Classification of the likelihood of Indonesian Facebook users in spreading hoaxes using Support Vector Machine (SVM)

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Abstract. Social media is the most commonly accessed internet content by Indonesian netizens; 97.4 % Indonesians access social media while using the internet. In 2016, Facebook was the most commonly used social media format for Indonesian internet users. While many are benefited by the features offered by Facebook, many also use Facebook for things that they are not supposed to, such as sharing hoaxes, either intentionally or unintentionally. This clearly puts Facebook users at a disadvantage, considering the increasing trend of hoax-sharing nowadays. Therefore, this research aims to prevent the spread of hoax through Facebook by analyzing the pattern of how people use Facebook. This pattern is obtained from a survey on 200 samples that use Facebook, chosen by purposive sampling. Using the Support Vector Machine method, an application of the collaboration between mathematics and computer science, the acquired data is used to predict whether or not someone has the potential of spreading hoaxes. Simulation results show that the average of the prediction accuracy of this binary classification problem is 86 percent. Hence, it is hoped that Facebook could prevent the sharing of hoaxes by making use of the results from this research.

Keywords: Classification, facebook, hoax, Support Vector Machines

1. Introduction

In Southeast Asia, Indonesia has the largest number of internet users [1]. Internet users in Indonesia accessed social media while using the internet [1]. Majority use social media to share information and knowledge [2]. Alas, not all the information shared in social media are correct and many people are involved in sharing the hoax, whether or not they are aware of it.

The social media Facebook is the most accessed social media by Indonesian internet users with 71.6 million users [3]. Facebook is also the media where popular hoaxes are commonly shared, even more than regular news sites as content can be shared among users without significant third party filtering, fact-checking, or editorial judgment [4]. This makes Indonesian internet users, especially Facebook users, prone to being exposed to hoaxes. Moreover, many people, young and old, read hoaxes and reported that they believed in the hoaxes [5].

Not only that, the people who created the hoaxes alsoexploited the situation that resulted from the spread of the hoaxes [6], Tambuscio et al. [7] implied that the main cause of rapid, large-scale spread of hoaxes is the lack of understanding as well as awareness that there are hoaxes in social media. According to Allcott and Gentzkow [4], educational level and age are also related to one’s ability in distinguishing the true and fake news in Facebook. As for the impact of the spread of hoaxes, it could become a threat...
on its own towards peace and harmony in the society, especially if the hoax touches on the issue of ethnicity, religion, or any other sensitive issues that could provoke certain groups of people [8].

With the ubiquitous spread of fake news in Facebook, Facebook had attempted to find the solution to this problem, for example by giving the hoax label to any content proven to be hoaxes, through partnership with the community or organizations that are dedicated to fact-checking [9]. Even so, Facebook does not yet have an algorithm to prevent the spread of fake news from the user’s side, which will be the focus of the classification done in this research. The prevention of spreading fake news from the user’s side is also important, considering that Facebook users are the key players in spreading hoaxes.

To help prevent the spread of hoaxes from the user’s side, this research attempts to classify Facebook users according to their likelihood in spreading hoaxes, using machine learning, via the Support Vector Machine (SVM) method. Machine learning is a study method that develops models that can learn data that are given through a learning process, i.e. determining parameter values from the model based on training data, which are data involved in model building. In SVM, training data are accompanied by a target value, such that a model that produces the most relevant output of a target value, can be built from the training data [10]. This is done by creating a hyperplane to separate the two types of target values, such that the distance between the nearest data is maximized. The data with the nearest distance to the hyperplane are called support vectors, which is the basis of the function of decision making in this method [11]. In this research, the target value is the category or class of the likelihood of someone in spreading hoaxes in Facebook.

The hypothesis in this research is that the Facebook usage pattern can be used to predict accurately the likelihood of a Facebook user in spreading hoaxes in Facebook. Hence, this research aims to classify Facebook users to two classes: 1) the ones who are likely to spread hoaxes and 2) the ones who are not likely to spread hoaxes. This is measured by analyzing Facebook usage patterns and measuring the accuracy in the classification prediction. With this research, it is hoped that the result can be used to help prevent the spread of hoaxes in Facebook more efficiently.

2. Research method

2.1. Data collection

This research used primary data that are independently collected through online questionnaire from 26 August to 6 September 2017. In this research, 200 samples are used. Samples are Indonesian Facebook users who use Facebook at least once a month, chosen by purposive sampling and selected by screening questions to ensure that they meet the survey criteria. The minimum limit of using Facebook at least once a month was put in place to ensure that the sample is an active Facebook user.

