Telegram Chatbot Implementation Using Rasa Framework to Recommend Tourism in Semarang City

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Abstract

In the context of the rapid development of tourism, especially in Semarang City which offers 1393 tourist attractions, the confusion of tourists in choosing a destination is a challenge. This research proposes the implementation of a chatbot on the Telegram platform as a solution to facilitate tourists in determining tourist destinations that match their preferences. The research method includes data collection, conversation model, system design and development, implementation, and testing. By involving representative respondents, the survey provides a holistic picture of their perceptions and assessments of various aspects, reflecting the level of satisfaction and providing valuable insights. The survey results provide the percentage of answers from the total respondents, strengthening the validity and reliability of the data. The implementation of the chatbot proved to significantly help travelers by cutting search time and providing a satisfying interactive experience. However, performance evaluation using the Classification Report showed results that require improvement. Therefore, the research emphasizes the need for improved Machine Learning and Deep Learning performance evaluation to ensure more optimal results on Classification Report in the future.

Keywords: Rasa, Chatbot, Telegram, Natural Language Understanding, Natural Language Processing

Abstrak

Dalam konteks pesatnya perkembangan pariwisata khususnya di Kota Semarang yang menawarkan 1393 daya tarik wisata, kebingungan wisatawan dalam memilih destinasi menjadi sebuah tantangan. Penelitian ini mengusulkan penerapan chatbot pada platform Telegram sebagai solusi untuk memudahkan wisatawan dalam menentukan destinasi wisata yang sesuai dengan preferensinya. Metode penelitian meliputi pengumpulan data, model percakapan, perancangan dan pengembangan sistem, implementasi, dan pengujian. Dengan melibatkan responden yang representatif, survei ini memberikan gambaran menyeluruh mengenai persepsi dan penilaian mereka terhadap berbagai aspek, mencerminkan tingkat kepuasan dan memberikan wawasan yang berharga. Hasil survei memberikan persentase jawaban dari total responden, memperkuat validitas dan reliabilitas data. Penerapan chatbot terbukti membantu wisatawan secara signifikan dengan memangkas waktu pencarian dan memberikan pengalaman interaktif yang memuaskan. Namun evaluasi kinerja dengan menggunakan Laporan Klasifikasi menunjukkan hasil yang memerlukan perbaikan. Oleh karena itu, penelitian ini menekankan perlunya peningkatan evaluasi kinerja Machine Learning dan Deep Learning untuk memastikan hasil Laporan Klasifikasi yang lebih optimal di masa mendatang.

Kata kunci : Rasa, Chatbot, Telegram, Natural Language Understanding, Natural Language Processing

Introduction

Tourism has become a major attraction for many countries in increasing their sources of income apart from the oil and gas and tax sectors[1]. Currently, Indonesia, as a developing country, is actively promoting itself to attract international attention. The purpose of this effort is to make Indonesia more recognized by citizens of other countries and encourage them to visit the country. The promotions focus on the diversity of Indonesian tourism and culture, and the positive response has seen a surge in foreign tourist visits to Indonesia. Facing the development of an increasingly digital society, the application of digitalization in the tourism sector is the right step to meet tourism needs [2]. One of them is by utilizing information technology. Information Technology refers to a technology used to manage data, including the process of collecting, obtaining, compiling, storing, and manipulating data with various methods to produce quality information [3]. The developments include Augmented Reality, Virtual

Reality, and Artificial Intelligence. Artificial Intelligence is the focus of learning from intelligent agents that receive information from the environment and express their responses [4].

Chatbot is one part of the field of Artificial Intelligence Information Technology. Chatbots are also known as smart bots, digital assistants, or artificial conversational entities[5]. Chatbot is a computer program designed to interact with users through conversation or chat. The uses of chatbots are very diverse, and one of the advantages is providing efficient and fast customer service[6]. Chatbots can be used to provide product or service information, help users complete tasks or transactions, and provide answers to general questions. In addition, chatbots can also be used in various industries such as banking, e-commerce, healthcare, and others to improve interactions between companies and customers [7]. However, with the rapid development of tourism, we as tourists are quite confused by the many tourism options in Semarang. In the city of Semarang alone there are 1393 attractions that are still operating[8]. Therefore, implementing a chatbot on the telegram platform can make it easier for tourists to determine their desired tourist destination. If we discuss chatbots, we will also discuss Natural Language Processing (NLP) and Natural Language Understanding (NLU).

