

## Design of Hoax Filtering Plugin in Twitter Application Using SVM Method

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### ABSTRACT

**Objective:** This study aims to analyze and classify public sentiment toward prominent individuals on social media, focusing on distinguishing between acceptable opinion and hate speech. **Method:** A dataset comprising 700 tweets about public figures was collected and processed using the Support Vector Machine (SVM) classification algorithm, with Term Frequency–Inverse Document Frequency (TF-IDF) employed for feature weighting. The approach was chosen to evaluate the effectiveness of SVM in handling textual sentiment data. **Results:** The implementation of the SVM model demonstrated reliable performance in categorizing tweets according to sentiment polarity and identifying instances of hate speech. The TF-IDF weighting method enhanced the accuracy of feature representation within the model. **Novelty:** This study contributes to computational linguistics and social media analytics by providing an empirical evaluation of SVM's capability in sentiment classification related to public figures, offering potential applications for automated monitoring of online discourse and hate speech detection.

## INTRODUCTION

Freedom of opinion, also known as freedom of speech, is often misunderstood [1]. The right to speak freely in discourse, stated in the 1945 Constitution of the Republic of Indonesia (UUD RI 1945), is the opportunity to offer points of view and reflections either orally, recorded in print, or verbally [2]. However, hate speech can be considered hate speech if it has caused hostility, attacked, or spread against individuals or groups, either directly or indirectly [3].

Misclassification due to this ambiguity is feared to limit freedom of speech and opinion [4]. On the other hand, allowing people to express themselves freely will trigger hatred, discrimination, and violence against certain groups [5]. Hate speech can be spread on social media [6]. Twitter is one of the most influential social media platforms in this century [7]. Currently, there are 106 million Twitter user accounts, and this number continues to increase [8]. 55 million tweets are sent every day [9].

Indonesia is in eighth place as the country with the most tweets [10]. A study on Twitter social media sentiment analysis tested the level of customer satisfaction of mobile telecommunications service providers [11]. The accuracy of the SVM method used to assess tweets written in Indonesian was 73.43% in several previous studies [12], [15].

The goal of this website is to use Support Vector Machines to sort tweets on Twitter into those that insult public figures and those that do not. Therefore, this final project will test the development of an opinion investigation application on Twitter, which uses Support Vector Machine (SVM) techniques to characterize tweets containing insulting discourse and hoax news.

## RESEARCH METHOD

### A. Research Stages

The first step in this research was collecting data from Twitter. The next step was to collect data on public comments about fake news. The obtained data then underwent preprocessing. The data was manually labeled after going through the preprocessing process. Afterward, a Support Vector Machine (SVM) algorithm was used to classify the data. Positive, negative, and neutral were the three categories used to categorize the obtained data.

### B. SVM Modeling Scheme

The data classification process using the Multiclass SVM method can be seen in Figure 1.

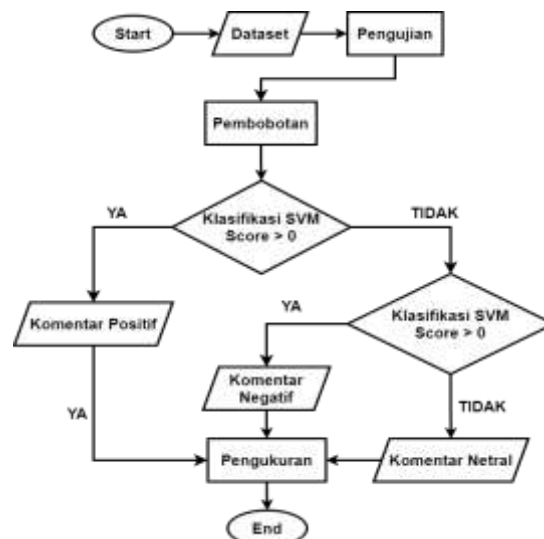


Figure 1. SVM Classification Process

### C. Support Vector Machine

The goal of the Support Vector Machine (SVM) method is to select the most effective function for separating two categories of objects. The answer for the two-class setting can use the following conditions:

$$\min_{w^{ij}} \frac{1}{2} (w^{ij})^T w^{ij} + c \sum_r t_r^{ij}$$

subject to:

$$w^{ij} x_r + b^{ij} \geq t_r^{ij}, \text{ jika } y_r = i$$

$$w^{ij} x_r + b^{ij} \leq t_r^{ij}, \text{ jika } y_r \neq i$$

$$t_r^{ij} \geq 0,$$

SVM was originally used to divide data into two classes. Support Vector Machine can be developed to support multiclass classification. The separator can be a line in two dimensions, a plane in three dimensions, or a hyperplane in more than three dimensions. SVM was originally used to divide data into two classes. SVM can be developed to support multiclass classification. The two-class case requires different strategies for multiclass SVM. There are several Multiclass SVM techniques, one of which is the One-Against-One Multiclass SVM strategy. By creating a number of binary SVM models that will later be compared with each other in the One-Again-One method. There must be a number of  $k(k-1) / 2$  binary SVM models built to classify data into  $k$  classes.

#### D. Kernel Engineering

Information mining or AI procedures are widely developed with the assumption of linearity, so the resulting algorithms are more suitable for linear cases. Frequent cases are usually nonlinear. To overcome this indirect nature, a portioning strategy can be used. A higher-dimensional feature space  $F$  is mapped to the input data space  $x$  using a kernel method. In SVM, the kernel function typically used is:

Linear kernel:  $x^T x$

Kernel polynomial:  $(x^T x_i + 1)^p$

RBF Kernel:  $(-\frac{\gamma}{2} \|x - x_i\|_2^2)$

#### E. Confusion Matrix

The characterization assessment in this study uses a Confusion Matrix strategy. The prediction matrix will be compared with the original classes, which contain real information and predicted classification values, in this method. Once the framework effectively characterizes the tweets, the action is expected to determine how precise or accurate the groupings have been created by the framework. The situation for the leading-order test using the Confusion Matrix technique should be seen in Figure 2.

| Predicted Value | Actual Values       |                     |
|-----------------|---------------------|---------------------|
|                 | 1 (Positive)        | 0 (Negative)        |
|                 | 1 (Positive)        | 0 (Negative)        |
| 1 (Positive)    | TP (True Positive)  | FP (False Positive) |
| 0 (Negative)    | FN (False Negative) | TN (True Negative)  |

Figure 2. Confusion Matrix

## RESULTS AND DISCUSSION

#### A. Data collection

The data in this study is secondary. Indonesian-language text taken from Twitter using the Python programming language is included in the dataset. Access keys and tokens are required as proof of authentication by Twitter developers to use the Twitter API. All data collected is public opinion regarding government programs. The information collection was conducted to obtain 1,400 pieces of

information.

## B. Data Preprocessing

Preprocessing is the stage where information obtained by crawling over 1,400 pieces of data is first processed. Cleansing, case folding, tokenizing, filtering, and stemming are the methods used for data preprocessing.

## C. Cleansing

Cleansing is a phase that aims to remove characters or images from the join URL (<http://situs.com>), username or references to it (@username), hashtags (#), retweets, and emojis. Table 1 displays the data results after the Cleansing process.

**Table 1.** Data Results After Cleansing Process

| No | Raw Data                                                                                                                                                     | Cleansing Results                                                                                                        |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 1  | RT @Kompascom: Kaesang: My father could deceive the Indonesian people with his simplicity. Why can't I?                                                      | Kaesang, the father of simplicity, deceives the Indonesian people                                                        |
| 2  | RT @adi098: The Corruption Eradication Committee (KPK) is prohibited from bringing armed Brimob personnel into the DPR building.                             | KPK prohibits Brimob personnel from bringing weapons into the DPR building                                               |
| 3  | RT @agege: Lawyer Hotman Paris Hutapea Becomes Legal Counsel for Habib Rizieq Shihab                                                                         | Hotman Paris Hutapea's event as Habib Rizieq Shihab's legal representative                                               |
| 4  | RT @slavko: They Said They Wanted to Send the UI Student Executive Board Chair to Asmat, But Foreign Journalists Who Wanted to Cover the Event Were Expelled | He said he wanted to send the chairman of BEM UI Asmat, but foreign journalists wanted to cover it, just throw them out. |
| 5  | RT @Metrotv: Ministry of Home Affairs Revokes Regional Regulation on Alcoholic Beverages                                                                     | Ministry of Home Affairs revokes regional regulation on alcoholic beverages                                              |

