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Implementation of Data Mining Using Naïve Bayes Classification Method To Predict Participation of Governor And Vocational Governor Selection in Jemirahan Village, Jabon District

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Abstract−General Election (ELECTION) is an important political event to determine a leader in a democratic country. The General Election (ELECTION) in East Java, which was held on June 27, 2018 yesterday was the election of the Governor and Deputy Governor for the period 2019-2024. There are two pairs of candidates for Governor and Deputy Governor. Through the General Election (ELECTION) then all parties can be accommodated what they want and aspire to so that a better life can be realized. The community is the determining component of the success or failure of an Election. Therefore, in this study, the researcher wanted to examine how to participate in the election in Jemirahan Village, Gabon District by using the classification method, the Naïve Bayes algorithm. To predict General Participation (PEMILU) in Jemirahan Village, Gabon District, it can be done using the Naïve Bayes Algorithm with 6 predefined variables. The results of the prediction of participation from the data taken were 300 data divided by 2 namely 65% of 195 Training data and 35% of 105 Testing data.

Keywords: Data Mining, Classification, Naïve Bayes, Election Participation

1. INTRODUCTION

General Election (ELECTION) is an important political event to determine the leader in a democratic country. Permanent Voter List (DPT) is a citizen who has been registered to vote at the Polling Station (TPS). There are several problems related to the DPT including the General Election Commission (KPU) is difficult to get the NIK from people who are in prison. With these problems, resulting in a lack of public participation to participate in this election.

Therefore, in this study, the researcher wanted to examine how the electoral participation in Jemirahan Village, Jabon District by using the classification method, the naïve Bayes algorithm. The focus of this study is to predict the participation of the Governor and Deputy Governor in the Jemirahan Village, Gabon District, Sidoarjo Regency. This research uses a qualitative research approach.

Election data token is data from the General Election Commission (KPU) of Sidoarjo specifically in Jemirahan Village, Jabon District. Data will be processed using the naïve Bayes classification method to find out who participated in the election of the Governor and Deputy Governor in June 2018 in Jemirahan Village, Gabon District.

2. THEORY

2.1 Election

General Election (ELECTION) is an activity to determine a leader from the Democratic State. Elections are also very important in democracies that include a system of representation and work on it as a means of grouping people's voices in representative institutions. Then a quick counting system is needed to find out who is participating. [1]

Elections in Indonesia can be divided into 2 (two), namely:

1. New Order Election
   This election began in 1955 and is the first General Election (ELECTION) held in the State of Indonesia.
2. Electoral Reform Era
   The General Election process in 1997 and became a milestone in the reform era..

2.2 Data Mining

Data Mining is a data collection process that is processed by various methods. Another term for data mining is knowledge-discovery in the database (KDD). The purpose of data mining is to utilize the data and process it to obtain new and useful information.

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There are several types of data mining grouping according to [2]:

1. Description
   To describe patterns in a data.
2. Estimation
   The goal is more numerical than category, this estimation is almost similar to classification.
3. Predictions
   The result of predictions is to show something that hasn't happened yet
4. Classification
   The purpose of this classification is categorical
5. Clustering
   Clustering is more towards grouping records or cases that have similar data
6. Association
   To identify the relationship between events that occur at one time.

The data mining phase is interactive and the stages of data mining are divided into several stages including [3]

