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Implementation of Chatbot Artificial Intelligence in a Company Website to Improve Customer Service Automatically Using the TF-IDF Method

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Abstract

In today's digital age, improving customer service is one of the keys to business success. Successfully retaining and attracting new customers is a challenge that must be faced. The application of chatbot technology powered by artificial intelligence (AI) on business websites has been proven to provide more efficient and responsive customer service. This research aims to develop and implement an AI chatbot that uses the TF-IDF (Term Frequency-Inverse Document Frequency) method to automatically understand and answer customer queries. The TF-IDF method is used to extract key features from the text of customer questions and match them with the most relevant answers in the database. The results of implementing this AI chatbot showed a significant improvement in the speed and quality of customer service responses, thus helping to improve customer satisfaction and company performance. This research provides valuable insights for businesses looking to integrate AI technology into their customer service strategy.

Keywords: Chatbot AI, Artificial Intelligence, TF-IDF Method.

1. Introduction

In today's digital era, companies face great challenges in meeting customer needs efficiently and responsively. With the development of artificial intelligence (AI) technology, implementing chatbots on company websites is an attractive strategy to improve customer service automatically. AI chatbots can provide quick responses and 24/7 availability, potentially improving user experience.

Nonetheless, optimizing chatbot performance to respond appropriately to customer needs remains a challenge. One method that can be applied to strengthen chatbot capabilities is Term Frequency-Inverse Document Frequency (Tf-Idf). This method helps chatbots understand customer questions and requests better, so that the responses provided are more relevant and efficient.

This research aims to explore the implementation of AI chatbots in corporate websites with a focus on the Tf-Idf method. A case study will be conducted at PT Zenka Folks to provide in-depth insight into the implementation of an AI chatbot in a competitive online environment. It is expected that this research can overcome existing barriers and optimize customer service automatically.

2. Theoretical Basic

2.1. Definition Of Chatbot

A chatbot is a subset of artificial intelligence designed to interact directly with humans. Chatbot only interprets the keywords in the input and answers them with the most appropriate answer, or a similar pattern of words that exist in pre-generated documents [3].

2.2. Preprocessing Data

Data preprocessing is a step to convert initial data into a more understandable form. This is crucial because the initial data is often unstructured. Preprocessing is important in data mining because it benefits the quality of the data before analysis. The main focus is to ensure accuracy, completeness, consistency, timeliness, trustworthiness, and good interpretation of the data. By fulfilling these six criteria in the preprocessing process, data analysis becomes smoother because data from various sources are presented in a uniform format [3].

2.3. Definition Of Artificial Intellegency (AI)

Artificial intelligence is the study of agents that gain knowledge from their environment and act within that environment to achieve set goals [9].

2.4. Term Frequency-Inverse Document Frequency (Tf-Idf)

TF-IDF (Term Frequency - Inverse Document Frequency) is a word weighting method by determining the frequency of occurrence of words in a document. TF-IDF performs word (term) weighting in each document by paying attention to the frequency or frequency of the word appearing in a document. TF-IDF performs word (term) weighting on each document by paying attention to the frequency or frequency of the word appearing in a document [8].

3. Metodelogi Penelitian

The research method used by the author. The research method is a series of investigations and a brief description of the research activities. The flow of research conducted is shown in the figure below.