Natural Language Processing (NLP) is a type of advanced technology that gives computers the ability to understand and respond to human language[9]. It is not just about processing words or phrases, but rather understanding the context, meaning, and nuances in a conversation. NLP allows computers to parse sentences, identify entities such as people, places, or objects, and even pick up on implied meanings or emotions in writing or speech[10]. In other words, NLP aims at creating a more natural communication interface, where humans can talk to computers without language barriers or obscurity of meaning[11]. NLU itself is a part of NLP that reads human language and transforms the unstructured data into structured data so that it can be understood by computers[12].NLU involves computational system skills in solving sentence structure, identifying meaning, and interpreting context from conversations or text[13]. NLU is able to identify relationships between words, recognize entities, and understand the meaning of structural changes in sentences. With technological advances and the use of machine learning methods, NLU can be improved to understand more complex contexts, such as implicit meanings and differences in the use of words based on specific contexts [14]. That is why in carrying out chatbot creation, it will definitely be related to NLP and NLU. Because basically the goal of a chatbot lies not only in increasing technical efficiency, but in empowering users to communicate with technology in a more human way and creating a more personalized interaction experience[15]. In implementing this chatbot, the author uses the Telegram application.

Telegram is a cloud-based mobile and desktop messaging application with a focus on security and speed[16]. Telegram provides an advanced communication platform with speed, security, and innovation in the digital age. With an intuitive interface, users can enjoy instant messaging, file sending, and voice chat features, while maintaining security through end-to-end encryption and Secret Chat options[17]. In early 2023 alone, Telegram's usage reached 700 million active users, an increase of about 230% from 2019[18]. That is the background for choosing Telegram as a place to implement a chatbot, apart from its guaranteed speed and security, Telegram is also one of the most widely used instant messaging applications.

There is a previous study that discusses the implementation of a chatbot using the Rasa framework for tourist information services in Pati City which resulted in the use of the Rasa framework and BERT algorithm in building a chatbot for academic tourism information services bringing positive results. The research in Pati City involved data collection through interviews, discussions, and observations, focusing on crucial aspects for chatbot implementation. Data analysis used qualitative methods with systematic organization of information. The results of the chatbot implementation in Kota Pati showed positive user responses, indicating the potential to improve accuracy and acceptance. This holistic approach provides better insight into chatbot implementation in the context of tourism information, with a positive impact on visitor experience[19].

Then there is also previous research on the application of the cosine similarity method in tourist service chatbot applications in the Malang area resulting in the application of the Cosine Similarity method in chatbots not only facilitates natural language processing, but also provides information in a way that is easily understood by users. In the development of chatbots for tourist services, artificial intelligence technology plays an important role with its learning capabilities. The use of Tf-Idf and Cosine Similarity methods in the chatbot not only speeds up execution time, but also produces maximum recall rates. This chatbot system is expected to be a substitute for customer service, providing easy access to information for users of public tourism services in Malang. Thus, chatbot becomes an efficient and innovative solution in supporting better tourist information services [20].

The next research, namely the development of a chatbot for interactive tourist information in South Tangerang using the Rasa framework, resulted in the development of a tourist information chatbot in South Tangerang using the Rasa framework being successfully implemented. This chatbot is able to provide relevant and interactive responses to user questions regarding tourist information in South Tangerang. Integration with the website and Tele-

gram allows users to access the chatbot through two different communication channels, providing flexibility and convenience in interaction. Features such as travel information search, interactive responses, and availability on the Telegram platform provide added value in obtaining information effectively and efficiently. Thus, the use of tourist information chatbots can improve the overall tourist experience and support the city's tourism sector [21]. From some of the previous explanations, the purpose of this research was made because of the background of tourist confusion caused by too many tourist destinations in the city of Semarang and its surroundings. Therefore, with this research, it is hoped that tourists can better understand which tourist attraction they want to go to, by integrating a chatbot in the Telegram application, it is hoped that tourists can use it more easily and flexibly.

