

User Satisfaction Analysis of the E-Berpadu Website at the Bekasi District Court Using the C4.5 Algorithm

Muhammad Fikri Hidayat^{1*}, Eva Rahmawati², Sri Diantika³

^{1,2,3}Universita Bina Sarana Informatika

fikrihidayatmuhammad13@gmail.com^{1*}, eva.ehw@bsi.ac.id², sri.szd@bsi.ac.id³

Abstract

The development of electronic government (e-government) has encouraged public institutions to improve the quality of digital services to provide more effective, transparent, and user-oriented services. One implementation is the e-Berpadu (Integrated Electronic Criminal Case Files) website developed by the Supreme Court of the Republic of Indonesia to support electronic criminal case administration. This study aims to measure user satisfaction with the e-Berpadu website at the Bekasi District Court, develop a user satisfaction classification model using the C4.5 algorithm, and identify the factors influencing user satisfaction. The study employed a quantitative method with a data mining approach involving 265 respondents. The research variables consisted of System Quality, Information Quality, Service Quality, and System Use. The research process included data cleaning, transformation, labeling, data selection, an 80:20 data split, C4.5 model development, and performance evaluation using accuracy, precision, recall, and F1-score. The results showed that 96.23% of respondents were satisfied, while 3.77% were dissatisfied. The pruned C4.5 model achieved an accuracy of 98.11%, precision of 98.15%, recall of 98.11%, and an F1-score of 97.81%. Information Quality, particularly the clarity of feature usage instructions (IQ2), was identified as the most influential factor, followed by System Use (SU2), Service Quality (SV2), and System Quality (SQ2). These findings provide valuable insights for improving the quality of the e-Berpadu website.

Keywords: C4.5 Algorithm; Data Mining; Decision Tree; e-Berpadu; e-Government; User Satisfaction

1. Introduction

The development of information technology has encouraged governments in various countries, including Indonesia, to implement electronic government (e-government) systems as a means to provide more effective, efficient, transparent, and accountable public services. Digital transformation has become an important government strategy in improving service quality and strengthening good governance [1]. The Supreme Court of the Republic of Indonesia implemented e-Berpadu (Integrated Electronic Criminal Case Files) to support electronic criminal case handling and integration among law enforcement agencies.

The success of an information system depends on the level of acceptance and satisfaction of its users. Based on the DeLone and McLean model, system quality, information quality, and service quality are the main factors influencing user satisfaction. Several previous studies have shown that these qualities have a significant impact on user satisfaction with e-government services [2].

This study aims to measure the level of user satisfaction with the e-Berpadu website at the Bekasi District Court and build a user satisfaction classification model using the C4.5 algorithm. The C4.5 algorithm was chosen due to its ability to produce accurate decision trees and identify the most influential features [3]. The results of this study are expected to provide recommendations for improving e-Berpadu services.

2. Research Methodology

2.1. Research Design and Approach

This study employs a quantitative methodology integrated with a data mining approach to evaluate user satisfaction. The quantitative aspect is utilized to measure the variables derived from the DeLone and McLean information systems success model, while the data mining approach, specifically the C4.5 classification algorithm, is applied to uncover complex patterns within the user satisfaction data [4], [5]. The context of this research is deeply rooted in the evaluation of E-Government initiatives, which aim to improve the efficiency and effectiveness of public governance [1]. Specifically, this study focuses on the implementation of the electronic justice system (e-Berpadu) at the Bekasi District Court, which is part of a broader national agenda to realize a fast, simple, and low-cost judicial process [12], [14].

2.2. Population, Sample, and Data Collection

Data collection was conducted comprehensively through primary and secondary methods, including field observations, literature studies, structured questionnaires, and institutional documentation. The population of this study encompasses all active users of the e-Berpadu application under the jurisdiction of the Bekasi District Court. The respondents in this study comprise various stakeholders involved in the utilization of the e-Berpadu service, including Police Investigators and Civil Servant Investigators (PPNS), prosecutors or officials from the Public Prosecution Service, as well as judges, substitute clerks (PP), and staff of the Bekasi District Court. Furthermore, the respondent pool encompasses officers from Correctional Institutions (Lapas) and Correctional Facilities (Bapas), alongside members of the general public who have previously utilized the e-Berpadu service.

