International Journal of Education and Life Sciences (IJELS)
Vol. 3, No. 1, 2025: 1532-1544

Analysis of Customer Satisfaction Quality in the Painting & Welding Monitoring System with the Naïve Bayes Algorithm

Miftahu Rizkiyah[1], Aswan Supriyadi Sunge[2], Ahmad Turmudi Zy[3]
Universitas Pelita Bangsa

Corresponding Author: Miftahu Rizkiyah; mrizkiyah@mhs.pelitabangsa.ac.id

A R T I C L E I N F O

Keywords: Customer Satisfaction, Painting And Welding Monitoring System, Naive Bayes Algorithm

Received : 25, November
Revised : 20, December
Accepted: 12, Januari

A B S T R A C T

The painting and welding monitoring system represents an advancement intended to improve efficiency and quality in manufacturing procedures. This study evaluates customer satisfaction levels concerning the system by employing the Naive Bayes algorithm. Data was gathered through customer surveys, concentrating on essential factors such as reliability, ease of use, and the accuracy of the information delivered by the system. The Naive Bayes algorithm was applied to forecast customer satisfaction based on the collected survey data. The findings suggest that customer satisfaction levels can be determined with high precision, with reliability being the most significant factor. These results offer important insights for system developers to enhance the functionality of the painting and welding monitoring system.

INTRODUCTION

In the digital transformation era, efficiency and accuracy are paramount for business success, especially in industries such as manufacturing, construction, and other technical fields. One area requiring improvement is the monitoring of painting and welding tasks. These tasks, often conducted manually, are prone to inefficiencies, inaccuracies, and delays (Taheri Kahnamouei & Moallem 2024).

Digital transformation has reshaped operational paradigms, encouraging industries to adopt automated systems for enhanced efficiency. Despite this shift, many organizations continue relying on traditional methods, which are labor-intensive and susceptible to human error (Mastarida et al., 2022). Painting and welding processes, for instance, demand meticulous monitoring to ensure quality, yet their management often lacks integration with advanced digital tools.

According to (Ghifari et al., 2023), leveraging technology in industrial operations enhances both productivity and accuracy. However, the challenge lies in implementing systems that align with user needs while maintaining reliability. Effective monitoring systems must provide real-time data and predictive insights to support decision-making.

Furthermore, successful adoption of such systems is influenced by user satisfaction, which integrates factors like usability, reliability, and responsiveness (Haerani et al., 2019). (Studies by Lusardi et al., 2010) (Sabri & MacDonald, 2010) highlight the growing role of machine learning in addressing customer needs, showcasing how predictive analytics can enhance operational decisions.

This study introduces an automated monitoring system integrated with the Naive Bayes algorithm to predict and analyze customer satisfaction. This system aims to improve efficiency, accuracy, and accessibility. Specifically, this research explores the factors influencing satisfaction and offers a framework for improving system functionality. By identifying key satisfaction determinants, these findings aim to guide system developers in overcoming operational glitches and creating better user experiences. The main contribution of this research is the development of an automatic monitoring system based on the Naive Bayes algorithm which not only predicts the level of customer satisfaction but also provides deeper insight into the factors that influence satisfaction so that it can help make more precise decisions and improve service quality overall.

LITERATURE REVIEW

Customer Satisfaction

Customer satisfaction is a critical metric for assessing service quality and operational performance. It reflects the degree to which products or services meet or exceed customer expectations. Key factors influencing satisfaction include reliability, ease of use, and accuracy, which align closely with this study's focus (Oliver, 1997).

Naive Bayes Algorithm

The Naive Bayes algorithm is a probabilistic machine learning method commonly used for classification tasks. Its key strength lies in its simplicity and efficiency, particularly in high-dimensional data scenarios. Despite assuming

feature independence, the algorithm delivers robust results in applications such as text classification and sentiment analysis.

Previous Studies

- (Hopipah & Mayasari, 2021) employed Naive Bayes and backward elimination for customer satisfaction classification, achieving significant improvements in accuracy.
- (Chrishariyani et al., 2022)analyzed customer satisfaction in food delivery services using Naive Bayes, achieving 100% accuracy.
- (Ghifari et al., 2023)developed a monitoring system for improving task management in industrial settings, emphasizing system efficiency and reliability.
- (Wantoro, 2021)highlighted the importance of real-time monitoring systems in improving operational workflows, particularly in maintenance and repair services.
- (AMELIA et al., 2021) explored the application of data-driven approaches to enhance logistical efficiency in manufacturing settings.
- (Ulfah et al., 2023) investigated the role of quality management systems in enhancing customer satisfaction through optimized monitoring.
- (Jollyta et al., 2020) introduced advanced data mining techniques to analyze customer preferences and improve satisfaction metrics.
- (Saputra et al., 2018) applied decision support systems to classify satisfaction in various industrial domains, emphasizing the role of algorithms like Naive Bayes.
- (Ariani et al., 2018) Employee recruitment with a manual system has obstacles due to time and subjective selection. With the research of employee status determination classification, the right pattern is obtained. The Naïve Bayes and Rapidminer methods are very easy to use.
- (Zy et al., 2023) In this study, it is recommended to use the Decision Tree Algorithm as a decision-making tool for classification on the NSLKDD dataset.