Research Methodology

In selecting a development method for the chatbot, the waterfall method was chosen for the main reasons of structural clarity, strong documentation, and tight project control. The organized structure provides a clear view of the development steps, while detailed documents help with project understanding and maintenance. Tight control over schedule and budget provides certainty. For an overview of this method, it is shown in Figure 1.
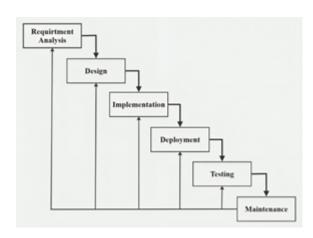

Figure 1: Waterfall method

Requirtment Analysis

Data Collection

The data collection process for tourist destination research involves two methods, namely primary data collection through direct visits and secondary data through literature and previous visitor experiences. Primary data collection was done by observation, interviews, and on-site visual documentation. Secondary data is obtained from articles, websites, and visitor reviews. By combining these two types

of data, this research is expected to provide a complete picture of the destination, identifying trends and important aspects for development and promotion.

Conversation Model

A conversational model is an approach or framework used to design, develop, and understand verbal interactions between humans and machines. An example of a chatbot conversation model as shown in Figure 2.
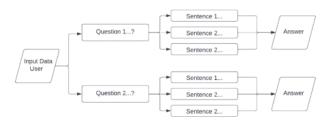

Figure 2: Conversational model process

After the user enters his input, the user asks about tourist recommendations in Semarang and its surroundings. Then the chatbot will process the question, then provide follow-up questions or statements. After that, it will be directed to the answer that matches the initial question from the user. As for the visulization of the chatbot itself, it will be shown in Figure 3
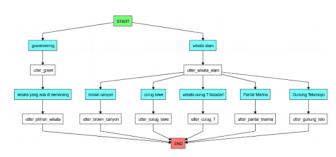

Figure 3: Rasa Visualize

From this visualization, when the user enters the "Start" command, the chatbot will provide 2 further statements. This will continue continuously until the user enters the "End" command. In this conversation model, the use of NLU is very much needed, because we as humans will definitely start entering several words ranging from nonstandard words, slank words, abbreviated words, and also typo words. Therefore, the chatbot will transform the language into its machine language which has been trained repeatedly from the database it already has, so that it will bring up results that are appropriate or relevant to the statements we input.

System Design

In the process of designing and developing a chat-bot system, the System Design and Development aspect plays a key role. An effective chatbot generally involves three main files: NLU, domains, and stories. First, the NLU file is the part of the chatbot that is responsible for processing and understanding user commands or questions, see Figure 4. This file contains language models and patterns that assist the chatbot in identifying entities, parsing meaning, and providing appropriate responses.
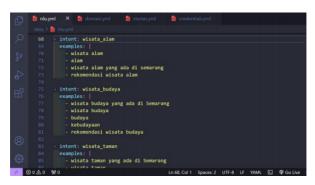

Figure 4: NLU file

Then, the domain file serves as a guide for the chatbot to know the topics and functions that it can access, see Figure 5. This file includes a list of relevant actions and entities, helping the chatbot to respond correctly according to the context of the conversation.

