Journal of Information System and Technology Research

journal homepage: https://journal.aira.or.id/index.php/jistr/

Data Mining Grouping Of Drug Users By Age Using Clustering Method (Case Study: BNN Binjai City)

Rizki Putri Ananda*, Budi Serasi Ginting*, Tio Ria Pasaribu*
Progam Studi Sistem Informasi STMIK KAPUTAMA Binjai Jl. Veteran No. 4A-9A, Binjai 20714, North Sumatra

ARTICLE INFO

Article history:

Received Apr 1, 2022
Revised May 4, 2022
Accepted Apr 28, 2022
Available online May 31, 2022

Keywords:

Data Mining
Clustering
Drag User
Age

ABSTRACT

Drug trafficking and abuse is a very complex problem, which requires efforts to overcome it. Given that there are still many obstacles in the process of grouping drug users at the Binjai City BNN Office, for this reason the author tries to create a system to support a computerized grouping process that can help automatically classify drug users based on age, so there is an opportunity to design a grouping data mining system in it. Data mining is part of a computer-based information system that employs one or more computer learning techniques to analyze and extract knowledge automatically that is used to support grouping within an organization or a company. *Clustering* is a method that is applied to create a grouping data mining system to make it easier for staff to classify drug users based on age. Based on the analysis that has been done on grouping drug user data using the *clustering*, it is necessary to do the *cluster* several times to get the same results according to the first process. In this process, the process is carried out 10 times to obtain *cluster*. In *cluster* 1 which is 3 9 4, *cluster* 2 is 3 1 4, *cluster* 3 is 3 5 4 with the number of members *of cluster* 1 as much as 322 data, *cluster* 2 as much as 81 data and *cluster* 3 as much as 97 data.

.

Corresponding Author:

Rizki Putri Ananda
Progam Studi Sistem Informasi STMIK KAPUTAMA Binjai Jl. Veteran No. 4A-9A, Binjai 20714, North Sumatra
Email: rizkiputriananda16@gmail.com

1. INTRODUCTION

National Narcotics Agency (BNN) is an institution Non-Ministry Government (LPNK) Indonesia on duty to coordinate agencies government in the field of prevention, eradication of abuse and narcotics trafficking (P4GN). BNN is led by a head directly responsible to the President. Along with the times, the demands of life encourage a variety of crimes committed by humans. One of the criminal acts that often occur today is the abuse of narcotics which is quite common among the public, even the current circulation of narcotics does not look at who is the user, regardless of the position, education and background of the person, ranging from ordinary people to officials. countries, adults and even students are involved in drug abuse.[1]

Therefore the problem that now it has reached an alarming situation is the increasing number of narcotics abuse, so that it becomes an urgent state problem. The motivations and causes why people take these drugs can vary, among others, as an act of rebellion due to rejection by the environment such as feelings of inferiority, a broken family background, heartbreak, as an action to reduce stress and depression, just trying to get a comfortable and pleasant feeling or as an action to escape from the realities of life.[1]–[3] Many factors cause rampant multiple drug abuse this year, which increased rapidly, especially in North Sumatra, namely Binjai City. From data abuse and circulation narcotics in the Binjai area show a tendency increase from year to year. Of course, the question is how the Agency's efforts National Narcotics (BNN) in solve this problem, because with a generation whose morals have been broken it is impossible to form good nation. [4]

https://doi.org/xx.xxxx/xxxxxxx.xxxxxx

Law Number 22 Years 1997 concerning Narcotics regulates efforts to eradicate crime narcotics crime through threats fine, imprisonment, criminal life imprisonment, and the death penalty. In In addition, Law No 22 of 1997 also regulates regarding the use of narcotics for medical purposes and health and regulates medical and social rehabilitation. The results of this study Hopefully the National Narcotics Agency can find out the region and type most drugs used so that it can take policies to address drug abuse, in the form of anti-drug counseling to the community, and also create a clean village program drugs (shine) in the fight drugs through prevention, eradication, abuse and narcotics trafficking.[5]

