

Identification of the Success of Learning Al Islam and Kemuhammadiyah Using Machine Learning

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Abstract— Learning Al Islam and Kemuhammadiyah (AIK) is one of the compulsory learning in all levels of Muhammadiyah education which has the general goal of forming human learners who are pious, noble, advanced and superior in science and technology as the embodiment of *tajdid amar makruf nahi mungkar*. In order to achieve the objectives of learning in education, the measurement and evaluation of these subjects should be carried out. The Muhammadiyah University of Riau as one of the Muhammadiyah universities in Indonesia that applies AIK education in its learning curriculum has not measured the success rate of this course. Therefore this study will identify the success of AIK learning at Universitas Muhammadiyah Riau with machine learning artificial intelligence technology. The data source is the students' grades in this AIK course, then by using the Machine Learning method K-Nearest Neighbor classification algorithm will measure the success rate of learning. From 149 sample data that were conducted training and testing (90% of training data and 10% of test data) as well as conducting several trials of K parameter values, the best accuracy results obtained at parameter $k = 2$ with an accuracy value of 71.43%.

Keywords—Al Islam and Kemuhammadiyah, K-Nearest Neighbour, Learning Success, Machine Learning.

I. INTRODUCTION

Muhammadiyah Higher Education as a higher education institution in Indonesia has a characteristic in its learning curriculum, which has a compulsory Al Islam and Kemuhammadiyah (AIK) course. Al Islam and Kemuhammadiyah education must be taken by students at all levels of Muhammadiyah education [4]. The general aim of AIK education is the formation of learners who are pious, noble, progressive and superior in science and technology as an embodiment of the da'wah missionary *amar makruf nahi munkar*. The AIK course is divided into four sections which are intended as a description of the general objectives above so that it is more measurable. After completing all these AIK courses, students are expected to have competencies:

(AIK 1): Knowing and understanding the nature of God, humans, and life in accordance with the guidance of the Qur'an and authentic Hadith and science, practice the correct worship procedures based on the Qur'an and Sunnah Maqbullah. (AIK 2): Having *akhlaqul karimah* attitude in *mu'amalah* that benefits themselves, society, nation, and country. (AIK 3): Able to internalize Muhammadiyah's mission in various aspects of life. (AIK 4): Mastering and

integrating Islamic values in the development and application of science.

Universitas Muhammadiyah Riau has implemented the Al Islam and Kemuhammadiyah learning curriculum, but until now there has been no measurement of the success rate of learning this course. Measuring the success of a learning activity is quite important because it is one form of evaluation in learning. Through this measurement, it will be seen whether the objectives of learning have been achieved or not in accordance with the curriculum used, the teaching techniques carried out by lecturers supporting the course, and the anomalies that occur in the learning process.

Machine Learning is a type of artificial intelligence that provides computers with the ability to learn from data, without explicitly having to follow programmed instructions. Machine learning technology is not only applied in the industrial world but also in the world of education such as education data security, fraud detection in exams, recommendation systems and so on [2]. In this study, we will try to measure the success of AIK course learning using the K-Nearest Neighbor algorithm, which is a method of extracting data in machine learning for classification that has a high degree of accuracy [1]. Value data and supporting lecturers in AIK (1) to AIK (4) courses at the Muhammadiyah University of Riau will be conducted training and testing using the k-NN algorithm so that it will produce a classification measurement of learning outcomes for the course.

Related studies that have been carried out previously include: "Machine Learning-Based App for Self-Evaluation of Teacher-Specific Instructional Style and Tools" (Duhzin, Fedor and Gustafsson, Anders, 2018), "A Ranking Based KNN Approach for Multi-Label Classification" (T.H. Chiang, et al, 2012), "Rate of Convergence of K-Nearest Neighbor Classification" (M. Doring, et al, 2018) dan "Distance Metric for Large Margin Nearest Neighbor" (K.Q. Weinberger and L.K. Saul, 2009).