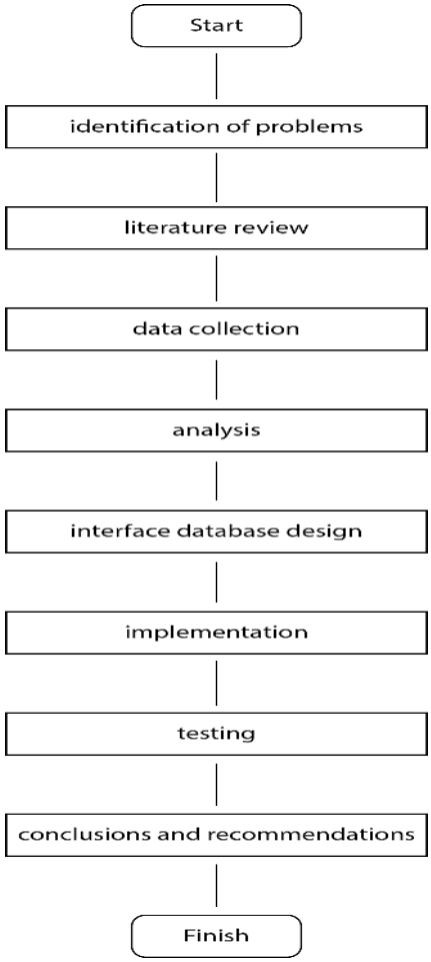

Fig. 1: Research Flow

3.1. Process Design

In designing this chatbot, an approach using tf-idf for weighting and word similarity was taken. Therefore, users can ask questions to the bot to get information about the services provided by the company. The following is a diagram of the chatbot application.

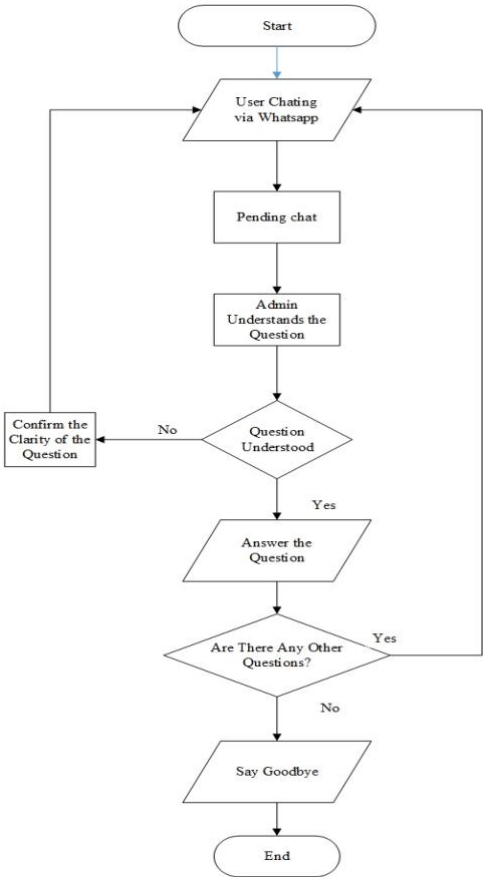

Fig. 2: Simple Flowchart for a Web-Based Chatbot Application

3.1. System Architecture

a. Preproccesing data

- Case Folding At this stage, the query is converted into lowercase letters with the lower() function in python. The case folding stage not only processes queries from users, but also processes documents in the system. The following is an example of data that has gone through the case folding process:

Table 1: Case Folding

Before Case Folding	After Case Folding
Catalog, Tipe yang jadi dasar untuk semua jenis produk. Foto produk kamu bakal tampil dengan latar polos yang memperkuat detail produk sehingga customer bisa melihat keseluruhan produk secara jelas.	catalog, tipe yang jadi dasar untuk semua jenis produk. foto produk kamu bakal tampil dengan latar polos yang memperkuat detail produk sehingga customer bisa melihat keseluruhan produk secara jelas.

- Tokenizing At this stage, queries and documents are broken down into words and stored in an array. The following is an example of data that has gone through the Tokenizing process:

Table 2: Tokenizing

Before Tokenizing	After Tokenizing
catalog, tipe yang jadi dasar untuk semua jenis produk. foto produk kamu bakal tampil dengan latar polos yang memperkuat detail produk sehingga customer bisa melihat keseluruhan produk secara jelas.	catalog tipe yang jadi dasar untuk semua jenis produk foto kamu bakal tampil dengan latar polos yang memperkuat detail

	produk
	sehingga
	customer
	bisa
	melihat
	keseluruhan
	produk
	secara
	jelas

- Third Stage Stemming, at this stage queries and documents that have gone through the tokenizing stage are carried out the stemming process, which is to convert all terms or words into basic words. The following are some examples of stemming results from a documenta

Table 3: Stemming

Before Stemming	After Stemming
catalog	catalog
tipe	tipe
yang	
jadi	
dasar	
untuk	
semua	semua
jenis	jenis
produk	produk
foto	foto
kamu	
bakal	
tampil	tampil
dengan	
latar	latar
polos	polos
yang	
memperkuat	memperkuat
detail	detail
produk	
sehingga	sehingga
customer	customer
bisa	
melihat	melihat
keseluruhan	keseluruhan
produk	
secara	secara
jelas	jelas

b. TF-IDF

TF-IDF (Term Frequency – Inverse Document Frequency) is a method of weighting words by determining the frequency of occurrence of words in a document.

$$idft = \log\left(\frac{D}{df_t^1}\right)$$

Description:
tf = the number of words to look for in a document
max(tf) = the highest number of occurrences of a term in the same document.

