



## Impression Flow Based on Comment in Islamic Studies from Instagram Using Sentiment Analysis

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### ABSTRACT

Islamic studies in industrial revolution 4.0 grown very rapidly. Everyone can access an information everywhere and everytime using their end devises such a smartphone and laptop base on internet access using a social media such instagram, facebook, and twitter. development of da'wah media that is not only through radio television and through studies conducted either in mosques or other places for delivering of studies and insights about Islam for all muslims in Indonesian country especially in Kalimantan Selatan. One of aplication social media for studying islam is Instagram. All of preachers is very easily make a post on Instagram for sharing a religious knowledge to users of Instagram social media, hence this case a lot of Islamic da'wah accounts in great demand by the muslims people in Indonesia. Islamic posts made by preachers on Instagram make a lot of conflict and the direction of negative or positive impressions left by users through the comments column provided from instagram. To determine the positive and negative directions of the post from a preacher. We develop a system for detecting the direction of impression from all of comment on Islamic content on Instagram created by the user using a sentimen analysis. This system analyzes comments left on a post from a preacher's Instagram story. The system that was built succeeded for classifying the filtered comments by attributing the direction of the da'wah impression posted by the preacher. The classification of the impression direction of this system contains 3 impression directions, namely positive, negative, and neutral.

**KEYWORDS** Islamic Studies; Industrial Revolution 4.0; Social Media; Instagram; Impression; Sentiment Analysis.

### ABSTRAK

Kajian islam di era revolusi industry tumbuh begitu pesat. Setiap orang dapat mengakses suatu informasi dimana saja dan kapan saja dengan menggunakan perangkat akhir mereka seperti smartphone dan laptop berbasis akses internet menggunakan media sosial seperti instagram, facebook, dan twitter. Perkembangan media dakwah tidak hanya melalui radio, televisi dan melalui kajian-kajian baik yang dilakukan di Masjid maupun tempat lainnya dalam menyampaikan wawasan tentang islam bagi umat islam di Indonesia khususnya di Kalimantan. Salah satu aplikasi social media untuk mengkaji islam adalah instagram. Para pendakwah sangat mudah membagikan kajian di Instagram untuk berbagi wawasan agama untuk pengguna media sosial instagram, oleh karenanya banyak sekali akun-akun dakwah islam yang banyak diminati oleh kaum muslimin di indonesia. Postingan islami yang dibuat oleh ustadz di Instagram banyak menimbulkan konflik dan arah kesan negatif atau positif yang ditinggalkan pengguna melalui kolom komentar yang disediakan oleh instagram. Untuk mengetahui arah positif dan negatif dari postingan seorang pendakwah kami membangun sistem untuk mendeteksi arah kesan dari semua komentar pada konten Islami di Instagram yang dibuat oleh pengguna menggunakan analisis sentimen. sistem ini menganalisa komentar yang ditinggalkan pada sebuah postingan dari story instagram seorang pendakwah. Sistem yang dibangun berhasil melakukan klasifikasi terhadap komentar yang di saring dengan pengatributan terhadap arah kesan dakwah yang di posting oleh pendakwah. Klasifikasi arah kesan dari system ini terapat 3 arah kesan yaitu positif, negaif, dan netral.

**KATA KUNCI** Kajian Islam; Revolusi Industri 4.0; Media Sosial; Instagram; Kesan; Analisa Sentimen

## Introduction

Islamic da'wah developed so rapidly in the industrial revolution 4.0 era. This is marked by the amount of online preaching conducted by preachers through social media, especially Instagram. Statistics Data in Indonesia (Adinda and Pangestuti 2019) reveal that there are so many Instagram users. Almost every time, the Indonesian people are online on Instagram for checking timelines or checking posted motivation by preachers. One of the social media, such as Instagram, appeared on October 6, 2010. Kevin Systrom and Mike Krieger designed Instagram. Instagram is an application used to share photos that allow users to take pictures, apply digital filters, and share them with various social networking services. Preachers use this media to convey Islamic teachings, advice, and motivation for their followers. The preachers simply post in their timeline to share knowledge and other things in preaching. Their posts will be read and pondered by their followers. They sometimes cause pros and cons among followers who read the post posted by the preachers. Some posts have negative, positive, or neutral impressions.

Every comment from netizens, a term for social media users who make comments on social media accounts. Comments from various netizens will give an impression to the posts by the preacher, some of the words give a negative impression, and some give a positive impression. Discussion of netizens from posts on Instagram posted by preachers can be used as data to determine the direction flow of the impression of the posts. All collected data from netizen comments on posts will be stored and determined the value of all comments to classify the directing of the impression from the preacher's posts. Every word from Instagram can be seen in figure 1.



