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SENTIMENT ANALYSIS REVIEW ON TWITTER ABOUT THE SUPREME COURT REPUBLIC OF INDONESIA USING SUPPORT VECTOR MACHINE ALGORITHM BASED PARTICLE SWARM OPTIMIZATION AS FEATURE SELECTION METHODS

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ABSTRACT

The Supreme Court of the Republic of Indonesia has sought to develop a positive image of the judiciary through various programs. Sentiment analysis constituted a popular research area even in sentiment analysis of text content on twitter. The Support Vector Machine (SVM) classification algorithm was proposed by many researchers to be used in the review sentiment analysis. SVM is able to identify the separated hyperplane that maximizes the margin between two different classes. However, SVM has a weakness for parameter selection or suitable feature. Feature selection can be used to reduce the less relevant attributes on the dataset. The feature selection algorithm used is Particle Swarm Optimization (PSO) to solve the optimization problem in order to increase the classifications accuracy Support Vector Machine. This research generate text classification in the positive or negative of The Supreme Court of the Republic of Indonesia review on twitter. The evaluation was done by using 10-Fold Cross Validation and the measurement accuracy is measured by Confusion Matrix and ROC curve. The result showed an increasing in accuracy SVM of 91.05% to 91.72%.

Keywords: *Sentiment Analysis, Twitter, SVM, PSO, Feature Selection, Classification Text.*

1. INTRODUCTION

The Supreme Court of the Republic of Indonesia has sought to develop a positive image of the judiciary through various programs. Opinion mining, also known as sentiment analysis, is the process aiming to determine whether the polarity of a textual corpus (document, sentence, paragraph etc.) tends towards positive, negative or neutral [1]. Sentiment analysis constituted a popular research area even in sentiment analysis of text content on twitter. Support Vector Machine (SVM) is supervised learning methods that analyze data and recognize the patterns that are used for classification [2]. SVM identifies a separate hyperplane that maximizes the margin between two classes [3]. On the other hand, the practicality of SVM is impacted due to the problems of choosing suitable SVM parameters [2]. The feature subset selection, along with the parameter setting in the SVM training procedure significantly influences the classification accuracy [4]. Feature selection can be based on reduction of a huge feature space, e.g. by elimination of less relevant attributes with respect to given task or on construction of new, more suitable attributes [5]. It can make classifiers more efficient/effective by reducing the amount of data to be analyzed as well as identifying relevant features to be considered in the learning process [6]. Wrappers use the classification accuracy of some learning algorithm as their evaluation function [7]. Datasets with unimportant, noisy or highly correlated features will significantly decrease the classification accuracy rate [8]. Particle Swarm Optimization (PSO)3 is an optimization technique that very simple to apply and there are few

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parameter to modify [2]. PSO is particularly attractive for feature selection in that particle swarms will discover the best feature combinations as they fly within the problem space [9]. PSO has strong search ability in the problem space and can discover optimal solutions quickly [9]. It is easy to implement with few parameters, and it is widely used to solve the optimization problems, as well as feature selection problem [10]. In this study, the algorithm Support Vector Machine and Particle Swarm Optimization algorithm will be applied as a method of feature selection. Researchers will compare these methods to classify text on twitter review of the Supreme Court of the Republic of Indonesia in order to improve the accuracy of sentiment analysis.

2. LITERATURE REVIEW

2.1 Sentiment Analysis

Sentiment analysis, also called opinion mining, is the field of study that analyzes people's opinions, sentiments, evaluations, appraisals, attitudes, and emotions towards entities such as products, services, organizations, individuals, issues, events, topics, and their attributes [11]. The goal is to determine the attitude or opinion of a presenter or author with regard to a certain topic or target [2].

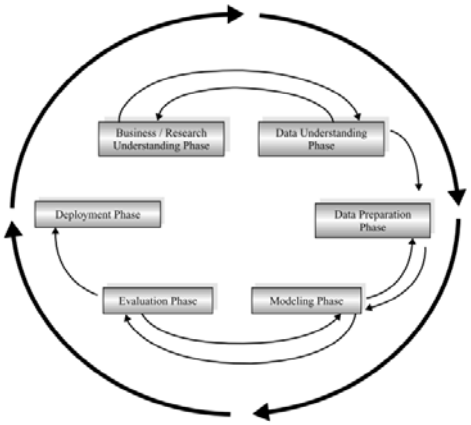
2.2 Data Mining

Data mining is the application of specific algorithms for extracting patterns from data [12]. The ongoing remarkable growth in the field of data mining and knowledge discovery has been fueled by a fortunate confluence of a variety of factors [13]:

1. The explosive growth in data collection, as exemplified by the supermarket scanners above
2. The storing of the data in data warehouses, so that the entire enterprise has access to a reliable current database
3. The availability of increased access to data fromWeb navigation and intranets
4. The competitive pressure to increase market share in a globalized economy
5. The development of off-the-shelf commercial data mining software suites
6. The tremendous growth in computing power and storage capacity

The six phases are as follows [14]:

1. Business understanding phase. The first phase in the CRISP–DM standard process may also be termed the research understanding phase.
   a. Enunciate the project objectives and requirements clearly in terms of the business or research unit as a whole.
   b. Translate these goals and restrictions into the formulation of a data mining problem definition.
   c. Prepare a preliminary strategy for achieving these objectives.