## D. Folding Case

The process of converting all uppercase letters in a document to their standard form (lowercase) is called case folding. Other characters are treated as boundaries or separators. Table 2 displays the results of the case folding procedure.

**Table 2.** Data Results After Case Folding Process

| No | Cleaning Results                                                                                                                                              | Folding Case Results                                                                                                     |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 1  | Kaesang: My father could deceive the Indonesian people with his simplicity. Why can't I?                                                                      | Kaesang, the father of simplicity, deceives the Indonesian people                                                        |
| 2  | The Corruption Eradication Committee (KPK) is prohibited from bringing armed Brimob personnel into the DPR building.                                          | KPK prohibits Brimob personnel from bringing weapons into the DPR building                                               |
| 3  | Lawyer Hotman Paris Hutapea Becomes Legal Counsel for Habib Rizieq Shihab                                                                                     | Hotman Paris Hutapea's event as Habib Rizieq Shihab's legal representative                                               |
| 4  | They said they wanted to send the UI Student Executive Board (BEM UI) chairman to Asmat, but foreign journalists who wanted to cover the event were expelled. | He said he wanted to send the chairman of BEM UI Asmat, but foreign journalists wanted to cover it, just throw them out. |
| 5  | Ministry of Home Affairs Revokes Regional Regulation on Alcoholic Beverages                                                                                   | Ministry of Home Affairs revokes regional regulation on alcoholic beverages                                              |

### E. Tokenizing

The next step after case folding is tokenization. To produce sentences or words that can stand alone, the data is processed without punctuation. Table 3 displays the data results after the tokenization procedure.

**Table 3.** Data Results After Tokenizing Process

| No | Cleaning Results                                                                         | Folding Case Results                                              |
|----|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1  | Kaesang: My father could deceive the Indonesian people with his simplicity. Why can't I? | Kaesang, the father of simplicity, deceives the Indonesian people |
| 2  | The Corruption Eradication Committee (KPK) is prohibited from bringing                   | KPK prohibits Brimob personnel from bringing                      |

| No | Cleaning Results                                                                                                                                              | Folding Case Results                                                                                                     |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|    | armed Brimob personnel into the DPR building.                                                                                                                 | weapons into the DPR building                                                                                            |
| 3  | Lawyer Hotman Paris Hutapea Becomes Legal Counsel for Habib Rizieq Shihab                                                                                     | Hotman Paris Hutapea's event as Habib Rizieq Shihab's legal representative                                               |
| 4  | They said they wanted to send the UI Student Executive Board (BEM UI) chairman to Asmat, but foreign journalists who wanted to cover the event were expelled. | He said he wanted to send the chairman of BEM UI Asmat, but foreign journalists wanted to cover it, just throw them out. |
| 5  | Ministry of Home Affairs Revokes Regional Regulation on Alcoholic Beverages                                                                                   | Ministry of Home Affairs revokes regional regulation on alcoholic beverages                                              |

## F. Filtering

Using a stoplist algorithm (which removes less important words) or a wordlist algorithm (which stores important words), filtering is a stage that aims to eliminate common words that appear frequently in large numbers and have no significant meaning. The data results after going through the filtering process can be seen in Table 4.