**Figure 1.** Comment netizens on Instagram Da'wah Islam

In the previous researchers (Adinda and Pangestuti 2019), research is motivated by technology that influences the development of the internet in Indonesia, especially on Instagram for traveling and promoting the destination's tourism in Malang. The author uses Instagram as an appropriate promotional media because people can update their status wherever and whenever. They conduct quantitative research with Explanatory Research type. The population in this study is visitors to the Jodipan Colorful Village. The number of samples used was 118 respondents of Jodipan Colorful Village who followed the @exploremalang account with a purposive sampling technique with the specified characteristics. Data collection in this research was conducted using a questionnaire. Measurement scale using a Likert scale. The data in the author's research were analyzed with descriptive data analysis techniques, simple regression data analysis, and t-test. All of the data in this research was processed using the help of IBM SPSS Statistics 20 for Windows.

The previous researcher (Ortigosa, Martín, and Carro 2014) used sentiment analysis, a new method for sentiment analysis on Facebook, starting with a written message by users, supports to extract information about the polarity of user sentiments (positive, neutral, or negative), as transmitted in the message they write, and for creating a model of sentiment polarity that users

commonly use and to detect significant emotional changes. Material and Methods. The researchers applied this method at SentBuk. A Facebook application is also presented in this paper. SentBuk takes messages written by users on Facebook and classifies them according to their polarity, showing the results to users through an interactive interface. It also supports detection of emotional changes, emotional search for friends, classification of users according to their messages, and statistics. The results obtained through this approach show that it is feasible to perform sentiment analysis on Facebook. Adaptive e-learning systems can use this information to support personalized learning, considering the user's emotional state when recommending activities that are most suitable to be handled at all times. On the other hand, students' sentiments towards a course can serve as feedback for teachers, especially in the case of online learning, where face-to-face less frequent contact.

In this research, we use sentiment analysis to determine the direction flow for each post from a preacher on Instagram. It makes netizens get a negative or positive impression. We collected all of the comments for each post by preachers. All of the collected data will be stored in the system for the assessment of negative or positive impressions to netizens on the preacher preaching that they followed.

## **Material and Method**

This research uses the sentiment analysis method for data retrieval through Instagram and the qualitative or naturalistic approach because it is done naturally. Opinion mining or sentiment analysis is computational research of opinions, sentiments, and emotions expressed textually. When an organization/company/individual wants to obtain a public statement about its products, image, and services, they do not need to conduct conventional surveys and expensive focus groups.

This research design uses a case study design to learn and understand a specific case in the research location, and the expected result will be generalized from particular cases. In our research, we make a scheme to determine the direction flow of impressions from all comments for each post in Instagram Islamic studies. Our system will collect and store data in the database to determine flow direction impression using sentiment analysis. To determine the sentiment analysis was chosen for the sentiment classification of the retrieved commentaries (Poecze, Ebster, and Strauss 2018).

Determining the positive or negative polarity of an opinion can be done manually, but as the source of opinion increases, more and more, of course, the time and effort needed to classify the polarity of the opinion will be increasingly used. Therefore, it is proposed to apply machine learning methods to organize the polarity of views from such vast data sources. To do that, you can use one of the functions of text mining, in this case, is the classification of documents

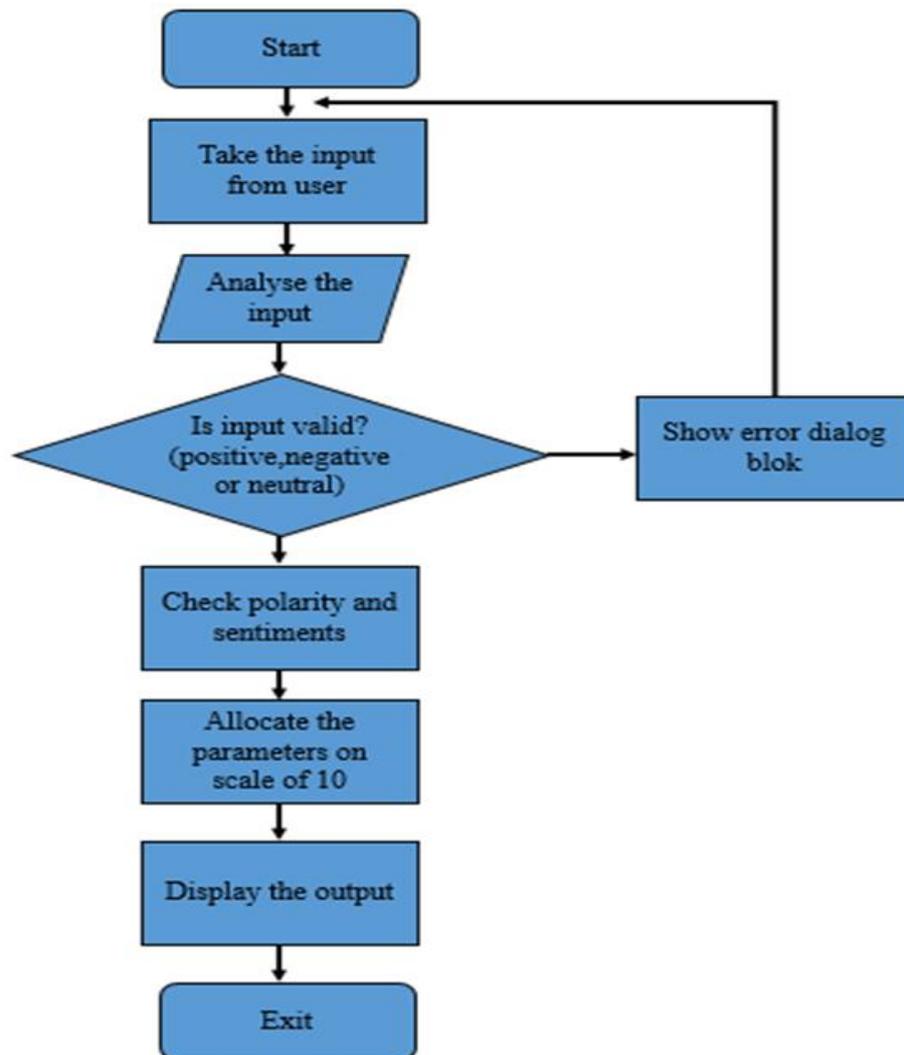
Text mining is known as text data mining or knowledge discovery from a textual database. Following the book of *The Text Mining Handbook*, text mining can be defined as extracting information where a user interacts with a group of documents using analytical tools that are components in data mining. The purpose of text mining is to get helpful information from a collection of documents. So, the data source used in text mining is a collection of texts that have an unstructured or semi-structured format. The specific tasks of text mining include the categorization of texts and the grouping of texts.

