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Selection of Specialization Class Using Support Vector Machine Method in SMA Negeri 1 Ambon

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ABSTRACT

The curriculum is a system or education plan that is made by a government to form the abilities and character of children based on a standard, one of its forms is the division of specialization classes at the senior high school level. The 2013 curriculum emphasizes that all students in Indonesia can practice their abilities based on their interests and talents, therefore students no longer choose majors but choose abilities (interests) they specialize in. This research uses the Support Vector Machine (SVM) method in the Decision Making System (DMS) of specialization classes at SMA Negeri 1 Ambon. Using the factors driving student acceptance and selection as input data, the SVM method is processed with MATLAB Software and produces a classification of interest class with an accuracy rate of 100%.

Keywords: 2013 Curriculum; Classification; Support Vector Machine

INTRODUCTION

The curriculum is a plan about forming the abilities and character of children based on a standard [1], The 2013 curriculum is a curriculum that simplification [2] and thematic-integrative, adding rainy learning hours to encourage students or students, one of the forms is the division of specialization classes at the High School level (SMA)[3]. Specialization aims to provide opportunities for students to develop their interests in a group of subjects by their scientific interests in tertiary institutions [4] and developing their interest in a particular discipline or skill [5].

Decision Making System is the process of choosing between two or more alternative actions to achieve goals or objectives. Several studies have concluded that there are various decision-making methods can determine reliable results. In this case, the method to be applied is the Support Vector Machine (SVM) algorithm, the SVM method is a technique for making predictions, both in the case of classification and regression [6][7][8]. SVM was introduced by Boser, Guyon, Vanpik, dan first presented in 1992 [9][10] at the Annual Workshop on Computational Learning Theory. The basic concept of SVM is a harmonization of computation theories that have existed tens of years before, such as the Hyperplane margin introduced by Aronszajn in 1950 [11]. However, until 1992 there had never been an effort to assemble these components. The basic principle of SVM is linear classifier [12], and further developed to be able to work on non-linear problems by incorporating the concept of kernel tricks in high-

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dimensional space [13]. SVM is a classification method with a relatively fast computative time and several studies have shown that SVM is superior in classifying. In Addition, There is a research about the classification of acoustic events using SVM-based clustering schemes. Several Classifiers Based On Support Vector Machines (SVM) Are Developed Using Confusion Matrix Based Clustering Schemes To Deal With The Multi-Class Problem [14][15]. The main purpose of SVM is to increase the speed of training and testing, meaning that SVM can be used for large data [16]. Support Vector Machine (SVM) is used along with continuous wavelet transform (CWT), an advanced signal-processing tool, to analyze the frame vibrations during start-up [17].

METHODS

This type of research is a case study. Namely, the SVM method determines the choice of interest in tenth-grade students. The material used in this study is secondary data obtained from the Sekolah Menengah Atas (SMA) Negeri 1 Ambon. Secondary data taken from SMA Negeri 1 Ambon is in the form of a value criterion as a measure of interest selection include the initial test scores in SMA 1 or a comparison score to determine the choice of interest in tenth-grade students.

In detail, the flowchart diagram of the Support Vector Machine (SVM) can be seen in the following Figure 1:

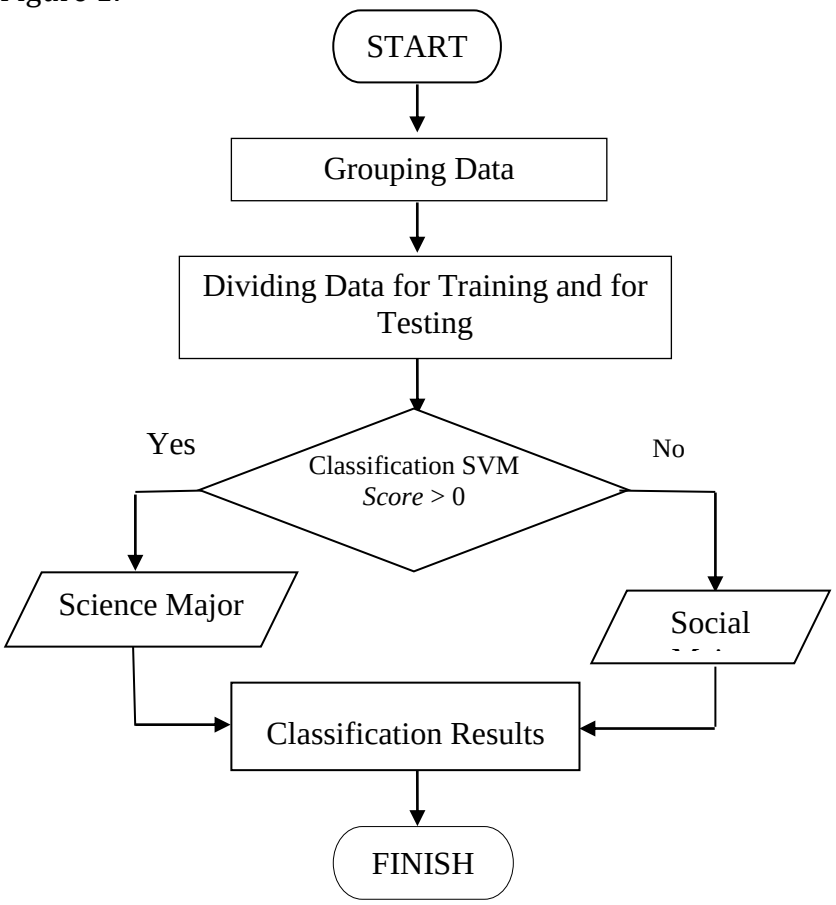

Figure 1. Flowchart Diagram of Support Vector Machine (SVM)

This research uses the linear SVM method with MATLAB software to analyze data. The Ratio of training and testing data used is 7:3 from each grouping that has been determined.

For this research method the variables used for data are the National Exam Score (X_1), Initial Test Score (X_2), Psychology Score (X_3). While the target or output is Major/ Interest (Y). Data obtained as follows:

Table 1. SVM Method Data

NO	NATIONAL EXAM SCORE (REC)	INITIAL TEST SCORE	PSYCHOLOGY SCORE	FINAL SCORE	MAJOR/ INTEREST
1	82	35	106.7	74.57	SCIENCE
2	80.2	34	86.2	66.8	SOCIAL
3	80	34	100	71.33	SCIENCE
4	81.5	34	94.4	69.97	SOCIAL
5	80	34	93.9	69.30	SOCIAL
6	85.5	33	111.8	76.77	SCIENCE
7	84.5	33	111.9	76.47	SCIENCE
8	80	33	86.1	66.37	SOCIAL
9	81.5	33	109.6	74.70	SCIENCE
10	80.8	32	106.3	73.03	SCIENCE
11	80	32	97	69.67	SOCIAL
12	83	32	106.7	73.90	SCIENCE
13	82.5	32	92.6	69.03	SOCIAL
14	81.9	31	107.7	73.53	SCIENCE
15	80.5	31	92.6	68.03	SOCIAL
16	80	31	98.7	69.90	SOCIAL
17	81.5	31	83.3	65.27	SOCIAL
18	80	31	91.3	67.43	SOCIAL
19	85.5	30	90.6	68.70	SOCIAL
20	84.5	30	101.3	71.93	SCIENCE
21	80	30	89.7	66.57	SOCIAL
22	80	30	93.6	67.87	SOCIAL
23	83	30	88.3	67.10	SOCIAL
24	82.5	30	111.4	74.63	SCIENCE
25	81.9	30	97.7	69.87	SOCIAL
26	80.5	30	109.6	73.37	SCIENCE
27	80	30	104.5	71.50	SCIENCE
28	81.5	30	100	70.50	SCIENCE
29	83	30	91.1	68.03	SOCIAL
30	82.5	30	103.9	72.13	SCIENCE
31	81.9	30	100	70.63	SCIENCE
32	80.5	28	104.2	70.90	SCIENCE
33	83.9	28	106	72.63	SCIENCE
34	84	28	92.9	68.30	SOCIAL
35	80.5	28	87.7	65.40	SOCIAL
36	80.4	28	86.9	65.10	SOCIAL
37	81.3	28	111.9	73.73	SCIENCE

