7}\right)\right) = 0.985228136$$

$$Entropy(STB) = \left(-\frac{2}{3} * log_2\left(\frac{2}{3}\right)\right) + \left(-\frac{1}{3} * log_2\left(\frac{1}{3}\right)\right) = 0.9182958341$$

Tabel 3. Result of Entropy and Gain

Node	Atribut	Jumlah kasus (s)	Tidak (Si)	Ya (Si)	Entropy	Gain
1	Total	15	5	10	0.9182958341	
	Responsiveness					0.2013033333
	SB	5	1	4	0.7219280949	
	B	6	1	5	0.6500224216	
	STB	4	3	1	0.8112781245	
	Assurance					0.03249533333
	SB	7	2	5	0.8631205686	
	B	4	1	3	0.8112781245	
	STB	4	2	2	1	
	Tangible					0.01098533333
	SB	5	2	3	0.9709505945	
	B	6	2	4	0.9182958341	
	STB	4	1	3	0.8112781245	
	Emphaty					0.1348693333
	SB	5	2	3	0.9709505945	
	B	7	1	6	0.5916727786	
	STB	3	2	1	0.9182958341	
	Reliability					0.2748626667
	SB	5	0	5	0	
	B	7	3	4	0.985228136	
	STB	3	2	1	0.9182958341	

Data collection technique.

Questionnaire data that has been collected amounted to 311 data, then the data is divided into two parts, namely training data and testing data. Training data is 80% and testing data is 20%. 249 data is used for training data and 62 data is used for testing data. The results of the training data are used to obtain the results of the level of student satisfaction in the form of a decision tree and testing data is used to determine the level of accuracy of the classification results carried out. The classification process using Knowledge discovery in databases (KDD) will analyze the satisfaction of the reliability, responsiveness, assurance, empathy, and tangible variables.

Table.4 Classification of student satisfaction assessment attributes

Variabel	Kode	Atribut
Reliability	P1	Materi Pembelajaran
	P2	Mengajar sesuai jadwal
	P3	Sistem Penilaian
Responsiveness	P4	Kemampuan menjawab pertanyaan
	P5	Urusan administrasi
	P6	Kemampuan merespon masalah atau keluhan
Assurance	P7	Pengembangan Ilmu
	P8	Kemudahan informasi
	P9	Lingkungan sekolah aman
Empathy	P10	Komunikasi siswa and guru
	P11	Keramahan guru
	P12	Keterbukaan and sikap kooperatif
Tangible	P13	Kelas and lingkungan sekolah yang bersih
	P14	Prasarana olahraga
	P15	Alat pendukung kegiatan belajar
	P16	Laboraturium yang lengkap
	P17	Kebersihan toilet

From the classification of the attributes that exist, the table will be categorized according to the results with values satisfied and dissatisfied, then it will be used as training data and testing data.

From the results calculation of the entropy and gain of each attribute of the training data, it will produce a table as follows:

Table .5 Entropy and Gain Calculation

Kode Atribut	Nilai Kriteria	Jumlah kasus	Satisfied	Un	Entropy	Gain
		249	**230**	**19**	**0,389024685**	
P1	4	91	87	4	0,260145364	0,567170426
	3	143	132	11	0,391243564	
	2	14	10	4	0,863120569	
	1	1	1	0	0	
P2	4	166	154	12	0,374408845	0,254162565
	3	75	71	4	0,300391417	
	2	7	5	2	0,863120569	
	1	1	0	1	0	
P3	4	113	109	4	0,220779923	0,559456358
	3	127	114	13	0,476439191	
	2	9	7	2	0,764204507	
	1	0	0	0	0	
P4	4	136	129	7	0,292611368	0,43716436
	3	105	95	10	0,453716339	
	2	7	6	1	0,591672779	
	1	1	0	1	0	
P5	4	118	114	4	0,213579815	0,527902562
	3	121	111	10	0,411429831	
	2	8	4	4	1	
	1	2	1	1	1	
P6	4	105	100	5	0,276195428	0,52215024
	3	117	109	8	0,359834024	
	2	25	20	5	0,721928095	
	1	2	1	1	1	
P7	4	128	123	5	0,237977151	0,494608268
	3	113	103	10	0,431428208	
	2	8	4	4	1	
	1	0	0	0	0	
P8	4	128	122	6	0,272970858	0,471029068
	3	111	101	10	0,436770455	
	2	9	7	2	0,764204507	
	1	1	0	1	0	
P9	4	166	158	8	0,278669804	0,377899326
	3	78	69	9	0,51594693	
	2	4	3	1	0,811278124	
	1	1	0	1	0	
P10	4	123	120	3	0,165427034	0,53647048
	3	110	102	8	0,376019851	

