

Implementation of the Smart Indonesia Card Scholarship (KIP) Acceptance Using the K-NN Method (Case Study: Politeknik Siber Cerdika Internasional)

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ABSTRACT

Keywords: IT scholarship acceptance; smart indonesia card (KIP); K-nearest neighbor (K-NN). This study discusses the implementation of the K-Nearest Neighbor (K-NN) method in the process of receiving the Smart Indonesia Card (KIP) scholarship at the Cerdika International Cyber Polytechnic. The main purpose of this study is to improve accuracy and efficiency in the selection of KIP scholarship recipients. The K-NN method was chosen because of its ability to classify data based on the proximity of features between samples. This research involves analyzing data on prospective scholarship recipients which includes variables such as academic achievement, economic conditions, and extracurricular activities. The results of the implementation of the K-NN method show that this method can be used as an effective tool in the selection process of KIP scholarship recipients, with a fairly high level of accuracy compared to traditional methods. This finding is expected to help the Polytechnic in increasing transparency and fairness in providing scholarships.



Introduction

Higher education is one of the important aspects in the development of a country, playing a vital role in improving the quality of human resources. However, access to higher education is still a challenge for some people, especially those from low economic backgrounds. To overcome this inequality, various scholarship programs have been introduced, one of which is the Smart Indonesia Program (PIP) better known as the KIP Scholarship (Smart Indonesia Card) (Maulida & Sari, 2015).

The Indonesia Smart Program through the Indonesia Smart Card (KIP) is the provision of education cash assistance to all school-age children (6-21 years old) and one of the national programs (listed in the 2015-2019 RPJMN) in government regulations since the end of 2014. The Smart Indonesia Program through KIP is part of the improvement of the Poor Student Assistance Program (BSM).

SCI Polytechnic under the Mansyur Al-Makki Foundation is the first Polytechnic in Cirebon that has Digital Business, Network Computer Engineering Engineering, and

Community Economic Rural Empowerment study programs. SCI Polytechnic carries the tagline Skillfull College which ensures that each graduate has the best skills in their study program. All Study Programs have been accredited by LAMEMBA, LAM TEKNIK, and BAN-PT in 2023.

Law Number 12 of 2012 concerning Higher Education has given a mandate to the government to realize affordability and equitable distribution in obtaining access to quality higher education that is relevant to the interests of the community for progress, independence, and welfare. The government is obliged to increase access and learning opportunities and prepare intelligent and competitive Indonesian people. (Law (UU) No. 12 of 2012 concerning Higher Education, 2012). One of the government's efforts to increase access to learning for the community is through the provision of scholarships.

The Smart Indonesia Card Program (KIP) is an initiative of the Indonesian government that aims to ensure that all Indonesian children have access to a proper education. (Amadi et al., 2023). Through this program, students from underprivileged families are assisted in the form of scholarships that cover tuition fees and other needs. The implementation of this program is expected to help reduce the dropout rate and improve the quality of human resources in Indonesia. (Zainal, Joesyiana, Zainal, Wahyuni, & Adriyani, 2023).

However, as the number of KIP scholarship recipients increases every year, an accurate and fair recipient selection process is a challenge in itself. (NEGARA, n.d.). In practice, several obstacles are often faced, such as invalid recipient data, a selection process that takes a long time, and the potential for human error in determining scholarship recipients. Therefore, a system is needed that can help the selection process of scholarship recipients efficiently and on target.

Cerdika International Cyber Polytechnic as one of the educational institutions participating in the KIP program, also experienced challenges in the selection process of scholarship recipients. This institution needs a system that can process scholarship applicant data quickly and accurately so that it can select prospective scholarship recipients who are truly entitled more efficiently. (Maryaningsih, Siswanto, & Mesterjon, 2013).

In this context, the K-Nearest Neighbor (K-NN) method can be applied as a solution to solve the problem. K-NN is one of the methods in machine learning used for classification and regression (Bugis, Cakra, Patombongi, & Suarna, 2024). This method works by comparing new data with existing data and determining the class of the new data based on proximity (similarity) with several nearby data.

By applying the K-NN method in the selection of KIP scholarship recipients at the Cerdika International Cyber Polytechnic, it is hoped that the selection process can be faster, more efficient, and more accurate. This system can help reduce errors in determining scholarship recipients and ensure that scholarships are awarded to those who are truly in need and meet the criteria.