The primary data was gathered using a closed-ended questionnaire formatted with a 5-point Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree). The measurement of user satisfaction through such scales is highly effective in gauging subjective perceptions of public service quality, as demonstrated in previous e-government evaluations [10], [15].

Table 1 : Likert scale

Response Criteria	Score
Strongly Disagree (SD)	1
Disagree (D)	2
Netral (N)	3
Agree (A)	4
Strongly Agree (SA)	5

2.3. Research Variables and DeLone & McLean Model

To build a robust theoretical framework, this study adopts the modified DeLone and McLean IS Success Model, which has been widely proven effective in measuring E-Government success [9], [10]. The independent variables (predictors) include:

1. System Quality (SQ): Measures the technical performance, reliability, and ease of use of the e-Berpadu platform. In the context of online services, system quality is a fundamental driver of user engagement [2].
2. Information Quality (IQ): Evaluates the accuracy, timeliness, completeness, and relevance of the case data provided by the system. High information quality is critical for inter-agency data exchange [11].
3. Service Quality (SV): Assesses the responsiveness, assurance, and empathy of the technical support team managing the e-Berpadu platform [2].
4. System Use (SU): Reflects the frequency and intensity of users utilizing the system for their operational tasks [13].

Table 2 : Research Instrument

Variable	Code	Statement
Kualitas Sistem (System Quality)	SQ1	Website E-BERPADU PN Bekasi dapat diakses dengan cepat (tidak lambat).
	SQ2	Menu dan antarmuka (tampilan) website mudah dipahami oleh pengguna baru.
	SQ3	Website jarang mengalami error atau down saat digunakan untuk mengunggah berkas.
Kualitas Informasi (Information Quality)	IQ1	Informasi status berkas perkara yang ditampilkan di E-BERPADU selalu akurat dan terkini.
	IQ2	Petunjuk atau panduan penggunaan fitur di dalam website sudah jelas dan mudah dipahami.
	IQ3	Pemberitahuan atau notifikasi terkait status berkas dikirimkan dengan tepat waktu.
Kualitas Layanan (Service Quality)	SV1	Petugas PN Bekasi merespons dengan cepat apabila terdapat kendala atau pertanyaan terkait E-BERPADU.
	SV2	Proses verifikasi dokumen administrasi melalui E-BERPADU berjalan dengan lancar dan sesuai standar waktu.
	SV3	Layanan E-BERPADU membantu mempermudah birokrasi antar instansi penegak hukum.
Penggunaan Sistem (System Use / Intensitas Penggunaan)	SU1	Saya secara rutin menggunakan website E-BERPADU PN Bekasi untuk menyelesaikan urusan administrasi perkara.
	SU2	Website E-BERPADU telah menjadi platform utama yang selalu saya gunakan untuk berinteraksi dan mengurus dokumen pidana di Pengadilan Negeri Bekasi.

These four variables were operationalized into 11 specific indicators. The dependent variable (target class) is User Satisfaction (US), which acts as the ultimate measure of system success. For the classification task, the target variable was mapped into two distinct categorical classes: "Satisfied" (Puas) and "Dissatisfied" (Tidak Puas).

2.4. Research Stages

The research stages are a series of processes systematically executed to achieve the research objectives. In this study, the research stages begin with problem identification and conclude with the interpretation of the classification results using the C4.5 algorithm. These stages are designed to develop an accurate classification model for user satisfaction with the e-Berpadu website and to identify the factors that influence user satisfaction.

In general, the research stages conducted consist of problem identification, data collection, data preprocessing, classification model development using the C4.5 algorithm, model evaluation, and interpretation of the research results.