Source : D. T. Larose, *Data Mining Methods and Models*. 2005.
Figure. 1. CRISP–DM is an iterative, adaptive process.

2. Data understanding phase
   a. Collect the data.
   b. Use exploratory data analysis to familiarize yourself with the data, and discover initial insights.
   c. Evaluate the quality of the data. d. If desired, select interesting subsets that may contain actionable patterns.
3. Data preparation phase
   a. This labor-intensive phase covers all aspects of preparing the final data set, which will be used for subsequent phases, from the initial, raw, dirty data.
   b. Select the cases and variables you want to analyze and that are appropriate for your analysis.
   c. Perform transformations on certain variables, if needed. d. Clean the raw data so that it is ready for the modeling tools.
4. Modeling phase
   a. Select and apply appropriate modeling techniques.
   b. Calibrate model settings to optimize results.
   c. Often, several different techniques may be applied for the same data mining problem.
   d. Finally, come to a decision regarding the use of the data mining results.
5. Evaluation phase

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a. The modeling phase has delivered one or more models. These models must be evaluated for quality and effectiveness before deploy them for use in the field.
b. Determine whether the model in fact achieves the objectives set for it in phase 1.
c. Establish whether some important facet of the business or research problem has not been accounted for sufficiently.
d. Finally, come to a decision regarding the use of the data mining results.
e.

6. Deployment phase
   a. Model creation does not signify the completion of the project. Need to make use of created models according to business objectives.
   b. Example of a simple deployment: Generate a report.
   c. Example of a more complex deployment: Implement a parallel data mining process in another department.
   d. For businesses, the customer often carries out the deployment based on your model.

The most common data mining tasks [13]:

1. Description
   Sometimes, researchersandanalysts are simply trying tofindways to describe patterns and trends lying within data.
2. Estimation
   Estimation is similar to classification except that the target variable is numerical rather than categorical. Models are built using "complete" records, which provide the value of the target variable as well as the predictors. Then, for new observations, estimates of the value of the target variable are made, based on the values of the predictors.
3. Prediction
   Prediction is similar to classification and estimation, except that for prediction, the results lie in the future.
4. Classification
   In classification, there is a target categorical variable, such as income bracket, which, for example, could be partitioned into three classes or categories: high income, middle income, and lowincome. The data mining model examines a large set of records, each record containing informationonthe targetvariable as well as a set of input or predictor variables.
5. Clustering
   Clustering refers to the grouping of records, observations, or cases into classes of similar objects.Acluster is a collection of records that are similar to one another, and dissimilar to records in other clusters. Clustering differs from classification in that there is no target variable for clustering. The clustering task does not try to classify, estimate, or predict the value of a target variable. Instead, clustering algorithms seek to segment the entire data set into relatively homogeneous subgroups or clusters, where the similarity of the records within the cluster is maximized and the similarity to records outside the cluster is minimized.
6. Association
   The association task for data mining is the job of finding which attributes "go together." Most prevalent in the businessworld, where it is known as affinity analysis or market basket analysis, the task of association seeks to uncover rules for quantifying the relationship between two or more attributes. Association rules are of the form "If antecedent, then consequent," together with a measure of the support and confidence associated with the rule.

2.3 Classification

Classification is the process of placing a specific object (concept) in a set of categories, based on the respective object (concept) properties [15]. The process of classification is based on four fundamental components [15]:

1. Class -the dependent variable of the model- which is a categorical variable representing the 'label' put on the object after its classification.
2. Predictors -the independent variables of the model- represented by the charac teristics (attributes) of the data to be classified and based on which classification is made.
3. Training dataset -which is the set of data containing values for the two previous components, and is used for 'training' the model to recognize the appropriate class, based on available predictors.
4. Testing dataset, containing new data that will be classified by the (classifier) model constructed above, and the classification accuracy (model performance) can be thus evaluated.

2.4 Support Vector Machines

Support Vector Machines (SVMs) are a set of related methods for supervised learning, applicable

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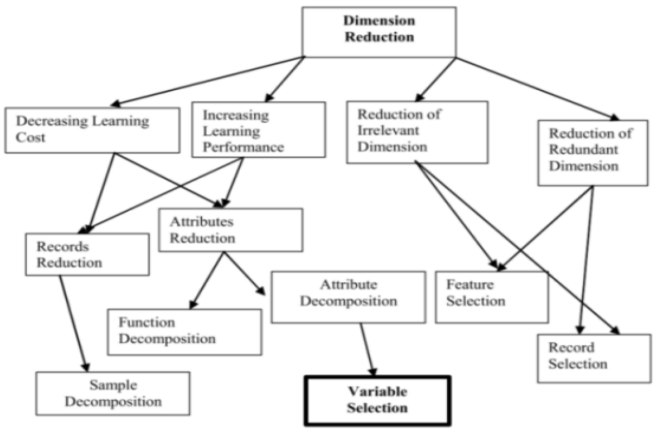
to both classification and regression problems [16]. Support Vector Machine (SVM) is supervised learning methods that analyze data and recognize the patterns that are used for classification [2]. SVM identifies a separate hyperplane that maximizes the margin between two classes [3]. On the other hand, the practicality of SVM is impacted due to the problems of choosing suitable SVM parameters [2]. The feature subset selection, along with the parameter setting in the SVM training procedure significantly influences the classification accuracy [4].