Based on the research of Sri Rahayu, Dodon T. Nugrahadi, and Fatma Indriani, Lambung Mangkurat University (Science with the title "*Clustering* Determination of Regional Crime Potential in Banjar Baru City Using the K-*Means Method"* concluded that "In *Clustering*The grouping of potential regional crimes in the city of Banjarbaru is processed based on alignment. This is done so that the results of the *clustering*/ grouping of potential regional crimes in the city of Banjarbaru become more specific." Based on Roy Setiawan's research at the Jakarta LP3I Polytechnic Lentera ICT with the title "Implementation of Data Mining Using *the K-Means Clustering* to Determine New Student Promotion Strategies" concluded that the profile generated from data mining with *the K-Means algorithm Clustering* can provide knowledge to determine promotion strategies at the LP3I Jakarta Polytechnic. The knowledge obtained from the results of clustering is that prospective students are dominated by low and middle economic communities.[6]–[9].

2. RESEARCH METHOD

The research method is carried out to find something in a systematic way using scientific methods and applicable sources. In the process of this research, it is shown to provide more meaningful results for the National Narcotics Agency (BNN) of Binjai City in classifying drug user data by age using the *clustering* so as to provide better results. Based on the research method used, the flow of activities is made as follows:

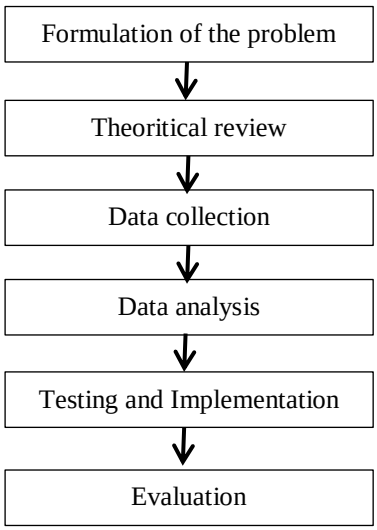

Figure 1 Research Workflow

Based on the picture above, it can be seen that there are several stages in completing the research, namely:

1. Problem Identification This stage is the initial stage in research, namely by determining the background of the problem, objectives and benefits so as not to get out of the problem and discussion or preparation of the thesis made.
2. Theoretical Study This stage is looking for information, sources related to the problems faced, both from literature studies, journals and the internet as a support and basic foundation for thesis writing.

3. Data collection
This stage is the collection of data needed in making a thesis such as interviews, observations which can then be processed to the next stage.

4. Data analysis

This stage is the stage of managing and analyzing the data that has been obtained so that the data can be grouped according to predetermined variables.

5. Testing and implementation This stage is the stage that performs the validation and implementation of the data that has been previously analyzed and the preparation of the program.

6. Evaluation

This stage is the stage of taking conclusions and suggestions that can be made in the preparation of the thesis. With the conclusion, the results of the entire thesis will be known and it is hoped that with suggestions there will be improvements and benefits for others.[7], [10], [11]

3. RESULTS AND DISCUSSION

The following will explain the results and discussion that has been obtained **:**

The following displays in tables 1 and 2 are the results of the iteration calculation

Then form a cluster into 3 groups (K=3) and determine the center point of the centroid. The clustering calculation process is as follows.
K=3 Centroids
C1= (5,9,5) taken from R . data
C2= (3,8,2) taken from S . data
C3= (3,9,2) taken from T . data

Iterasi 1 :

1. A (4,9,4)

C1=(5,9,5)= $\sqrt{(4-5)^2+(9-9)^2+(4-5)^2}$ =1,41
C2=(3,8,2)= $\sqrt{(4-3)^2+(9-8)^2+(4-2)^2}$ = 2,45
C3=(3,9,2)=$\sqrt{(4-3)^2+(9-9)^2+(4-2)^2}$ =2,24