METHODOLOGY

Research Design

This research employs a quantitative approach to analyze customer satisfaction with the painting and welding monitoring system. The study integrates the Naive Bayes algorithm to predict satisfaction levels based on key attributes.

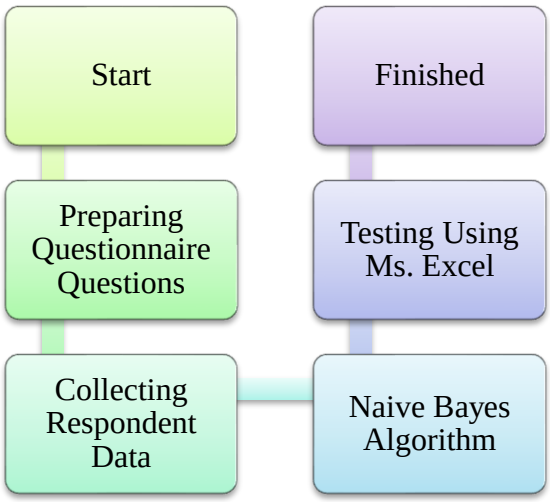


Figure 1. Research Flow Chart

Data Collection

Primary data were collected through structured surveys distributed to 150 respondents, including employees and users of the monitoring system. The survey used a five-point Likert scale to assess factors such as reliability, usability, and information accuracy.

Data Preprocessing

Collected data underwent preprocessing to ensure accuracy and relevance. Steps included handling missing values, normalizing responses, and encoding categorical variables. The dataset was divided into training (80%) and testing (20%) sets for model validation.