Figure 5: Domain file

Furthermore, the stories file plays a role in directing the flow of the conversation, see Figure 6. This file describes the scenarios that may occur during the interaction with the user, giving the chatbot guidance on how to respond and act in each situation.
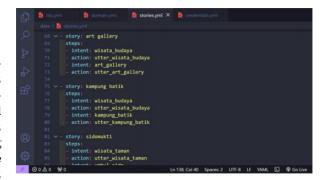

Figure 6: Stories file

Implementation

The use of the Rasa framework provides advantages in designing and managing interactions with users. The implementation process involves several key commands, including "Rasa train" and "Rasa run." In a chatbot implementation using the Rasa framework, the "Rasa train" command is used to train a language model based on a dataset, while the "Rasa run" command is used to run and test the chatbot. "Rasa train" involves Machine Learning techniques to understand conversational patterns, while "Rasa run" allows direct evaluation of the chatbot's responses in real situations.

Deployment

Finally, to integrate the chatbot with the Telegram platform, the use of Ngrok can be a solution. Ngrok is a global reverse proxy tool that provides protection and acceleration for network applications and services at a global level. As a unified entry platform, Ngrok brings together several elements, including reverse proxy, load balancer, API gateway, firewall, and DDoS protection, in an efficient system [24]. Ngrok serves as a tunnelling tool that allows a chatbot being developed in a local environment to be publicly accessible on the internet. This process involves configuring a webhook on the Telegram API to connect it with the URL provided by Ngrok, allowing the chatbot to function effectively on the Telegram platform, see Figure 7.

Figure 7: Integrate to Telegram by Ngrok

Testing

In this study, researchers used 3 testing methods, namely by using Confusion Matrix, Black Box and also User Acceptance Test (UAT). Confusion matrix is a performance evaluation tool commonly used in machine learning and statistics, especially in the context of classification [25]. Black box testing is a software testing method that focuses on testing the external functionality of a system without paying attention to or examining its internal implementation or source code [26]. User Acceptance Testing (UAT) is the final testing stage in the software development cycle where the system is tested to ensure that it meets business requirements and user needs[27].

Maintenance

In the Maintenance stage, the focus of this stage lies on response monitoring, bug handling, content updates, and user feedback management in an effort to maintain and improve the quality of the chatbot. Response monitoring helps identify user interaction patterns, enabling appropriate improvements. In addition, monitoring and handling of bugs or response issues will be carried out regularly to maintain optimal performance. Regular content updates are also conducted to ensure the completeness and currency of information, which we prioritize over user feedback. With this approach, the chatbot can maintain the quality of being responsive, accurate and providing a satisfying experience, along with tracking valuable information from user feedback.

Result and Discussion

Interface Chatbot

In Figure 8, the chatbot profile view on Telegram displays a profile photo, profile name (chatbot), chatbot username, and description of the chatbot.

Figure 8: Display of the Chatbot Profile

When you first use the chatbot, a start button will appear. Users can press this button to start or use the chatbot. Apart from typing the "Start" command, users can also type greetings such as hi, hello, excuse me, test. Users can also type greeting commands such as Assalamualaikum, shalom, good morning (Figure 9, 10).

Figure 9: Display of the Chatbot Profile

Figure 10: Proof that the chatbot can respond well

Training Data

In Table 1 it is shown that there are several lists of intent which are used as training data in determining the accuracy of the chatbot. The intent training data in the NLU file is a collection of example conversations that include various forms of user questions or statements that express a specific intent. The training process uses this dataset to teach the chatbot to recognize conversational patterns and contexts. Thus, the quality and diversity of the intent dataset plays a key role in developing the chatbot's ability to respond accurately to various situations.

Table 1: User Intent List

Intent Type	Description	Total Sample
greet	chatbot initial greet	27
goodbye	chatbot ends conversation	16
pilihan_wisata	select a tourist destination menu	5
wisata_alam	select a landscape destination menu	4
wisata_budaya	select a cultural tourism destination menu	5
wisata_taman	select the park's tourist destination menu	8
wisata_kuliner	select a culinary destination menu	4
brown_canyon	description of Brown Canyon and other additional information	4
curug_lawe	description of Curug Lawe and other additional information	4
art_gallery	description of Art Gallery and other additional information	4
kampung_batik	description of Batik Village and other additional information	4
saloka_park	description of Saloka Park and other additional information	3
dusun_semilir	description of Dusun Semilir and other additional information	3
toko_oen	description of Toko Oen and other additional information	3
soto_bangkong	description of Soto Bangkong and other additional information	3