II. THEORETICAL FRAMEWORK

Machine learning has two models in the learning process, namely Supervised Learning and Unsupervised Learning. In the supervised learning model, we train the machine to give the output that we have set or expected. The algorithm applied to the machine is intended to make an input into the output that we expect. Whereas in the unsupervised learning model, we do not teach machines to produce a certain output.

We only teach them what the correct inputs are and then the machine itself will determine the output.

The work process of machine learning in this study is described as follows:

1. Data Set

In machine learning, there are two data set models, namely public data sets and private data sets. In public data sets, the data used are data that are public and are also obtained from public repositories. On the other hand, private data sets are data specifically obtained at the place of the study. This stage is called Pre-Processing, which will process the dataset to be more specific according to research needs. There will be several sub-processes in this Pre-Processing such as Data Cleaning, Data Integration, Data Reduction, and Data Transformation.

2. Method and Algorithm.

There are five methods in extracting machine learning data, and each of which has algorithms that can help solve the problem. The following methods and algorithms are described:

- a) Estimation Method, the algorithm that can be used: Linear Regression, Neural Network, Support Vector Machine, etc.
- b) Prediction Method, the algorithm that can be used: Linear Regression, Neural Network, Support Vector Machine, etc.
- c) Classification Method, the algorithm that can be used: Naïve Bayes, K-Nearest Neighbor, C4.5, ID3, CART, Linear Discriminant Analysis, Logistic Regression, etc.
- d) Clustering Method, the algorithm that can be used: K-Means, K-Medoids, Self Organizing Map, Fuzzy C-Means, etc.
- e) Association methods, algorithms that can be used: FP Growth, Apriori, Coefficient of Correlation, Chi-Square, etc.

3. Knowledge

At this stage, knowledge (patterns or models) will be obtained from the methods and algorithms that have been implemented to solve the problem. Five possible knowledge that will be obtained, such as Formula/function in the form of a regression formula or function, Decision Tree, Correlation Level, Rule and finally Cluster.

4. Evaluation

At this stage, the use of machine learning algorithms in solving problems will be evaluated according to the method. The following evaluation techniques can be used:

- a) Estimation Method, the evaluation used is to calculate the error value using: Root Mean Square Error (RMSE), MSE, MAPE, etc.
- b) Prediction Method, the evaluation used is to calculate the error value using: Root Mean Square Error (RMSE), MSE, MAPE, etc.
- c) Classification Method, the evaluation conducted is Confusing Matrix to calculate the accuracy

value and ROC Curve to calculate the Area Under Curve (AUC)

- d) Clustering Method, evaluations conducted are Internal Evaluation using Davies-Bouldin Index and Dunn Index, and External Evaluation using Rand Measure, F-Measure, Jaccard Index, Fowlkes-Mallows Index, and Confusing Matrix.
- e) Association method, the evaluation is done by making Lift Chart using Lift Ratio and doing the Precision and Recall (F-Measure) calculation.

III. RESEARCH METHOD

The following are the stages carried out in this study:

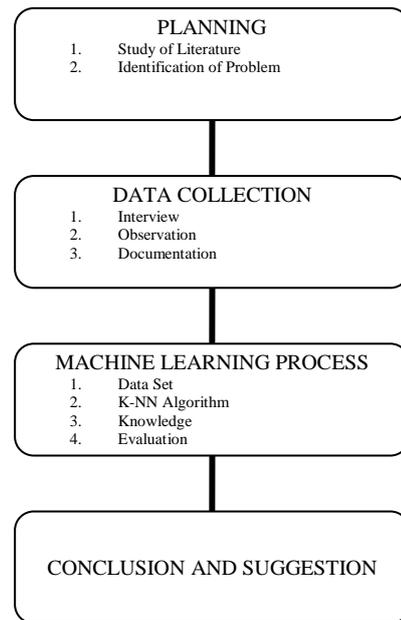


Fig 1. Research Method

A. Planning Phase

At this planning stage, literature study activities were carried out in the form of scientific journals, books and other documents that can help identify further research problems. The result of this stage is a research plan to identify the success of learning Al Islam and Kemuhammadiyah at Universitas Muhammadiyah Riau.