2. B (3,8,4)

C1=(5,9,5)=$\sqrt{(3-5)^2+(8-9)^2+(4-5)^2}$ =2,45
C2= (3,8,2)= $\sqrt{(3-3)^2+(8-8)^2+(4-2)^2}$ = 2
C3=(3,9,2)=$\sqrt{(3-3)^2+(8-9)^2+(4-2)^2}$ =2,24

3. C (3,7,4)

C1= (5,9,5) = $\sqrt{(3-5)^2+(7-9)^2+(4-5)^2}$ = 3
C2= (3,8,2)= $\sqrt{(3-3)^2+(7-8)^2+(4-2)^2}$ = 2,24
C3= (3,9,2)= $\sqrt{(3-3)^2+(7-9)^2+(4-2)^2}$ = 4,12

4. D (4,9,6)

C1=(5,9,5)=$\sqrt{(4-5)^2+(9-9)^2+(6-5)^2}$ = 1,41
C2=(3,8,2)= $\sqrt{(4-3)^2+(9-8)^2+(6-2)^2}$ =4,24
C3=(3,9,2)=$\sqrt{(4-3)^2+(9-9)^2+(6-2)^2}$ = 4,12

5. E (2,9,1)

C1= (5,9,5) = $\sqrt{(2-5)^2+(9-9)^2+(1-5)^2}$ = 5
C2= (3,8,2)= $\sqrt{(2-3)^2+(9-8)^2+(1-2)^2}$ = 0
C3=(3,9,2)=$\sqrt{(2-3)^2+(9-9)^2+(1-2)^2}$ =1,41

6. F (3,9,3)

C1=(5,9,5)=$\sqrt{(3-5)^2+(9-9)^2+(3-5)^2}$ = 2,83
C2=(3,8,2)= $\sqrt{(3-3)^2+(9-8)^2+(3-2)^2}$ =1,41
C3= (3,9,2)= $\sqrt{(3-3)^2+(9-9)^2+(3-2)^2}$ = 1

7. G (2,6,6)

C1=(5,9,5)=$\sqrt{(2-5)^2+(6-9)^2+(6-5)^2}$ =4,36
C2=(3,8,2)= $\sqrt{(2-3)^2+(6-8)^2+(6-2)^2}$ =4,58
C3=(3,9,2)=$\sqrt{(2-3)^2+(6-9)^2+(6-2)^2}$ = 5,10

8. H (3,10,2)

C1=(5,9,5)=$\sqrt{(3-5)^2+(10-9)^2+(2-5)^2}$ = 3,74
C2=(3,8,2)= $\sqrt{(3-3)^2+(10-8)^2+(2-2)^2}$ = 2
C3= (3,9,2)= $\sqrt{(3-3)^2+(10-9)^2+(2-2)^2}$ = 1

9. I (4,5,4)

C1=(5,9,5)=$\sqrt{(4-5)^2+(5-9)^2+(4-5)^2}$ = 4,24
C2=(3,8,2)= $\sqrt{(4-3)^2+(5-8)^2+(4-2)^2}$ = 3,74
C3=(3,9,2)=$\sqrt{(4-3)^2+(5-9)^2+(4-2)^2}$ = 4,58

10. J (2,6,3)

C1=(5,9,5)=$\sqrt{(2-5)^2+(6-9)^2+(3-5)^2}$ =4,69
C2=(3,8,2)= $\sqrt{(2-3)^2+(6-8)^2+(3-2)^2}$ =2,45
C3=(3,9,2)=$\sqrt{(2-3)^2+(6-9)^2+(3-2)^2}$ =3,32

11. K (5,9,5)

C1= (5,9,5) = $\sqrt{(5-5)^2+(9-9)^2+(5-5)^2}$ = 0
C2=(3,8,2)= $\sqrt{(5-3)^2+(9-8)^2+(5-2)^2}$ = 3,74
C3=(3,9,2)=$\sqrt{(5-3)^2+(9-9)^2+(5-2)^2}$ = 4,58