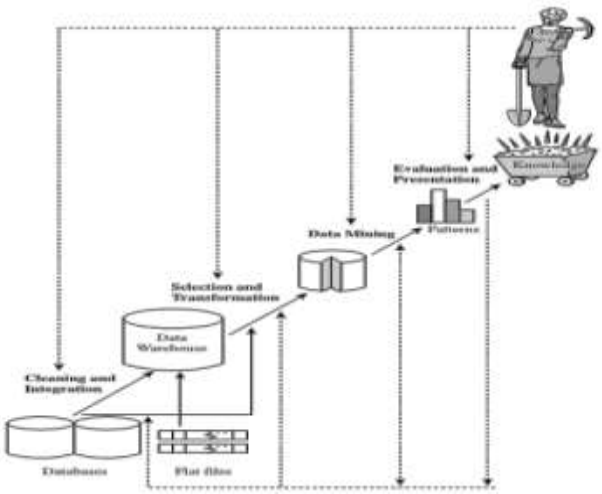

Figure 1. Data Mining Stages

1. CleaningIs the process of removing / cleaning an inconsistent data.
2. Integration (integration)I s the merging of data from various databases into one new database
3. Selection (Selection) Data selection (data selection) Not all data in the database is used, only the data taken is suitable for analysis.
4. Transformation
   Data will be converted into a format that is suitable for the data mining process.
5. Data mining process
   Is the most important process in the method used to find knowledge?
6. Pattern evaluation
   Identify a unique and interesting pattern in the knowledge base
7. Knowledge presentation
   It is a presentation of knowledge of the methods used to obtain the knowledge obtained by users.

2.3 Naïve Bayes Method

The Naïve Bayes method is a method for calculating probability values by adding up frequencies and combinations of values from a dataset. Naïve Bayes is assumed as a simplification of the attribute value of the attributes that are free if given output value. The advantage of using Naïve Bayes is that this method only requires two data: training data and testing set to collect the data you want to obtain [4].

The Naïve Bayes' theorem is:

$$P\ (H|X) = \frac{P(X|H)P\ (H)}{P\ (X)} \qquad (1)$$

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Informasi:
X : Data dengan kelas yang tidak diketahui
H : Data hipotesis yang merupakan kelas khusus
P (H | X): probabilitas hipotesis H berdasarkan kondisi X (probabilitas posterior)
P (H) : Hipotesis probabilitas H (probabilitas sebelumnya)
P (X | H): Probabilitas X didasarkan pada kondisi hipotesis H
P (X) : Probabilitas X

To explain a Naïve Bayes method it is necessary to know that in the classification process it requires guidance to determine a class that is suitable for analysis.

2.4 Weka Tools

WEKA is a practical tool. WEKA is an acronym for the Waikato Environment for Knowledge Analysis, created at the University of Waikato, New Zealand. WEKA can also be used at several different levels and contains tools for preprocessing data, namely: classification, regression, grouping, association, and visualization. [6]

By presenting various algorithms to the WEKA tool, it can choose to choose the best and can solve a problem. WEKA functions multi platform and can be used as a library in Java applications. In the development of WEKA with version, 3.8 can manage large data using Hadoop and Spark. WEKA provides four (4) interfaces for managing datasets, namely:

1. Explorer: used to find the right algorithm. All data will be loaded into memory
2. Experimentation: used to find suitable parameters. The process can be automated.
3. Knowledge flow: used to process data flow. The settings that can be carried out can organize and manage large data collected.
4. Simple CLI (Command Line Interface)

3. METHODOLOGY

The design of the application of data mining application prediction of the participation of the Governor and Deputy Governor election can be divided into the following stages, namely:

1. Classification diagram
2. Data Collection
3. Manual Calculation
4. WEKA Stages / User Interface Design

3.1 Classification Diagram

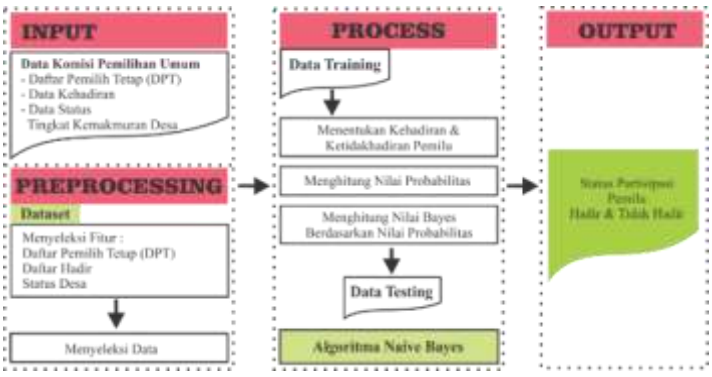

Figure 2. Classification diagram

3.2 Data Collection

Searching and collecting data is carried out first before conducting research. The following are the activities carried out in searching and collecting data that support this research.

a. Study of literature

This method is carried out in a literature study on the application concept that will be used by finding data related to population data for the General Election (ELECTION). The theory used comes from journal books and previous research that supports problem-solving in the research to be conducted.