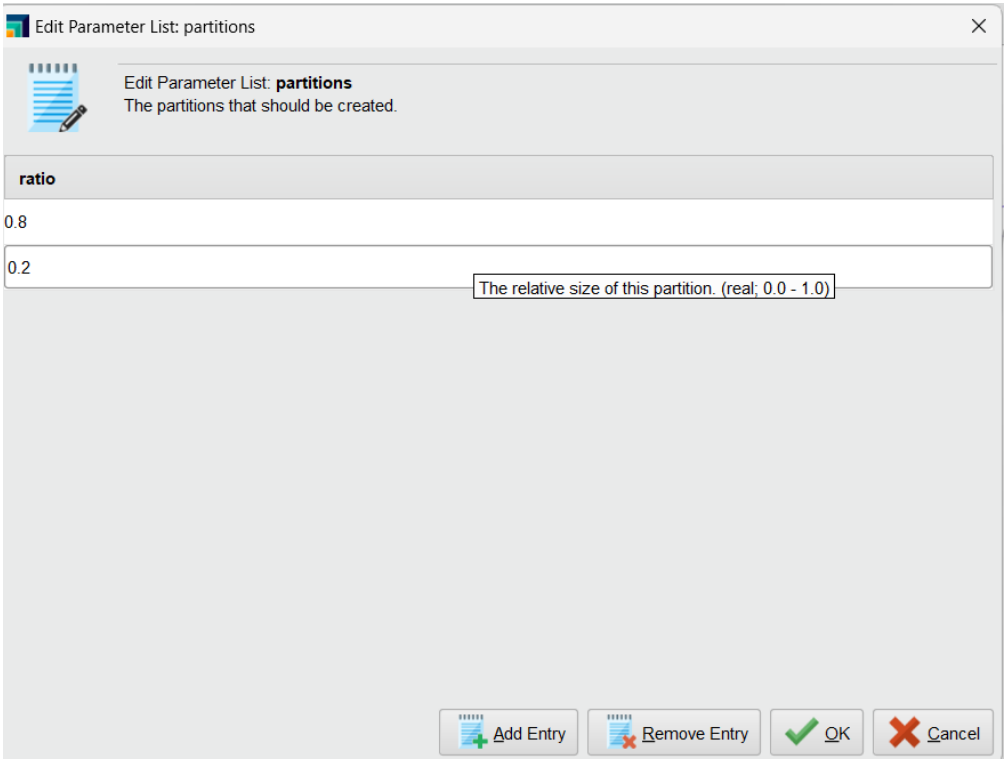


Figure 2. Data Training & Testing

R...	Nama	Jenis Kelamin	Position	Usia	Alamat	EaseOfUse	Reliability	Efficiency	OverallQuali...	Accuracy	Spe
1	Wina	Wanita	Technician	21 - 30	Cikarang	5	5	5	5	5	4
2	Aprella	Wanita	Staff	> 30	Cikarang	3	3	4	4	4	4
3	Dian	Wanita	Admin	21 - 30	Cikarang	3	4	5	4	4	5
4	Bangkit Akbar ...	Pria	Supervisor	21 - 30	Cikarang Selat...	5	5	5	4	5	4
5	Muhammad yu...	Pria	Oprator forklift	> 30	Jl keramat asa...	4	4	4	4	4	4
6	Riana	Wanita	Testing Admin	> 30	Kedungwaringi...	4	4	4	4	4	4
7	Jamin Suprianto	Pria	Technician	> 30	Perum Puri Nir...	5	5	5	5	5	5
8	Iwan F	Pria	Securty	> 30	Bekasi timur	4	5	5	5	5	5
9	Atik	Wanita	RP TLM Admin	> 30	Jababeka	4	4	4	4	4	4
10	Salsa Kamelita...	Wanita	Admin	21 - 30	Cikarang	5	5	4	4	5	5
11	Mifta Sadikah ...	Wanita	Admin	> 30	Tambun	5	5	5	5	5	5
12	Abdul rahman	Pria	Operator	21 - 30	Cibitung	4	4	5	4	4	4
13	Suryanto	Pria	FBO Helper	21 - 30	Perumahan M...	4	4	5	4	4	4
14	Alif unggul hida...	Pria	Karyawan sw...	21 - 30	Kebumen	4	4	4	4	4	3
15	Syaiful	Pria	Inspector	> 30	Bekasi	3	4	4	4	4	4
16	Muhammad e...	Pria	Painter	21 - 30	Desa jaya mu...	5	4	4	4	4	4
17	Bagus tri hand...	Pria	Operator	21 - 30	Cikarang	4	4	4	4	4	4

Figure 3. Data After Preprocessing

Model Implementation

The Naive Bayes algorithm was implemented using RapidMiner. Key steps included feature selection, model training, and performance evaluation. Metrics such as accuracy, precision, and recall were used to assess model effectiveness.