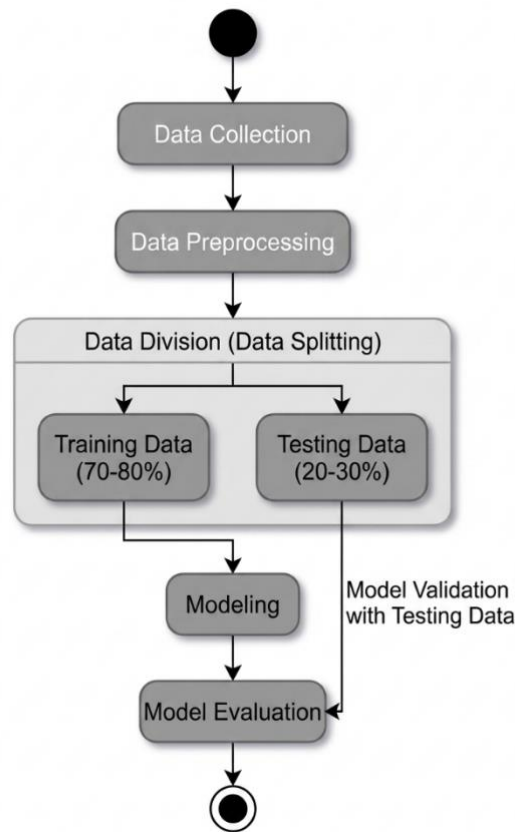


Fig. 1 : Research Process

2.5. Data Mining Framework and C4.5 Algorithm

The analytical phase followed the Knowledge Discovery in Databases (KDD) framework. To predict and classify the satisfaction levels, the C4.5 algorithm was implemented. The C4.5 algorithm is an extension of ID3 that generates decision trees based on Information Theory, widely recognized for its high accuracy in evaluating public service satisfaction [6], [7], [8]. The tree construction process involves calculating the Entropy to measure the impurity or randomness of the dataset, and the Information Gain to select the best splitting attribute.

The formula for Entropy is defined as:

$$\text{Entropy}(S) = - \sum (p_i * \log_2(p_i))$$

Where 'S' is the dataset, and 'p_i' is the proportion of records belonging to class 'i' in the dataset. Following the entropy calculation, the Information Gain for each attribute is computed to determine the root and subsequent nodes. The attribute with the highest Information Gain is selected as the splitting node. The Gain formula is:

$$\text{Gain}(S, A) = \text{Entropy}(S) - \sum ((|S_v| / |S|) * \text{Entropy}(S_v))$$

Where 'A' is the specific attribute, 'v' represents the possible values of attribute A, and 'S_v' is the subset of S where attribute A has value v [5], [15].

To optimize the model and prevent overfitting a common issue where the model learns the noise in the training data rather than the actual patterns a post-pruning technique was applied. Pruning simplifies the decision tree by removing branches that do not contribute significantly to the classification accuracy, thereby enhancing the model's predictive power on unseen data [4].

3. Results and Discussion

3.1. Descriptive Analysis of e-Berpadu Implementation

Before delving into the machine learning classification, a descriptive statistical analysis was conducted on the responses from the 265 participants. The implementation of the e-Berpadu website at the Bekasi District Court yielded an overwhelmingly positive user experience. Out of the 265 respondents, 255 users (96.23%) were classified as "Satisfied", while only 10 users (3.77%) were categorized as "Dissatisfied". This stark contrast highlights that the e-Berpadu application has successfully met its primary objective of facilitating electronic criminal case administration, significantly reducing bureaucratic bottlenecks, and fostering seamless inter-agency coordination [1], [11].

An in-depth look at the research variables reveals that the overall average score stood at 3.86, placing it firmly in the "Good" category. System Use (SU) emerged as the highest-performing variable with an average score of 3.92. Notably, the indicator SU2 (utilizing e-Berpadu as the primary platform for document management) achieved a peak score of 4.01. This suggests that the mandatory adoption policies and the operational necessity of the platform have driven high utilization rates across the judicial ecosystem [13].

Service Quality (SV) followed with an average score of 3.88, indicating that the IT support and verification officers at the court are highly responsive and capable of assisting users when they encounter issues [2]. Information Quality (IQ) obtained a score of 3.83, confirming that the digital dossiers and case tracking information are accurate and reliable. Lastly, System Quality (SQ) scored 3.80, which, while being the lowest among the four, still indicates a strong technical foundation. However, it also points to potential areas for UI/UX improvements to make the platform even more user-friendly [9].

What is your level of satisfaction with the E-BERPADU website in the Bekasi District Court?
266 jawaban

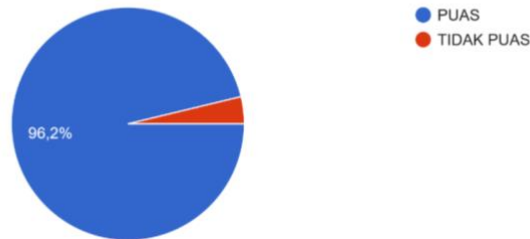


Fig. 2 : User Satisfaction Level

3.1.1. Respondent Characteristics

Respondent characteristics are utilized to provide a general overview of the e-Berpadu website users who serve as the data source for this research. The identification of these characteristics is based on the users' roles when accessing the e-Berpadu services and the intensity of their system utilization.