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b. Observation

The method of data collection is done by research in the Office of the General Election Commission (KPU) Sidoarjo. So, with the data obtained, it can be implemented into the application system that is to be created.

3.2.1 Variables and Features

A variable is a collection of variables consisting of entities. The variables used for election data are 6 attributes. While features are the contents of variables. Data that has been obtained from the General Election Commission (KPU) can be known variables and features as follows:

Table 1. variables and Features

No.	Variable	Feature	Description
1	Nama	-	Names, Categorical Features
2	Age	Numerik {17,18,19,20,20,21,22,23,24,25, 26,27,28,29,30,31,32,33,34,35, 36,37,38,39,40,41,42,43,44,45, 46,47,48,49,50,51,52,53,54,55, 56,57,58,59,60,61,62,63,64,65, 66,67,68,69,71,73,74,76,77,78, 80,83}	Age, Numeric Features
3	Gender	Categorical {L, P}	Male Female
4	Distance	Categorical{J1, J2, J3}	J1= 0-150 meterS, J2= 150-200 meterS, J3= >200 meterS
5	Marital status	Categorical { B, S, P}	B = Not married yet S = Marriage P = Never Married
6	Presence	Categorical	Present and Not Present

3.2.2 Flowchart

In understanding a table form with attributes and records, from there a solution is obtained. In general, the Naive Bayes algorithm in the stages of determining solutions can be passed with the following picture:

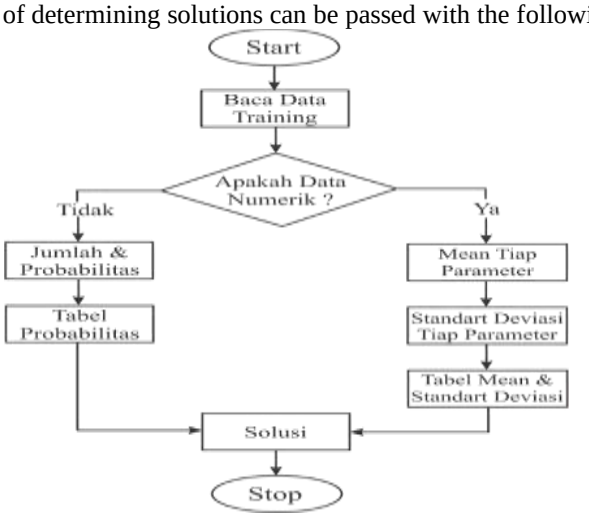

Figure 3. Data Flowchart Training

The captions from Figure 3.2 are:
1. Read training data
2. Calculating the number and probability
3. Get Bayes values based on probability
4. Produce a solution

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Figure 4. Flowchart Data Testing

The description of Figure 3.3 is:
a. Test data input
b. Determine the prediction class
c. Get the results of trial data

3.2.3 Tools Weka

Following is the User Interface design created using the Weka GUI Chooser Tools.

Figure 5. Initial Display of WEKA Application

Figure 6. Display User Interface

4. DISCUSSION

Data obtained from the General Election Commission (KPU) Sidoarjo. The data will be tested using the Naive Bayes classification method with Weka Tools and Website. The data set was taken as much as 300 data divided by 2, as much as 65% of 195 training data and as much as 35% of 105 testing data.