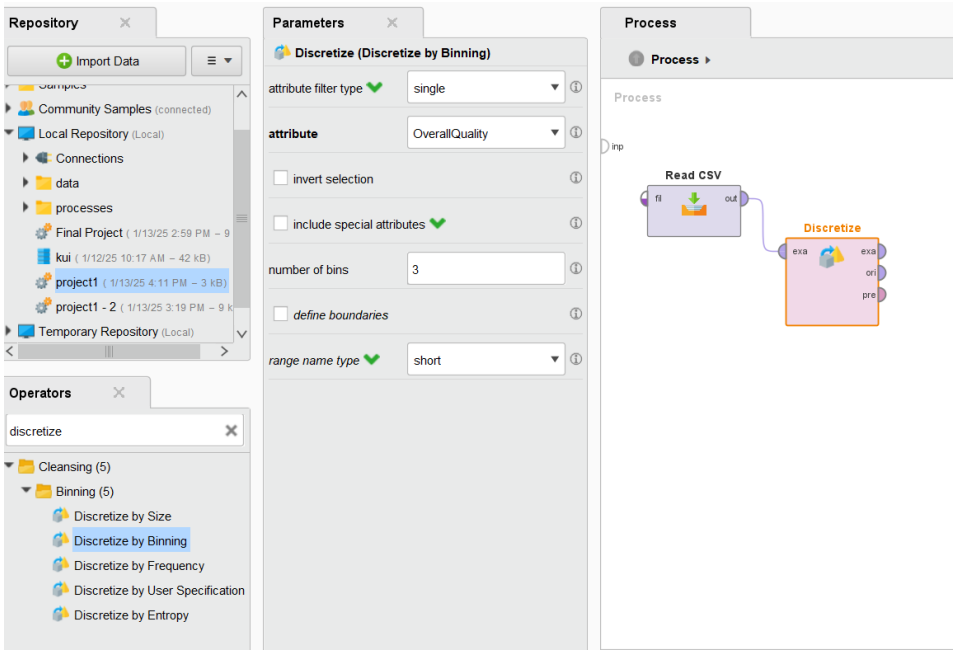


Figure 4. Operator Discretize

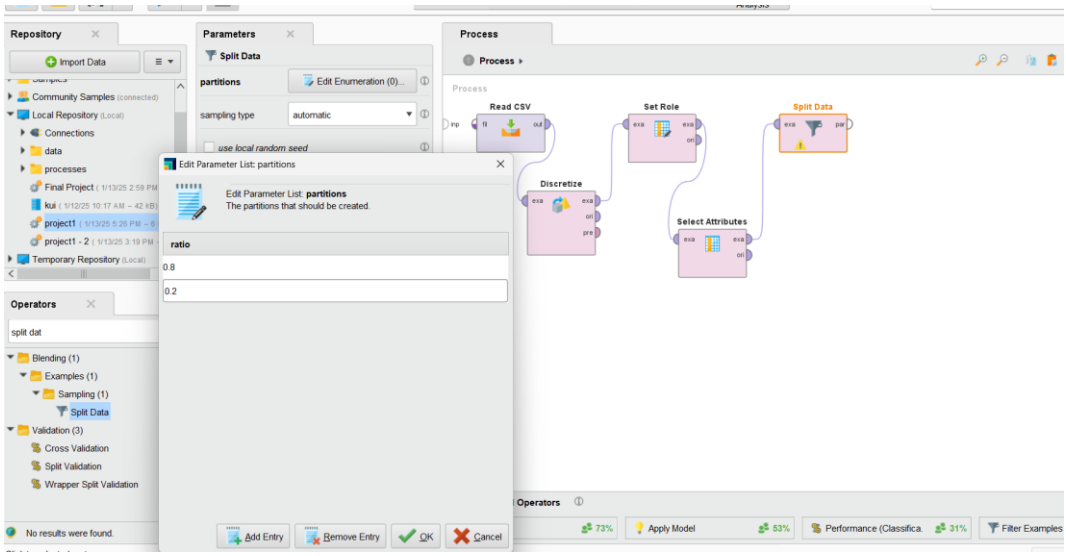


Figure 5. Target Variable

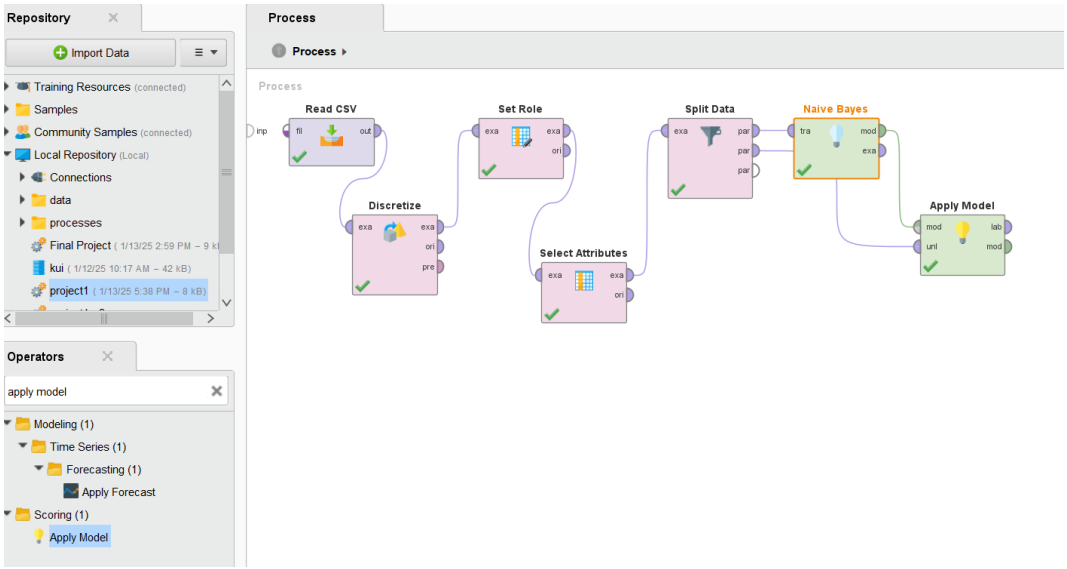


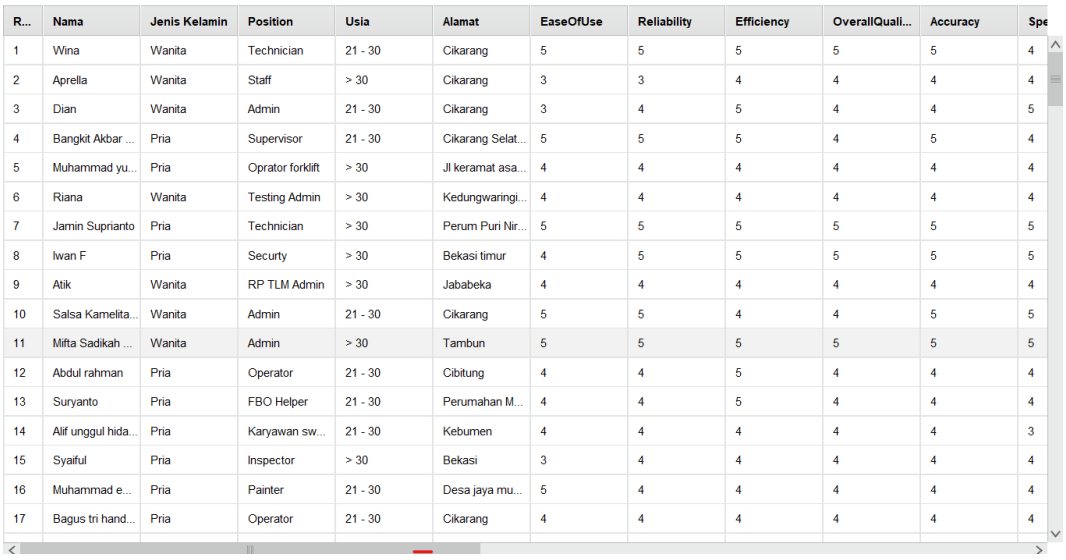
Figure 6. Naive Bayes Classification Modeling