This study will examine how the implementation of the K-NN method can be applied in the selection process of KIP scholarship recipients at the Cerdika International

Cyber Polytechnic, as well as analyze the effectiveness and efficiency of this method in solving existing problems. It is hoped that the results of this study can make a positive contribution to efforts to improve the quality and fairness of KIP scholarship distribution in Indonesia (Hisyam, Khotimah, Dewi, & Viridi, 2024).

The Indonesia Smart Card Scholarship (KIP) Lecture is one of the scholarship pathways offered by the government to increase access to higher education for people who are outstanding and economically disadvantaged. (K. Religion, 2020) The KIP Lecture Scholarship used to be called the Bidikmisi Scholarship which was later renamed in 2020. From 2015 to 2019, the Directorate General of Islamic Education through the Directorate of Islamic Religious Higher Education has provided Bidikmisi scholarships to 37,850 students. After transforming into KIP Lecture, the quota has increased quite significantly. If in 2019 the Bidikmisi quota was only 11,000 students, then in 2020 it will be 17,565 people. (Romadhon, 2023). With the increase in the quota of KIP Lecture recipients, it is necessary to take accurate steps in determining the eligibility of KIP Lecture recipients.

The K-Nearest Neighbors (K-NN) method is one of the machine learning algorithms that can be applied to predict or classify data based on its relationship with existing data. (Subhan, 2021). In the context of receiving KIP scholarships, the use of the K-NN method can help in identifying the candidates who are most eligible to receive assistance, by comparing their profiles with data from previous scholarship recipients.

One way that can be done in the selection process for KIP Lecture Scholarship admissions is to classify prospective scholarship recipients because the right classification results are very important to determine the eligibility of scholarship recipients. Several methods for classifying the eligibility of scholarship recipients have been proposed by many researchers. Such as the research of M. Khalil who carried out the Application of the K-Nearest Neighbor (kNN) Method in the Scholarship Recipient Selection Process. (Kholil, 2018) A. Sumiah and N. Mirantika also compared the K-Nearest Neighbour method to recommend determining scholarship recipients (Sumiah & Mirantika, 2020).

The objectives to be achieved through this research are as follows: 1. Implementing more structured and organized data management to support more effective analysis and selection. 2. Increase transparency in the selection process by providing clear information on how decisions are made using the K-NN method. 3. Determine and use key variables that affect the eligibility of scholarship acceptance to improve the accuracy of selection.

According to (Rachma, 2022) This study shows that there are 23 regencies/cities that are included in the classification category of poverty level less than average and the remaining 15 regencies/cities are included in the classification category of poverty level more than average. The higher the per capita expenditure index, the rate of GDP, and the average length of school-issued in an area, it shows the improvement in community welfare and the quality of human resources in the Regency/City area. Meanwhile, the higher the open unemployment rate in an area, it shows the decrease in the level of community welfare in the Regency/City area. The accuracy results produced from the

classification using the K-Nearest Neighbor algorithm showed the highest accuracy of 76.67% with the best k parameter values of k = 1 and k = 2.

Method

The model used in this study is the standard method by applying the K-Nearest Neighbor (K-NN) method. At this stage, the researcher will classify the indicators of receiving KIP scholarships for students, with this model it can make it easier for researchers to apply the model of the algorithm that aims to produce final scores in the form of accuracy, precision, and recall.

This research is included in case study research, which is research that is carried out intensively, in detail, and in depth on an organization, institution, and certain symptoms. A case study is a more sophisticated strategy when the subject matter of a study is related to "how" or "why", or if the researcher has little chance of being investigated, when to control the events to be investigated, and when the focus of the research is on contemporary (present) phenomena in the context of real life.

Results and Discussion

K-Nearest Neighbor Test Results

SW

Table 1 Data Set

No	Student Name	Status	Euclidean Distance	Ranking
1	Muhamad Zaenal Asikin	Fail	2.000	1
2	Sri Hartini	Fail	22.361	2
3	Iin Tarsini	Fail	22.361	3
4	Adam Hernawan	Fail	22.361	4
5	Aurelia Widya Astuti	Fail	22.361	5
6	Azka Muharam	Fail	22.361	6
7	Tantra Agun Wiguna	Fail	22.361	7
8	Moh Hisyam Hauzaan	Fail	24.495	8
9	Arulafiah Nurwahid	Fail	24.495	9
10	Egi Ahmad Baihaqi	Accepted	31.623	10
11	Adila Septiyani	Accepted	31.623	11
12	Fika Sabila	Accepted	31.623	12