2.5 Feature Selection

Feature selection is one of the most important factors which can influence the classification accuracy rate. If the dataset contains a number of features, the dimension of the space will be large and non-clean, degrading the classification accuracy rate[10]. There are four major reasons for performing dimension reduction [16]:

1. Decreasing the learning (model) cost;



Source : O. Maimon and L. Rokach, *Data Mining and Knowledge Discovery Handbook*. 2010.

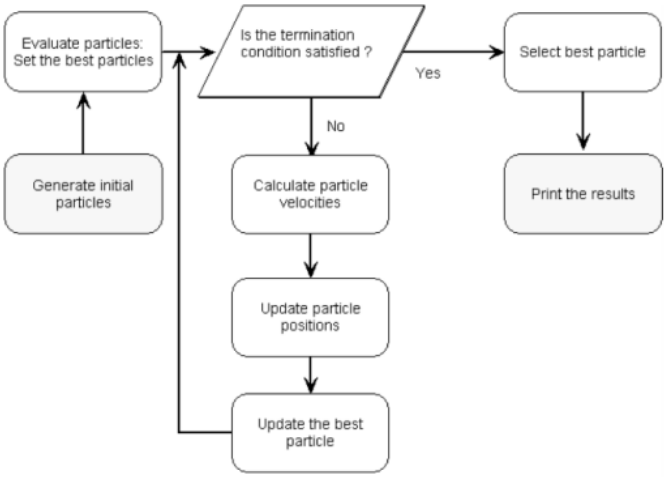
Figure 2. Texonomy of dimension reduction problem

2. Increasing the learning (model) performance;
3. Reducing irrelevant dimensions;
4. Reducing redundant dimensions.

2.6 Particle Swarm Optimization (PSO)

Particle swarm optimization is a kind of swarm intelligence algorithms which origins from the behavior of bird foraging [17]. Assume the following scenario: a group of birds are randomly searching food in an area [12]. There is only one piece of food in the area being searched [12]. The birds do not know where the food is [12]. But they know how far the food is and their peers' positions [12]. So what's the best strategy to find the food? An effective strategy is to followthe bird which is nearest to the food [12]. Particle swarm optimization (PSO) is an evolutionary computation technique [18]. It finds global optimum solution in search space through the interactions of individuals in a swarm of particles [18]. Each particle represents a candidate solution to the problem and it has its own position and velocity [18]. Particle Swarm Optimization (PSO) is an optimization technique that very simple to apply and there are few parameter to modify [2]. PSO is particularly attractive for feature selection in that particle swarms will discover the best feature combinations as they fly within the problem space [9]. PSO has strong search ability in the problem space and can discover optimal solutions quickly [9]. Instead of these methods choose PSO algorithm which is firstly proposed by Kennedy and Eberhart [17].

The basic scheme of PSO algorithm is presented in Figure 3 [12] .



Source : Abraham, Grosan, and Ramos, *Swarm Intelligence in Data Mining*, vol. 20, no. 2006, pp. 1–20, 2006.

Figure 3. The basic structure of PSO

2.7 k-fold Cross-validation

An alternative approach to 'train and test' that is often adopted when the number of instances is small (and which many prefer to use regardless of size) is known as k-fold cross-validation [19]. If the dataset comprises N instances, these are divided into k equal parts, k typically being a small number such as 5 or 10. (If N is not exactly divisible by k, the final part will have fewer instances than the other k − 1 parts.) A series of k runs is now carried out. Each of the k parts in turn is used as a test set and the other k −1 parts are used as a training set [19].

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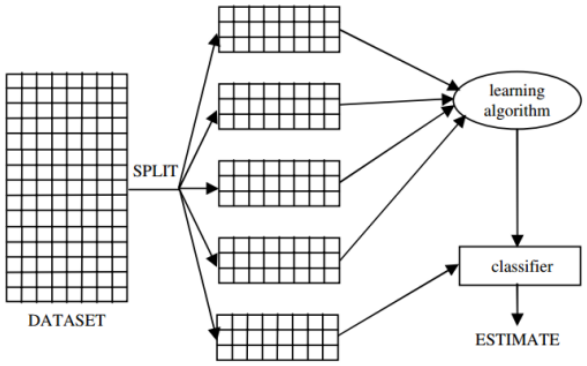


Source : M. Bramer, *Principles of Data Mining*. 2007.
Figure. 4. k-fold Cross-validation

2.8 Confusion Matrix

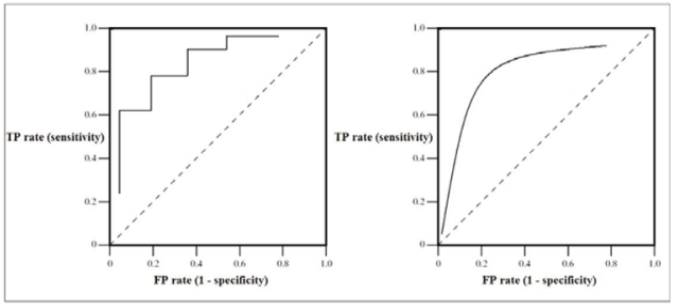
Evaluation of the performance of a classification model is based on the counts of (testing) objects correctly and incorrectly predicted. These counts are tabulated in the so-called confusion matrix [15].