RESEARCH RESULT

Data Analysis

Survey responses revealed the distribution of satisfaction levels across three categories:

- High Satisfaction (Range 1): Representing respondents highly satisfied with system reliability and ease of use.
- Medium Satisfaction (Range 2): Indicating areas for improvement, particularly in response time and technical support.
- Low Satisfaction (Range 3): Highlighting dissatisfaction, often linked to system inaccuracies or interface challenges.



R...	Nama	Jenis Kelamin	Position	Usia	Alamat	EaseOfUse	Reliability	Efficiency	OverallQuali...	Accuracy	Spe
1	Wina	Wanita	Technician	21 - 30	Cikarang	5	5	5	5	5	4
2	Aprella	Wanita	Staff	> 30	Cikarang	3	3	4	4	4	4
3	Dian	Wanita	Admin	21 - 30	Cikarang	3	4	5	4	4	5
4	Bangkit Akbar ...	Pria	Supervisor	21 - 30	Cikarang Selat...	5	5	5	4	5	4
5	Muhammad yu...	Pria	Oprator forklift	> 30	Jl keramat asa...	4	4	4	4	4	4
6	Riana	Wanita	Testing Admin	> 30	Kedungwaringi...	4	4	4	4	4	4
7	Jamin Suprianto	Pria	Technician	> 30	Perum Puri Nir...	5	5	5	5	5	5
8	Iwan F	Pria	Securty	> 30	Bekasi timur	4	5	5	5	5	5
9	Atik	Wanita	RP TLM Admin	> 30	Jababeka	4	4	4	4	4	4
10	Salsa Kamelita...	Wanita	Admin	21 - 30	Cikarang	5	5	4	4	5	5
11	Mifta Sadikah ...	Wanita	Admin	> 30	Tambun	5	5	5	5	5	5
12	Abdul rahman	Pria	Operator	21 - 30	Cibitung	4	4	5	4	4	4
13	Suryanto	Pria	FBO Helper	21 - 30	Perumahan M...	4	4	5	4	4	4
14	Alif unggul hida...	Pria	Karyawan sw...	21 - 30	Kebumen	4	4	4	4	4	3
15	Syaiful	Pria	Inspector	> 30	Bekasi	3	4	4	4	4	4
16	Muhammad e...	Pria	Painter	21 - 30	Desa jaya mu...	5	4	4	4	4	4
17	Bagus tri hand...	Pria	Operator	21 - 30	Cikarang	4	4	4	4	4	4

Figure 7. Responden Dataset

R...	Nama	Jenis Kelamin	Position	Usia	Alamat	EaseOfUse	Reliability	Efficiency	OverallQuali...	Accuracy	Spe
134	Asep	Pria	Helper	21 - 30	Cibuntu	3	3	3	3	3	3
135	Buhariyanto	Pria	Helper	21 - 30	Bekasi Timur	5	5	5	5	5	5
136	Della	Wanita	Admin	21 - 30	Karawang	3	3	3	3	3	3
137	Eko	Pria	Skill	> 30	Bekasi timur	5	5	5	5	5	5
138	Shanum	Wanita	Assistance	21 - 30	Karawang	4	4	4	4	3	3
139	Agung	Pria	Skill	> 30	Bekasi Timur	5	5	5	5	5	5
140	Hendro	Pria	Helper	> 30	Cibarusah	3	3	3	3	3	3
141	Wibowo	Pria	Skill	> 30	Bekasi Timur	5	5	5	5	4	5
142	Prayitno	Pria	Helper	> 30	Cibarusah	3	3	3	3	3	3
143	Anji Asmara	Pria	Scaffolder	> 30	Cikarang pusat	5	5	5	5	5	5
144	Dede	Pria	Helper	21 - 30	Cibitung	3	3	3	3	3	3
145	Yogi	Pria	Skill	> 30	Bekasi timur	5	5	5	5	5	5
146	Rangga	Pria	Helper	21 - 30	Cikarang	3	3	4	3	3	3
147	Eko prasetyo	Pria	Engineer	21 - 30	Bekasi timur	5	5	5	5	4	5
148	Samsul	Pria	Helper	21 - 30	Cibarusah	3	3	3	3	3	3
149	Budi Prasetyo	Pria	Engineer	21 - 30	Cikarang timur	5	5	5	5	5	5
150	Azmi Hardian	Pria	Engineer	21 - 30	Cikarang selat...	5	5	5	5	5	5

Figure 8. Responden Dataset

Model Performance

The Naive Bayes model achieved:

- **Overall Accuracy**: 90%
- **Range 1 Accuracy**: 100%
- **Range 2 Accuracy**: 80%
- **Range 3 Accuracy**: 93.75%

These results underscore the algorithm's effectiveness in classifying satisfaction levels. Reliability emerged as the most significant factor, followed by usability and accuracy.