Here are some examples of data that has gone through the tf stage:

Table 4: Term Frequency

Token	Keywords	TF										DF
		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	
tipe	0	1	1	1	0	0	0	0	0	0	0	3
dasar	0	1	0	0	0	0	0	0	0	0	0	1
jenis	0	1	0	0	1	0	0	0	0	0	0	2
produk	0	1	1	1	1	1	1	1	1	1	0	9
foto	1	1	1	0	0	0	0	0	0	1	0	3
bakal	0	1	1	1	0	1	0	1	0	0	0	5
tampil	0	1	0	0	0	1	0	1	1	0	0	4
latar	0	1	0	0	0	0	0	0	0	0	0	1
polos	0	1	0	0	0	0	0	0	0	0	0	1
memperkuat	0	1	0	0	0	0	0	0	0	0	0	1
detail	0	1	0	0	0	0	0	0	0	0	0	1
customer	0	1	0	0	0	0	0	0	0	0	0	1
melihat	0	1	0	0	0	0	0	0	0	0	0	1
keseluruhan	0	1	0	0	0	0	0	0	0	0	0	1
jelas	0	1	0	0	0	0	0	0	0	0	0	1

c. Weighting

Table 5: Weighting

W									
D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**
0,523	0,523	0,523	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
0,699	0	0	0,699	0	0	0	0	0	0
0,046	0,046	0,046	0,046	0,046	0,0458	0,0458	0,046	0,046	0
0,523	0,523	0	0	0	0	0	0	0,523	0
0,301	0,301	0,301	0	0,301	0	0,301	0	0	0
0,398	0	0	0	0,398	0	0,3979	0,398	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0

3.3. Reqruitment Design

System design is a stage where the steps focus on software design such as UML modeling, data structure, software architecture, and user interface (interface). The design stage is carried out by converting software requirements based on the results of the needs analysis into design form, so that they can be implemented in the program at the implementation stage. Parameters The technical requirements of the previous stage are. Study in advance and prepare a system design.

The system design helps determine what hardware and system prerequisites will be used, and also helps determine the overall system architecture. The Use Case Diagram of the Chabot System can be described as follows:

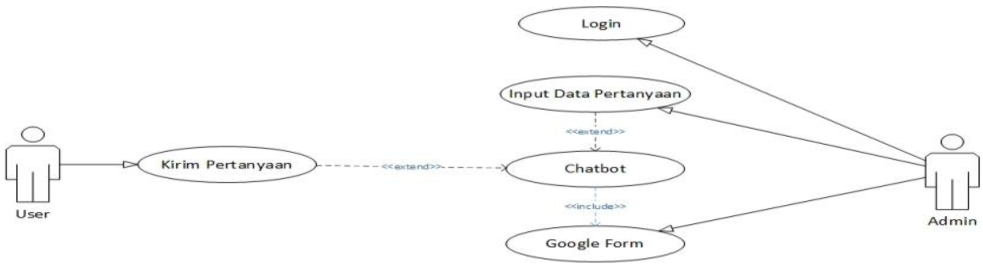

Fig. 3: Use Case Diagram

4. Results And Discussion

4.1 Reqruitment Design

a. Main Page

Here is the main page of the chatbot website. The main page display can be seen in Figure 4.