**Table 4.** Data Results After Filtering Process

| No | Tokenizing Results                                                                                                   | Filtering Results                                                          |
|----|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Kaesang: My father could deceive the Indonesian people with his simplicity. Why can't I?                             | Kaesang, the father of simplicity, deceives the Indonesian people          |
| 2  | The Corruption Eradication Committee (KPK) is prohibited from bringing armed Brimob personnel into the DPR building. | KPK prohibits Brimob personnel from bringing weapons into the DPR building |
| 3  | Lawyer Hotman Paris Hutapea Becomes Legal Counsel for Habib Rizieq Shihab                                            | Hotman Paris Hutapea's event as Habib Rizieq Shihab's legal representative |

| No | Tokenizing Results                                                                                                                                            | Filtering Results                                                                                                        |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 4  | They said they wanted to send the UI Student Executive Board (BEM UI) chairman to Asmat, but foreign journalists who wanted to cover the event were expelled. | He said he wanted to send the chairman of BEM UI Asmat, but foreign journalists wanted to cover it, just throw them out. |
| 5  | Ministry of Home Affairs Revokes Regional Regulation on Alcoholic Beverages                                                                                   | Ministry of Home Affairs revokes regional regulation on alcoholic beverages                                              |

### G. Stemming

Stemming is the process by which each word is transformed from a compound word to its root word. The Nazief and Adriani algorithm from the Sastrawi library is used for stemming.

**Table 5.** Data Results After Stemming Process

| No | Filtering Results                                                                                                                                             | Stemming Results                                                                                                         |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 1  | Kaesang: My father could deceive the Indonesian people with his simplicity. Why can't I?                                                                      | Kaesang, the father of simplicity, deceives the Indonesian people                                                        |
| 2  | The Corruption Eradication Committee (KPK) is prohibited from bringing armed Brimob personnel into the DPR building.                                          | KPK prohibits Brimob personnel from bringing weapons into the DPR building                                               |
| 3  | Lawyer Hotman Paris Hutapea Becomes Legal Counsel for Habib Rizieq Shihab                                                                                     | Hotman Paris Hutapea's event as Habib Rizieq Shihab's legal representative                                               |
| 4  | They said they wanted to send the UI Student Executive Board (BEM UI) chairman to Asmat, but foreign journalists who wanted to cover the event were expelled. | He said he wanted to send the chairman of BEM UI Asmat, but foreign journalists wanted to cover it, just throw them out. |

| No | Filtering Results                                                                    | Stemming Results                                                                     |
|----|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 5  | Ministry of Home Affairs<br>Revokes Regional<br>Regulation on Alcoholic<br>Beverages | Ministry of Home Affairs<br>revokes regional<br>regulation on alcoholic<br>beverages |

## H. Manual Labeling

Researchers used manual data set labeling involving linguistics to determine tweet labels before beginning the data classification process. The three types of data labels used in this study were positive, negative, and neutral. Table 6 shows some of the results of the manual labeling.

**Table 6.** Example of Manual Labeling Results

| No | Tweet                                                                                                                                                         | Class    |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1  | Kaesang: My father could deceive the Indonesian people with his simplicity. Why can't I?                                                                      | Positive |
| 2  | The Corruption Eradication Committee (KPK) is prohibited from bringing armed Brimob personnel into the DPR building.                                          | Neutral  |
| 3  | Lawyer Hotman Paris Hutapea Becomes Legal Counsel for Habib Rizieq Shihab                                                                                     | Positive |
| 4  | They said they wanted to send the UI Student Executive Board (BEM UI) chairman to Asmat, but foreign journalists who wanted to cover the event were expelled. | Positive |
| 5  | Ministry of Home Affairs Revokes Regional Regulation on Alcoholic Beverages                                                                                   | Neutral  |



## I. Data Testing Results

The results obtained from testing SVM with linear kernel and RBF can be seen in table 7.

**Table 7.** Comparison of Linear Kernel and RBF

| Kernel | Accuracy | Precision | Recall | F1-Score |
|--------|----------|-----------|--------|----------|
| Linear | 54%      | 0.266     | 0.50   | 0.347    |
| RBF    | 79%      | 0.782     | 0.783  | 0.782    |

Based on Table 7, the linear kernel produced an accuracy of 54%, while the RBF kernel produced an accuracy of 79%. From both tests, it can be seen that the RBF kernel is superior to the linear kernel in terms of accuracy.