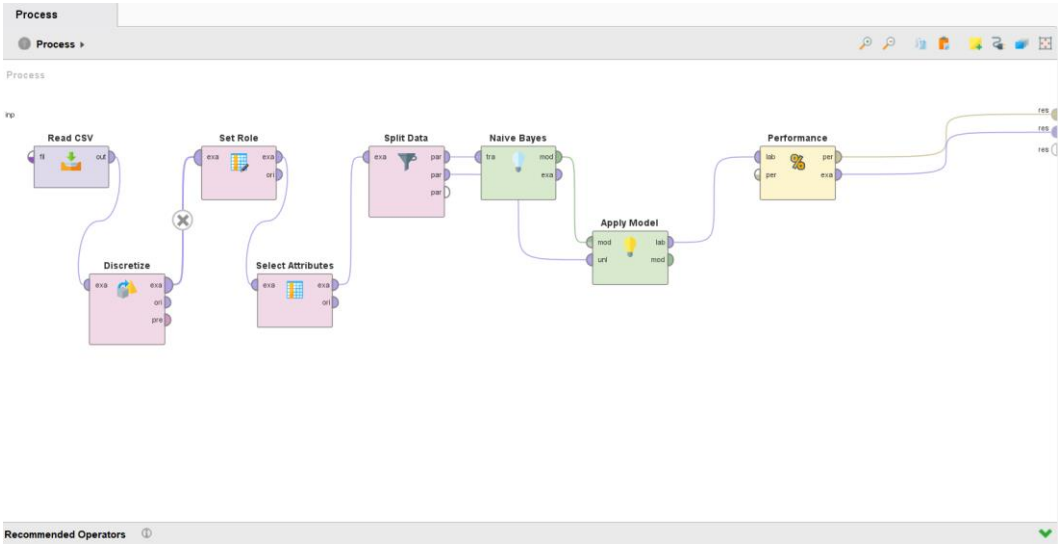
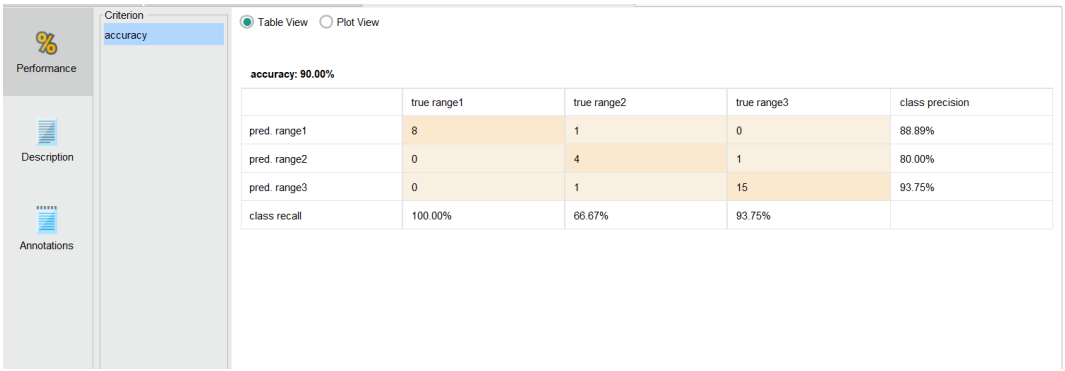


Figure 9. Model and Accuracy



	true range1	true range2	true range3	class precision
pred. range1	8	1	0	88.89%
pred. range2	0	4	1	80.00%
pred. range3	0	1	15	93.75%
class recall	100.00%	66.67%	93.75%	