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Table 2. Dataset

No	Nama	Usia	Jenis Kelamin	Jarak	Status Nikah	Kehadiran
1	A ZAMZANI KURNIAWAN	33	L	0-150 meter	B	Hadir
2	ABD KHAFIF	19	L	>200 meter	B	Tidak Hadir
3	ABD. KARIM AS'ARI	51	L	>200 meter	S	Hadir
4	ABDUL ADIM	43	L	>200 meter	S	Hadir
5	ABDUL HAKIM KURNIAWAN	22	L	>200 meter	B	Hadir
6	ABDUL KADIR	60	L	>200 meter	S	Hadir
7	ABDUL KHAKIM KURNIAWAN	22	L	>200 meter	B	Tidak Hadir
8	ACH BAGUS FIRMAN KHAMALA	22	L	0-150 meter	B	Hadir
9	ACH BASORI	31	L	150-200 meter	B	Hadir
10	ACH SUGIYANTO	30	L	150-200 meter	B	Hadir

Table 3. Training Data

No	Usia	Jenis Kelamin	Jarak	Status Nikah	Kehadiran
1	33	L	0-150 meter	B	Hadir
2	19	L	>200 meter	B	Tidak Hadir
3	51	L	>200 meter	S	Hadir
4	43	L	>200 meter	S	Hadir
5	22	L	>200 meter	B	Hadir
6	60	L	>200 meter	S	Hadir
7	22	L	>200 meter	B	Tidak Hadir
8	22	L	0-150 meter	B	Hadir
9	31	L	150-200 meter	B	Hadir
10	30	L	150-200 meter	B	Hadir

Table 4. Testing Data

No	Usia	Jenis Kelamin	Jarak	Status Nikah	Kehadiran
1	54	P	>200 meter	S	?
2	20	L	>200 meter	B	?
3	39	P	150-200 meter	S	?
4	76	P	150-200 meter	S	?
5	61	L	150-200 meter	S	?
6	44	L	>200 meter	S	?
7	71	P	150-200 meter	S	?
8	50	P	>200 meter	S	?
9	42	P	150-200 meter	S	?
10	27	P	>200 meter	S	?

4.1 Data

The data used are 300 data. The dataset is divided into two data, namely: Training Data and Data Testing. Training Data is used by classification algorithms to form a classifier model. While Data Testing is used to measure the extent to which the classifier managed to classify correctly.

4.1.2 Data Pre Processing

Unprocessed data is raw data, so it needs to be prepared in advance so that it can be used in the Data Mining process.

4.2 Proses

The process used at this stage is to find out the results of the Naive Bayes classification calculation on the Weka Tools and Website.

4.2.1 Tools Weka

Following is the User Interface design created using the Weka GUI Chooser Tools.

Set File Arff

a. *Open file .csv*
   The first step is determining the distribution of Training data and Testing data with the CSV extension
b. *Save .arff*
   Furthermore, each file is saved with the default file format of WEKA namely ARFF, the file will change to the extension *training*.arff and *testing*.arff

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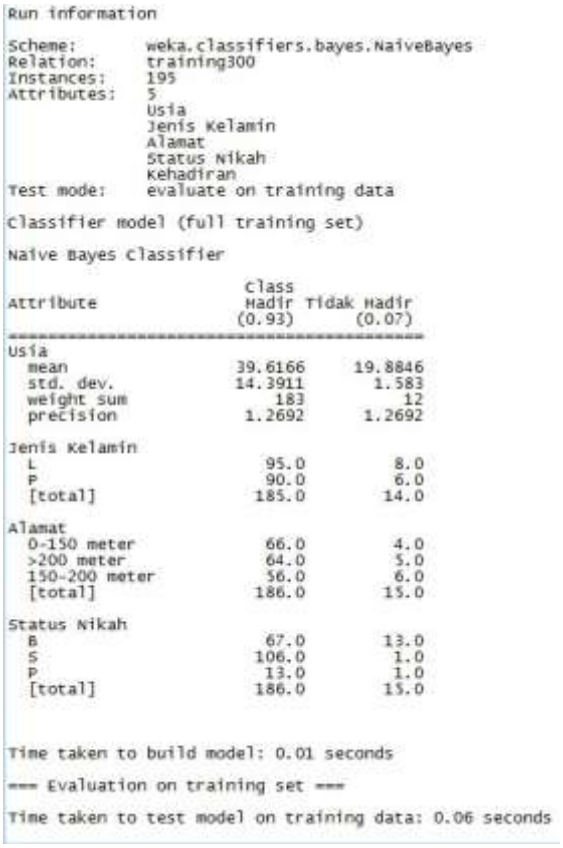
Set Training (Algoritma *Naïve Bayes*)