CLASSIFICATION	PREDICTED CLASS		
		Class = YES	Class = NO
OBSERVED CLASS	Class = YES	*a* (*true positive*-TP)	*b* (*false negative* -FN)
	Class = NO	*c* (*false positive*-FP)	*d* (*true negative*-TN)

Source : F. Gorunescu, *Data Mining: Concepts,Models and Techniques*. 2011.
Figure. 5. Confusion matrix for a 2-class model

2.9 Receiver Operating Characteristic (ROC) Curve

ROC curve is a two-dimensional ”tool” used to assess classification performances [15]. This diagonal line divides the ROC space as follows: (a) points above the diagonal represent good classification results, and (b) points below the diagonal line represent poor classification results [15].



Source : F. Gorunescu, *Data Mining: Concepts,Models and Techniques*. 2011.
Figure. 6. ROC graph (discrete/continuous case) Several

A rough guide for classifying the accuracy of a diagnostic test using AUC is the traditional system, presented below [15]:
0.90 - 1.00 = excellent classification; 0.80 - 0.90 = good classification; 0.70 - 0.80 = fair classification; 0.60 - 0.70 = poor classification; 0.50 - 0.60 = failure.

2.10 Review From Related Research Study

There are several studies using Support Vector Machines as classifiers in text classification sentiment analysis on the review, including four related studies discussed in this study have different models, but the classifier Support Vector Machine (SVM) has been shown to have the highest accuracy amongo ther classifiers. Particle Swarm Optimization (PSO) can be used as an optimization model that can be used to produce the accuracyof Support Vector Machine (SVM) is higher. Comparison of four related research can be seen in Table1.

Table I. Comparison To Related Research Tittle

Tittle	***Pre Processing***	***Feature Selection***	***Classifier***	***Accuracy***
Opinion Mining of Movie Review using Hybrid Method of Support Vector Machine and Particle Swarm Optimization [2]	Filter Data Data Cleansing Extract to Text File	Case Normalization Tokenization Stemming Generate N-Grams Particle Swarm Optimization (PSO)	Support Vector Machines (SVM)	76,20 %
Sentiment classificati on of online reviews to travel destinations by supervised machine learning approaches [20]	Converted all characters to lowercase	N-Grams	Support Vector Machines (SVM)	73,97 %
Algorithm Application Support Vector Machine With Genetic Algorithm Optimization Technique For Selection Features For The Analysis Of Sentiment On Twitter [21]	Tokenization, Stopword Removal, Stemming, Generate 2-gram	Genetic Algorithm (GA)	Support Vector Machines (SVM)	93,50%
Feature Selection Based on Genetic Algorithm, Particle Swarm	Tokenization, Stopword Removal,	Genetic Algorithm (GA), Principal	Support Vector Machin	83.00%

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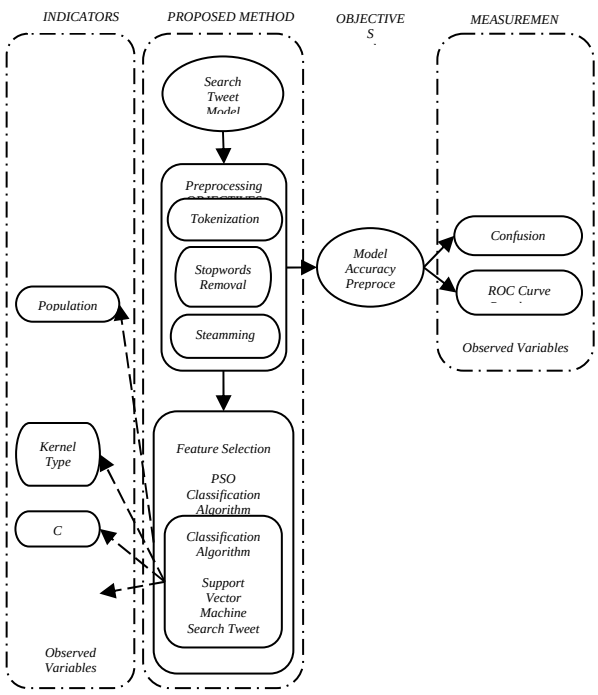
Tittle	*Pre Processing*	*Feature Selection*	*Classifier*	*Accuracy*
Optimization and Principal Component Analysis for Opinion Mining Cosmetic Product Review [22]	Stemming	Component Analysis (PCA)	es (SVM)	
The model proposed	Tokenization, Stopword Removal, Stemming	Particle Swarm Optimization (PSO)	Support Vector Machine (SVM) classifier	?

In this study, the algorithm Support Vector Machine and Particle Swarm Optimization algorithm will be applied as a method of feature selection. Researchers will compare these methods to classify text on twitter review of the Supreme Court of the Republic of Indonesia in order to improve the accuracy of sentiment analysis.

3.11 Research Framework

The research framework model used is the method of improvement, which is often used in research in the field of science and engineering, including the field of computing therein. The components of the method improvement thinking method are Indicators, Proposed Methods, Objectives and Measurements. The framework of thought in this study started from the analysis of twitter sentiment on the Supreme Court of the Republic of Indonesia. So with this the author tries to make a soft computing by using Support Vector Machine (SVM) based Particle Swarm Optimization (PSO). For that Particle Swarm Optimization (PSO) to solve the problem. To develop applications based on the model created, use RapidMiner. Then tested by Cross validation on the performance of the two methods, the results are shown by Confusion Matrix and ROC curve. Below is a frame of thought in the form of a chart:



C=*Constant*
ε =*Epsilon*

Figure. 7. Illustrates The Framework Proposed In This Study

3. RESEARCH METHOD

3.1 Design Research

Research to mean a systematic problem solving activity, undertaken with care and concern in the context of the situation at hand [23]. Four of the most common research methods that you might use (either individually or combined) are action research, experiment, case study and survey [24]. In the context of a research project, a method refers to an organised approach to problem-solving that includes (1) collecting data, (2) formulating a hypothesis or proposition, (3) testing the hypothesis, (4) interpreting results, and (5) stating conclusions that can later be evaluated independently by others [23].