12. L (4,8,3)

C1=(5,9,5)=$\sqrt{(4-5)^2+(8-9)^2+(3-5)^2}$ = 2,45
C2=(3,8,2)= $\sqrt{(4-3)^2+(8-8)^2+(3-2)^2}$ = 1,41
C3=(3,9,2)=$\sqrt{(4-3)^2+(8-9)^2+(3-2)^2}$ = 1,73

13. M (3,9,6)

C1=(5,9,5)=$\sqrt{(3-5)^2+(9-9)^2+(6-5)^2}$ = 2,24
C2=(3,8,2)=$\sqrt{(3-3)^2+(9-8)^2+(6-2)^2}$ = 4,12
C3= (3,9,2)= $\sqrt{(3-3)^2+(9-9)^2+(6-2)^2}$ = 4

14. N (2,10,4)

C1=(5,9,5)=$\sqrt{(2-5)^2+(10-9)^2+(4-5)^2}$ = 3,32
C2=(3,8,2)= $\sqrt{(2-3)^2+(10-8)^2+(4-2)^2}$ = 3
C3=(3,9,2)=$\sqrt{(2-3)^2+(10-9)^2+(4-2)^2}$ = 2,45

15. O (3,1,7)

C1=(5,9,5)=$\sqrt{(3-5)^2+(1-9)^2+(7-5)^2}$ = 8,49
C2=(3,8,2)= $\sqrt{(3-3)^2+(1-8)^2+(7-2)^2}$ = 8,60
C3=(3,9,2)=$\sqrt{(3-3)^2+(1-9)^2+(7-2)^2}$ = 9,43

16. P (3,1,7)

C1=(5,9,5)=$\sqrt{(3-5)^2+(1-9)^2+(7-5)^2}$ = 8,49
C2=(3,8,2)= $\sqrt{(3-3)^2+(1-8)^2+(7-2)^2}$ = 8,60
C3=(3,9,2)=$\sqrt{(3-3)^2+(1-9)^2+(7-2)^2}$ = 9,43

17. Q (2,1,1)

C1=(5,9,5)=$\sqrt{(2-5)^2+(1-9)^2+(1-5)^2}$ = 9,43
C2=(3,8,2)= $\sqrt{(2-3)^2+(1-8)^2+(1-2)^2}$ =7,14
C3=(3,9,2)=$\sqrt{(2-3)^2+(1-9)^2+(1-2)^2}$ = 8,12

18. R (5,9,5)

C1= (5,9,5)=$\sqrt{(5-5)^2+(9-9)^2+(5-5)^2}$ = 0
C2=(3,8,2)= $\sqrt{(5-3)^2+(9-8)^2+(5-2)^2}$ =3,74
C3=(3,9,2)=$\sqrt{(5-3)^2+(9-9)^2+(5-2)^2}$ = 3,61

19. S (3,8,2)

C1=(5,9,5)=$\sqrt{(3-5)^2+(8-9)^2+(2-5)^2}$ = 3,74
C2= (3,8,2)= $\sqrt{(3-3)^2+(8-8)^2+(2-2)^2}$ = 0
C3= (3,9,2)= $\sqrt{(3-3)^2+(8-9)^2+(2-2)^2}$ = 1

20. T (3,9,2)

C1=(5,9,5)=$\sqrt{(3-5)^2+(9-9)^2+(2-5)^2}$ = 3,61

C2= (3,8,2)= $\sqrt{(3-3)^2+(9-8)^2+(2-2)^2} = 1$
C3= (3,9,2)= $\sqrt{(3-3)^2+(9-9)^2+(2-2)^2} = 0$

