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The 1st International Conference of Combinatorics, Graph Theory, and Network Topology

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The First International Conference on Combinatorics, Graph Theory and Network Topology (ICCGANT)

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Preface

It is with my great pleasure and honor to organize the First International Conference on Combinatorics, Graph Theory and Network Topology which is held from 25-26 November 2017 in the University of Jember, East Java, Indonesia and present a conference proceeding index by Scopus. It is the first international conference organized by CGANT Research Group University of Jember in cooperation with Indonesian Combinatorics Society (INACOBMS). The conference is held to welcome participants from many countries, with broad and diverse research interests of mathematics especially combinatorical study. The mission is to become an annual international forum in the future, where, civil society organization and representative, research students, academics and researchers, scholars, scientist, teachers and practitioners from all over the world could meet in and exchange an idea to share and to discuss theoretical and practical knowledge about mathematics and its applications. The aim of the first conference is to present and discuss the latest research that contributes to the sharing of new theoretical, methodological and empirical knowledge and a better understanding in the area mathematics, application of mathematics as well as mathematics education.

The themes of this conference are as follows: (1) Connection of distance to other graph properties, (2) Degree/diameter problem, (3) Distance-transitive and distance-regular graphs, (4) Metric dimension and related parameters, (5) Cages and eccentric graphs, (6) Cycles and factors in graphs, (7) Large graphs and digraphs, (8) Spectral Techniques in graph theory, (9) Ramsey numbers, (10) Dimensions of graphs, (11) Communication networks, (12) Coding theory, (13) Cryptography, (14) Rainbow connection, (15) Graph labelings and coloring, (16). Applications of graph theory

The topics are not limited to the above themes but they also include the mathematical application research of interest in general including mathematics education, such as:(1) Applied Mathematics and Modelling, (2) Applied Physics: Mathematical Physics, Biological Physics, Chemistry Physics,(3) Applied Engineering: Mathematical Engineering, Mechanical engineering, Informatics Engineering, Civil Engineering,(4) Statistics and Its Application,(5) Pure Mathematics (Analysis, Algebra and Geometry),(6) Mathematics Education, (7) Literacy of Mathematics,(8) The Use of ICT Based Media In Mathematics Teaching and Learning,(9) Technological, Pedagogical, Content Knowledge for Teaching Mathematics, (10) Students Higher Order Thinking Skill of Mathematics, (11) Contextual Teaching and Realistic Mathematics, (12) Science, Technology, Engineering, and Mathematics Approach, (13) Local Wisdom Based

Education: Ethnomathematics, (14) Showcase of Teaching and Learning of Mathematics, (16) The 21st Century Skills: The Integration of 4C Skill in Teaching Math.

The participants of this ICCGANT 2017 conference were 200 people consisting research students, academics and researchers, scholars, scientist, teachers and practitioners from many countries. The selected papers to be publish of Journal of Physics: Conference Series are 80 papers. On behalf of the organizing committee, finally we gratefully acknowledge the support from the University of Jember of this conference. We would also like to extend our thanks to all lovely participants who are joining this unforgettable and valuable event.