Based on the data collection results, the research respondents originate from several user groups involved in the electronic criminal case administration process.

Using a purposive sampling technique, the final sample consisted of 265 valid respondents. The demographics of these respondents were highly diversified, ensuring a holistic perspective from all stakeholders involved in the criminal justice system: the general public representing service recipients (27.92%), police and civil servant investigators managing case files (27.55%), internal court officials and judges (27.17%), prosecutors handling indictments (16.23%), and correctional officers managing detention data (1.13%).

As you log in in e-Berpadu:

265 answers

Copy diagram

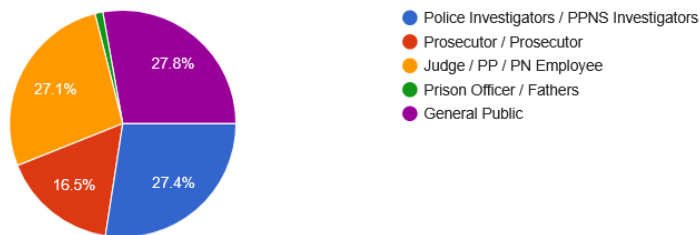


Fig. 3 : Google Form

Table 3 : Distribution of Respondents Based on e-Berpadu User Roles

No	User Role	Number of Respondents	Percentage
1	General Public	74	27.92%
2	Police Investigators / Civil Servant Investigators	73	27.55%
3	Judges / Substitute Clerks / District Court Staff	72	27.17%
4	Prosecutor's Office / Prosecutors	43	16.23%
5	Correctional Institution / Parole Board Officers	3	1.13%
Total		265	100%

Based on Table 3, the majority of respondents belong to the general public category, comprising 74 respondents (27.92%), followed by police/civil servant investigators with 73 respondents (27.55%), and judges/District Court staff with 72 respondents (27.17%).

3.2. Data Preprocessing and Transformation

In the data mining phase, the dataset comprising 265 records underwent rigorous preprocessing. A data cleaning procedure confirmed the absence of any missing values or extreme outliers. To optimize the C4.5 algorithm's performance, which handles categorical data more efficiently, the continuous Likert scale scores were discretized into three categorical bins: Low (1.00 - 2.33), Medium (2.34 - 3.66), and

High (3.67 - 5.00) [7]. The dataset was subsequently divided using a stratified percentage split method: 80% of the data (212 instances) was allocated for the training phase to build the decision tree model, while the remaining 20% (53 instances) was reserved for the testing phase to evaluate the model's accuracy on unseen data.

Table 4 : Data Transformation Rules

Rentang Nilai	Kategori
1.00 – 2.33	Rendah
2.34 – 3.66	Sedang
3.67 – 5.00	Tinggi

Based on these rules, the average value of each research indicator is categorized into discrete attribute values.

3.3. Decision Tree Modeling with C4.5

During the model construction phase using the 212 training instances, the Entropy for the entire dataset was initially calculated. Subsequently, the Information Gain for all 11 predictor attributes was computed to determine the root node and the structural hierarchy of the decision tree. The algorithm identified the attribute IQ2 (Clarity of instructions and guides for using website features) as the most dominant determinant of user satisfaction, yielding the highest Information Gain value of 0.6033. Consequently, IQ2 was designated as the root node of the decision tree [8], [15].

This statistical finding is theoretically sound and practically significant. In complex e-government systems like e-Berpadu, where users span from highly technical court admins to general public users, the clarity of instructions (IQ2) acts as the primary gateway to user success. If users understand how to navigate the system, their satisfaction increases exponentially. Following IQ2, the next most influential attributes that formed the subsequent branches of the tree were System Use (SU2) with a gain of 0.1442, Service Quality (SV2) with 0.1121, and System Quality (SQ2) with 0.0995.