Research method used by researchers is experimental research method with the following stages:

1. Data Collection: Data for this experiment were collected, and then selected from the data that does not fit.
   Data Collection: Data for this experiment were collected, and then selected from the data that does not fit.
2. Data Initial Processing: Model selected based on the suitability of the data with the best

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method of some text classification method that has been used by previous researchers. The model used is the algorithm of Support Vector Machines (SVM).

Initial Processing Data: Model selected based on the suitability of the data with the best method of some text classification method that has been used by previous researchers. The model used is the algorithm of Support Vector Machines (SVM).

3. Proposed method: To improve the accuracy of the algorithm of Support Vector Machines (SVM), then the addition of the improved method of optimization that combines Particle Swarm Optimization (PSO).
4. Experiment and Testing Methods: For experimental research data, researchers used Rapid Miner 7.6 to process the data and as an aid in assessing the accuracy of the data of experiments conducted in the study.
5. Evaluation and Validation Results: The evaluation was conducted to determine the accuracy of the model algorithm Support Vector Machines. Validation is used to compare the results of the accuracy of the model used by the results that have been there before. Validation technique used is Cross Validation, accuracy algorithm will be measured using the Confusion Matrix and the processed data in the form of the ROC curve.

3.2 Data Collection

During May to November 2017 data collected 1500 tweets from the Search Twitter about the Supreme Court of the Republic of Indonesia.

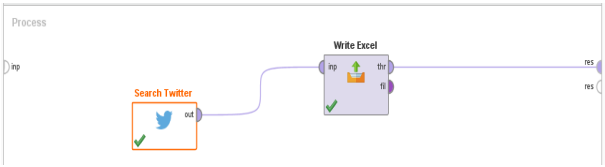

Figure. 8. Data Collection On Twitter Search

3.3 Initial Data Processing

The amount of data obtained from data collection is as many as 1500 data consisting of 1083 data with positive sentiment and 417 data with negative sentiment, but not all attributes are used because it must go through several stages of data processing (preparation data).

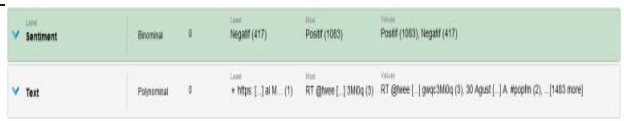

Figure. 9. Attributes And Data Used In Initial Data Processing

3.4 Proposed method

The method proposed in this research is to use wrapper feature selection method. Of the type wrapper used is Particle Swarm Optimization (PSO) Algorithm as a feature selection method that the accuracy of the classifier Support Vector Machine (SVM) can be increased. The author uses the classifier Support Vector Machine (SVM) as it is very capable of identifying separate hyperplane that maximizes the margin between the two classes, efficient and is a popular machine learning techniques for text classification, and has good performance. Particle Swarm Optimization (PSO) applied writer is using Support Vector Machine (SVM) were tested in the wrapper stage.

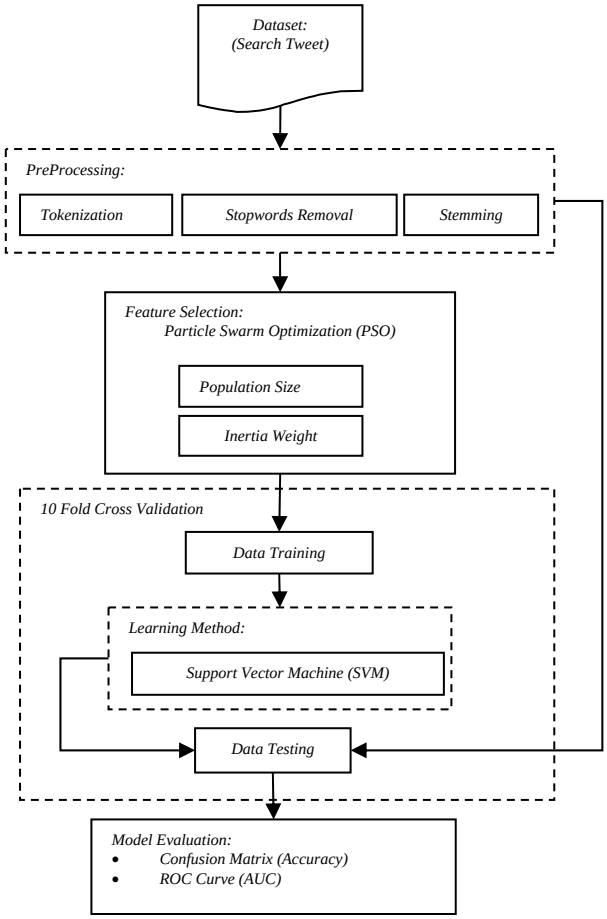

Figure. 10. Proposed Method

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3.5 Evaluation and Validation Results

The proposed model is to apply Support Vector Machine (SVM) and Support Vector Machine (SVM) based on Particle Swarm Optimization (PSO). Application of Support Vector Machine (SVM) algorithm by determining the weight value first. After obtaining the highest accuracy and AUC value, the weight will be used to find the highest accuracy and AUC value. While the implementation of Particle Swarm Optimization (PSO) based Vector Machine Support (SVM) algorithm is based on the weight value of the algorithm. Having found the most ideal accuracy value of these parameters the next step is to determine the value of weight. Having found the most ideal accuracy value of these parameters the next step is to determine the weight to form an ideal algorithm structure for solving the problem.