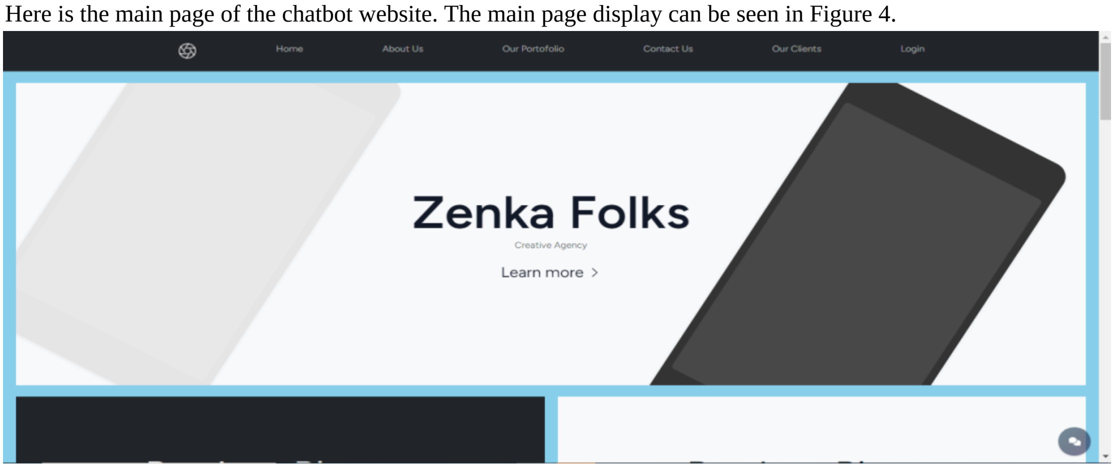

Fig. 4: Main Website Implementation Page

b. Chatbot Page

Here is a chatbot page where the user can type the question as desired. The chatbot page display can be seen in Figure 5.

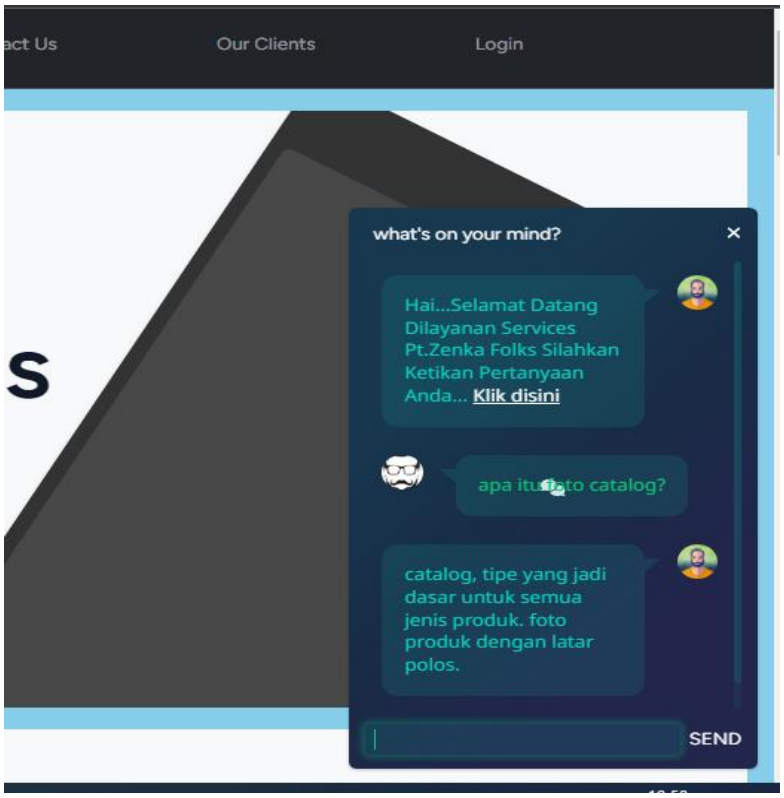

Fig. 5: Chatbot Implementation Page

5. Conclusion

The research and development of the chatbot application for the Zenka Folks Website has been successfully completed. The study showed that the Term Frequency-Inverse Document Frequency (Tf-Idf) method can be successfully applied in chatbot development, achieving a 100% accuracy rate during testing. This chatbot application effectively facilitates users in obtaining information about the services provided by the company and assists the marketing admin in responding to inquiries, thereby enhancing the quality of B to C negotiations for the company.information related to services or services provided by the company and helps the company's marketing admin work in replying to questions, while improving the quality of the company's B2C negotiations.

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