Textual information can generally be divided into fact and opinion information. Facts are objective expressions of objects, events, and their possession. Opinions can be in the form of subjective words for describing a person's sentiments, judgments, or feelings about an object, event, or control of that object. They explained that sentiment analysis is part of the work that

reviews everything related to computational opinions, sentiments, and subjectivity. Sentiment analysis is a tool to process a collection of search results to find the attributes of a product (quality, features, etc.) and the process of obtaining the results of his opinion.

### Sentiment Analysis Method

Utilizing the method of sentiment analysis where the data obtained will be used to consider the direction flow of impression (Go, Bhayani, and Huang 2009). The data obtained is used for analyzing the value of flow direction from impression posts by the preachers. The flow of sentiment analysis can be seen in figure 2.



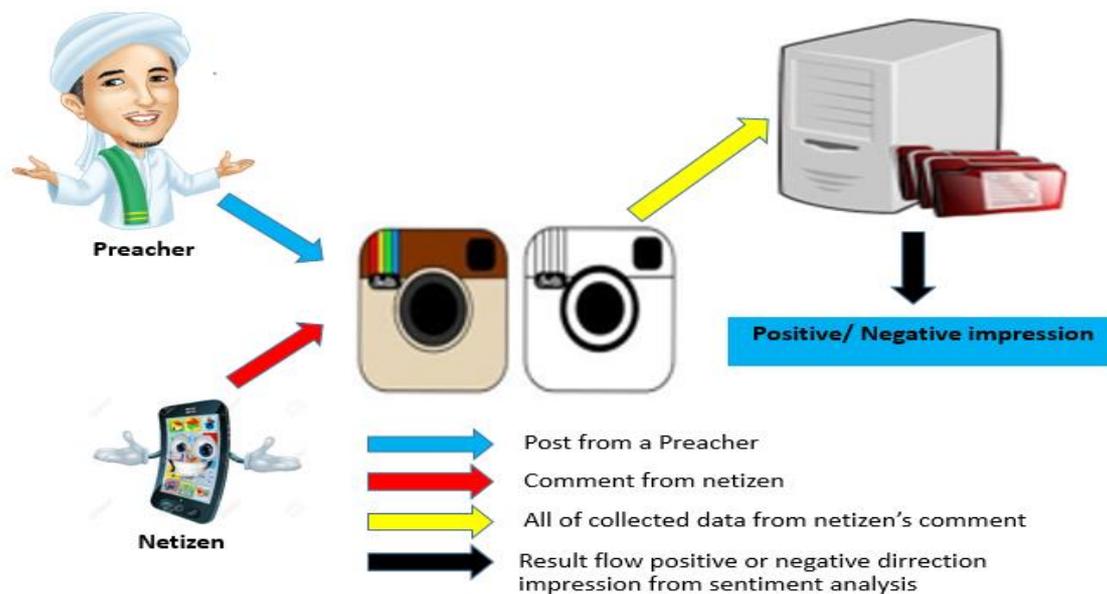
**Figure 2.** Flowchart sentiment analysis

From Figure 2, the process of sentiment analysis, where the user can enter data from all of the comments in Islamic da'wah Instagram when the system is run. Sentiment analysis will provide information to the requested data by giving output in the form of data based on data that received many positive comments on the product in the input by the user.

Sentiment Analysis combines data mining and text mining, a method used to process various opinions given by consumers or experts through multiple media regarding a product, service, or agency (Kosasih 2019). Sentiment analysis is a method used to understand, extract opinion data,

and process textual data automatically to get a sentiment contained in an opinion. Sentiment analysis consists of 3 types of opinions, namely positive opinions, opposing opinions, and neutral views. The sentiment analysis of companies or related institutions can find out the public response to a service or product through general feedback or even experts (Bandorski et al., 2016).