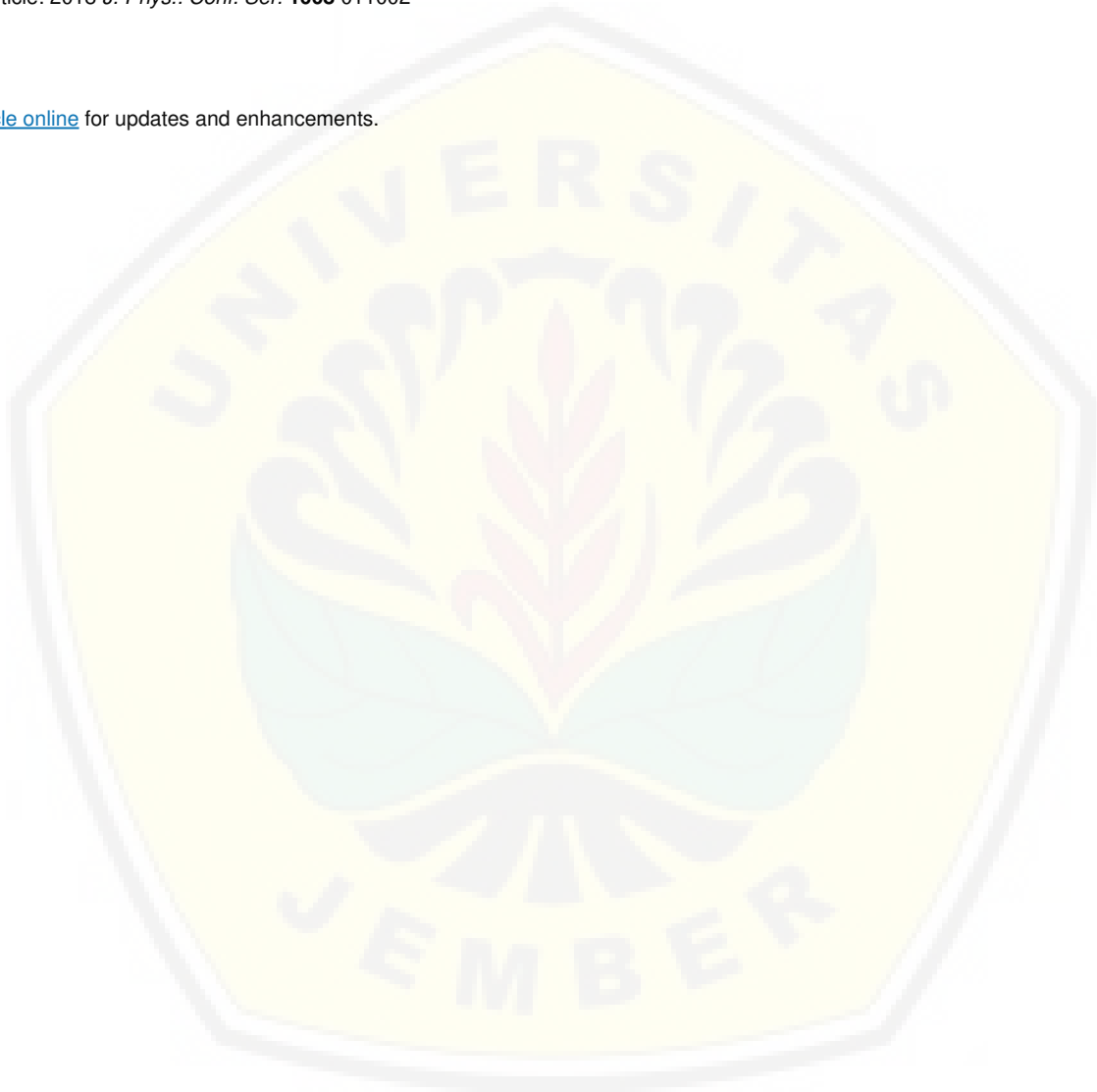<div align="right">Prof. Drs. Dafik, M.Sc., Ph.D.</div>

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The Committees of The First International Conference on Combinatorics, Graph Theory and Network Topology (ICCGANT)

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The committees of the First International Conference on Combinatorics, Graph Theory and Network Topology would like to express gratitude to all Committees for the volunteering support and contribution in the editing and reviewing process.

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Peer review statement

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Peer review statement

All papers published in this volume of *Journal of Physics: Conference Series* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

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Sentiment analysis system for movie review in Bahasa Indonesia using naive bayes classifier method

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Abstract—There are many ways of implementing the use of sentiments often found in documents; one of which is the sentiments found on the product or service reviews. It is so important to be able to process and extract textual data from the documents. Therefore, we propose a system that is able to classify sentiments from review documents into two classes: positive sentiment and negative sentiment. We use Naive Bayes Classifier method in this document classification system that we build. We choose Movienthusiast, a movie reviews in Bahasa Indonesia website as the source of our review documents. From there, we were able to collect 1201 movie reviews: 783 positive reviews and 418 negative reviews that we use as the dataset for this machine learning classifier. The classifying accuracy yields an average of 88.37% from five times of accuracy measuring attempts using aforementioned dataset.