Testing

In this research using, the two methods used are Black Box Testing and User Acceptance Testing (UAT). Black Box Testing is a software evaluation method that focuses on testing external functionality without paying attention to internal implementation details. The goal is to ensure that the software behaves in accordance with user expectations and meets business requirements. Meanwhile, User Acceptance Testing is the last method used in software testing with the main focus of UAT is to involve end users in evaluating software before launch. The goal is to ensure that the software not only meets business requirements but is also recognized by users as an acceptable solution.

Machine Learning Performance Evaluation Testing

Classification report is a classification model performance evaluation tool that provides a summary of important metrics such as precision, recall, F1-score, and accuracy in machine learning as well as deep learning. The goal is to provide a holistic view of the extent to which the model can predict

accurately and efficiently. Benefits include identifying model weaknesses or strengths, guiding adjustments, and more targeted optimization to improve classification model performance in the context of AI [28]. The accuracy value that can be displayed from the chatbot model is about 62%, so it is not good enough for classification report evaluation. The results of the classification report on the chatbot are shown in Figure 11.

Figure 11: Results of the classification report

Black Box Testing

In Table 2, several inputs are shown that can be done on the chatbot. Then after running, Black Box testing is carried out which the results of the test are valid or can be run as a whole.

Table 2: Validation Test on Black Box Method

Input	Response	Result
greet	Selamat datang di Semawis (Semarang Wisata) - Chatbot Rekomendasi Wisata Semarang. Silahkan…	Valid
goodbye	Terimakasih, senang sekali bisa membantu. Semoga Chatbot Semawis ini dapat menolong…...	Valid
pilihan_wisata	Berikut merupakan menu rekomendasi wisata yang tersedia di Chatbot Semawis ini…...	Valid
wisata_alam	Berikut merupakan rekomendasi Wisata Alam yang berada di daerah Semarang dan sekitarnya…...	Valid
wisata_budaya	Berikut merupakan rekomendasi Wisata Budaya yang berada di daerah Semarang dan sekitarnya…...	Valid
wisata_taman	Berikut merupakan rekomendasi Wisata Budaya yang berada di daerah Semarang dan sekitarnya…..	Valid
wisata_kuliner	Berikut merupakan rekomendasi Wisata Kuliner yang berada di daerah Semarang dan sekitarnya…..	Valid
brown_canyon	Brown Canyon adalah sebuah bekas penambangan tanah yang menjadi salah satu…..	Valid
curug_lawe	Curug lawe merupakan wisata alam air terjun yang berada di Semarang. 'Curug' dalam…..	Valid
art_gallery	Semarang Contemporary Art Gallery, Sebelum beroperasi sebagai sebuah galeri seni, bangunan…...	Valid
kampung_batik	Dulunya, Kampung Batik Semarang ini menjadi salah satu sentra kerajinan batik besar…...	Valid

User Acceptance Testing

In this study, researchers used 35 respondents to test whether the chatbot was in accordance with user expectations and answered with an accurate response. The following are the results of the User Acceptance test shown in Table 3.

Table 3: User Acceptance Test Results from Respondent

No	Question	Total Answer					Presentage				
		VB	B	GE	G	VG	VB	B	GE	G	VG
1.	How well does the chatbot provide appropriate answers to your questions about travel destinations?	0	0	0	17	18	0%	0%	0%	48.6%	51.4%
2.	How well does the chatbot provide answers that are easy to understand?	0	0	5	14	16	0%	0%	14.2%	40%	45.8%
3.	How fast is the chatbot in responding to questions?	0	0	2	11	22	0%	0%	5.8%	31.4%	62.8%
4.	Does the chatbot provide accurate and up-to-date information about tourist destinations in Semarang?	0	1	0	16	18	0%	2.8%	0%	45.8%	51.4%
5.	To what extent did the chatbot help you find interesting tourist destinations in Semarang?	0	0	3	18	14	0%	0%	8.6%	51.4%	40%
6.	How engaging is the chatbot in providing travel destination recommendations?	0	1	5	11	18	0%	2.9%	14.3%	31.4%	51.4%
7.	What is your overall level of satisfaction with the interaction with the chatbot in providing travel destination recommendations?	0	1	1	15	18	0%	2.9%	2.9%	42.8%	51.4%