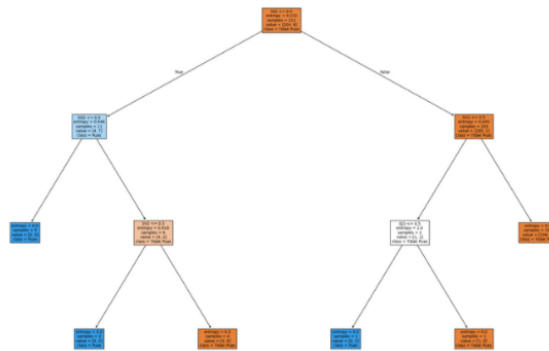


Fig. 4 : Initial Decision Tree Construction

Based on the initial decision tree structure, the classification process is performed by following the branching rules from the root node to the terminal nodes (leaf nodes). Each leaf node generates a final decision in the form of a user satisfaction category.

3.4. Model Pruning and Rule Extraction

To enhance the interpretability and predictive stability of the model, a post-pruning technique was applied. Complex decision trees are often prone to overfitting, capturing noise specific to the training data. The pruning process successfully reduced the tree's complexity, trimming the total number of nodes from an initial 11 down to 7 terminal leaf nodes, without sacrificing the core classification patterns [4].

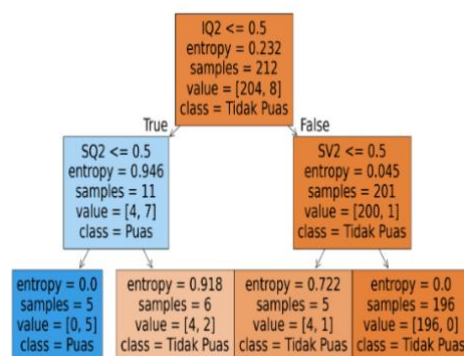


Fig 5: Decision Tree After Pruning

The Image 3 displays the visualization of the decision tree generated by the C4.5 algorithm. This image is divided into two parts: the left side shows the decision tree model before pruning, which has a more complex branch structure, while the right side shows the model after pruning, which is simpler to prevent overfitting. In the After Pruning model, it is clearly visible that the IQ2 attribute acts as the root node, which then branches out to the SQ2 and SV2 attributes to determine the user's final classification result, which is either in the "Puas" (Satisfied) or "Tidak Puas" (Dissatisfied) class.

The pruned decision tree allows for the extraction of highly interpretable IF-THEN rules, which provide actionable intelligence for system developers. Some of the critical rules extracted include:

- Rule 1: IF Information Quality regarding feature guidelines (IQ2) is High (≤ 0.50) AND System Quality related to interface design (SQ2) is High (≤ 0.50), THEN the user is classified as 'Satisfied'.
- Rule 2: IF Information Quality (IQ2) is High BUT System Quality (SQ2) is Low (> 0.50) AND Service Quality responsiveness (SV1) is Low, THEN the user is classified as 'Dissatisfied'.
- Rule 3: IF Information Quality (IQ2) is Low (> 0.50) AND System Use frequency (SU1) is High, THEN the user is classified as 'Dissatisfied'.
- These rules demonstrate that while clear instructions are paramount, they must be supported by a reliable interface and responsive helpdesk to guarantee satisfaction [3], [6].

3.5. Model Pruning and Rule Extraction

Table 5: Evaluation Results of the C4.5 Model After Pruning

No	Parameter Evaluasi	Value
1	Accuracy	98.11%
2	Precision	98.15%
3	Recall	98.11%
4	F1-Score	97.81%

Table 5 presents the results of the model performance evaluation. The pruned C4.5 model achieved an accuracy of 98.11%. The generated decision rules indicate that if users find the feature usage instructions clear and the website interface easy to understand ($IQ2 \leq 0.50$ and $SQ2 \leq 0.50$ based on attribute mapping), then they tend to fall into the Satisfied category.

The robustness of the pruned C4.5 model was rigorously evaluated against the 53 testing data points using a Confusion Matrix. The model demonstrated outstanding predictive capabilities across multiple metrics. It achieved an overall Accuracy of 98.11%, indicating that it correctly classified the vast majority of the instances. The Precision was recorded at 98.15%, and the overall Recall was 98.11%, culminating in an F1-Score of 97.81%. The confusion matrix detailed 51 True Positives, 1 True Negative, 1 False Positive, and 0 False Negatives [15].