13	Rayhan Syawal Fizriki	Accepted	31.623	13
14	Alif Suryalaksana	Accepted	31.623	14
15	Elvira Fitriyanti	Accepted	31.623	15
16	Andika Bagus Saputra	Accepted	31.623	16
17	Ahmad Syibahi	Accepted	31.623	17
18	Muhamma d Khoerudin	Accepted	33.166	18
19	Mamduh Rihadatul Aisy	Accepted	33.166	19
20	Satrio Rafif Firmansah	Accepted	33.166	20
21	Siti Ainul Kholoifah	Fail	33.166	21

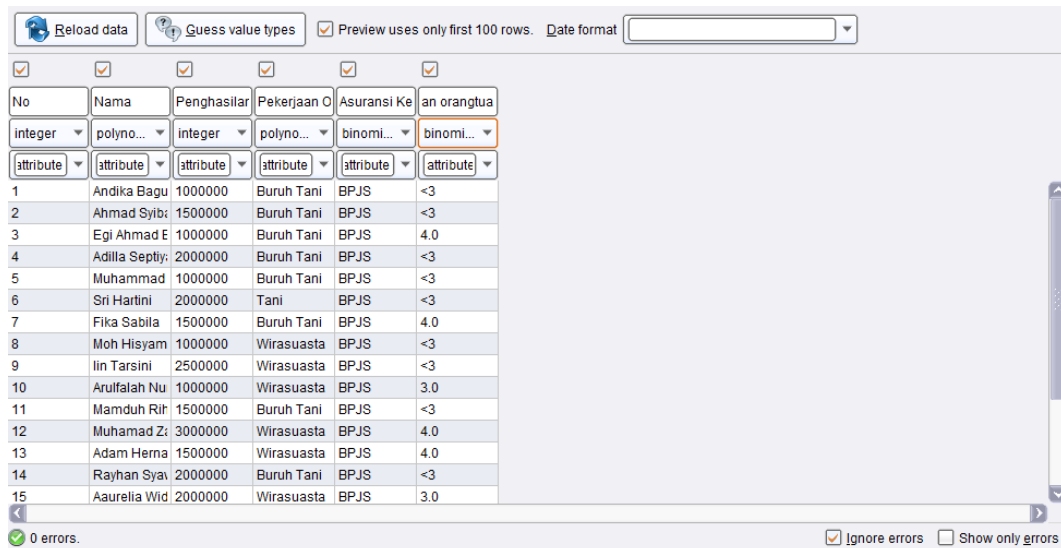


Figure 2 Rapidminer Operator

Then the read excel menu is double-clicked or clicked and dragged to the main process page as shown in the following figure 5.3:

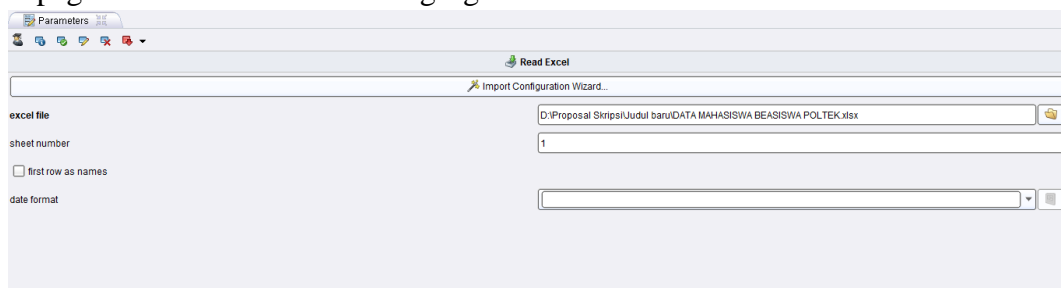


Figure 3 Import Configuration Wizard.