As shown in Table 3, this is an explanation of the survey conducted involving 35 respondents. By involving a representative number of respondents, this table provides a comprehensive picture of their perceptions and ratings of the various aspects presented in the survey questions. The survey not only reflects the variation in satisfaction levels of the respondents, but also provides valuable insights into the extent to which certain elements are valued by the group. To get the percentage of the question, it is obtained from how many respondents gave an answer out of the total number of respondents. The following is an explanation of the 3rd table:

1. Question 1, from a total of 35 respondents, 17 votes chose the Good option and 18 votes chose the Very Good option. Based on this value, if we convert it into a percentage, we get $17/35 \times 100\% = 48.6\%$ for the Good option. And for the Very Good option, we get a percentage value of $18/35 \times 100\% = 51.4\%$.

2. Question 2, from a total of 35 respondents, we get 5 votes for the Good Enough option, 14 votes for the Good option, and 16 votes for the Very Good option. Based on this value, if we convert it into a percentage, we get $5/35 \times 100\% = 14.2\%$ for the Good Enough option. For the Good option, we get a percentage of $14/35 \times 100\% = 40\%$ And for the Very Good option, we get a percentage of $16/35 \times 100\% = 45.8\%$.

3. Question 3, from a total of 35 respondents, 2 votes were obtained for the Good Enough option, 11 votes for the Good option, and 22 votes for the Very Good option. Based on this value, if we convert it into a percentage, we get $2/35 \times 100\% = 5.8\%$ for the Good Enough

option. For the Good option, we get a percentage of $11/35 \times 100\% = 31.4\%$. And for the Very Good option, we get a percentage of $22/35 \times 100\% = 62.8\%$.

4. Question 4, from a total of 35 respondents, we get 1 vote for the Bad option, 16 votes for the Good option, and 18 votes for the Very Good option. Based on this value, if we convert it into a percentage, we get $1/35 \times 100\% = 2.8\%$ for the Bad option. For the Good option, we get a percentage of $16/35 \times 100\% = 45.8\%$. And for the Very Good option $18/35 \times 100\% = 51.4\%$

5. Question 5, from a total of 35 respondents, 3 votes were obtained for the Good Enough option, 18 votes for the Good option, and 14 votes for the Very Good option. Based on this value, if we convert it into a percentage, we get $3/35 \times 100\% = 8.6\%$ for the Good Enough option. For the Good option, we get a percentage of $18/35 \times 100\% = 51.4\%$. And for the Very Good option, we get a percentage of $14/35 \times 100\% = 40\%$.

6. Question 6, from a total of 35 respondents, we get 1 vote for the Bad option, 5 votes for the Good Enough option, 11 votes for the Good option, and 18 votes for the Very Good option. Based on this value, if we convert it into a percentage, we get $1/35 \times 100\% = 2.9\%$ for the Bad option. For the Good Enough option, we get a percentage of $5/35 \times 100\% = 14.3\%$. For the Good option, a percentage of $11/35 \times 100\% = 31.4\%$ is obtained. And for the Very Good option, a percentage of $18/35 \times 100\% = 51.4\%$ is obtained.

7. Question 7, from a total of 35 respondents, we get 1 vote for the Bad option, 1 vote for the Good Enough option, 15 votes for the Good option, and 18 votes for the Very Good option. Based on this value, if we convert it into a percentage, we get 1/35 x 100%=2.9% for the Bad option. For the Good Enough option, we get a percentage of 1/35 x 100%=2.9%. For the Good option, a percentage of 15/35 x 100%=42.8% is obtained. And for the Very Good option, a percentage of 18/35 x 100%=51.4% is obtained.