B. Data Collection Phase

At this stage, interviews and direct observations were carried out at Universitas Muhammadiyah Riau, then documented the results obtained from the values of students who had completed the learning of Al Islam and Kemuhammadiyah (AIK 1 to AIK 4).

C. Machine Learning Process

The process of machine learning in identifying the success of learning Al Islam and Kemuhammadiyah in this study is described as follows:

5. Data Set

This dataset process is intended for understanding and processing data. In this study, the dataset model

used is a private dataset of Universitas Muhammadiyah Riau.

6. Algorithm of K-Nearest Neighbour.

In this study, the K-Nearest Neighbor (k-NN) algorithm is used, which is a classification method for a set of data based on learning data that has been classified previously. This algorithm is also called a lazy learner because it stores the training provided in a record and does nothing until it is tested [5]. This algorithm is included in the supervised learning model, where the results of the new query instance will be classified based on the majority of the proximity of the k-NN category. The steps of the k-NN algorithm are as follows [6]:

- a) Determine the K parameter (number of nearest neighbors).
 - b) Calculate the square of the Euclidean distance of the object to the given training data, using the formula:
- $$D(a,b) = \sqrt{\sum_{k=1}^d (a_k - b_k)^2} \tag{1}$$
- c) Sort the results of the second step above based on the smallest value.
 - d) Collecting category Y (nearest neighbor classification based on K value)
 - e) By using the category of the nearest majority neighbor, the object category can be predicted.

7. Knowledge.

In this research, the expected knowledge is the result of identifying the success of students in learning Al Islam and Kemuhammadiyah using the K-Nearest Neighbor algorithm.

8. Evaluation

The evaluation carried out in the research to identify the success of students in learning Al Islam and Kemuhammadiyah using the K-Nearest Neighbor algorithm is by making Confusing Matrix to calculate the accuracy value and ROC Curve to calculate Area Under Curve (AUC).

D. Conclusion and Suggestion Phase

At this stage, conclusions are drawn from the final results of the research conducted, and suggestions are given for future research development.

IV. IMPLEMENTATION AND RESULTS

Data obtained from the academic system of the Universitas Muhammadiyah Riau for the needs of this study is in the form of a component assessment file for each Al Islam and Kemuhammadiyah course (AIK 1 to AIK 4) from each lecturer teaching the course, the final transcript of students who have completed the course and a list of lecturers' names teaching the course. As a sample, the data used is from the Faculty of Teacher Training and Education consisting of four study programs, with a total of 149 data.

The data were processed using the K-Nearest Neighbor algorithm learning machine as follows:

A. Data Cleaning Phase

The first process in the pre-processing stage is Data Cleaning. At this stage, we removed data duplication, examined inconsistent data and corrected data errors. Examples of data cleaning processes in this study can be seen in the image below:

170601011	AMI RESTIA NINGSIH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601014	AFSA AZIZA ISMAYANI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-
170601015	SEPTIKA JAYANI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601017	DESI SARTIKA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601018	ECA PUTRI RAMADANIA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601019	HAFI ADILA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601020	RAHMATUL AULIA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601021	AFRIANI SAPUTRI	UM 101	Al Islam 1		
170601022	YUNI SARAH	UM 101	Al Islam 1		
170601023	YOLLA AMANDA	UM 101	Al Islam 1		
170601001	ILHAM AKBAR	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601002	WINDI FITALOKA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601005	RENDI PRANATA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-
170601008	ISWANDI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601010	DEVA SASOGA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601012	SAPNI AGUSTINA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601016	EKA SRIWAHYUNI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601009	WANDA USTITAMA	UM 101	Al Islam 1		
170602002	HELLANDA WIDYO TANIA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-
170602003	FINNI SUJARWO	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602004	ENDANG ARAFAH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602006	LARA HARDI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602009	AYU LILIS SUNDARI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602010	KHANIM MUMTAZAH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-

Fig. 2. Sample of Data before Cleaning

In the picture above, we can see that there are some inconsistent data, that is, there is a vacancy of the name of the supporting lecturer (data with highlights). at this cleaning stage, the blank data will be corrected by filling in the name of the appropriate lecturer in the academic year, class and course that the lecturer is able to. The results can be seen in the following figure 3.