Every post posted by the preacher will take all of the comment data from his timeline. Netizen comments on this post are used to determine the direction of positive or negative impressions using sentiment analysis. The process of determining the positives and negatives of a position posted by the preacher can be seen in Figure 3.



**Figure 3.** Process sentiment analysis for detecting flow direction of impression

From Figure 3, the process of sentiment analysis, where when the system was running, all of the collected data from netizens comment in a post by the preacher. Sentiment analysis will provide information to the requested data by giving output in the form of data based on data that received many comments on the posted post by the preacher. A preacher makes a post to his Instagram in his timeline, published by the preacher will be commented on by the netizens. All comments from netizens will be collected and stored in the system for detecting the sentiment in the statement posted by the preacher. In the design, all of the data comments from a post by a preacher will be classified by the system using sentiment analysis for detecting the impression. The flow of the direction impression will be organized that positive or negative impression. Hence, our system will give the preacher the knowledge of his post that makes a netizen feel the negative or positive compression (Ke et al. 2020).

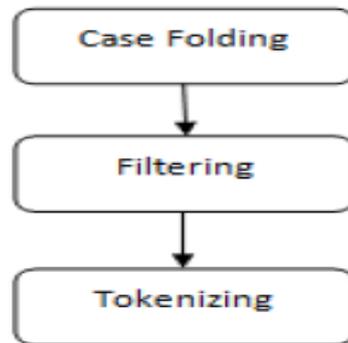
This Research activities for text mining include extracting and storing text, preprocessing text content, collecting statistical data, and indexing and sentiment analysis.

### Document Extraction

Text that will be carried out by text mining, in general, has characteristics including a high dimension, noise in the data, and a text structure that is not good. In this case, the data used comes from Twitter. Data originating from Twitter has relatively high complexity. This is because

the characteristics of Twitter are the use of language that is not under the standard language and the number of spelling errors in writing tweets (Nguyen, Shirai, and Velcin 2015).

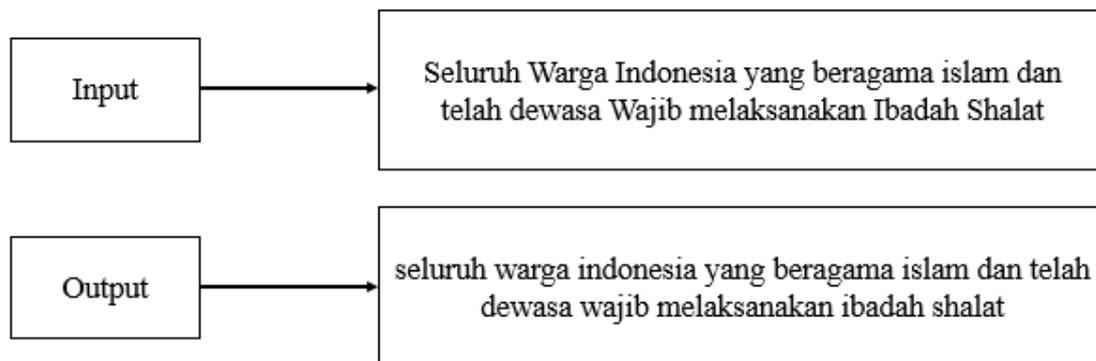
The method used in studying text data is by first determining the features representing each word for each element in the document. According to (Neal Dickert 2012), a preprocessing stage is needed before deciding the representative features, generally done in text mining on documents, namely case folding, tokenizing, and filtering. This process can be seen in figure 4.



**Figure 4.** Extraction Dokumen Process

### Case Folding

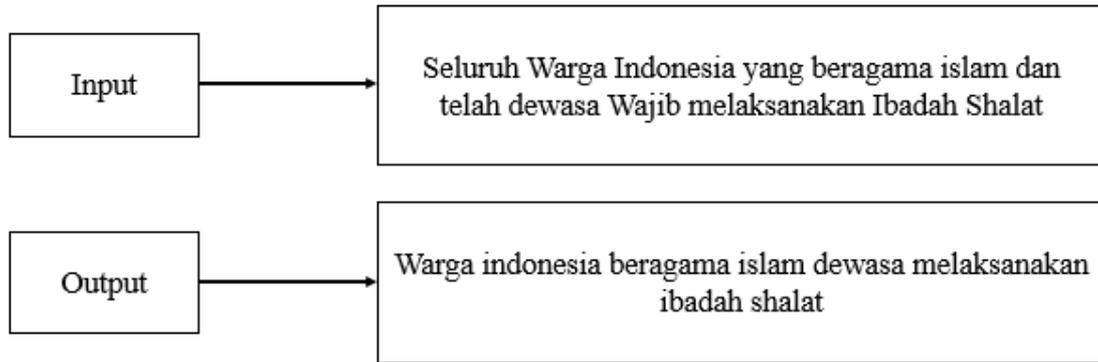
Case folding changes all uppercase or capital letters in Twitter to lowercase (Rozi, Pramono, and Dahlan 2012). Only letters 'A' to 'Z' are accepted. Characters other than letters are omitted and are considered a delimiter. The delimiter is a sequence of one or more characters used to limit or separate data presented in plain text. Examples of this stage as in Figure 5.