Figure 10. Accuracy Results

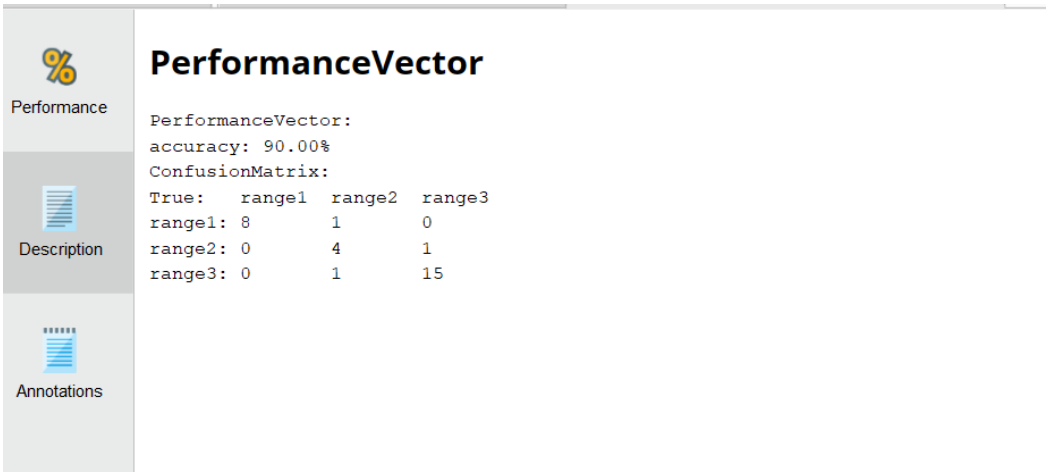
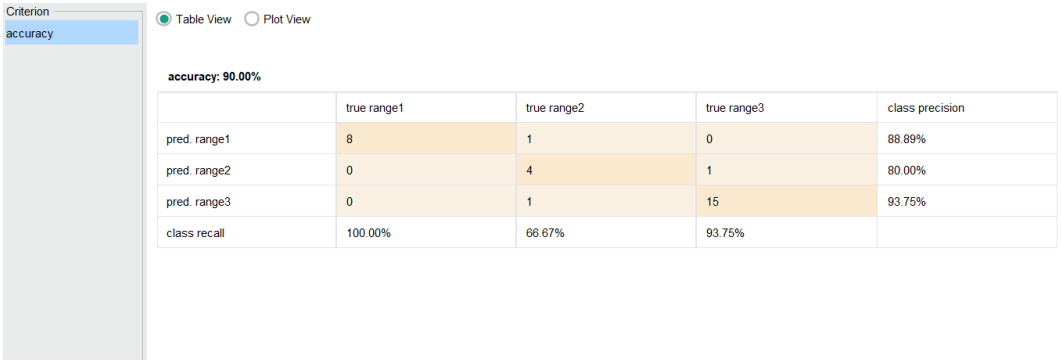


Figure 11. Vector Performance Results



	true range1	true range2	true range3	class precision
pred. range1	8	1	0	88.89%
pred. range2	0	4	1	80.00%
pred. range3	0	1	15	93.75%
class recall	100.00%	66.67%	93.75%	

Figure 12. Model Accuracy Results

DISCUSSION

The findings confirm the Naive Bayes algorithm's suitability for customer satisfaction analysis. The high accuracy demonstrates its potential for real-world applications, particularly in identifying key drivers of satisfaction.

While reliability is the dominant factor, addressing usability and accuracy can further enhance satisfaction. The study also highlights the need for improved data preprocessing and model optimization to address limitations such as feature independence assumptions.

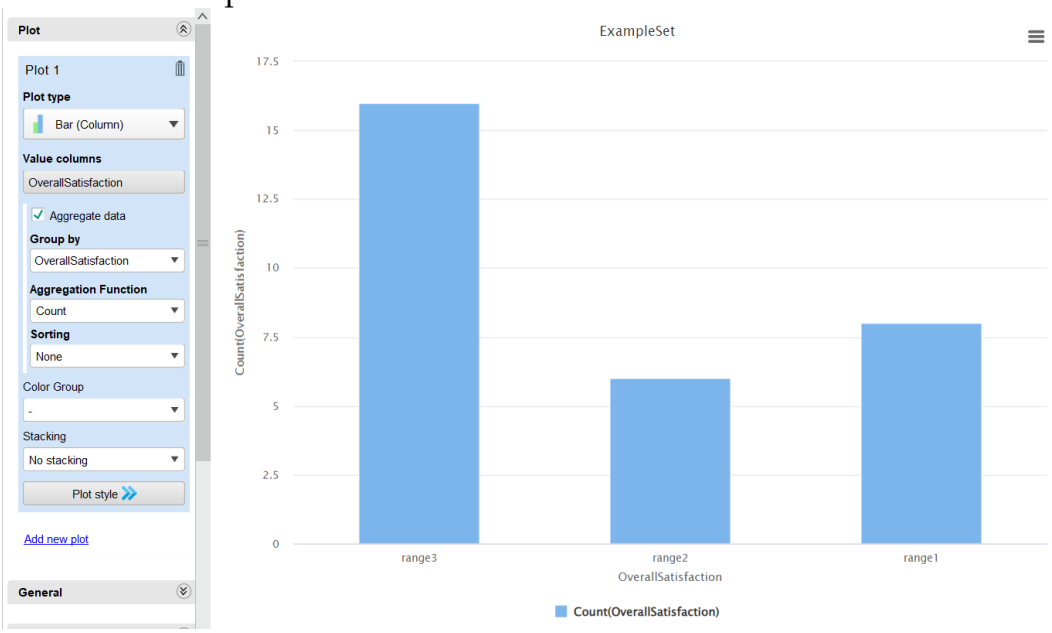


Figure 13. Visualization Results Based on 3 Range Categories

CONCLUSIONS

This study clearly illustrates the robust potential of the Naive Bayes algorithm in effectively assessing customer satisfaction. The findings emphasize the fundamental importance of ensuring system reliability, usability, and accuracy, as these factors directly contribute to a positive user experience and long-term customer retention.