a. *Open training set.*arff
b. *Choose Classify Naïve Bayes*
   To see what is produced by the probability of this training data, use the classification method with the Naïve Bayes algorithm, at this stage of the process determining in the Classify tab, selecting the "Choose" option will lead to the Classifier. Various methods will be presented in the sub menu available at WEKA. Where the determination of sub menus in this study was directed at WEKA → *Classify* → *Bayes* → *Naïve Bayes*
c. *Use Training Set*
   The next step is to determine the training test by selecting the "Test Options" → "Use Training Set" Then test the testing data to determine the predicted participation of the Governor Election in Jemirahan Village, Gabon District.
d. *Start Training Set*
   Select "Start" to begin processing the training set on the data that comes from training. arff
e. *Save model*
   From the set of training set processes that are known to present the output of both text and graphics. The final stage is first to save the "Save model" from the output of the "Classifier"



```
Run information

Scheme:       weka.classifiers.bayes.NaiveBayes
Relation:     training300
Instances:    195
Attributes:   5
              Usia
              Jenis Kelamin
              Alamat
              Status Nikah
              Kehadiran
Test mode:    evaluate on training data

Classifier model (full training set)

Naive Bayes Classifier

                          Class
Attribute               Hadir  Tidak Hadir
                        (0.93)      (0.07)
============================================
Usia
  mean                39.6166     19.8846
  std. dev.           14.3911      1.583
  weight sum              183          12
  precision            1.2692      1.2692

Jenis Kelamin
  L                      95.0         8.0
  P                      90.0         6.0
  [total]               185.0        14.0

Alamat
  0-150 meter            66.0         4.0
  >200 meter             64.0         5.0
  150-200 meter          56.0         6.0
  [total]               186.0        15.0

Status Nikah
  B                      67.0        13.0
  S                     106.0         1.0
  P                      13.0         1.0
  [total]               186.0        15.0


Time taken to build model: 0.01 seconds

=== Evaluation on training set ===

Time taken to test model on training data: 0.06 seconds
```

Figure 7. Save Model Data Training Results

Set Testing

By repeating the steps starting from "Open file" by specifying the training1. by file again and continue by selecting the "Classify" tab to start the testing sets testing phase. The aim is to prove that the presentation of training data that has been processed and ended by saving the process of training data results.

a. *Open Training Set*.arff
b. *Choose Classify Naïve Bayes*
   To see what is produced by the probability of this training data, use the classification method with the Naïve Bayes algorithm, at this stage of the process determining in the Classify tab, selecting the "Choose" option will lead to the Classifier. Various methods will be presented in the sub menu available at WEKA. Where the determination of sub menus in this study was directed at WEKA → *Classify* → *Bayes* → *Naïve Bayes*
c. *Load Model*

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Then call the training data that has been stored previously. With the aim to test data from testing data that is ready. In the "Result list" right click select "Load Model" to call the data model.