**Figure 5.** Case Folding Process

### Filtering

The filtering step is the stage of taking important words from the token results. The comments will be cleared of special characters, URL links, usernames, and emoticons at this step. Based on research from (Soepomo 2014), emoticons here are omitted because they will affect the results of significant accuracy. The filtering stage is also done by removing stopwords. Stopwords are common words that can appear in large numbers and are considered to have no meaning. Examples of stopwords are "yang", "dan", "di", "dari", and so on. An example of this step can be seen in figure 6.



**Figure 6.** Filtering Process

### Tokenizing

The tokenizing or parsing is cutting the input string based on each word composing it (Soepomo 2014). In principle, this process is to separate every word that makes up a document. In general, each word is identified or divided by another word by a space character, so the tokenizing process relies on the space character in the document to separate words. An example of this stage is shown in Figure 7



**Figure 7.** Tokenizing Process

### Sentiment Analysis

Textual information can generally be divided into fact and opinion information. Facts are objective expressions of objects, events, and their possession. Opinions can be in the form of subjective words that describe a person's sentiments, judgments, or feelings about an object,

event, or control of that object. The system explained that sentiment analysis is part of the work that reviews everything related to computational opinions, sentiments, and subjectivity of texts. Added by (Valdivia et al. 2018) that sentiment analysis is a tool to process the collection of search results aimed at finding the attributes of a product (quality, features, etc.) and the process of obtaining the results of his opinion (Dang, Moreno-García, and De la Prieta 2020).

The primary task in sentiment analysis is to group the polarity of the text in the document, whether the opinions expressed in the paper are positive, negative, or neutral. Research on sentiment analysis has been developing since 2003. It is part of text mining which is computational research based on sentiments, emoticons, opinions, comments, and every expression expressed by the text (Poecze, Ebster, and Strauss 2018).

Sentiment analysis is focused on reviewing classification based on polarity. Based on category, sentiment analysis is divided into two main groups. Namely, the classification document into an opinion or fact, or known as the classification of subjectivity (subjectivity classification), and classification documents into positive or negative, or known as sentiment analysis (Nguyen, Shirai, and Velcin 2015). This is an essential process for determining documents with opinions and documents that conclude ideas of positive, negative, or neutral value.

### Part of Speech Tagging

Part-of-speech Tagging or often called Tagging or POS Tagging is the process of giving or determining a label for a word in a sentence (Blankers, van der Gouwe, and van Laar 2019) While part-of-speech according to a category of words in terms of a grammatical perspective, such as nouns, verbs, adverbs, adjectives and so on.

Several approaches can be used to make POS Tagging: a rule-based system, a probabilistic approach, and a transformational-based approach (Blankers, van der Gouwe, and van Laar 2019). One of the tagging tools based on probabilistic methods is POS Tagging for Indonesian made by Alfian Farizki Wicaksono using the Hidden Markov Model. Hidden Markov Model (HMM) is a statistical model of a system that calculates the probability of an unobservable event based on observable events (Peng et al. 2020).

Probability calculation is done by looking at other events that can be observed directly. HMM POS tagging has the advantage of processing out of vocabulary words not found in an annotated corpus. The role of POS tagging in text preprocessing is to sort out the terms formed from a sentence, in this case, a comment, based on the word class in Indonesian. The class of words known in the Indonesian corpus is shown in table 1.

Tabel 1. Word Class in Indonesian Sentences

POS Indonesia	Meaning	Example
OP	Kurung Buka	{{
CP	Kurung Tutup	}}
GM	Garis Miring	/
;	Titik Koma	;
:	Titik Dua	:
"	Tanda Kutip	"
.	Tanda Titik	.
,	Tanda Koma	,

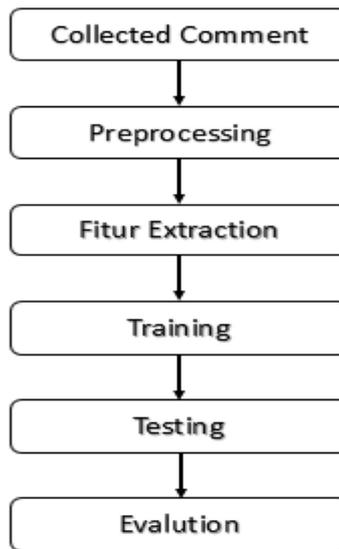
-	Garis	-
...	Tanda Pengganti	...
JJ	Kata Sifat	Baik, Bagus
RB	Benda Berpemilik	Sementara, Nanti
NN	Kata Kerja Intransitive	Pergi
NNG	Kata Kerja Transitif	Membeli
IN	Preposisi	Di, Ke, Dari
MD	Modal	Bisa
CC	Kata Sambung Setara	Dan, Atau, Tetapi
SC	Kata Sambung Tidak Setara	Jika, Ketika
DT	Determiner	Para, Ini, Itu
UH	Interjection	Wah, Aduh, Oi
CDO	Kata Bilangan Berurut	Pertama, Kedua, Ketiga
CDC	Kata Bilangan Kolektif	Berdua
CDP	Kata Bilangan Pokok	Satu, Dua, Tiga
CDI	Kata Bilangan Tidak Bisa	Beberapa
PRP	Kata Ganti Orang	Saya, Mereka
WP	Kata Tanya	Apa. Siapa, Dimana
PRN	Kata Ganti Bilangan	Kedua-Duanya
PRL	Kata Ganti Lokasi	Sini, Situ
NEG	Negasi	Bukan. Tidak
SYM	Symbol	#, %, ^, &, *
RP	Particle	Pun, Kah
FW	Kata Asing	Word