1. Introduction

Information presented in cyberspace is now more diverse and the media used means in the process of information diffusion are growing. One of the main media used in the process diffusing information in cyber media is text or document media. The ability in order to extract information from documents is absolutely necessary. The method of extracting information from data in the form of documents is known as text mining. Over 80% of information is currently stored in the form of text, so that text mining is believed to have high commercial value potential [1]. describe the steps taken in text mining: tokenizing, filtering, stemming, tagging, and analyzing [2].

Sentiment analysis is one of the new branches in the domain of text mining or data extraction in the form of text, consisting of processing and extracting textual data automatically in order to obtain information [3, 4, 5, 6, 7]. Sentiment analysis can be utilized as a tool in seeing the public response of a particular event, either positive or negative response, so that the next strategic steps can be undergone immediately. An example of sentiment data in the form of document is movie review from various sites on the internet. Reviews obtained from movie reviews sites can be used a reference for movie fans to know recommended and also a medium for movie producers to know the public responses towards the movie released. Movie review can be divided into a number of categories based on the sentiments contained in the document.

There are some difficulties in developing sentimental analysis study on movie review using Bahasa Indonesia partly due to the lack of studies on movie review documents using Bahasa Indonesia and the lack of corpus or textual literature for movie review using Bahasa Indonesia as the original language of the document.

Based on the description above, the researchers are interested in creating a system which is capable of categorizing movie review in Bahasa Indonesia into two categories of positive and negative sentiments using the method of Naïve Bayes Classifier [8, 9]. Naïve Bayes Classifier method is one of the supervised learning models based on statistics and probability with high level of accuracy [10].

2. Result and Discussion

The steps in this study include the step of literature review, data collection, and system development. The method employed in system development is the method of Naive Bayes Classifier [11]. The flow diagram of the study steps is illustrated in Figure 1.
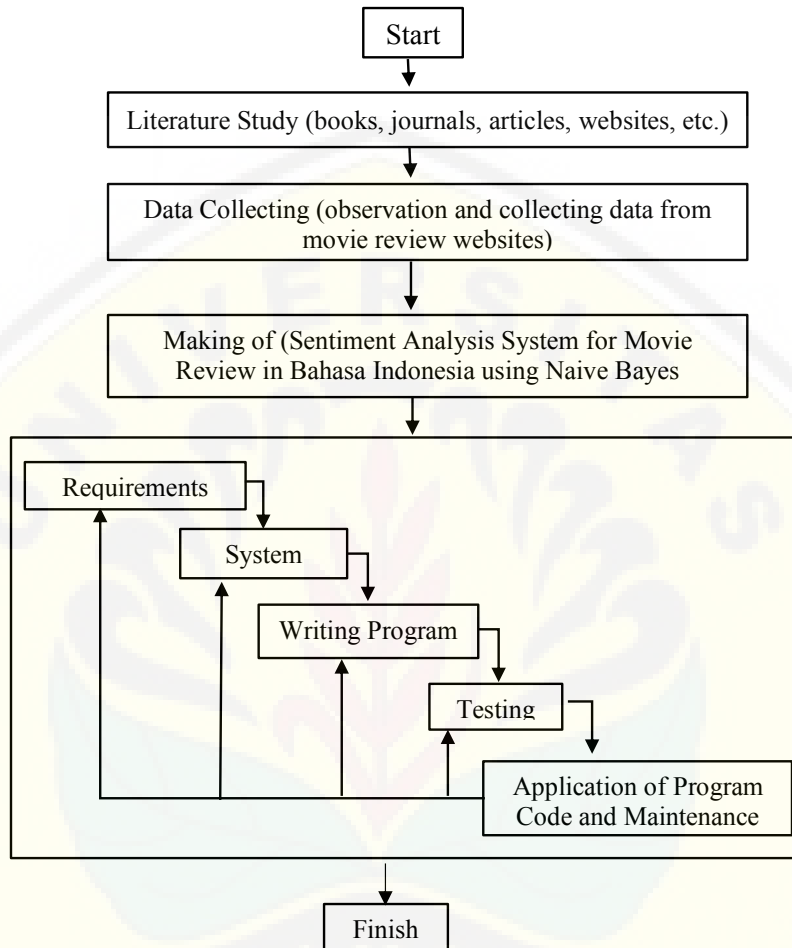