170601011	AMI RESTIA NINGSIH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601014	AFSA AZIZA ISMAYANI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-
170601015	SEPTIKA JAYANI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601017	DESI SARTIKA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601018	ECA PUTRI RAMADANIA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601019	HAFI ADILA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601020	RAHMATUL AULIA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601021	AFRIANI SAPUTRI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	E
170601022	YUNI SARAH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	E
170601023	YOLLA AMANDA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	E
170601001	ILHAM AKBAR	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601002	WINDI FITALOKA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601005	RENDI PRANATA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-
170601008	ISWANDI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601010	DEVA SASOGA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170601012	SAPNI AGUSTINA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601016	EKA SRIWAHYUNI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B
170601009	WANDA USTITAMA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	E
170602002	HELLANDA WIDYO TANIA	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-
170602003	FINNI SUJARWO	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602004	ENDANG ARAFAH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602006	LARA HARDI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602009	AYU LILIS SUNDARI	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	B+
170602010	KHANIM MUMTAZAH	UM 101	Al Islam 1	Dr.H.M Rasyad Zein, MM	A-

Fig. 3. Sample of Data after Cleaning

B. Data Integration Phase

At this stage, we combined data from several sources (databases, datacube, files) into an appropriate data store. In this study, the value of the learning outcomes of Al Islam and Kemuhammadiyah obtained from the academic system of the Universitas Muhammadiyah Riau was arranged based on the names of the lecturers in each AIK course. Therefore, it was combined into a new file containing a recapitulation of all the grades of AIK learning outcomes of Universitas Muhammadiyah Riau students. Examples of data integration processes can be seen in the image below:



SISTEM INFORMASI AKADEMIK
UNIVERSITAS MUHAMMADIYAH RIAU
Jl. KH. Anwar Dariani 68, Sukajadi, Pekanbaru

Detail Nilai Mata Kuliah Mahasiswa

Mata Kuliah : PI 11101 AL ISLAM I
Dosen Pengasuh : Dr. Baidarus, MM., M.Ag
Kelas / Trin AKD : 1 / 20141
Semester / SKS : 1 / 2

Program Studi : Pendidikan Informatika (REGULER-4)
Hari / Tgl Ujian : Rabu / 01-01-1930 / 00:00 - 00:00

No.	NIM	Nama Mhs	Prs	Tgs1	Tgs2	Tgs3	Tgs4	Tgs5	UTS	UAS	Akhir	Grade
			10%	20%	0%	0%	0%	0%	30%	40%		
1	140601001	ARMAN RIWANSYAH	100	80	0	0	0	0	60	60	70.20	B
2	140601002	SRIDEVI MALINDA	100	80	0	0	0	0	70	74	76.60	B
3	140601003	FITRA WATI	100	80	0	0	0	0	70	74	76.60	B
4	140601004	AMALIYA GUSNIATI	95	78	0	0	0	0	70	74	77.70	B
5	140601005	YALDI DEFRIANDI	90	74	0	0	0	0	64	66	69.40	B
6	140601006	NURBANDA KINANTI	100	78	0	0	0	0	68	70	74.00	B
7	140601007	ALYA ANDRIANI PUTRI	100	80	0	0	0	0	70	72	75.80	B
8	140601008	PUPUT REZA RENZANI	100	80	0	0	0	0	62	64	70.20	B
9	140601009	ELLA AZHARI	90	78	0	0	0	0	74	76	77.20	B
10	140601010	TESYA GUSTIA SYAFRON	95	78	0	0	0	0	64	66	70.70	B
11	140601011	LIA ARDANI NASUTION	100	80	0	0	0	0	76	86	83.20	A
12	140601012	NURSAFIRAH	100	80	0	0	0	0	76	78	80.00	A