	2	13	7	6	0,995727452	
	1	3	1	2	0,918295834	
P11	4	181	171	10	0,308287539	0,303999094
	3	64	57	7	0,498027887	
	2	3	2	1	0,918295834	
	1	1	0	1	0	
P12	4	94	92	2	0,14854949	0,59410727
	3	139	129	10	0,373131023	
	2	14	9	5	0,940285959	
	1	2	0	2	0	
P13	4	145	144	1	0,059431847	0,599084095
	3	96	83	13	0,572108447	
	2	6	3	3	1	
	1	2	0	2	0	
P14	4	167	159	8	0,277426509	0,37359491
	3	75	65	10	0,566509507	
	2	6	6	0	0	
	1	1	0	1	0	
P15	4	183	174	9	0,282904793	0,329906151
	3	62	53	9	0,597597776	
	2	3	3	0	0	
	1	1	0	1	0	
P16	4	147	142	5	0,214136757	0,482034899
	3	95	84	11	0,517135489	
	2	6	4	2	0,918295834	
	1	1	0	1	0	
P17	4	77	76	1	0,100000943	0,550270631
	3	124	122	2	0,119116027	
	2	39	31	8	0,73206669	
	1	9	1	8	0,503258335	

From the table above, it is known that the largest gain is attribute P13 (Clean classrooms and school environment) with a gain of 0.599084095. Thus, the root node obtained is attribute P13 (clean class and school environment) which is included in the tangible variabl

Operational Service Quality Variables

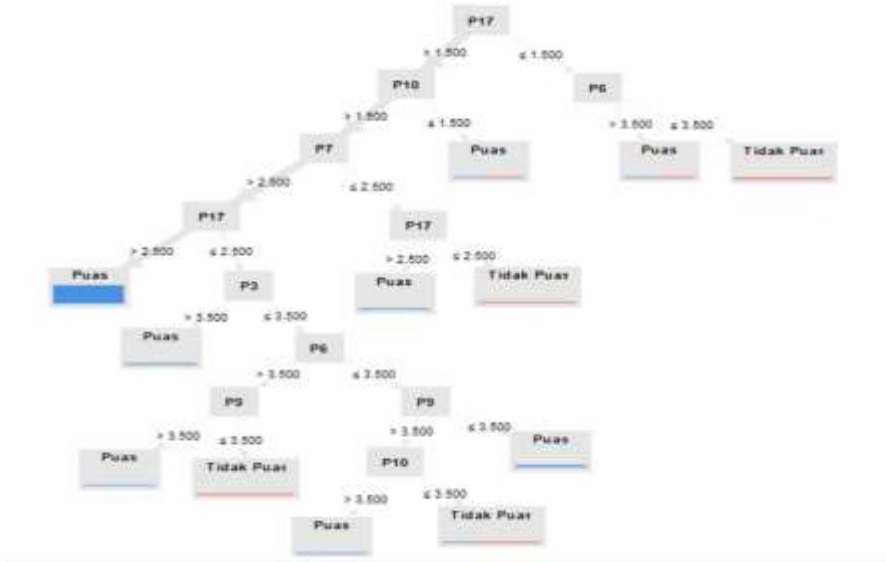
Table.6 Operational Indicator

Variabel	Dimensi	Indikator	Sumber
Service Quality	*Tangible* / Bukti fisik (fasilitas fisik,	1. Kebersihan ruangan kelas and	Analisis KeSatisfieand Mahasiswa

	perlengkapan, pegawai, and sarana komunikasi)	lingkungan sekolah	Terhadap Kualitas Pelayanan Dengan Metode Fuzzy Service Quality (Studi Kasus Di Jurusan Matematika Fmipa Usu) (Turnip et al., 2014)
		2. Tersedianya lapangan and prasarana olahraga untuk ekstrakurikuler	
		3. Tersedianya alat pendukung kegiatan belajar mengajar (Proyektor, speaker, dll)	
		4. Kebersihan toilet	
		5. Peralatan lengkap pada laboraturium sebagai pendukung proses belajar mengajar	
	Reliability / Keandalan (pelayanan yang dijanIfn secara akurat and memuaskan)	1. Guru menyampaikan materi pembelajaran dengan jelas	
		2. Guru mengajar sesuai jadwal yang ditetapkan	
		3. System pemberian nilai secara objektif	
	Responsiveness / Daya tanggap (keinginan para guru untuk membantu para siswa and memberikan pelayanan dengan tanggap)	1. Kemampuan guru dalam menjawab pertanyaan siswa dengan jelas	
		2. Semua administrasi dilayani and	