NO	NATIONAL EXAM SCORE (REC)	INITIAL TEST SCORE	PSYCHOLOGY SCORE	FINAL SCORE	MAJOR/ INTEREST
38	81.9	28	92.5	67.47	SOCIAL
39	81	28	86.8	65.27	SOCIAL
40	80.2	28	105	71.07	SCIENCE
41	82	27	109.9	72.97	SCIENCE
42	83.6	27	110.5	73.70	SCIENCE
43	80	27	93.8	66.93	SOCIAL
44	82.5	27	94.9	68.13	SOCIAL
45	81.6	27	91.3	66.63	SOCIAL
46	85	27	106.6	72.87	SCIENCE
47	82.9	27	106	71.97	SCIENCE
48	83.5	27	94.7	68.40	SOCIAL
49	80	27	93.3	66.77	SOCIAL
50	80	27	111.1	72.70	SCIENCE

The amount of data in this study amounted to 50 data that will be divided into data testing and training. The target data of the Department is divided into 3 groups with the following conditions:

Science Major for y > 80 with the very smart requirement
Neutral Major for 70 ≤ y ≤ 80 with the average requirement
Social Major for y < 70
Hint: y = Major

RESULTS AND DISCUSSION

SVM linear search for hyperplane with the largest margin, known as Maximum Marginal Hyperplane (MMH). Based on the **Lagrangian** formulation mentioned, MMH can be rewritten as a boundary decision:

$$d(X^T) = \sum_{i=1}^{l} y_i \alpha_i X_i X^T + b_0 \quad (1)$$

Where y_i is the label of support vector classes X_i. X^T is the tuple; α_i and b_0 are the numerical parameter determined automatically by the SVM optimization algorithm, and l is the number of *Support Vector*. The results of the program for the grouping of testing data are as follows:

Table 2. Software Processing Results for Testing Data

No	Original Data	svmStruct1	svmStruct2	svmStruct3	Software Results
1	0	0	0	0	0
2	0	1	0	0	0
3	0	1	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	1	0	0	0

No	Original Data	svmStruct1	svmStruct2	svmStruct3	Software Results
9	1	1	1	1	1
10	1	1	1	1	1
11	1	1	1	1	1
12	1	1	1	1	1
13	1	0	1	1	1
14	1	1	1	1	1
15	1	0	1	1	1
16	1	1	1	1	1

From Table 2 above it can be seen, the SVM method classification shows the output with 99% accuracy for testing data. This can be seen from the comparison between the target data and the output target. With Hyperplane obtained from each class as follows:

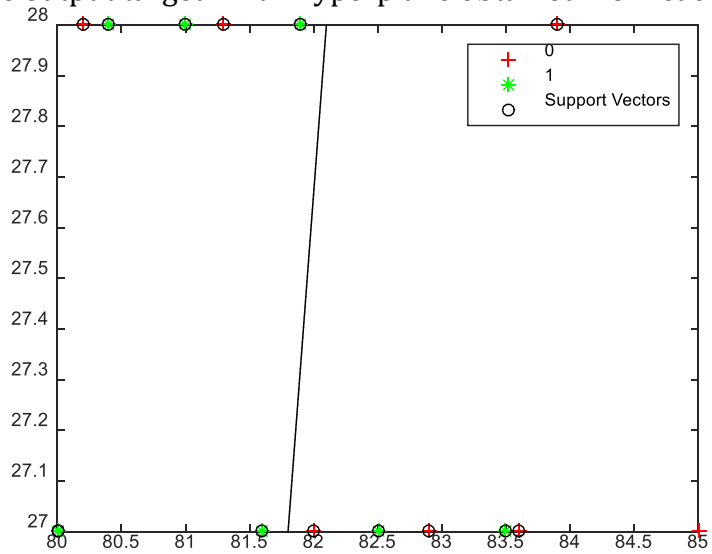

Figure 2. *Hyperplane* for svmStruct1

Based on Figure 2 above it can be explained that the svmStruct1 data shows that the data in the two classes are not completely separate can be seen from several red circles whose distribution is around the green circle area.

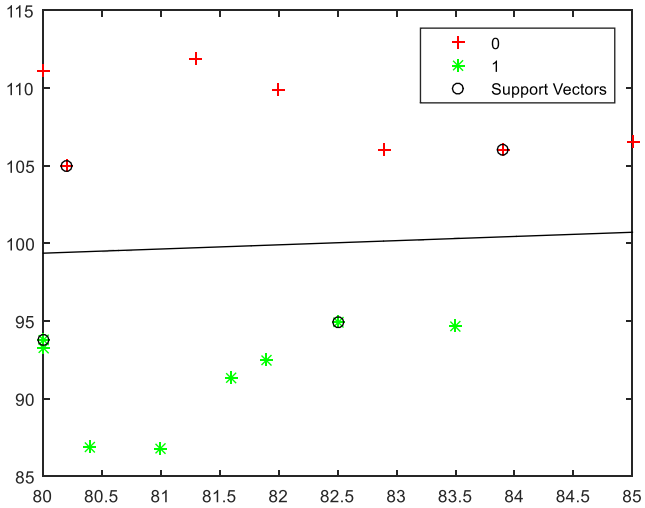

Figure 3. *Hyperplane* for svmStruct2

Based on Figure 3 above it can be explained that the data in svmStruct2 is properly classified in class 0 (which is the science major group) or class 1 (which is the social major group) while those that are Support Vector are patterns within a circle.

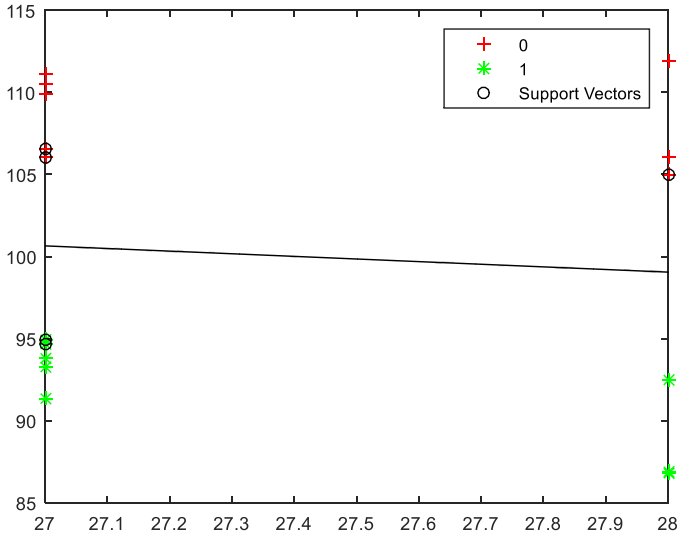

Figure 4. *Hyperplane* for svmStruct3

Based on Figure 4 above it can be explained that all svmStruct3 data is properly classified into class 0 (which is the science major) or class 1 (which is the social major), while those that are Support Vector are patterns within a circle.

CONCLUSIONS

From the results of the software output that is matched with the real data, it is seen that 100% of the output data is the same as the real data. This shows for the SVM method of class division of interests carried out by the school according to the ability of children. Based on the results of research with the SVM method there is no difference between the results of the assessment using software and real data. In other words the results of the SVM method are said to be perfect.

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