## J. Implementation

### 1. Dashboard Page



**Figure 3.** Admin Dashboard Page

Figure 3 shows a dashboard display where you can see the dataset used, the method used, the accuracy of the Support Vector Machine method, and the total amount of incoming data, as well as providing a classification diagram display of the SVM method.

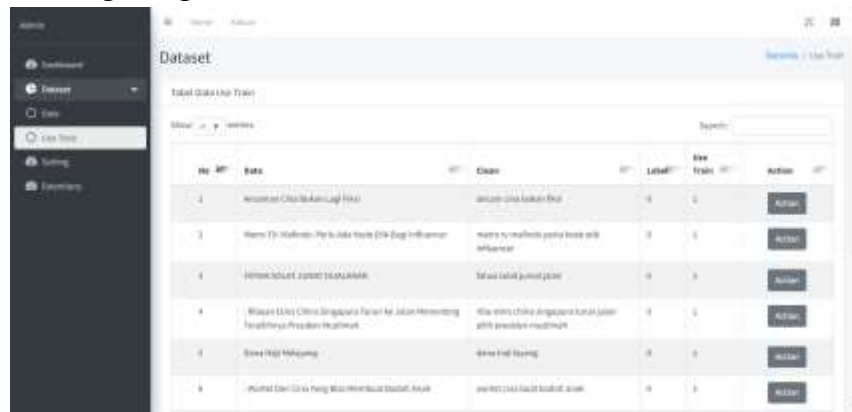
### 2. All Dataset Page

| No | ID | Data                                               | Status                                        | Label | Action |
|----|----|----------------------------------------------------|-----------------------------------------------|-------|--------|
| 1  | 1  | Label data Indonesia yang sudah termasuk Indonesia | Label Indonesia yang sudah termasuk Indonesia | 1     | Action |
| 2  | 2  | Label data Indonesia yang sudah termasuk Indonesia | Label Indonesia yang sudah termasuk Indonesia | 2     | Action |
| 3  | 3  | Label data Indonesia yang sudah termasuk Indonesia | Label Indonesia yang sudah termasuk Indonesia | 3     | Action |
| 4  | 4  | Label data Indonesia yang sudah termasuk Indonesia | Label Indonesia yang sudah termasuk Indonesia | 4     | Action |
| 5  | 5  | Label data Indonesia yang sudah termasuk Indonesia | Label Indonesia yang sudah termasuk Indonesia | 5     | Action |
| 6  | 6  | Label data Indonesia yang sudah termasuk Indonesia | Label Indonesia yang sudah termasuk Indonesia | 6     | Action |

**Figure 4.** All Data Page

In Figure 4 is an image that displays all the datasets used, where on this page the admin can manage data such as editing and deleting.