Table 1. Iteration I Calculation Results

No	Alternatif	C1	C2	C3	Group
1	A	1,41	2,45	2,24	1
2	B	2,45	2,00	2,24	2
3	C	3,00	2,24	2,83	2
4	D	1,41	4,24	4,12	1
5	E	5,00	0,00	1,41	2
6	F	2,83	1,41	1,00	3
7	G	4,36	4,58	5,10	1
8	H	3,74	2,00	1,00	3
9	I	4,24	3,74	4,58	2
10	J	4,69	2,45	3,32	2
11	K	0,00	3,74	3,61	1
12	L	2,45	1,41	1,73	2
13	M	2,24	4,12	4,00	1
14	N	3,32	3,00	2,45	3
15	O	8,49	8,60	9,43	1
16	P	8,49	8,60	9,43	1
17	Q	9,43	7,14	8,12	2
18	R	0,00	3,74	3,61	1
19	S	3,74	0,00	1,00	2
20	T	3,61	1,00	0,00	3

Next is to calculate the ratio between Between Cluster Variation (BCV), because the centroid C1 = (5,9,5) C2 = (3,8,2) C3=(3,9,2) then the BCV calculation is as follows.

$d(C_i, C_j) = \sqrt{\sum(x_i - x_i)^2}$

$d(C_1, C_2) = \sqrt{(5-3)^2+(9-8)^2+(5-2)^2} = 3{,}74$

$d(C_1, C_3) = \sqrt{(5-3)^2+(9-9)^2+(5-2)^2} = 3{,}61$

$d(C_2, C_3) = \sqrt{(3-3)^2+(8-9)^2+(2-2)^2} = 1$

BCV $= d(C_i, C_j) + d(C_1, C_3) + d(C_2, C_3)$

$= 3{,}74 + 3{,}61 + 1 = 8{,}35$

So that the value of the BCV ratio is 8.35

Then do the calculations for iteration II, before doing the calculations for iteration II, it is necessary to make the centroid center of the three clusters first.

Iteration 2: K = 3

Centroid 1 Group 1

$C_1 = \left(\frac{4+4+2+5+3+3+3+5}{8}\right) = 3{,}83$

$\left(\frac{9+9+6+9+9+1+1+9}{8}\right) = 6{,}63$

$\left(\frac{4+6+6+5+6+7+7+5}{8}\right) = 5{,}75$

= (3,83 6,63 5,75)

Centroid 2 Group 2

$C_2 = \left(\frac{3+3+2+4+2+4+2+3}{8}\right) = 2{,}88$

$\left(\frac{8+7+9+5+6+8+1+8}{8}\right) = 6{,}50$

$\left(\frac{4+4+1+4+3+3+1+2}{8}\right) = 2{,}75$

= (2,88 6,50 2,75)

Centroid 3 Group 3

$C_3 = \left(\frac{3+3+2+3}{4}\right) = 2,75$

$\left(\frac{9+10+10+9}{4}\right) = 9,50$

$\left(\frac{3+2+4+2}{4}\right) = 2,75$

= (2,75 9,50 2,75)

So K=3 Centroid

C_1 = (3,83 6,63 5,75)

C_2 = (2,88 6,50 2,75)

C_3 = (2,75 9,50 2,75)

The results of the calculations, the results of the iteration 2 calculations are obtained, as shown in the table below.

Table 2. Iteration II Calculation Results

No	Alternatif	C1	C2	C3	Grup
1	A	2,84	3,98	3,22	1
2	B	2,31	1,96	1,97	2
3	C	1,90	1,35	2,81	2
4	D	2,42	4,25	3,52	1
5	E	5,55	0,00	1,97	2
6	F	3,69	2,52	0,61	3
7	G	1,76	3,40	4,83	1
8	H	5,08	3,58	0,94	3
9	I	2,42	2,25	4,83	2
10	J	3,25	1,04	3,59	2
11	K	2,84	3,98	3,22	1
12	L	3,10	1,89	1,97	2
13	M	2,47	4,10	3,30	1
14	N	4,13	3,82	1,54	3
15	O	5,80	6,95	9,51	1
16	P	5,80	6,95	9,51	1
17	Q	7,54	5,84	8,71	2
18	R	2,84	3,98	3,22	1
19	S	4,04	1,68	1,70	2
20	T	4,48	2,61	0,94	3

After calculating using the existing cluster formula, iteration 2 occurs the same as iteration 1 and no data moves groups again so that the calculation can be stopped. So that a cluster graph of drug use data can be made based on age.