Fig. 4. Data before integration is carried out

In Figure 4 above is an example of data from the results of a course lectured by one of the lecturers in a current school year in faculties, study programs, and classes at the Muhammadiyah University of Riau. In this integration process, we will combine some of the required data. In this case and in accordance with the example in Figure 4, the data that is integrated is the data from the lectures of a lecturer supporting the same course in the current school year, at the same faculty and study program. The results can be seen in Figure 5 below.

Mata Kuliah : PI 11101 AL ISLAM I
Dosen Pengasuh : Dr. Baidarus, MM., M.Ag
Kelas / Trin AKD : 1 / 20141
Semester / SKS : 1 / 2

Program Studi : Pendidikan Informatika (REGULER-4)
Hari / Tgl Ujian : Rabu / 01-01-1930 / 00:00 - 00:00

No.	NIM	Nama Mhs	Prs	Tgs1	Tgs2	Tgs3	Tgs4	Tgs5	UTS	UAS	Akhir	Grade
			10%	20%	0%	0%	0%	0%	30%	40%		
1	140601001	ARMAN RIWANSYAH	100	80	0	0	0	0	60	60	70.20	B
2	140601002	SRIDEVI MALINDA	100	80	0	0	0	0	70	74	76.60	B
3	140601003	FITRA WATI	100	80	0	0	0	0	70	74	76.60	B
4	140601004	AMALIYA GUSNIATI	95	78	0	0	0	0	70	74	77.70	B
5	140601005	YALDI DEFRIANDI	90	74	0	0	0	0	64	66	69.40	B
6	140601006	NURBANDA KINANTI	100	78	0	0	0	0	68	70	74.00	B
7	140601007	ALYA ANDRIANI PUTRI	100	80	0	0	0	0	70	72	75.80	B
8	140601008	PUPUT REZA RENZANI	100	80	0	0	0	0	62	64	70.20	B
9	140601009	ELLA AZHARI	90	78	0	0	0	0	74	76	77.20	B
10	140601010	TESYA GUSTIA SYAFRON	95	78	0	0	0	0	64	66	70.70	B
11	140601011	LIA ARDANI NASUTION	100	80	0	0	0	0	76	86	83.20	A
12	140601012	NURSAFIRAH	100	80	0	0	0	0	76	78	80.00	A

Fig. 5. Data after integration is carried out

C. Data Transformation Phase

At this stage, we carried out the process of normalization and data collection to be the same. In this study, there are differences in the course code variable and the name of Al Islam and Kemuhammadiyah courses (AIK 1 to AIK 4) due to differences in the curriculum of the student year. This would be normalized according to the latest curriculum regulations used without eliminating the objectives of each AIK course as it has been described in the Introduction. The Grade Value will also be normalized according to table 1.

TABLE I. GRADE CONVERSION

Grade in Letter	Grade in Number
A	4,0
A-	3,75
B+	3,5
B	3
B-	2,75
C+	2,5
C	2
D	1
E	0

Examples of the transformation of the course code can be seen in the following figure.

84	180601036	MEGA OCTAVIA SARI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
85	180601039	MAY AULDINA	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
86	180601020	SYADRI YASMAAN	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
87	180601024	ILHAM GUSPURI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
88	180601026	FACHILA TRI ASTUTI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
89	180601038	KUNU ANGGORANI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
90	180601030	KUNU ANGGORANI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
91	180601025	SUSI APRILIANTI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
92	180601017	IRRI WAKHYUNI	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
93	180601028	REZA NIUR AKHYAR	PI 11101	AI Islam 1	PI 12104	AI Islam 2	UM 404	AI Islam 4	PI 11102	Kemuhammadiyah
94	170601063	RETI SOEDONO	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
95	170601004	IRWATI NUR ROHMANNI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
96	170601011	ARI RESTI WANGSOSI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
98	170601014	AFSA AZZA ISMAYANI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
99	170601019	SEPTIKA JAYANI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
100	170601017	DESI SARTIKA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
103	170601018	ECCA PUTRI RABINDHARA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
104	170601021	AFRIANS SAPUTRI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
105	170601022	KUNU SARIAN	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
106	170601023	HOLLA ANANDA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
107	170601021	LHAM ANBAR	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4