		dikerjakan dengan cepat and tepat
		3. Sikap pihak sekolah dalam merespon and menanggapi keluhan siswa
	Assurance / Jaminan (pengetahuan, kemampuan, kesopanan, and sifat dapat dipercaya yang dimiliki oleh para guru)	1. Keamanan lingkungan sekolah
		2. Meningkatkan kemampuan pengembangan ilmu
		3. Kemudahan dalam memperoleh informasi tentang pendidikan
	Empathy / Empati (perhatian tulus yang diberikan kepada siswa)	1. Komunikasi antara siswa dengan pihak sekolah terjalin
		2. Keterbukaan and sikap kooperatif antara siswa and guru
		3. Keramahan guru bimbingan and konseling dalam bimbingan layanan

RESEARCH RESULT AND DISCUSSION



The rules generated by the decision tree above are as follows:

Decision for Result = "Satisfied"=" Satisfied"

1. If P17 >1.5 and P10 ≤1.5 then The Result = "Satisfied"
2. If P17 ≤1.5 and P6 >3.5 then The Result = "Satisfied"
3. If P17 >1.5, P10 >1.5, P7 >2.5, and P17 >2.5 then The Result = "Satisfied"
4. If P17 >1.5, P10 >1.5, P7 ≤2.5, and P17 >2.5 then The Result = "Satisfied"
5. If P17 >1.5, P10 >1.5, P7>2.5, P17 ≤2.5 and P3 >3.5 then The Result = "Satisfied"
6. If P17 >1.5, P10 >1.5, P7>2.5, P17 ≤2.5, P3 ≤3.5, P6 >3.5 and P9 >3.5 then The Result = "Satisfied"
7. If P17 >1.5, P10 >1.5, P7>2.5, P17 ≤2.5, P3 ≤3.5, P6 ≤3.5 and P9 ≤3.5 then The Result = "Satisfied"
8. If P17 >1.5, P10 >1.5, P7>2.5, P17 ≤2.5, P3 ≤3.5, P6 ≤3.5, P9 >3.5 and P10 >3.5 then The Result = "Satisfied"

Decision for Result = "UnSatisfied"="UnSatisfied"

9. If P17 ≤1.5 and P6 ≤3.5 then The Result = "UnSatisfied"
10. If P17 >1.5, P10 >1.5, P7 ≤2.5 and P17 ≤2.5 then The Result = "UnSatisfied"
11. If P17 >1.5, P10 >1.5, P7 >2.5, P17 ≤2.5, P3 ≤3.5, P6 >3.5 and P9 ≤3.5 then The Result = "UnSatisfied"
12. If P17 >1.5, P10 >1.5, P7 >2.5, P17 ≤2.5, P3 ≤3.5, P6 ≤3.5, P9 >3.5 and P10 ≤3.5 then The Result = "UnSatisfied"

Testing Data Training

From the data mining process in RapidMiner, the training data with a percentage of 80% has 249 data records and resulted in 17 cases of error data, where the results and prediction values did not match.

. Table. 7 Testing and Training Data Result

Amount of data Training	Amount of Error	Positif True(TP)	Negatif True (TN)	Positif False (FP)	Negatif False (FN)
49	7	30	2	7	0

From the table of test results above, it can be used to find accuracy, precision, and recall. Accuracy is used to determine the level of closeness between the predicted value and the actual value. Precision is used to determine the level of accuracy of the information desired by the user with the answers given by the system. While recall is used to determine the level of success of the system in recalling an information.