### Obtaining Data

The dataset used in research is a public timeline of Indonesian tweets, which is a search result based on a preacher's post. The dataset is obtained by streaming using the API from Instagram and then stored in a database

### Results and Discussion

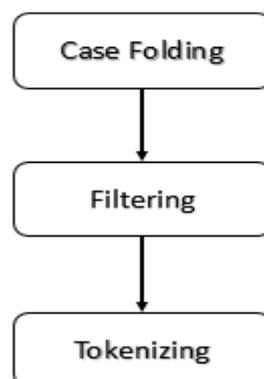
The implementation of this research was carried out with work steps such as figure.8.



**Figure 8.** Flowchart of research

The initial process at the implementation stage is the collection of datasets that will be used for both testing and training. Collection of bases by utilizing Instagram's API through data streaming techniques. The results of streaming data are then stored in a MySQL database. They were then preprocessing the data to simplify the dimensions of the dataset. Then the dataset is re-sorted through feature extraction by utilizing part-of-speech tagging to get the word class. After getting the word class from the dataset, opinion filtering is done using a rule-based built by previous research (Rozi, Pramono, and Dahlan 2012) to determine a comment includes an opinion or not. The comment results that are already in the opinion category will be separated into three sentiment categories. Namely, sentiments that have positive, negative, and neutral polarity. The separated results will be used as a training dataset where the separation process is done manually after the training dataset is formed, then the classification of comments in Instagram.

Before the tweet dataset is ready to use, it will first preprocess the data to be clean and prepared for use in the following process. The following is a flow chart regarding preprocessing data.



**Figure 9.** Preprocessing Data

It can be seen from the diagram above that the first stage of preprocessing data is case folding, which changes all capital letters to lowercase. Then filtering takes the form of deleting all characters besides the string and removing some characteristics from the Instagram comment's

data, for example, @username, #hashtag, HTTP: // URL, and "RT" or words that indicate if it repeats. This filtering also removes Stopword. This is useful to reduce the load or performance when conducting training and testing datasets. Furthermore, the dataset will be done tokenizing, namely solving based on words. This can be done by marking the space character as a delimiter. The next step is filtering all comments that have been preprocessing the previous data to get comment data that only contain opinions/sentiments.

The system was made to take all the netizen comment data on Instagram in Islamic studies. For examples of data taken are posts from Ustadz Abdullah Gymnastiar or known as A'a Gym. All comments taken from these posts are entered into the sentiment analysis system to show the direction of positive sentiment. This shows that what was posted by A'a Gym gives a positive impression to netizens who read it.



**Figure 10.** One of the posts by A'a Gym

From figure 10, we can see one of the posts shared by one of the most famous preachers in Indonesia, Abdullah Gymnastiar. A'a gym posted on his Instagram that is a piece of advice for his followers. This post will be read and commented on by netizens on A'a Gym Instagram. This post has an impact on netizens who read the post posted by A'a Gym. The positive or negative impression that netizens from this post will obtain.



**Figure 11.** All om comments from netizen to A'a Gym post

From figure 11, we can see one of the posts shared by one of the most famous preachers in Indonesia, Abdullah Gymnastiar. A'a gym posted on his Instagram that is a piece of advice for his followers. This post will be read and commented on by netizens on A'a Gym Instagram. This post has an impact on netizens who read the post posted by A'a Gym. The positive or negative impression that netizens from this post will obtain.

From figure 11, posts posted by A'a Gym get a lot of comments from netizens. These comments have a positive meaning and a negative meaning. All comments from netizens will be posted and stored in the system to determine the value of all comments. Using sentiment analysis, all netizens' collected comments will be determined in the direction of the impression obtained from the post. If the sentiment analysis result is negative, then the post gives a negative impression on netizens. Still, if the reverse effects of the sentiment analysis are positive, then the post provides a positive impression. This impression direction is used for netizens and preachers who want to know the post gives a positive or negative impression on other netizens. Figure 12 shows the result of the direction impression using sentiment analysis.