4. RESULT & DISCUSSION

4.1 Experimental Results Test Methods

1 Support Vector Machine (SVM)

Value of training cycles in this study was determined by by testing inserting C, epsilon. The best results in the experiment above SVM is with C = 0.0 and epsilon = 0.0 resulting accuracy 91.05% and AUC 0.952.

2. Support Vector Machine (SVM) Based on Particle Swarm Optimization (PSO)

Value of training cycles in this study was determined by testing inserting C, epsilon and population size. Here are the results of the experiments have been conducted to to determine the value of training cycles.

Table 2. Experimental Determination Of Value Training Cycles Svm- Based Pso

C	epsilon	SVM		Population size	SVM-PSO	
		accuracy	AUC		accuracy	AUC
0.0	0.0	91.05%	0.952	5	91.72%	0.953
0.1	0.1	89.63%	0.935	5	91.18%	0.926
0.2	0.2	89.70%	0.934	5	91.31%	0.942
0.3	0.3	90.04%	0.935	5	91.44%	0.939
0.4	0.4	90.04%	0.935	5	91.18%	0.938
0.5	0.5	90.17%	0.933	5	91.18%	0.944
0.6	0.6	90.17%	0.934	5	90.97%	0.938
0.7	0.7	90.17%	0.933	5	91.18%	0.942
0.8	0.8	90.10%	0.933	5	91.04%	0.937
0.9	0.9	90.10%	0.932	5	91.11%	0.940
0.00	1.0	72.05%	0.500	5	72.05%	0.500
1.00	1.0	72.05%	0.500	5	72.05%	0.500
1.00	0.0	89.70%	0.935	5	89.70%	0.953

The best results in the PSO-based SVM experiment above were with C = 0.0 and epsilon = 0.0 and the population size = 5 produced accuracy 91.72% and AUC 0.953.

4.2 Evaluation and Validation Results

The model proposed in the study on the Supreme Court of the Republic of Indonesia review is by applying Support Vector Machines (SVM), Support Vector Machine (SVM) based Particle Swarm optimization (PSO) to determine accuracy and AUC. The test method using Cross Validation with the design model as follows:

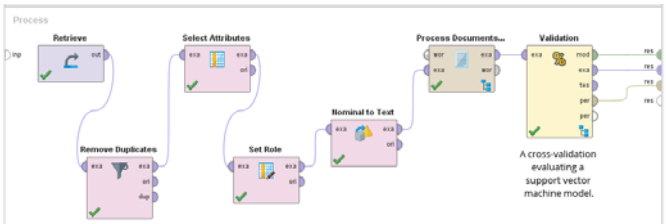

Figure. 11. Design Model Validation

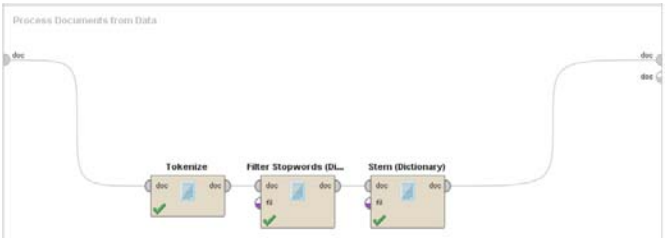

Figure. 12. Design Preprocessing Models

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Results of Testing Model Support Vector Machine (SVM)

4.3 Results of Testing Model Support Vector Machine (SVM)

In the determination of the research results of a review about the Supreme Court of the Republic of Indonesia using Support Vector Machine algorithm in the framework Rapid Miner as follows:

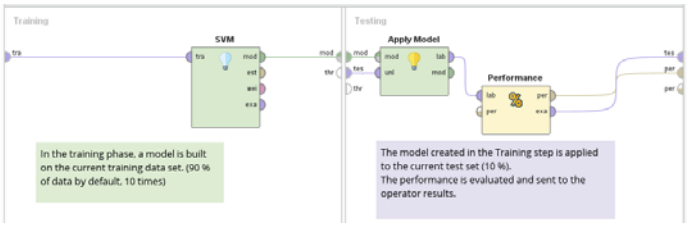

Figure. 13. Model Validation Testing Support Vector Machine

Value accuracy, precision and recall of training data can be calculated by using Rapid Miner. Test results using Support Vector Machine-based model of PSO is obtained in Table 2.

1. Confusion Matrix

Table 3 for data of the positive reviews of data search tweet about the supreme court of the republic of indonesia, 1051 are classified into a positive review in accordance with the predictions made by the method of data predicted SVM and 19 positive reviews but it turns out the prediction results of negative reviews. For data negative review of data search tweet about the supreme court of the republic of indonesia, 114 negative reviews are classified according to the predictions made by the method of data predicted SVM and 301 negative reviews prediction result is positive review.