d. *Open File Testing*.arff

e. *Re-Evaluate Model On Current Test Set*

The results of the testing1. earth data, which were previously saved are now displayed again after the call is made and the results are displayed in the "Classifier Output". The final step, to test the test data is by right-clicking on the "Result list", select evaluate model on current.

```
=== Model information ===

Filename:     model300.model
Scheme:       weka.classifiers.bayes.NaiveBayes
Relation:     training300
Attributes:   5
              Usia
              Jenis Kelamin
              Alamat
              Status Nikah
              Kehadiran
=== Classifier model ===
Naive Bayes Classifier
                          Class
Attribute                 Hadir Tidak Hadir
                         (0.93)      (0.07)
=============================================
Usia
  mean                 39.6166     19.8846
  std. dev.            14.3911       1.583
  weight sum               183          12
  precision             1.2692      1.2692

Jenis Kelamin
  L                        95.0         8.0
  P                        90.0         6.0
  [total]                 185.0        14.0

Alamat
  0-150 meter              66.0         4.0
  >200 meter               64.0         5.0
  150-200 meter            56.0         6.0
  [total]                 186.0        15.0

Status Nikah
  B                        67.0        13.0
  S                       106.0         1.0
  P                        13.0         1.0
  [total]                 186.0        15.0

=== Re-evaluation on test set ===

User supplied test set
Relation:     testing300
Instances:     unknown (yet). Reading incrementa
Attributes:   5

=== Summary ===

Total Number of Instances                0
Ignored Class Unknown Instances                1
```

Figure 8. Results of data in "Classifier Output"

Website

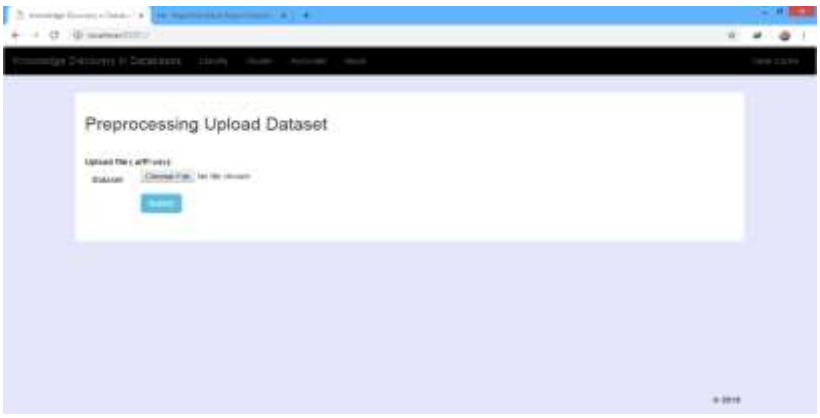

Figure 9. Index Menu Display

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1. After that, retrieve the database with the extension.csv /.Off

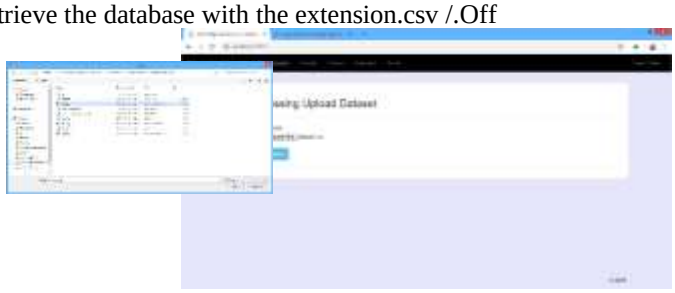

Figure 10. Display of Dataset Files

2. Select the classify method, flat Naïve Bayes Algorithm then select the Dataset file and Testing data then choose submit

Figure 11. Classify Views

Wait a while until the classification results display

Figure 12. Display of Naïve Bayes Classification Results

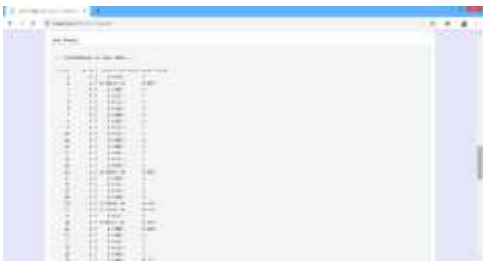

Figure 12. Display of Test Results

Calculate the Amount and Probability

To calculate the probability of target / class data we need to know the amount of data first. From the case studies that were raised namely in determining the presence and absence of elections for the Governor and Deputy Governor based on the age of 17 to 83 years. The number of probabilities is taken as much as 300 election data, and the data is called a data set.