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Then the Set Role menu is double-clicked or clicked and dragged to the *main process* page as shown in the following Figure 4:

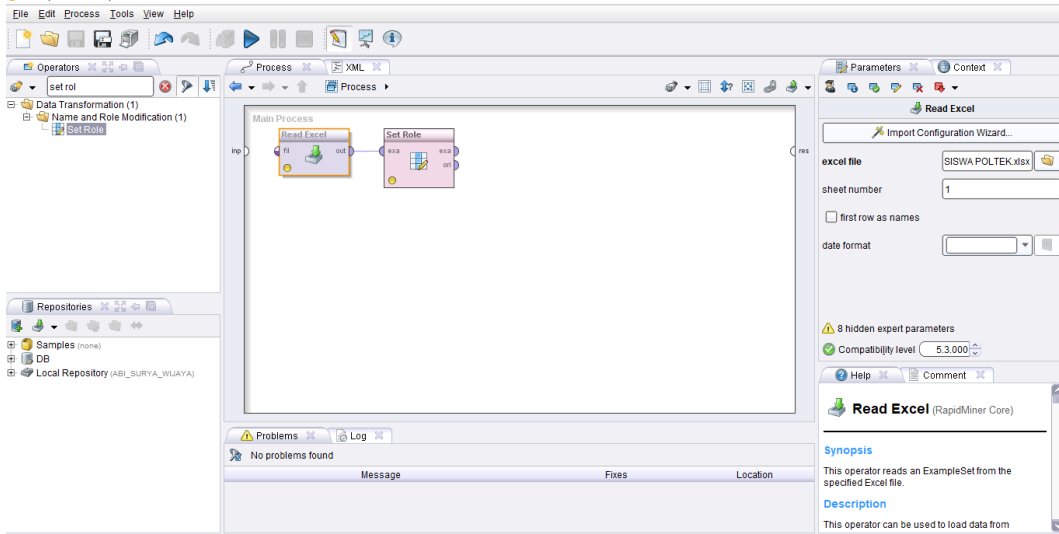


Figure 4 Set Role in the Main Process

Then the K-Nearest Neighbor (K-NN) menu is double-clicked or clicked and dragged to the *main process* page as shown in the following Figure 5:

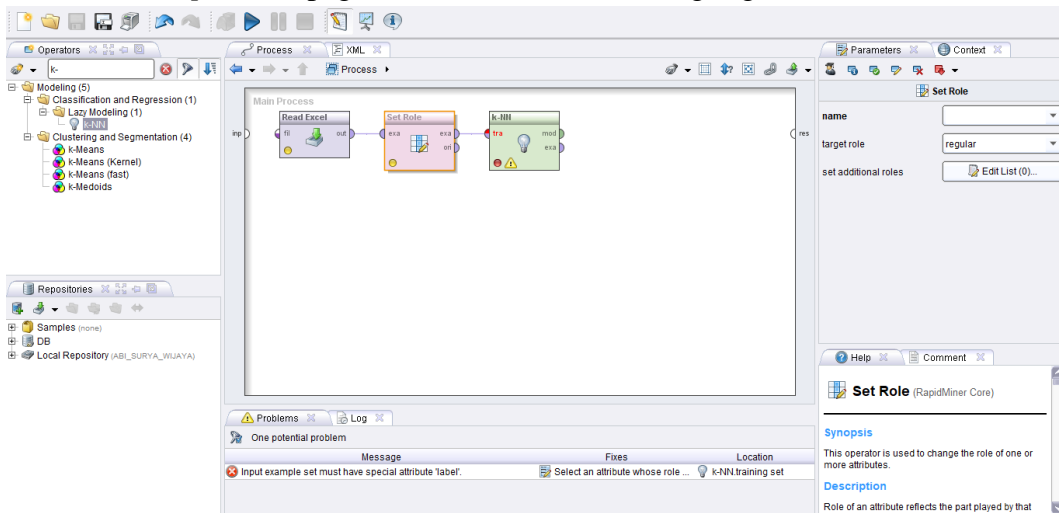


Figure 5 K-NN in the Main Process

The results obtained from testing the graph shape and description rule of K-Nearest Neighbor (K-NN) are as shown in the image below:

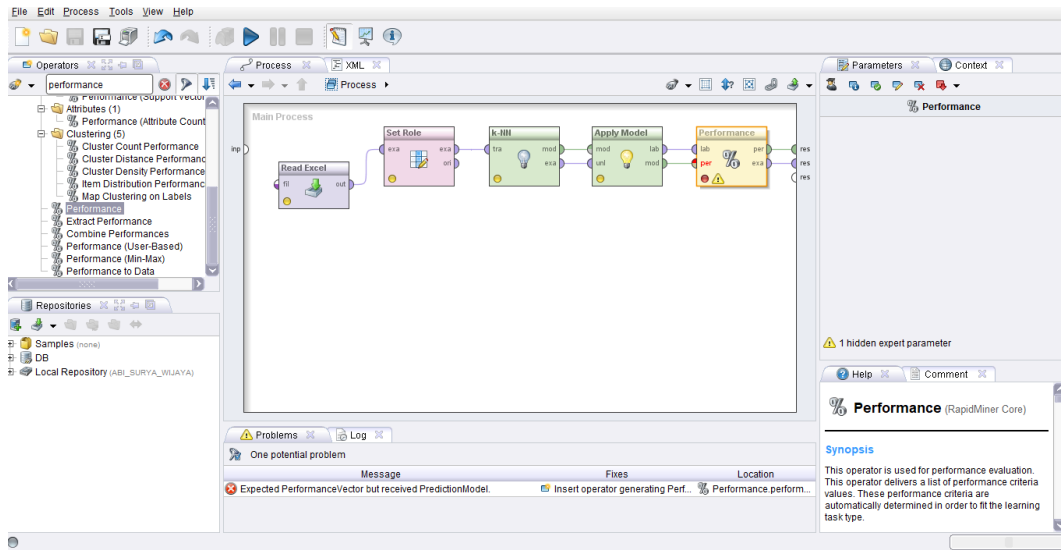


Figure 6 Design of K-NN Testing with Rapidminer

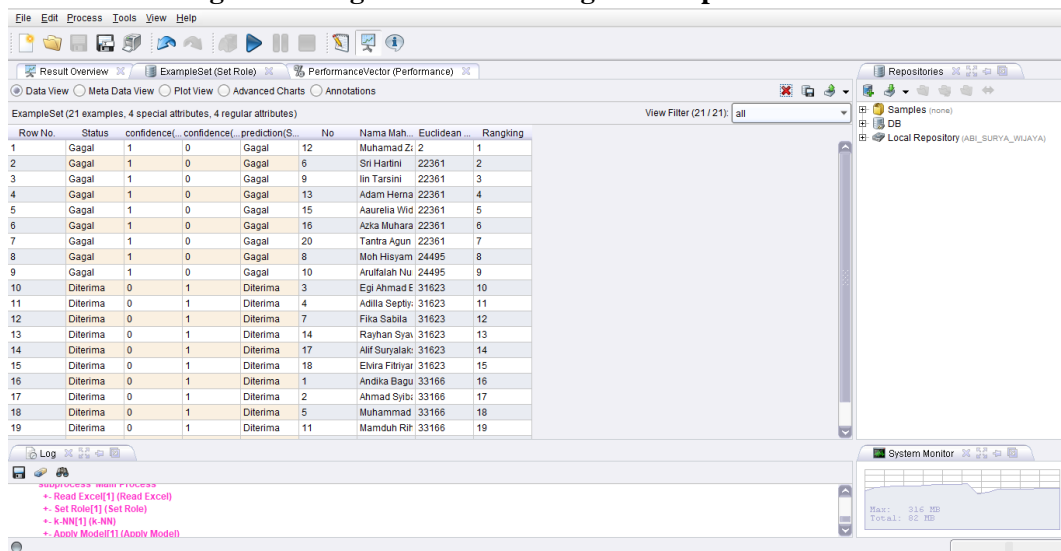


Figure 7 K-NN Test Results

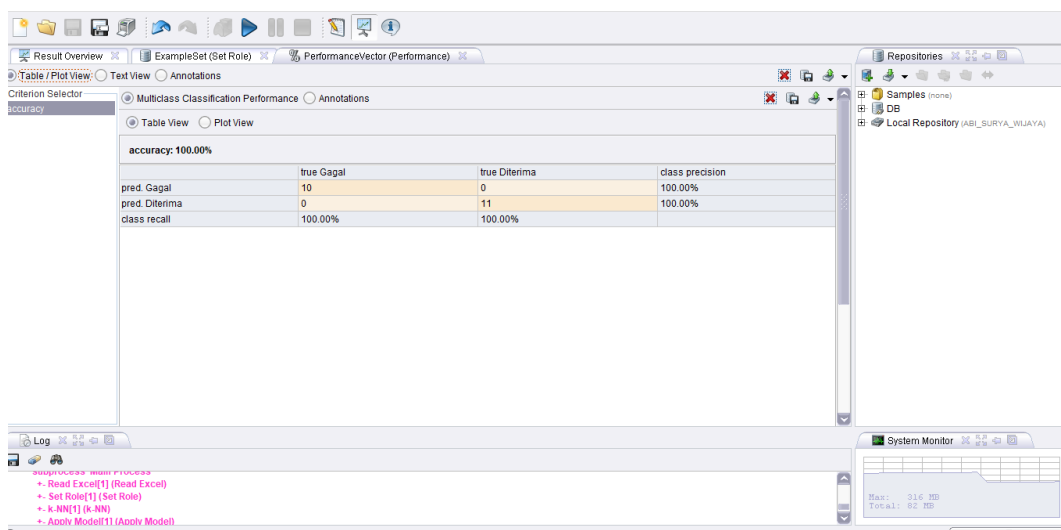


Figure 8 Accuracy PerformanceVector (Performance) Results

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Based on the K-NN test data in the figure above, it is stated that 81.82% of **the accuracy level of true predictions is accepted** for the use of K-NN in the process of receiving the KIP Scholarship at the International Cyber Polytechnic.