To calculate the accuracy, it is done by adding up the TP + TN divided by the number of training data.

$$\text{Accuracy} = \frac{TP+TN}{Amount\ of\ Date\ Training} = \frac{230+2}{249} = 0.9317 = 93\%$$

To calculate precision, it is calculated by dividing the number of true positive data (True Positive) by the number of true positive data (True Positive) plus false positive data (False Positive).

$$Precision = \frac{TP}{TP+FP} = \frac{230}{230+17} = 0.9311 = 93\%$$

To calculate recall, it is done by dividing the number of true positive data (True Positive) by the number of true positive data (True Positive) plus the number of false negative data (False Negative).

$$Recall = \frac{TP}{TP+FN} = \frac{230}{230+0} = 1 = 100\%$$

Table.8 Data Training Testing

Jenis Data	Percentage	Amount of data	Accuracy	Precision	Recall
Data Training	80%	249	93%	93%	100%

From the table above, it can be seen that there are 10 error cases where the results and predictions do not match.

Table.9 Result testing of data testing

Amount of data Testing	Amount ·ror	Positif True(TP)	Negatif True (TN)	Positif Flase(FP)	Negatif False (FN)
62	0	5	1	0	0

After testing and calculating accuracy, precision, and recall, a table for testing data is obtained

Table.10 Data Testing Assessment

Data Type	Percentage	Amount of data	Accuracy	Precision	Recall
Data Testing	20%	62	83%	83%	100%

The total sample data in this study were 311 respondent data, consisting of 281 cases stating that students were satisfied with the services provided by SMA N 1 Tanjungpinang and 30 cases stating that students were not satisfied with the services provided by SMA N 1 Tanjungpinang.

Table 11. Table of Responses Percentages

No	Responsese	Percentage
1	Satisfied Students	90.4%
2	Unsatisfied Student	9.6%

It is known from the table above that the satisfaction level of SMA N 1 Tanjungpinang students with the number of available data samples is 90.4% and the level of dissatisfaction of students at SMA N 1 Tanjungpinang is 9.6%. Therefore, it can be seen that the majority of SMA N 1 Tanjungpinang students are satisfied with the services provided by the teachers.

CONCLUSION

Based on the description of the results and discussion in chapter IV which uses the C4.5 decision tree algorithm to help find the decision tree model or pattern generated from the RapidMiner 9.10 application, the authors draw several conclusions after processing the data according to the research objectives of this thesis, namely:

1. The C4.5 decision tree algorithm method can be implemented and applied to analyze and determine student satisfaction with teacher performance. By dividing the sample data into two parts with a percentage of 80% and 20%. 80% for training data and 20% for testing data then calculate entropy and gain on the training data and apply the data to RapidMiner 9.10 so as to produce a decision tree which is then tested using available training data and testing data.
2. The level of student satisfaction with teacher performance is 90.4% using the total respondent data, which amounts to 311 data.

REFERENCES

Akbar, A. S. (2019). *Pengaruh Kualitas Layanan Terhadap KeSatisfieand Pelanggan (Studi pada Mahasiswa di LDC FEB UB).*

Anggia Dasa Putri. (2019). Data Mining Menggunakan Algoritma C4.5 Untuk Memprediksi KeSatisfieand Mahasiswa Terhadap Kinerja Dosen Di Kota

Batam. *Jurnal CBIS*, *02*(September), 56–66.

Aprilla, D., Baskoro, D. A., Ambarwati, L., & Wicaksana, I. W. S. (2013). *Belajar Data Mining dengan RapidMiner* (Vol. 5, Issue 4). http://esjournals.org/journaloftechnology/archive/vol1no6/vol1no6_6.pdf%5Cnhttp://www.airccse.org/journal/nsa/5413nsa02.pdf

Bayu Febriyanto, D. (2018). Implementasi Algoritma C4 . 5 Untuk Klasifikasi Tingkat KeSatisfieand Pembeli Online Shop. *Jurnal Riset Komputer*, *5*(6), 569–575.

Fadillah, W. R., Hartama, D., Damanik, I. S., Safii, M., & Suhendro, D. (2020). Implementasi Data Mining C4 . 5 Dalam Mengukur Tingkat KeSatisfieand Mahasiswa Terhadap Kinerja Asisten Laboratorium Komputer. *Prosiding Seminar Nasional Riset Information Science (SENARIS)*, *2*(3), 403–414.

Han, J., Kamber, M., & Pei, J. (2012). Data Mining : Concepts and Techniques. In *Data Mining*. Morgan Kaufman. http://linkinghub.elsevier.com/retrieve/pii/B9780123814791000010

Indra, R. (2019). *Kepala LPMP Hadiri Deklarasi Menuju Sekolah Sehat*. LPMP Kepulauan Riau. https://lpmpkepri.kemdikbud.go.id/aksi/detailkabar.php?id=56

Ismail, M. I. (2010). *Kinerja and Kompetensi Guru dalam Pembelajaran*. *13*.