Figure 1. Flow Chart of Research Phases

2.1 Data Collection

The data collection is performed in order to obtain the information needed to determine the system requirements. The data used in the study is divided into two categories based on the data source: primary data and secondary data. The primary data required in the development of the Sentiment Analysis System for Movie Review is a dataset of movie review. The movie review dataset is made by the researcher using a movie review obtained from the movie review web page of Movienthusiast. Secondary data required in this study is the root words in the Great Dictionary of the Indonesia Language (KBBI) and stop words dictionary or set of words which are considered less important and is able to be removed from the movie review text [12, 13, 14]. The dictionary of stop words used comes from the study conducted by Tala.

2.2 The Naive Bayes Classifier Method Implementation

The Sentiment Analysis System for Movie Review which is developed implements the Naive Bayes Classifier method in classifying the movie review documents into two classes: positive sentiment class and negative sentiment class. The flowchart regarding the overview of the Sentiment Analysis System for Movie Review is illustrated in Figure 2.
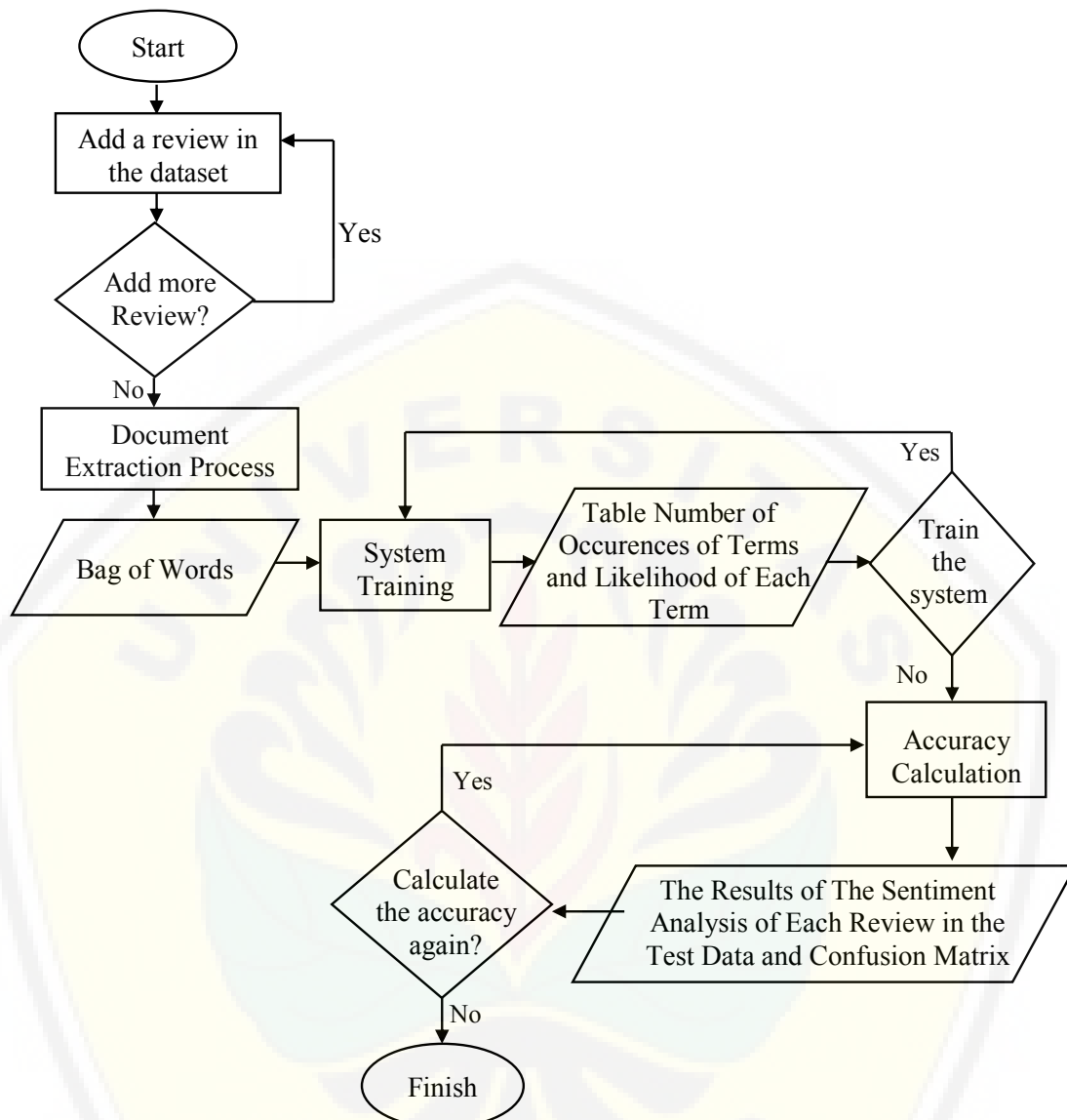
Figure 2. Overview of Film Review Sentiment Analysis System