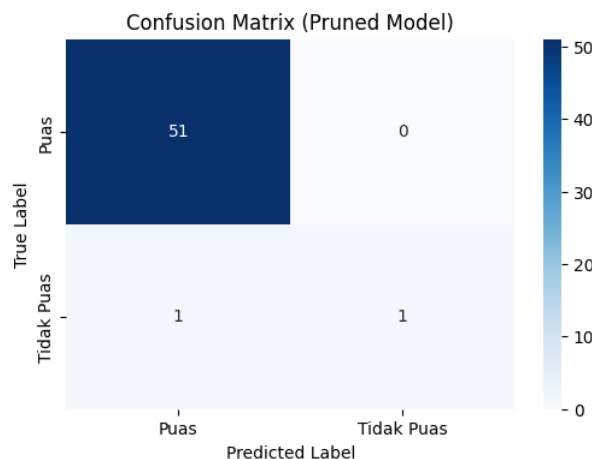


Fig. 6 : Confusion Matrix

Based on Image 6, the True Positives (TP) indicate that 51 user data points in the "Satisfied" category were correctly predicted as "Satisfied". The False Negatives (FN) value is 0, meaning no users in the "Satisfied" category were misclassified as "Dissatisfied". For False Positives (FP), 1 user data point actually belonging to the "Dissatisfied" category was incorrectly predicted as "Satisfied". Regarding True Negatives (TN), 1 user data point in the "Dissatisfied" category was correctly identified by the model. These results demonstrate that the model exhibits excellent performance in recognizing users with high satisfaction levels. However, the ability to detect dissatisfied users still requires further attention due to the relatively small amount of data in that category.

However, a critical analysis of the classification report per class reveals a phenomenon common in public service evaluation datasets: class imbalance. The model achieved a perfect 100% Recall for the "Satisfied" class, meaning it successfully identified all satisfied users in the test set. Conversely, the Recall for the "Dissatisfied" class was only 50%. This discrepancy occurs because the algorithm learned predominantly from the majority class (255 satisfied instances vs. only 10 dissatisfied instances). Despite this limitation in minority class prediction, the high precision and accuracy validate the C4.5 algorithm's utility as a reliable tool for mapping the general consensus of e-government user satisfaction [3], [8].

3.6. Managerial and Theoretical Implications

The findings of this study offer significant implications for the management of the Bekasi District Court and the broader implementation of electronic justice systems in Indonesia. Theoretically, this research reinforces the validity of combining the DeLone & McLean model with machine learning classifiers to provide a more nuanced, rule-based understanding of user satisfaction, going beyond traditional statistical regressions [9], [10].

Managerially, the identification of IQ2 (Clarity of instructions) as the root node sends a clear mandate to the IT development team of e-Berpadu. To maintain and elevate the 96.23% satisfaction rate, continuous investment must be directed toward creating comprehensive, accessible, and user-friendly digital manuals, video tutorials, and interactive tooltips within the platform [11], [13]. Furthermore, addressing the specific conditions highlighted in the decision rules—such as the lethal combination of poor system interface and slow service response—will be critical in converting the remaining 3.77% of dissatisfied users. By proactively addressing these data-driven insights, the court can fully realize a transparent, fast, and highly efficient electronic administration of justice [1], [12], [14].

4. Conclusion & Recommendations

The implementation of the e-Berpadu website at the Bekasi District Court resulted in a very high level of user satisfaction, with 96.23% of users falling into the Satisfied category. The C4.5 algorithm proved to be highly effective in classifying user satisfaction and mapping service evaluation patterns, achieving an accuracy rate of 98.11%. The most dominant factor influencing user satisfaction is the Information Quality dimension, specifically the attribute regarding the clarity of instructions or guidelines for using website features (IQ2). It is recommended that the institution prioritize the enhancement of information quality by providing more interactive tutorials for users.

Based on the conclusions obtained, the following are several recommendations for further development:

1. For the Institution (Bekasi District Court): It is recommended to prioritize the enhancement of information quality. Specifically, this can be achieved by providing short video tutorials, interactive guides, or clearer and more easily accessible manuals on the homepage of the e-Berpadu website. This effort aims to optimize the clarity of functional usage instructions (IQ2) for new users.
2. For Future Research: Considering the imbalanced data distribution between the "Satisfied" and "Dissatisfied" classes, future studies are advised to apply data balancing techniques, such as SMOTE (Synthetic Minority Over-sampling Technique). Furthermore, comparing the current model with other classification algorithms, such as Naive Bayes or Random Forest, is recommended to evaluate whether the model's performance can be improved for the minority class.

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