Jimanto, R. B., Yohanes, D., Kunto, S., & Si, S. (2014). Pengaruh Service Quality Terhadap Loyalitas Pelanggan Dengan Customer Satisfaction Sebagai Variabel Intervening Pada Ritel Bioskop the Premiere Surabaya. *Jurnal Manajemen Pemasaran Petra*, *2*(1), 1–7.

Kurniawan, A. W., & Puspitaningtyas, Z. (2016). Metode Penelitian Kuantitatif. In *Philosophy of Science* (1st ed.). Pandiva Buku. http://www.ncbi.nlm.nih.gov/pubmed/19528854%0Ahttp://libproxy.unm.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=51827937&site=eds-live&scope=site%5Cnhttp://content.ebscohost.com.libproxy.unm.edu/ContentServer.asp?T=P&P=AN&K=51

Larose, D. T. (2005). *Discovering knowledge in data: An introduction to data mining*. John Willey & Sons, INC.

Mardi, Y. (2019). Data Mining : Klasifikasi Menggunakan Algoritma C4 . *Jurnal Edik Informatika*, *2*.

Moertini, V. S. (2007). *Pengembangan Skalabilitas Algoritma Klasifikasi C4.5 Dengan Pendekatan Konsep Operator Relasi (Studi Kasus: Pra-Pengolahan And Klasifikasi Citra Batik)*. *33503504*.

Panjaitan, J. E., & Yuliati, A. L. (2016). Pengaruh Kualitas Pelayanan Terhadap KeSatisfieand Pelanggan Pada JNE Cabang Bandung [The Influence of Service Quality on Customer Satisfaction at JNE Branch in Bandung]. *DeReMa (Development Research of Management): Jurnal Manajemen*, *11*(2), 265. https://doi.org/10.19166/derema.v11i2.197

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (2015). Servqual: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality. In *Wiley Encyclopedia of Management* (pp. 1–1). https://doi.org/10.1002/9781118785317.weom090654

Rahmawati, D. (2013). Analisis Faktor-Faktor Yang Mempengaruhi KeSatisfieand Mahasiswa. *Jurnal Economia*, *9*(1), 52–65. https://doi.org/10.21831/economia.v9i1.1376

Sakyi, D. (2020). A comparative analysis of service quality among ECOWAS seaports. *Transportation Research Interdisciplinary Perspectives*, *6*, 100152. https://doi.org/10.1016/j.trip.2020.100152

Sugiyono, P. D. (2019). *Metode Penelitian Kuantitatif Kualitatif and R&D*.

Suharta, T. (2017). Pengembangan Instrumen Pengukur Tingkat KeSatisfieand Siswa Terhadap Kualitas Pelayanan Pendidikan Di Sekolah. *Jurnal Evaluasi Pendidikan*, *8*(2), 117–125. https://doi.org/10.21009/jep.082.07

Supriyadi, D., & Safitri, S. T. (2020). The Application of C4 . 5 Algorithm to Classify the User Satisfaction of Online Learning System. *International Journal of Information System and Technology*, *3*(2), 323–331.

Suyanto, D. (2019). *Data Mining untuk Klasifikasi and Klasterisasi Data*. Penerbit Informatika.

Turnip, H., Situmorang, M., & Siregar, R. (2014). Analisis KeSatisfieand Mahasiswa Terhadap Kualitas Pelayanan Dengan Metode Fuzzy Service Quality (Studi Kasus Di Jurusan Matematika Fmipa Usu). *Saintia Matematika*, *2*(2), 163–171.

Yasir, M., Suarman, & Gusnardi. (2017). Analisis Tingkat KeSatisfieand Siswaand Motivasi dalam Pembelajaran Kelompok (Cooperative Learning) and Kaitannya dengan The Result Belajar pada Mata Pelajaran Akuntansi. *Pekbis*, *2*.

Yucel, M., Aslan, Z., & Burunkaya, M. (2020). Classification of the temperature-dependent gain of an erbium-doped fiber amplifier by using data mining methods. *Optik*, *208*, 164515. https://doi.org/10.1016/j.ijleo.2020.164515