Note:	Total	: 300
	Number of attendance	: 285
	Number of Missing	: 15

Probability of Present

P (H | data)

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= Amount of target data Present/Amount of target data
=285/300
= 0,95

Probability Not Present
P (H | data)
= Amount of target data Not Available / Amount of target data
=15/300
= 0,05

Table 5. Probability of Training Data

Probability	Present	Not present
P (Present / Not Present)	0,9384615	0,0615385
JUMLAH	1	
P (Age | data)		
17	0,0218579	0,0833333
18	0,0382514	0,0833333
19	0,010929	0,25
20	0,0218579	0,25
21	0,0273224	0,25
22	0,0273224	0,0833333
23	0,010929	0
24	0,010929	0
25	0,0218579	0
26	0,0382514	0
27	0,0163934	0
28	0,0163934	0
29	0,0218579	0
30	0,0437158	0
31	0,0163934	0
32	0,0218579	0
33	0,0273224	0
34	0,0054645	0
35	0,0218579	0
36	0,0382514	0
37	0,010929	0
38	0	0
39	0,0218579	0
40	0,0163934	0
41	0,0327869	0
42	0,0218579	0
43	0,0327869	0
44	0,0273224	0
45	0,0218579	0
46	0,0163934	0
47	0,0273224	0
48	0,0218579	0
49	0,0218579	0
50	0,0327869	0
51	0,0218579	0
52	0,0163934	0
53	0,0218579	0
54	0,0218579	0

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55	0,0273224	0
56	0,0163934	0
57	0,0054645	0
58	0,0054645	0
59	0,0054645	0
60	0,0163934	0
61	0	0
62	0,0218579	0
63	0,010929	0
64	0,0054645	0
65	0	0
66	0,0054645	0
67	0,0054645	0
68	0	0
69	0,0054645	0
71	0	0
73	0	0
74	0,0054645	0
76	0	0
77	0,0054645	0
78	0,0054645	0
80	0	0
83	0,0054645	0
AMOUNT	1	1
P (Gender | data)		
L	0,5136612	0,5833333
P	0,4863388	0,4166667
AMOUNT	1	1
P (Address | data)		
Kademangan rt.09 rw.04	0,3442623	0,3333333
Kademangan rt.10 rw.04	0,3551913	0,25
Kademangan rt.11 rw.04	0,3005464	0,4166667
AMOUNT	1	1
P (Marital Status | data)		
B	0,3606557	0
S	0,5737705	0
P	0,0655738	0
AMOUNT	1	0

Table 6. DATA TESTING

Class Prediction		
Present	**Not present**	**Status**
0,0019706	0,0001292	Present
0,0013082	8,58E-05	Present
0,0017203	0,0001128	Present
0	0	Present
0	0	Present
0,0026016	0,0001706	Present
0	0	Present

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0,0029559	0,0001938	Present
0,0017203	0,0001128	Present
0,0014779	9,69E-05	Present
0,0030106	0,0001974	Present
0,0020331	0,0001333	Present
0,0012903	8,46E-05	Present
0,0002252	1,48E-05	Present
0,0030497	0,0002	Present
0,0022364	0,0001467	Present
0,001817	0,0001191	Present
0,0025414	0,0001667	Present
0,0029559	0,0001938	Present
0,0003097	2,03E-05	Present
0,0013517	8,86E-05	Present
0,0005407	3,55E-05	Present
0,0010166	6,67E-05	Present
0,0015483	0,0001015	Present
0,0012386	8,12E-05	Present
0,001817	0,0001191	Present
0,0004301	2,82E-05	Present
0,0012386	8,12E-05	Present
0,0020331	0,0001333	Present
0,0005711	3,74E-05	Present
0,0025414	0,0001667	Present
0,000929	6,09E-05	Present
0,0010814	7,09E-05	Present
0,0009585	6,29E-05	Present
0,0017203	0,0001128	Present
0,0019706	0,0001292	Present
5,63E-05	3,69E-06	Present
5,81E-05	3,81E-06	Present
0	0	Present
0,001817	0,0001191	Present
0,0001689	1,11E-05	Present
0,0024632	0,0001615	Present
0	0	Present
0,0012386	8,12E-05	Present
0,0012386	8,12E-05	Present
0,0019706	0,0001292	Present
0,0021504	0,000141	Present
0,0021473	0,0001408	Present
0,0006193	4,06E-05	Present
0,0017203	0,0001128	Present
0,0014779	9,69E-05	Present
0	0	Present
Class Prediction		
Present	**Not present**	**Status**
0,0002815	1,85E-05	Present
0,000811	5,32E-05	Present
0,0014779	9,69E-05	Present
0,0010166	6,67E-05	Present
0,001817	0,0001191	Present
0,0029559	0,0001938	Present
0,0005368	3,52E-05	Present
0,0002077	1,36E-05	Present