The explanation on Figure 2. above is: firstly, the derived from the movie review is submitted by the user one by one. The submitted review may be categorized into training data or test data based on the user's wishes. The system, then, executes the document extraction process in order to generate a collection of terms from each review text and so-called bag of words. The next step is to train the system. At this step, the system constructs a model of the training data by calculating the occurrences of each term in the training data and likelihood value [15]. The result of the system training process is a table of feature sets containing the number of occurrences and likelihood values of each term in the training data. The likelihood value is, then, incorporated into the next step which is the calculation of the system accuracy [16].

The system performs the classification process using the Naive Bayes Classifier method in order to obtain the best class of sentiment of each review in the category of data train. The results of the accuracy calculation are the sentiments of the classification of each test data review and the confusion matrix table obtained from the original sentiment comparison of the test data review and the sentiment of the analysis result. System accuracy can be concluded from the confusion matrix. The planning steps which are implemented based on the waterfall method [17].

2.3 Requirement Analysis

System requirement is the ability of the system to meet the condition desired by the users. System requirement analysis is performed by grouping the needs into functional requirements and non-functional requirements.

2.3.1 Functional Requirements

The functional requirements of the Sentiment Analysis System for Moview Review are as follows:

1. The system can manage (add, read, update, and delete) movie review datasets,
2. The system can manage (add, read, update, and delete) the dictionary of root words in Bahasa Indonesia,
3. The system can manage (add, read, update, and delete) the dictionary of stop words,
4. The system can perform the classifier training process and display the model in the form of feature sets of the term data from the training data,
5. The system can display the test data result and display confusion matrix generated from the classifier testing,
6. The system can display a set of movie review dataset terms derived from tokenizing, filtering, and stemming processes, and
7. The system can display sentiment analysis result derived from reviews submitted by users.

2.3.2 Non-Functional Requirements

Meanwhile, the non-functional requirements of the Sentiment Analysis System for Movie Review are as follows:

1. The system uses an authentication through login process in order to differentiate user level.
2. The system can run in various web browsers which support the system environment,
3. The system gives a fast response, and
4. The system has a user-friendly interface design.