Fig. 6. Data before the transformation is done

In Figure 6 above we can see differences in course code and naming of courses caused by curriculum changes. The course code PI 11101 refers to lectures under the name Al Islam 1, and the code PI 11102 refers to lectures under the name Kemuhammadiyah. Because of curriculum changes, there was a change in the course code and name, in the data above it can be seen that there is a UM 101 code with the name of Al Islam 1 course and UM 404 code with the name of the AIK 4 course. This transformation process will change different data earlier by following the latest curriculum, so that uniformity occurs and facilitates the next process. The results of this transformation can be seen in Figure 7 below.

84	180601036	MEGA OCTAVIA SARI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
85	180601039	MAY AULDINA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
86	180601020	SYADRI YASMAAN	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
87	180601024	ILHAM GUSPURI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
88	180601026	FACHILA TRI ASTUTI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
89	180601038	KUNU ANGGORANI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
90	180601030	KUNU ANGGORANI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
91	180601025	SUSI APRILIANTI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
92	180601017	IRRI WAKHYUNI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
93	180601028	REZA NIUR AKHYAR	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
94	170601063	RETI SOEDONO	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
95	170601004	IRWATI NUR ROHMANNI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
96	170601011	ARI RESTI WANGSOSI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
98	170601014	AFSA AZZA ISMAYANI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
99	170601019	SEPTIKA JAYANI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
100	170601017	DESI SARTIKA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
103	170601018	ECCA PUTRI RABINDHARA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
104	170601021	AFRIANS SAPUTRI	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
105	170601022	KUNU SARIAN	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
106	170601023	HOLLA ANANDA	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4
107	170601021	LHAM ANBAR	UM 101	AI Islam 1	UM 202	AI Islam 2	UM 303	AI Islam 3	UM 404	AI Islam 4

Fig. 7. Data after transformation is done

D. Data Reduction Phase

At this stage, we broke down the data into smaller forms but still produced the same analytical results. In this study, we selected the necessary variables in the process of identifying the success of learning Al Islam and Kemuhammadiyah at Universitas Muhammadiyah Riau. The variables needed in this study are Student Number (NIM), Student Name, AIK 1 Grade, AIK 2 Grade, AIK 3 Grade, AIK 4 Grade, and AIK Learning Success Category. The results of the reduction process can be seen in Figure 8 below.

Fig. 14. Test Results on 10% Data and Confidence Value for Each Category of AIK Learning Success Rate

To obtain the best accuracy and performance values, a number of K parameter trials were conducted. The results of which can be seen in the following table:

TABLE II. K PARAMETER AND ACCURACY RESULT

K Value	Accuracy Result
2	71,43 %
3	57,14 %
4	64, 29 %
5	57,14 %
6	57,14 %
7	50 %
8	50 %
9	50 %
10	50 %

V. CONCLUSION

The results of the study demonstrate that machine learning is able to identify the success of learning AI Islam and Kemuhammadiyah at Universitas Muhammadiyah Riau using the K-Nearest Neighbor algorithm classification method based on the student's AIK learning grade data. Furthermore, the results of identification carried out by

machine learning can be input to the leaders and related institutions at the University of Muhammadiyah Riau in monitoring and evaluating AIK learning. Finally, based on Table II, the experimental parameter set K, obtained the best accuracy and performance values, namely the parameter set K = 2 with an accuracy value of 71.43%.

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