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0,0016105	0,0001056	Present
0,0020813	0,0001365	Present
0,0017203	0,0001128	Present
0,0019706	0,0001292	Present
0,0002252	1,48E-05	Present
0,0029559	0,0001938	Present
0	0	Present
0,001817	0,0001191	Present
0,001561	0,0001024	Present
0,001561	0,0001024	Present
0,0026016	0,0001706	Present
0,0021473	0,0001408	Present
0,001817	0,0001191	Present
0,0014779	9,69E-05	Present
0,0022712	0,0001489	Present
0	0	Present
0	0	Present
0,0002252	1,48E-05	Present
0,0001966	1,29E-05	Present
0,0019706	0,0001292	Present
0,0017203	0,0001128	Present
0,0004542	2,98E-05	Present
0	0	Present
0,0027255	0,0001787	Present
0,0031219	0,0002047	Present
0,0001966	1,29E-05	Present
0,0020813	0,0001365	Present
0,0004542	2,98E-05	Present
0	0	Present
0,0031219	0,0002047	Present
0,0021473	0,0001408	Present
0,0013627	8,94E-05	Present
0,0010737	7,04E-05	Present
0,0013627	8,94E-05	Present
0,0016872	0,0001106	Present
0,0002904	1,90E-05	Present
0,0015248	1,00E-04	Present
0,0024632	0,0001615	Present
0,0011421	7,49E-05	Present
0,0016353	0,0001072	Present
0,001278	8,38E-05	Present
0,0037579	0,0002464	Present
0,001278	8,38E-05	Present
0,0021504	0,000141	Present
0,0013082	8,58E-05	Present

Comparison Results:

1. Based on the number of datasets (100, 200, 300) 65% of training data and 35% of testing data.

Table 7. Percentage Results From Dataset

	Class			Prosentase %
Prediksi	Benar	Salah	Hasil	
100 data	30	5	35	86.15 %
200 data	62	8	70	89.23 %

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300 data	92	13	105	87.69 %

2. Based on the number of each attribute (age, sex, distance, marital status)

Table 8. Percentage Result Attributes

	Class			Prosentase %
Prediksi	Benar	Salah	Hasil	
Usia	4	101	105	4.06%
Jenis Kelamin	100	5	105	100%
Jarak	44	61	105	100%
Status Nikah	100	5	105	100%

3. Based on the calculation tools weka, website, and manual

Table 9. Percentage Results From (tools, website, and manual)

	Class			Prosentase %
Prediction	Correct	False	Results	
Weka	92	13	105	87.69 %
Website	96	9	105	91.66%
Manual	102	3	105	97%

From the Naïve Bayes algorithm method, the predicted results of the 2018 Governor and Deputy Governor Election attendance level are 97% (102) data states are true and 3% (3) is incorrect.

5. CONCLUSION

From the research that has been done, it can be concluded:

1. To predict the participation of the General Election (PEMILU) in Jemirahan Village, Jabon District, it can be done using the Naïve Bayes Algorithm with 10 predefined variables.
2. Prediction results of election participation from the dataset taken are 300 data divided by 2, namely 56% of 195 Training data and 35% of 105 Testing data.
3. Prediction results are based on the presence attribute set. For the presence of 105 data, a 97% prediction value is obtained and a 3% prediction value is obtained.

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