In addition, the researcher weights the value of each answer given. The weight of the value can be seen in Table 4.

Table 4: Weighted score for each survey answer

Initial	Name	Weight
VB	Very Bad	1
B	Bad	2
GE	Good Enough	3
G	Good	4
VG	Very Good	5

Table 5: Calculation of score weights for each survey answer

No	Question	VB x 1	B x 2	GE x 3	G x 4	VG x 5	Total
1.	How well does the chatbot provide appropriate answers to your questions about travel destinations?	0	0	0	68	90	158
2.	How well does the chatbot provide answers that are easy to understand?	0	0	15	56	80	151
3.	How fast is the chatbot in responding to questions?	0	0	6	44	110	160
4.	Does the chatbot provide accurate and up-to-date information about tourist destinations in Semarang?	0	2	0	64	90	156
5.	To what extent did the chatbot help you find interesting tourist destinations in Semarang?	0	0	9	72	70	151
6.	How engaging is the chatbot in providing travel destination recommendations?	0	2	15	44	90	151
7.	What is your overall level of satisfaction with the interaction with the chatbot in providing travel destination recommendations?	0	2	3	60	90	155

By using these value weights, researchers can better know and understand how the level of success of this Tourism Recommendation chatbot on the Telegram platform. The calculation of the value weight on each survey answer can be seen in Table 5.

Testing Result

Based on the value weight calculation table:

1. In the first question, a total score of 158 was obtained. This data if paired with 35 respondent testers then produces a value of 158/35 = 4.514. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of 4,514/5 ×100% = 90.28%.

2. In the second question, a total score of 151 was obtained. This data if compared with 35 test respondents then produces a value of 151/35 = 4.314. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of 4,314/5 ×100%= 86.28%.

3. In the third question, a total score of 160 was obtained. This data, if compared with 35 respondent testers, produces a value of 160/35 = 4,571. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of 4,571/5 ×100%= 91.42%.

4. In the fourth question, a total score of 156 was obtained. This data if compared with 35 test respondents then produces a value of 156/35 = 4.457. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of 4,457/5 ×100% = 89.14%. In the fifth question, a total score of 151 was obtained. This data if compared with 35 test respondents then produces a value of 151/35 = 4.314. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of 4,314/5 ×100%= 86.28%.

5. In the sixth question, a total score of 151 was obtained. This data if compared with 35 test respondents then produces a value of 151/35 = 4.314. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of 4,314/5 ×100%= 86.28%. In the seventh question, a total score of 155 was obtained. This data

if paired with 35 test respondents then produces a value of $155/35 = 4.428$. To be able to find out how successful and useful this chatbot is, we can see it from the percentage value. Where this value is obtained from the calculation of $4,428/5 \times 100\% = 88.56\%$

Conclusion

In the conclusion of this article, the following are some of the results and suggestions obtained. First, the use of the Telegram application proved to be very effective as a platform for providing tourist destination chatbot services. The implementation of the chatbot is very helpful for tourists in finding tourist destinations that match their preferences, cutting down search time, and providing a satisfying interactive experience.

Nonetheless, the performance evaluation of the model using the Classification Report showed unsatisfactory results. Therefore, it should be emphasized to improve the performance evaluation of Machine Learning and Deep Learning so that the results of Classification Report can be better in the future. Even so, the Black Box and User Acceptance Testing (UAT) tests successfully proved that the system as a whole runs well. It is proven by the high level of respondent satisfaction, reaching more than 85%, which indicates that the chatbot can provide services that satisfy users.

In further development, it is necessary to consider the use of databases to support chatbot development. In addition, chatbot hosting is expected to be implemented to ensure service availability at all times. Additional suggestions include adding new tourist menus, providing restrictions or answers to inappropriate commands, improving the interactivity of the chatbot display, and regular data updates. With the implementation of these improvements and developments, it is expected that the chatbot can continue to provide accurate answers and add value to the tourist experience.

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