2.4 System Design

The design of the Sentiment Analysis System for Movie Review uses Unified-Modeling Language (UML) as the modeling language and object-oriented programming concept. The documentation of the created system includes:

2.4.1 Business Process

Business process diagram describes a series of inputs, needs, and outputs processed by the system in order to produce the desired destination by the user. Description of business process system can be seen in Figure 3.
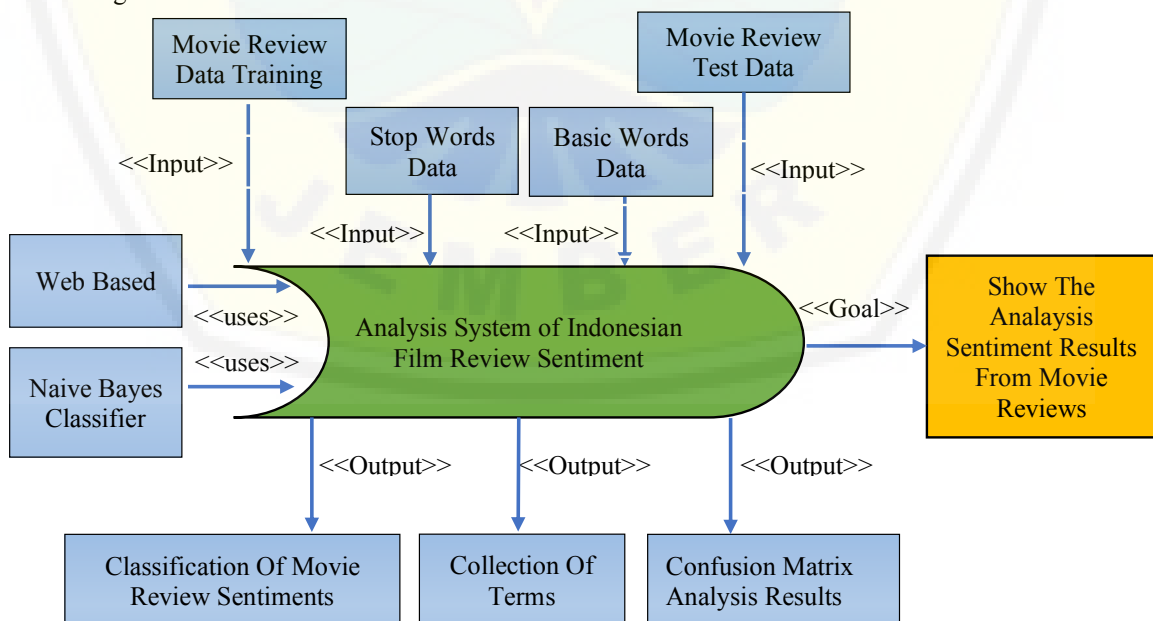