Anonymously, samples are asked to fill the questionnaire consisting of 2 parts: personal data and Facebook usage pattern. Personal data that are collected are multiple choice options on gender, age range, education level, residency (in province/state), and interests in reading. Facebook usage pattern consists of multiple choice questions on: frequency in opening, uploading, giving likes/reactions, sharing contents on Facebook, as well as the truth level of contents uploaded, frequency of users checking the truth when giving likes, reactions and shares, and the willingness of sharing the content if the sample knows that the content is not guaranteed to be true.

2.2. Data processing

The truth level of content uploaded, frequency of users checking the truth while giving likes, reactions and shares, and the willingness of sharing the content if the sample knows that the content is not guaranteed to be true, are the four variables used to measure the likelihood of someone in spreading hoaxes, as a new variable. The data collected from the other questions are used as features to predict one’s likelihood in spreading hoaxes.
To make machine learning easier, all non-numeric data is converted to numeric data. For the chance of spreading hoaxes; the higher the score, the less likely that person will spread hoaxes.

Considering that there are many respondents with different Facebook usage patterns, they are grouped into 3 groups: those who never give likes or share any content, those who only do either (but not both), and those who do both. Due to this grouping, the variables used to measure someone’s likelihood in spreading hoaxes are also adjusted. For example, the frequency of checking of a shared content’s truth is not used in predicting the chance of spreading hoaxes on the group that never shared contents.

Respondents with 0–66.7 % of the maximum value of the likelihood in spreading hoaxes score will be categorized as those who are likely to spread hoaxes, whereas the rest will be categorized as those who are not likely to spread hoaxes.

### 2.3. Machine learning

In this paper, we used a Support Vector Classifier (SVC) to classify the classes. The SVC model is as follows:

Given training vectors $x_i \in \mathbb{R}^p, i = 1, ..., n$, in two classes, and a vector $y \in \{1, -1\}^n$, SVC solves the following primal problem:

$$
\min_{w, b, \xi} \frac{1}{2} w^T w + C \sum_{i=1}^{n} \xi_i \\
\text{subject to } y_i (w^T \varphi(x_i) + b) \geq 1 - \xi_i, \xi_i \geq 0, \quad i = 1, ..., n
$$  

Its dual is:

$$
\min_{\alpha} \frac{1}{2} \alpha^T Q \alpha - e^T \alpha \\
\text{subject to } y^T \alpha = 0, \quad 0 \leq \alpha_i \leq C, \quad i = 1, ..., n
$$  

where $e$ is the vector of all ones, $C > 0$ is the upper bound, $Q$ is an $n$ by $n$ positive semidefinite matrix, $Q_{ij} = y_i y_j K(x_i, x_j)$ where $K(x_i, x_j) = \varphi(x_i)^T \varphi(x_j)$ is the kernel. The training vectors are implicitly mapped into a higher dimensional space by the function $\varphi$. The decision function used is as follow:

$$
\text{sgn} \left( \sum_{i=1}^{n} \alpha_i y_i K(x_i, x) + \rho \right)
$$

Afterwards, the scikit-learn module and Python 2.7 in the software of Enthought Canopy version 2.1.3.3542 are used for machine learning through a Support Vector Machine on the processed data, so that the likelihood of someone in spreading hoaxes through Facebook, can be predicted. In this process, a 20-fold cross-validation is used to prevent overlapping in the training data, as well as to obtain a more accurate measurement of prediction rate [10].

### 3. Results

From table 1, it is known that majority of the respondents (52 %) are people who are likely to spread hoaxes in Facebook.

By using the module scikit-learn on Enthought Canopy for machine learning with SVM to predict someone’s chance of spreading hoaxes on Facebook, testing data 10 % and parameter C from 0.1–10,
Table 1. Distribution of the likelihood of samples in spreading hoaxes

|                  | Likely | Unlikely |
|------------------|--------|----------|
| Likes and shares | 95     | 83       |
| Only likes / only shares | 8     | 2        |
| Neither          | 5      | 7        |
| Total            | 108    | 92       |

a SVM model that can predict whether someone is likely to spread hoaxes in Facebook, is obtained. The parameters that produced the model with the best accuracy (86 %) is when C=2.

4. Conclusion
From the model obtained through the SVM method, it can be concluded that personal data and Facebook usage patterns can be used to predict a Facebook user’s chance of spreading hoaxes in Facebook, with 86 % accuracy. With similar algorithm combined with data mining to obtain more accurate result, Facebook can also identify which users are more likely to spread hoaxes, so that Facebook can give a warning or a special notification to remind its users to always check the truth of the content that they are going to share, especially for those who are likely to spread hoaxes.

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