Classification

Based on the majority classification of the number of closest K values (K-3, K-5, K-7, K-9, and K-19) that are different, the following results are produced:

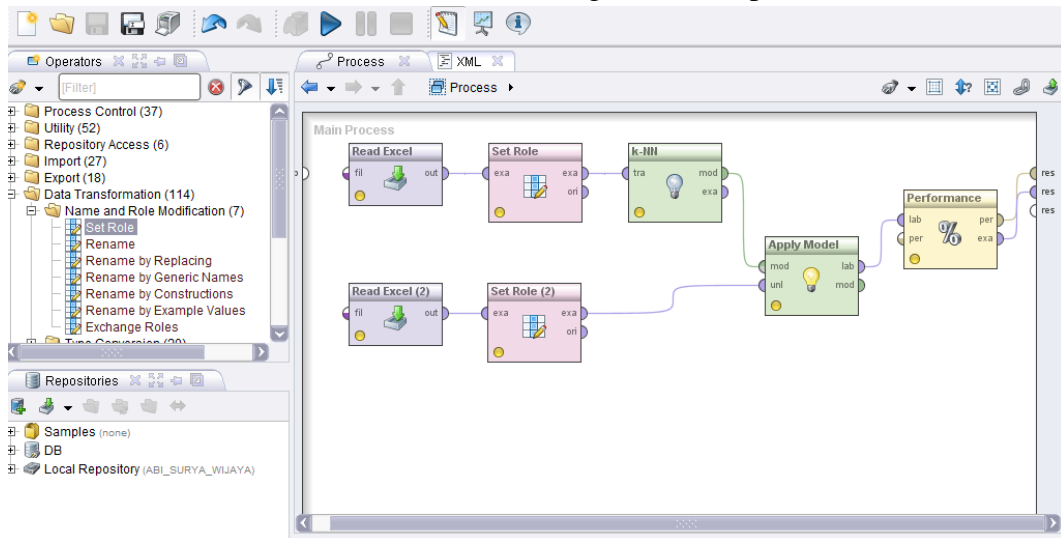


Figure 9 K-3 K-NN Test Design on Rapidminer

Row No.	Status	confidence	confidence	prediction(S...	No	Nama	Euclidean...	Rangking	J
1	Gagal	1	0	Gagal	12	Muhamad Z:	2	1	?
2	Gagal	1	0	Gagal	6	Sri Hartini	22361	2	?
3	Gagal	1	0	Gagal	9	lin Tarsini	22361	3	?
4	?	1	0	Gagal	?	?	?	?	DATA