Sentiment Analysis x +

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Impression Flow Using Sentiment Analysis

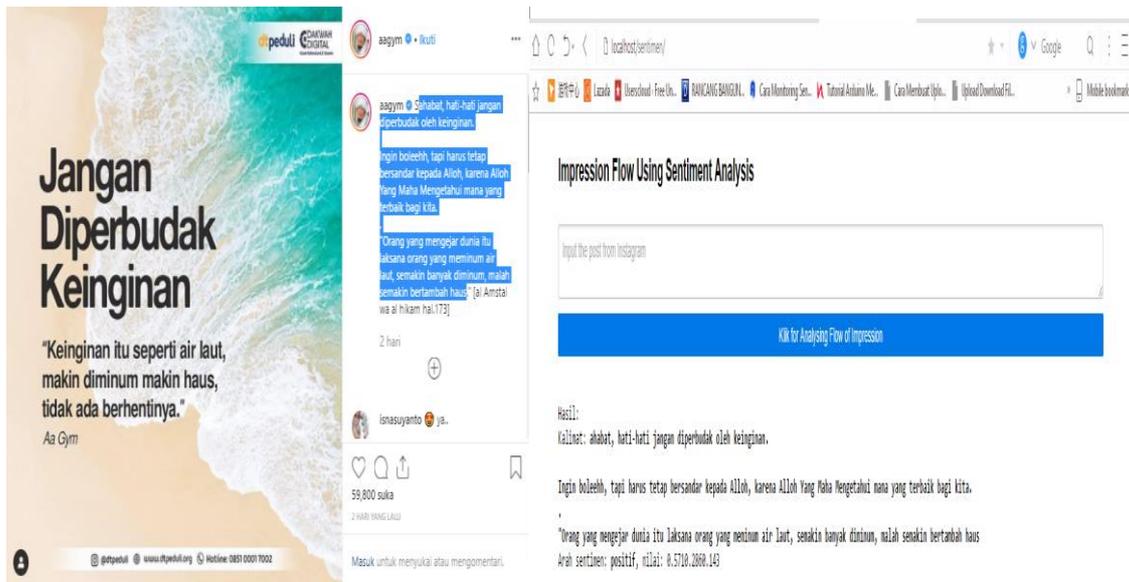
syukuri dan jalani episode apapun yang allah takdirkan. jangan sibuk oleh keinginan. dijamin allah akan memberikan yang terbaik kepada kita

Klik for Analysing Flow of Impression

Hasil:  
Kalimat: Sahabat nikmati setiap episode hidup ini yang allah takdirkan kepada kita, syukuri dan jalani tanpa keluh kesah  
Arah sentimen: netral, nilai: 0.3330.3330.333

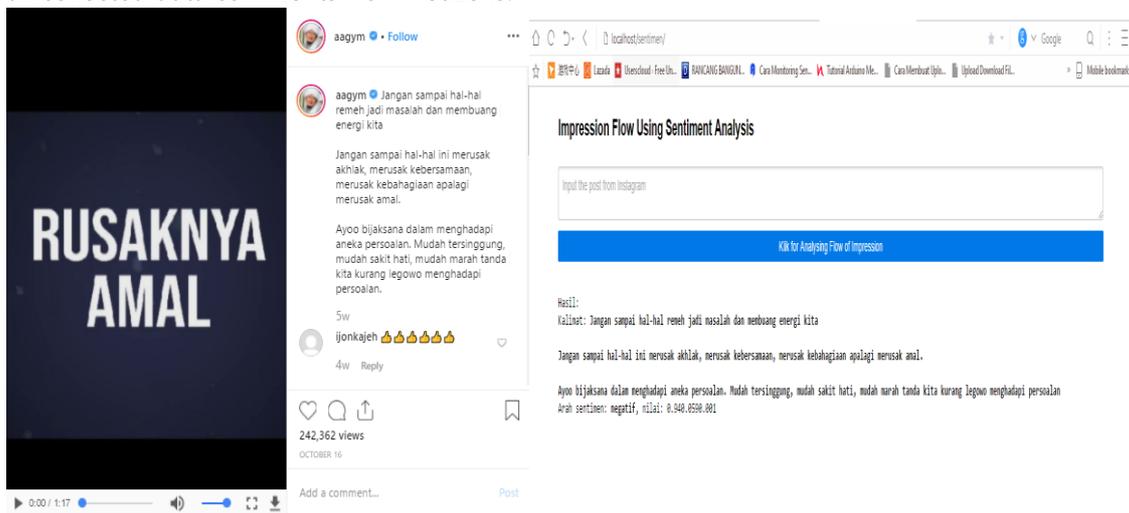
**Figure 12.** Result of Impression from Instagram

Figure 12 shows the impression results directly from the sentiment analysis of the A'Aa gym post, which is neutral. The results show that all netizen comments collected and analyzed using sentiment analysis now affect the post, whether positive, neutral, or negative. We try to select each post on Aa gym Instagram to detect flow impressions for each post posted by Aa Gym. Our analysis on Instagram has three directions flow of impressions.



**Figure 13.** Result of Positive Impression from Instagram

Figure 13 shows the result of the post in A'a Gym Instagram that has a positive impression from all collected data comments from netizens.



**Figure 14.** Result of Impression from Instagram

Figure 14 shows the result by post in A'a Gym Instagram that has a negative impression from all collected data comments from netizens.