### 3. Dataset Usage Page

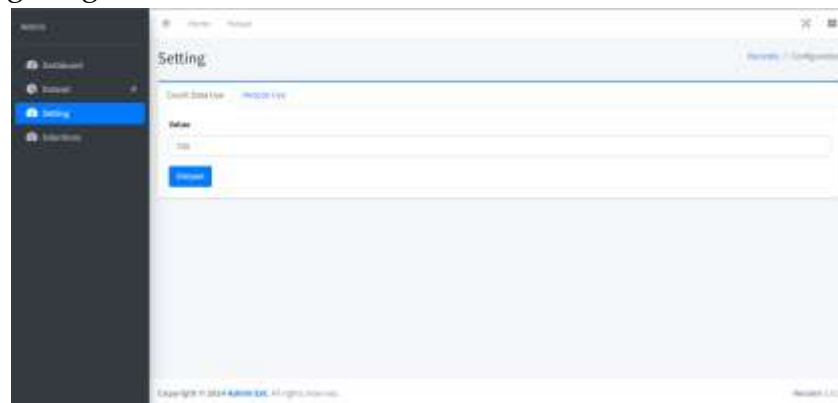


| No | Data                                                       | Clean                                                      | Label | Size | Action |
|----|------------------------------------------------------------|------------------------------------------------------------|-------|------|--------|
| 1  | Amman dan Chikilakun Lagi Pukul                            | Amman dan Chikilakun Lagi Pukul                            | 0     | 0    | Action |
| 2  | Wakil TP Mardiana: Puluhan Kematian Dikawatirkan           | Wakil TP Mardiana: Puluhan Kematian Dikawatirkan           | 0     | 0    | Action |
| 4  | Penyakit Scurvy: Penyakit Berakutal                        | Penyakit Scurvy: Penyakit Berakutal                        | 0     | 0    | Action |
| 4  | Wakil DPR Otonomi Singapura: Puluhan Kematian Dikawatirkan | Wakil DPR Otonomi Singapura: Puluhan Kematian Dikawatirkan | 0     | 0    | Action |
| 4  | Wakil DPR Otonomi Singapura: Puluhan Kematian Dikawatirkan | Wakil DPR Otonomi Singapura: Puluhan Kematian Dikawatirkan | 0     | 0    | Action |
| 5  | Wakil DPR Otonomi Singapura: Puluhan Kematian Dikawatirkan | Wakil DPR Otonomi Singapura: Puluhan Kematian Dikawatirkan | 0     | 0    | Action |

**Figure 5.** Dataset Usage Page

Figure 5 shows the use of datasets, where on this page the admin can manage data such as editing and deleting.

### 4. Settings Page



**Figure 6.** Settings Page

Figure 6 shows an image showing the settings page where the admin can manage data and set the method to be used.

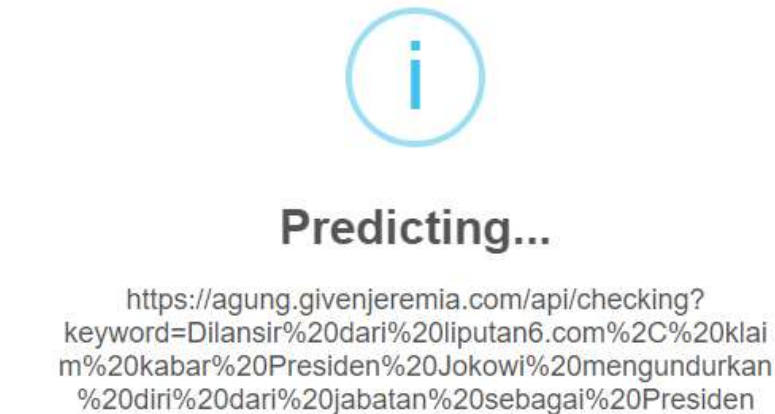
### 5. Extension Page



**Figure 7.** Extension Page

Figure 7 shows an extension page that is used to download and install an extension for the browser for data testing.

#### 6. Page When the Process of Performing Data Testing



**Figure 8.** Page When the Data Testing Process is in progress

Figure 8 shows a page where the program processes test data.

#### 7. Data Test Results Page



**Figure 9.** Data Test Results Page

Figure 9 shows a page that appears after the data testing process, namely the display of the data test results.

## CONCLUSION

**Fundamental Finding :** Based on the analysis of 1,400 tweets obtained from Twitter, this study concludes that the Support Vector Machine (SVM) method can effectively classify hate speech content. Using the RBF kernel and a configuration

matrix with a maximum iteration of 1,400 and a threshold of 0.3, the SVM model achieved an accuracy rate of 79%, demonstrating its strong potential for text classification in social media contexts. **Implication** : These results imply that SVM-based models can serve as a reliable foundation for developing automated systems to detect and mitigate hate speech on digital platforms, thereby supporting healthier online discourse and policy enforcement. **Limitation** : Nonetheless, the study is limited by the relatively small dataset size and the potential biases inherent in tweet sampling, which may restrict the model's generalizability to broader or multilingual datasets. **Future Research** : Future studies should explore larger and more diverse datasets, experiment with hybrid deep learning-SVM models, and assess model performance across different languages and cultural contexts to improve robustness and applicability.

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