Figure 10 Results of K-NN Testing with K=3 Condition

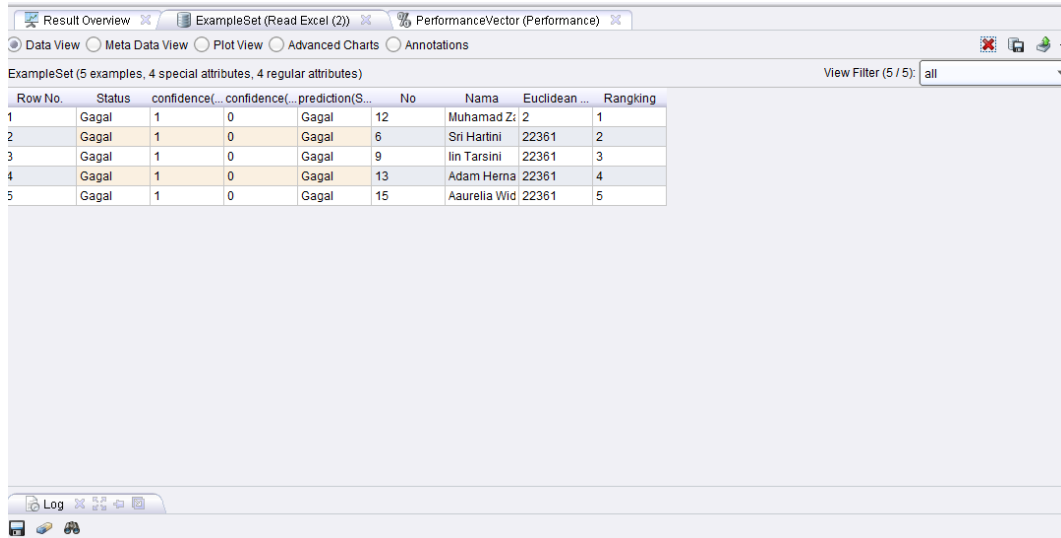


Figure 11 Results of K-NN Testing with K=5 Condition

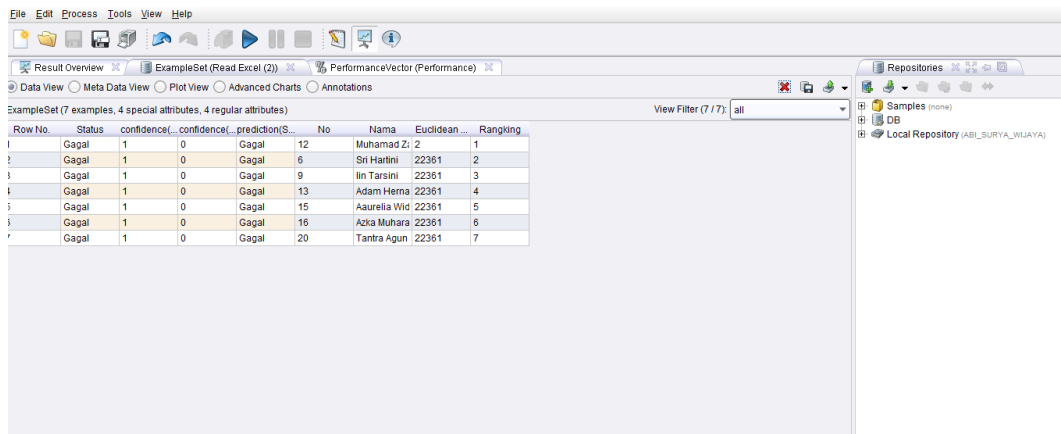


Figure 11 Results of K-NN Testing with K=7 Condition

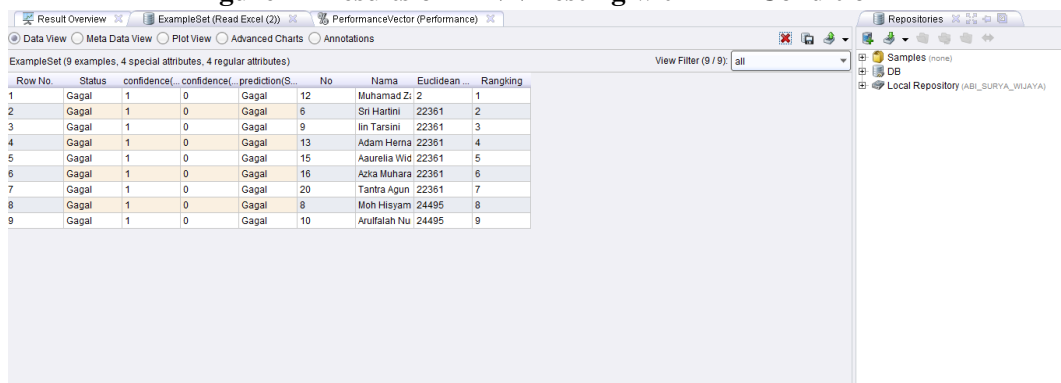


Figure 12 Results of K-NN Testing with K=9 Condition

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Row No.	Status	confidence	confidence	prediction(S	No	Nama	Euclidean	Ranging
1	Gagal	1	0	Gagal	12	Muhamad Zi	2	1
2	Gagal	1	0	Gagal	6	Sri Hartini	22361	2
3	Gagal	1	0	Gagal	9	Iin Tarsini	22361	3
4	Gagal	1	0	Gagal	13	Adam Hema	22361	4
5	Gagal	1	0	Gagal	15	Aurelia Wid	22361	5
6	Gagal	1	0	Gagal	16	Azka Muhara	22361	6
7	Gagal	1	0	Gagal	20	Tantra Agun	22361	7
8	Gagal	1	0	Gagal	8	Moh Hisyam	24495	8
9	Gagal	1	0	Gagal	10	Arulfatah Nu	24495	9
10	Diterima	0	1	Diterima	3	Egi Ahmad E	31623	10
11	Diterima	0	1	Diterima	4	Adilia Septhy	31623	11
12	Diterima	0	1	Diterima	7	Fika Sabila	31623	12
13	Diterima	0	1	Diterima	14	Rajhan Syah	31623	13
14	Diterima	0	1	Diterima	17	Alif Suryalaki	31623	14
15	Diterima	0	1	Diterima	18	Elvira Fitriyari	31623	15
16	Diterima	0	1	Diterima	1	Andika Bagu	33166	16
17	Diterima	0	1	Diterima	2	Ahmad Syib	33166	17
18	Diterima	0	1	Diterima	5	Muhammad	33166	18
19	Diterima	0	1	Diterima	11	Mamduh Rih	33166	19

Figure 13 Results of K-NN Testing with K=19 Condition

Results of Classification of Prospective Scholarship Recipients with K=3

The results of the K-NN test using 3 data produced 3 people who failed and the accuracy values were as follows:

K= 3 with 3 data, with the result

Percentage of failures = $3/3 = 100\%$

Percentage Accepted = $0/3 = 0\%$

This means that the accuracy level of failing the scholarship classification test using K=3 is 100%.

Results of Classification of Prospective Scholarship Recipients with K=5

The results of the K-NN test using 5 data resulted in 5 people failing, here is the calculation of the *accuracy* level:

K= 5 with 5 data with results Percentage failed = $5/5 = 100\%$ Percentage Accepted = $0/5 = 0\%$. This means that the accuracy level of the scholarship classification test using K=5 results in 100% failure and *the accuracy* is accepted as much as 0%.

Results of Classification of Prospective Scholarship Recipients with K=7

The results of the K-NN test using 7 data resulted in 7 people failing, here is the calculation of the *accuracy* level:

K= 7 with 7 data with results Percentage failed = $7/7 = 100\%$ Percentage Accepted = $0/7 = 0\%$. This means that the accuracy level of the scholarship classification test using K=7 results in 100% failure and *the accuracy* is accepted only 0%.

Classification Results of Prospective Scholarship Recipients with K=9

The results of the K-NN test using 9 data resulted in 9 people failing, here is the calculation of the *accuracy* level:

K= 9 with 9 data with results Percentage failed = $9/9 = 100\%$ Percentage Accepted = $0/9 = 0\%$

This means that the accuracy level of the scholarship classification test using K=9 results in 100% failure and *the accuracy* of the scholarship received 0%.

Results of Classification of Prospective Scholarship Recipients with K=19

The results of the K-NN test using 19 data resulted in 9 people failing and 10 being accepted, here is the calculation of the *accuracy* level:

K= 9 dengan 9 data dengan hasil Presentase gagal = $9/19 = 47\%$ Presentase Diterima = $10/19 = 53\%$. Artinya, tingkat accuracy pengujian klasifikasi Beasiswa menggunakan K=9 menghasilkan 47% gagal dan accuracy Beasiswa diterima 53%.

Conclusion

From the research on the implementation of the Smart Indonesia Card (KIP) scholarship at the Cerdika International Cyber Polytechnic using the K-Nearest Neighbor (K-NN) method, several important points can be concluded as follows: 1. Effectiveness of the K-NN Method: The K-NN method has proven to be effective in classifying prospective KIP scholarship recipients based on various criteria such as economic background, academic achievement, and other relevant criteria. With high accuracy, this method aids in objective and data-driven decision-making. 2. Accuracy and Accuracy: The implementation of K-NN in this case study shows a significant level of accuracy in predicting scholarship recipients. This shows that the model built can be relied on to select scholarship recipients fairly and on target. 3. System Sustainability: The K-NN-based selection system can be applied sustainably and integrated with the existing information system at the Cerdika International Cyber Polytechnic. Thus, the selection process can be carried out efficiently and consistently in the future. 4. Implementation Recommendations: With this system, the institution can more easily identify potential worthy recipients, so that the KIP scholarship program can be more targeted and have a positive impact on students in need.

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