## Conclusion

The sentiment analysis data for detecting the direction flow of impression shows that the postings of Islamic studies of the preachers showed that some of the posts they posted had positive, neutral, or negative beliefs. This system was created to give netizens an impression of the direction of sentiment sent by the preachers. The system analysis results show that not all posts posted by preachers always provide a positive impression to netizens. Every post has a flow of positive, neutral, and damaging impression.

Our future work will be improved in this research to classify each post and filter bot comments from netizens to distinguish negative comments and haters' comments by netizens. The system built filters comments, haters not to be entered into the sentiment analysis filter database. Hence this haters' statement will be detected and stored in the system as negative comments.

## References

- Adinda, Sakinah, and Edriana Pangestuti. 2019. "Pengaruh Media Sosial Instagram @exploremalang Terhadap Minat Berkunjung Followers Ke Suatu Destinasi(Survei Pada Followers Exploremalang)" 72 (1): 176–83.
- Bandorski, Dirk, Niehls Kurniawan, Peter Baltes, Reinhard Hoeltgen, Matthias Hecker, Dominik Stunder, and Martin Keuchel. 2016. "Contraindications for Video Capsule Endoscopy." *World Journal of Gastroenterology* 22 (45): 9898–9908. <https://doi.org/10.3748/wjg.v22.i45.9898>.
- Blankers, Matthijs, Daan van der Gouwe, and Margriet van Laar. 2019. "4-Fluoramphetamine in the Netherlands: Text-Mining and Sentiment Analysis of Internet Forums." *International Journal of Drug Policy* 64: 34–39. <https://doi.org/10.1016/j.drugpo.2018.11.016>.
- Dang, Nhan Cach, María N. Moreno-García, and Fernando De la Prieta. 2020. "Sentiment Analysis Based on Deep Learning: A Comparative Study." *Electronics (Switzerland)* 9 (3). <https://doi.org/10.3390/electronics9030483>.
- Go, Alec, Richa Bhayani, and Lei Huang. 2009. "Twitter Sentiment Classification Using Distant Supervision." *Processing*: 1–6.
- Ke, Pei, Haozhe Ji, Siyang Liu, Xiaoyan Zhu, and Minlie Huang. 2020. "SentiLARE: Sentiment-Aware Language Representation Learning with Linguistic Knowledge," 6975–88. <https://doi.org/10.18653/v1/2020.emnlp-main.567>.
- Kosasih, Engkos. 2019. "Literasi Media Sosial Dalam Pemasyarakatan Sikap Moderasi Beragama Social Media Literacy on Socializing Religious Moderate Action." *Bimas Islam Vol 12 No. 1 ISSN2657-188 (Online) ISSN 1978-9009 (Print)* 12 (1).
- Neal Dickert, Jr. 2012. "Abstract 17802: The Role of Cerebral Oxygenation as a Real-Time Monitoring Tool in Cardiac Arrest." *Circulation*, 1320–26.
- Nguyen, Thien Hai, Kiyooki Shirai, and Julien Velcin. 2015. "Sentiment Analysis on Social Media for Stock Movement Prediction." *Expert Systems with Applications* 42 (24): 9603–11. <https://doi.org/10.1016/j.eswa.2015.07.052>.
- Ortigosa, Alvaro, José M. Martín, and Rosa M. Carro. 2014. "Sentiment Analysis in Facebook and Its Application to E-Learning." *Computers in Human Behavior* 31 (1): 527–41. <https://doi.org/10.1016/j.chb.2013.05.024>.
- Peng, Haiyun, Lu Xu, Lidong Bing, Fei Huang, Wei Lu, and Luo Si. 2020. "Knowing What, How and Why: A near Complete Solution for Aspect-Based Sentiment Analysis." *AAAI 2020 - 34th AAAI Conference on Artificial Intelligence*, 8600–8607. <https://doi.org/10.1609/aaai.v34i05.6383>.
- Please, Flora, Claus Ebster, and Christine Strauss. 2018. "Social Media Metrics and Sentiment Analysis to Evaluate the Effectiveness of Social Media Posts." In *Procedia Computer Science*, 130:660–66. Elsevier B.V. <https://doi.org/10.1016/j.procs.2018.04.117>.
- Rozi, Imam, Sholeh Pramono, and Erfan Dahlan. 2012. "Implementasi Opinion Mining (Analisis

- Sentimen) Untuk Ekstraksi Data Opini Publik Pada Perguruan Tinggi." *Jurnal EECCIS* 6 (1): 37–43.
- Soepomo, Prof. 2014. "Penerapan Text Mining Pada Sistem Klasifikasi Email Spam Menggunakan Naive Bayes." *Penerapan Text Mining Pada Sistem Klasifikasi Email Spam Menggunakan Naive Bayes* 2 (3): 73–83. <https://doi.org/10.12928/jstie.v2i3.2877>.
- Valdivia, Ana, M. Victoria Luzón, Erik Cambria, and Francisco Herrera. 2018. "Consensus Vote Models for Detecting and Filtering Neutrality in Sentiment Analysis." *Information Fusion* 44: 126–35. <https://doi.org/10.1016/j.inffus.2018.03.007>.