Table 3. Confusion Matrix Model To Support Vector Machine Method

accuracy: 91.05% +/- 2.37% (mikro: 91.04%)

	true Positif	true Negatif	class precision
pred. Positif	1051	114	90.21%
pred. Negatif	19	301	94.06%
class recall	98.22%	72.53%	

Based on Table 3 shows that, the level of accuracy by using the SVM algorithm is equal to 91.05%, and can be calculated to find the value of Accuracy, Sensitivity, Specificity, PPV and NPV result in the equation below:

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} = \frac{1051+301}{1051+301+19+114} = \frac{1352}{1485} = 0.91048771$$

$$\text{Sensitivity} = \frac{TP}{TP+FN} = \frac{1051}{1051+114} = \frac{1051}{1165} = 0.902146592$$

$$\text{Specificity} = \frac{TN}{TN+FP} = \frac{301}{301+19} = \frac{301}{320} = 0.940625$$

$$PPV = \frac{TP}{TP+FP} = \frac{1051}{1051+19} = \frac{1051}{1070} = 0.98224299$$

$$NPV = \frac{TN}{TN+FN} = \frac{301}{301+114} = \frac{301}{415} = 0.72530012$$

Conclusion The results of the calculation of the above equation shown in Table 4 below:

Table 4. Value Accuracy, Sensitivity, Specificity, Ppv And Npv For Support Vector Machine Method

	Percentage (%)
Accuracy	91.05 %
Sensitivity	90.21 %
Specificity	94.06 %
PPV	98.22 %
NPV	72.53 %

2. ROC Curve

The calculation result is visualized by ROC curve. Comparison of two methods of comparison can be seen in Figureure 14 which is the ROC curve for Support Vector Machine algorithm. ROC curves in Figure 14. The express confusion matrix of Table 3. The horizontal line is a false positive and true positive vertical lines.

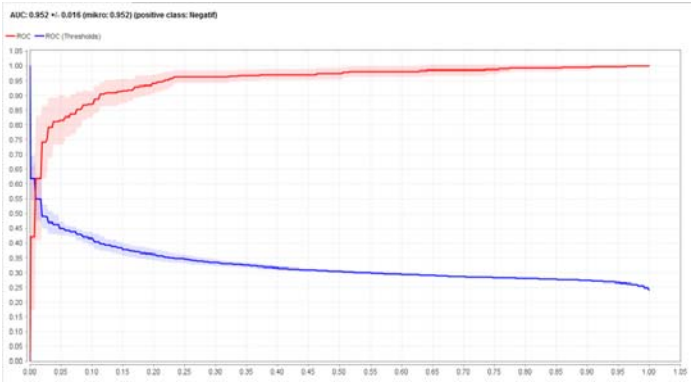

Figure. 14. ROC Curve Model Support Vector Machine (SVM) Before Using Particle Swarm Optimization (PSO)

From Figure 14 is a graph of the ROC with the value AUC (Area Under the Curve) of 0.952 in which diagnosis classification result was very good (excellent classification).

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4.4 Results of Testing Model Support Vector Machine (SVM)-Based Particle Swarm Optimization (PSO)

In a sentimental analysis research using Particle Swarm Optimization (PSO) based Vector Machine (SVM) algorithm on the RapidMiner framework as follows:

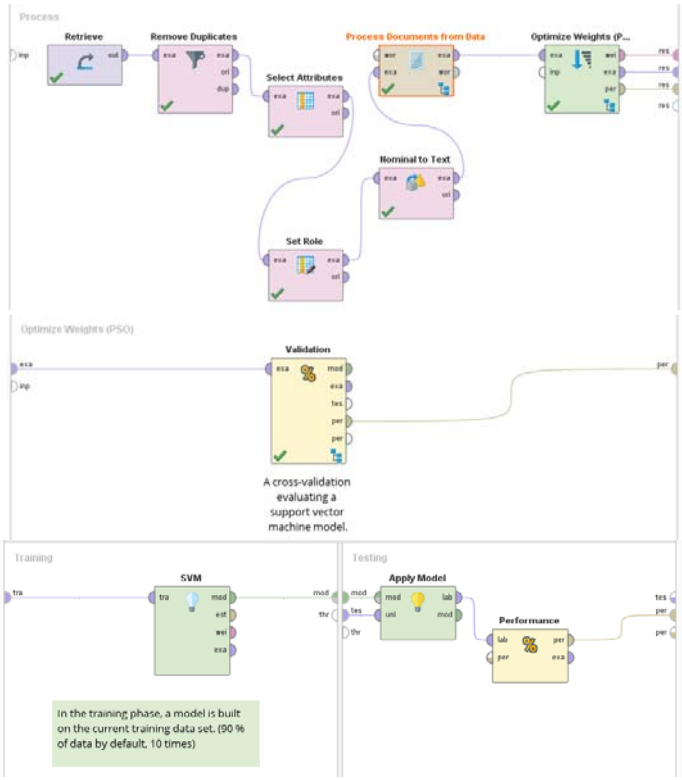

Figure. 15. Model Validation Testing Support Vector Machine-Based PSO

Value accuracy, precision and recall of training data can be calculated by using Rapid Miner. Test results using Support Vector Machine-based model of PSO is obtained in Table 5.

1. Confusion Matrix

Table 5 for data of the positive reviews of data search tweet about the supreme court of the republic of indonesia, 1053 are classified into a positive review in accordance with the predictions made by the method of data predicted SVM and 17 positive reviews but it turns out the prediction results of negative reviews. For data negative review of data search tweet about the supreme court of the republic of indonesia, 106 negative reviews are classified according to the predictions made by the method of data predicted SVM and 309 negative reviews prediction result is positive review.