RECOMMENDATIONS

- Prioritize enhancing system reliability to foster greater user confidence and establish a strong, trustworthy reputation.
- Revamp the user interface to ensure seamless navigation and improve accessibility, catering to a diverse user base.
- Leverage advanced data analytics techniques to enable continuous performance optimization and offer timely, data-driven insights for proactive decision-making.
- This version adds a layer of professionalism and clarity to your conclusions and recommendations. Let me know if you'd like further adjustments!

FUTURE RESEARCH

Future studies should consider exploring alternative algorithms, such as Random Forest or Support Vector Machines, to improve predictive accuracy and model performance. Additionally, expanding the dataset to include a broader range of variables, coupled with the integration of qualitative insights, can provide a deeper and more comprehensive understanding of customer satisfaction, ultimately leading to more robust and actionable findings.

ACKNOWLEDGMENT

The author would like to express gratitude to their parents and family for their continuous support and prayers, Finally, I would like to thank myself. I want to thank myself for believing in myself. I want to thank myself for doing all this hard work. I want to thank myself for never taking a break. I want to thank myself for never giving up, and for always being myself.

REFERENCES

AMELIA, L., SAVITRI, N., & AINI, S. N. U. R. (2021). *ANALISIS STRATEGI DISTRIBUSI BAHAN BANGUNAN KE KONSUMEN PADA RETAIL ROEMAHKITA PT. SEMEN INDONESIA DISTRIBUTOR (SID)*.

Ariani, F., Amir, N. A., Rizal, K., Sitasi, C., & Sunge, A. S. (2018). Klasifikasi Penetapan Status Karyawan Dengan Menggunakan Metode Naïve Bayes. *Paradigma*, *20*(2).

Chrishariyani, C. D. A. A. P., Rahman, Y., & Aini, Q. (2022). Kepuasan Pengguna Layanan Shopee Food Menggunakan Algoritma Naive Bayes. *Jurnal Sistem Informasi Bisnis*, *12*(2), 98–105.

Ghifari, A., Ahmad, I., & Neneng, N. (2023). Sistem Monitoring Pekerjaan Pada PT Pelabuhan Indonesia (Persero) Regional 2 Panjang. *Jurnal Informatika Dan Rekayasa Perangkat Lunak*, *4*(3), 260–269.

Hopipah, H. S., & Mayasari, R. (2021). Optimasi Backward Elimination untuk Klasifikasi Kepuasan Pelanggan Menggunakan Algoritme k-nearest neighbor (k-NN) and Naive Bayes. *Technomedia Journal*, *6*(1 Agustus), 99–110.

Jollyta, D., Ramdhan, W., & Zarlis, M. (2020). *Konsep data mining dan penerapan*. Deepublish.

Mastarida, F., Sahir, S. H., Hasibuan, A., Siagian, V., Hariningsih, E., Fajrillah, F., Gustiana, Z., Tjiptadi, D. D., & Pakpahan, A. F. (2022). *Strategi Transformasi Digital*. Yayasan Kita Menulis.

Saputra, R. A., Taufik, A. R., Ramdhani, L. S., Oktapiani, R., & Marsusanti, E. (2018). Sistem Pendukung Keputusan Dalam Menentukan Metode Kontrasepsi Menggunakan Algoritma Naive Bayes. *SNIT 2018*, *1*(1), 106–111.

Ulfah, M., Muharam, S., Maisyaroh, M., Saputri, R. Z., Gifari, N. A., & Mardatillah, A. (2023). SISTEM MANAJEMEN MUTU DALAM MENINGKATKAN KEPUASAN PELANGGAN. *PRIMER: Jurnal Ilmiah Multidisiplin*, *1*(2), 190–197.

Wantoro, A. (2021). Sistem Monitoring Perawatan Dan Perbaikan Fasilitas Gardu PT PLN Area Kota Metro. *Jurnal Tekno Kompak*, *15*(1), 116–130.

Zy, A., Sasongko, A. T., & Kamalia, A. Z. (2023). Penerapan Naïve Bayes Classifier, Support Vector Machine, dan Decision Tree untuk Meningkatkan Deteksi Ancaman Keamanan Jaringan. *KLIK: Kajian Ilmiah Informatika Dan Komputer*, *4*(1), 610–617.