Figure 3. Bussiness Process Movie Sentiment Analysis System Review

2.4.2   Use case Diagram

Use case diagram describes the system's functional needs in the form of diagram. Use case is needed to describe typical interactions between users and system. Use case diagram of the Sentiment Analysis System for Movie Review is illustrated in Figure 4.
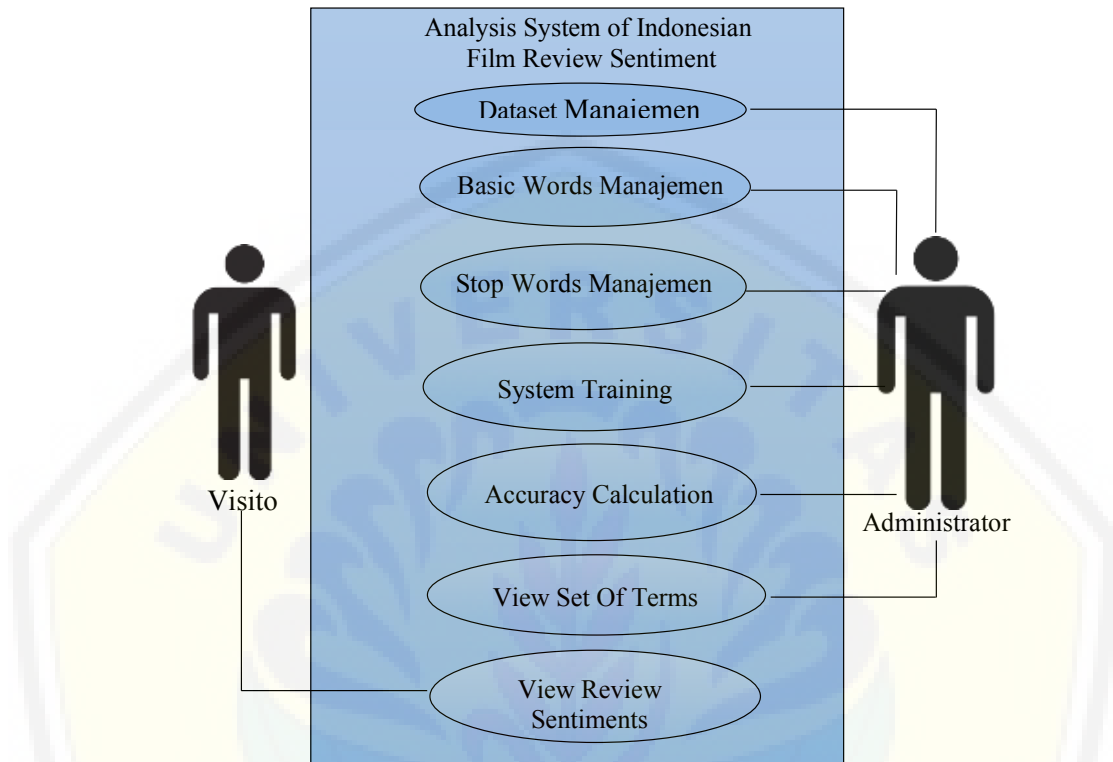

Figure 4. Use Case Diagram Sentiment Analysis Movie Review System

2.4.3 Deployment Diagram

Deployment diagram is a diagram illustrating the physical layout of the system. This diagram is included in order to describe the hardware and software required for the system to run according to the system needs. Deployment diagram of the Sentiment Analysis System for Movie Review can be seen in Figure 5.
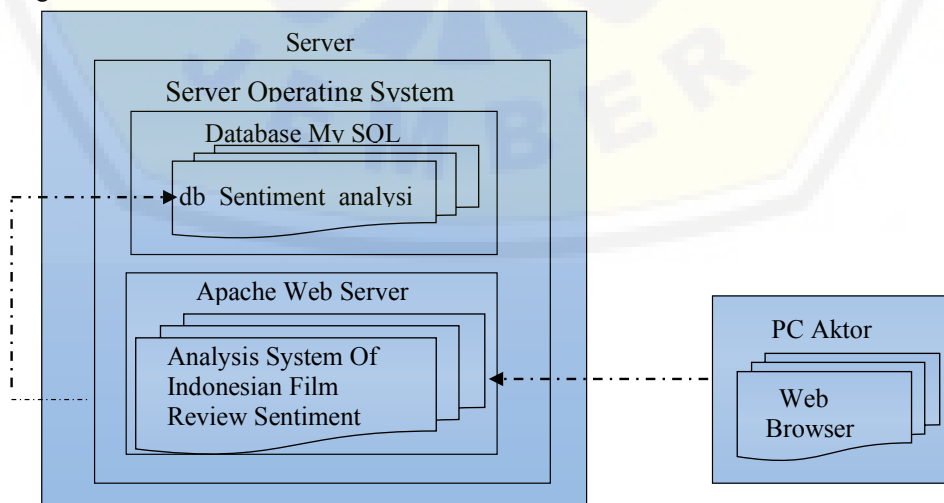