Table 5. Confusion Matrix Model For Support Vector Machine Method-Based Pso

accuracy: 91.72% +/- 1.78% (mikro: 91.72%)

	true Positif	true Negatif	class precision
pred. Positif	1053	106	90.85%
pred. Negatif	17	309	94.79%
class recall	98.41%	74.46%	

Based on Table 5 shows that, the level of accuracy by using the SVM algorithm based PSO is equal to 91.72%, and conclusion the results of the calculation of the above equation shown in Table 6 below:

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} = \frac{1053+309}{1053+309+17+106} = \frac{1362}{1485} = 0.91717172$$

$$\text{Sensitivity} = \frac{TP}{TP+FN} = \frac{1053}{1053+106} = \frac{1053}{1159} = 0.90854186$$

$$\text{Specificity} = \frac{TN}{TN+FP} = \frac{309}{309+17} = \frac{309}{326} = 0.94785276$$

$$PPV = \frac{TP}{TP+FP} = \frac{1053}{1053+17} = \frac{1053}{1070} = 0.98411215$$

$$NPV = \frac{TN}{TN+FN} = \frac{309}{309+106} = \frac{309}{415} = 0.74457831$$

Conclusion The results of the calculation of the above equation shown in Table 6 below:

Table 6. Value Accuracy, Sensitivity, Specificity, Ppv And Npv For Support Vector Machine Method-Based Pso

	Percentage (%)
Accuracy	91.72 %
Sensitivity	90.85 %
Specificity	94.79 %
PPV	98.41 %
NPV	74.46 %

2. ROC Curve

The calculation result is visualized by ROC curve. Comparison of two methods of comparison can be seen in Figure 14, which is the ROC curve for Support Vector Machine Algorithm-based PSO. ROC curves in Figure 16 expresses confusion matrix of Table 5. The horizontal line is a false positive and true positive vertical lines.

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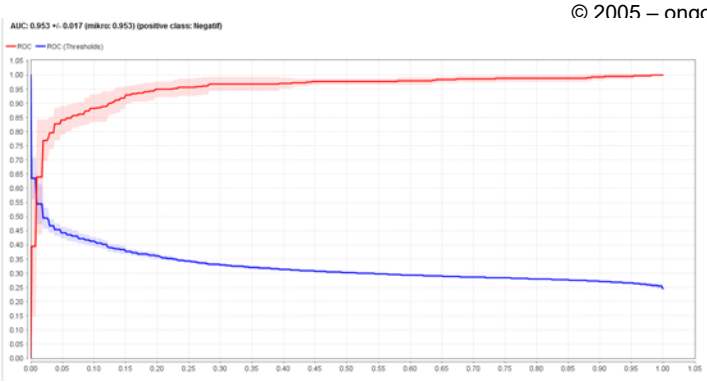

Figure. 16. ROC Curve Model Support Vector Machine (SVM) After Using Particle Swarm Optimization (PSO)

There is a chart of Figure 9 ROC AUC value (Area Under the Curve) of 0.953 in which the diagnosis result excellent classification.

4.5 Evaluation and Validation Analysis Model

From the test results above, the measurement accuracy using a confusion matrix and ROC curve proved that the test results of SVM-based PSO algorithm has a higher accuracy rate than the SVM algorithm. Value for the accuracy of the SVM algorithm model of 91.05% and an accuracy value for SVM-based PSO algorithm model of 91.72%, with a 0.67% difference in accuracy can be seen in Table 7 below:

Table 7. Testing Algorithms Svm And Svm-Based Pso

	Successful Classification of Possitive Review	***Successful Classification of Negative Review***	***Accuracy***	***AUC***
SVM	1051	301	91.05%	0.952
SVM Based PSO	1053	309	91.72%	0.953

For the evaluation using the curve ROC resulting value of AUC (Area Under the Curve) to the model algorithm SVM generate value 0.952 with a value of diagnosis Excellent Classification, then to the algorithm SVM-based PSO (Particle Swarm Optimization) to the accuracy of the total of 91.72% turned out to produce AUC values similar with SVM algorithm model (fixed) that is equal to 0.953 with the diagnosis Excellent value Classification, and the difference in value both at 0.01. Thus the SVM-based PSO algorithm can provide solutions to the problem in twitter review sentiment analysis of the Supreme Court of the Republic of Indonesia.

5. CONCLUSION

In this study tested the model using Support Vector Machine (SVM) and Support Vector Machine (SVM)-based Particle Swarm Optimization (PSO) using twitter data from various users with various positive and negative opinions about Indonesian Supreme Court real-time posting taken from Search Tweet on Software RapidMiner version 7.6. The resulting model was tested to get the value of accuracy, precision, recall and AUC of each algorithm to obtain the test by using Support Vector Machine (SVM) value obtained accuracy is 91.05% with the value of AUC is 0.952. Later the testing using Support Vector Machine-based Particle Swarm Optimization (PSO) values obtained 91.72% accuracy with the value of AUC is 0.953. Thus the results of testing the model above it can be concluded that Support Vector Machine (SVM)-based Particle Swarm Optimization (PSO) provide solutions to the problem of review sentiment review of the Supreme Court of the Republic of Indonesia is more accurate.

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