Figure 5. Deployment diagram of the Sentiment Analysis System for Movie

Sentiment Analysis System for Movie Review is developed as a web-based application. The webpage of Sentiment Analysis System for Movie Review is divided into two levels based on the user level: private page for the administrators and public page for the visitors. The private page contains the management dataset menu of the movie review, the stop words management menu, the training system menu, the accuracy calculation menu, and menu containing the set of terms from each movie review on the dataset. The public page contains an interface for visitors wanting to obtain sentiment analysis result from the movie reviews within the system. The main features displayed in the discussion are the dashboard page, system training page, system accuracy calculation page for the visitors.

2.5 System Interface Implementation`

The dashboard page is the first accessed page once the administrator has successfully logged in to the system. The dashboard contains brief information on datasets, such as the number of review for each category, the ratio of training and test data as well as the ratio of positive and negative training data. The information is displayed in the form of numbers and graphs of donut charts. System training page contains a table on the occurrences and likelihood values of each term in all train data. The process of system training in order to form feature sets is performed by the administrators through the interface page by selecting the button of "Latih".

The accuracy calculation page contains a list of reviews which become test data within the dataset, probability of the positive sentiment and negative sentiment for each test data, the result of the class analysis with the highest probability, and the accuracy value of the analysis result towards the original sentiment of the reviews. In addition to the review table of the test data, there are accuracy values of the system's last accuracy test result which have been converted into percentage format and confusion matrix table of the last accuracy test result. Accuracy calculation process is also initiated by the administrators through the interface page by selecting the "Hitung (calculate)" button.

The visitor page is the page which is for the visitors. The visitors can access this page in order to enter the review data they want to know the sentiment of. After selecting the "Lihat Sentiment (view sentiment)" button, the system classifies using the Naive Bayes method in order to obtain positive and negative sentiment probabilities as well as the sentiment result obtained based on the probability ratio of the two sentiment classes.

2.6 Accuracy Calculation Result

The testing process is conducted five times. The first test was conducted by selecting 600 reviews as the training data and 200 reviews as the random test data. Further tests were performed by adding 100 movie reviews as the test data and test data of 20 movie reviews into the dataset utilized for the previous test. Details of the composition of each training and test data for each test process can be seen in Table 1.

Table 1. Composition each training and test data for each test process

Testing no.	Number of Training Data	Number of Testing Data	Number of Positive Training Data	Number of Negative Training Data	Number of Positive Testing Data	Accuracy (%)
1	600	120	390	210	78	87,50%
2	700	140	454	246	91	87,86%
3	800	160	520	280	104	88,13%
4	900	180	585	315	117	88,33%
5	1000	201	650	350	132	90,05%

Based on the five times accuracy calculation processes of the Sentiment Analysis System for Movie Review, the obtained accuracy data for each process is available in the following table 2.

Table 2. Obtained accuracy data for each process

Testing no.	Number of Training Data	Number of Testing Data	Accuracy (%)
1	600	120	87,50%
2	700	140	87,86%

3	800	160	88,13%
4	900	180	88,33%
5	1000	201	90,05%
	Average Value:		88,37%

3. Conclusions

The Sentiment Analysis System for Movie Reviews implements the method of Naive Bayes Classifier in order to obtain the highest posterior probability value of the two review classes of sentiment. The posterior probability value is obtained from the total sum of log prior probability and log likelihood of each term in each review of the training data for each sentiment class. The average accuracy produced by the Sentiment Analysis System for Movie Review is 88.74% out of five time testing processes. The first test was conducted by training 600 movie reviews as the training data and classifying 120 movie reviews as the random test data. For each test, the dataset from the previous conducted test is added with 100 movie reviews as the training data and 20 movie reviews as the test data. The highest accuracy is obtained when the dataset used consists of 1,000 review of training data and 201 test data review and the percentage is 90.05%. The accuracy value is directly proportional to the number of reviews used as the dataset.

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