3.1 Graph Clustering

Create a cluster graph based on the calculations that have been done. The graphs obtained are as follows[6], [11]:

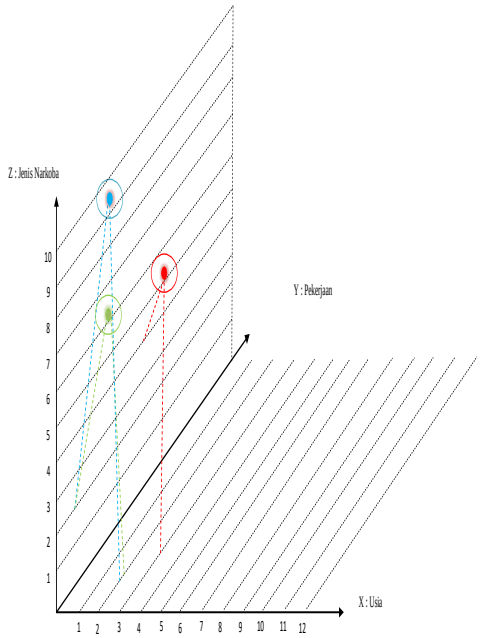

Figure 2. Graph of Drug Users Grouping Cluster

From 20 data obtained 3 *groups*, Cluster 1 has 6 data, *Cluster* 2 has 7 data, and *Cluster* 3 there are 7 data.

1. Cluster 1 There are 6 Data 3.83; 6.63; 5.75;

It can be seen that in *cluster* 1 there are users aged 36-45 years with civil servant jobs and the types of drugs used are methamphetamine and marijuana.

2. Cluster 2 There are 7 data 2.88; 6.50 2.75;

It can be seen that in *cluster* 1 there are users aged 26-35 years with student jobs and the type of drug used is Inex.

3. Cluster 3 There are 7 data 2.75; 9.50 2.75;

It can be seen that in *cluster* 1 there are users aged 26-35 years with self-employed jobs and the type of drug used is Inex.

3.2 Discussion

In designing the system, the author builds a system that has been done manually into a computerized system with the title data mining grouping drug users based on age using the *clustering* at the Binjai City National Narcotics Agency. The program created using *Matlab* GUI software and the database used is *Microsoft Excel*. This system will process the inputted data which then produces new information which is expected to be useful information, especially about drug users. The test will be carried out by processing the system input data, the data grouping process to be carried out is as follows:

1. *Clustering* Data

Stages of grouping Drug User data can be done on the "PROCESS" menu. The following is the process of grouping JHT data with a system that has been designed with the application of the *Clustering* using the MATLAB R2014a programming application:

a. Button Import Data

The import is used to import data files in *Microsoft excel* which will be processed using the *clustering*.

With the *button import* data, the data will appear in the table and will provide information on the amount of data and the inputted column.

The following is a page display after the data has been successfully input into the system:

Figure 3. Display After Data Input on the System

b. Button Cluster Process

After the data import process has been

carried out, the next step is to process the cluster to be processed, by selecting the number of *cluster*, for example 2 or 3 clusters. Then click *button* process *cluster* then the data will be processed, wait until the process is complete then the drug use grouping information data will appear. The following is the display after the data grouping process on the system:

Figure 4. Display after the Data Grouping Test Process

From the results above, each group can be added up as follows:

1. Group 1 A total of 322 data
2. Group 2 A total of 81 data
3. Group 3 A total of 97 data

Total data = 500 data

c. Results of the Data Grouping Process The results of the grouping of data that provide information in the form of coordinates for data grouping and the *cluster* , the display of the results for grouping the data is as follows:

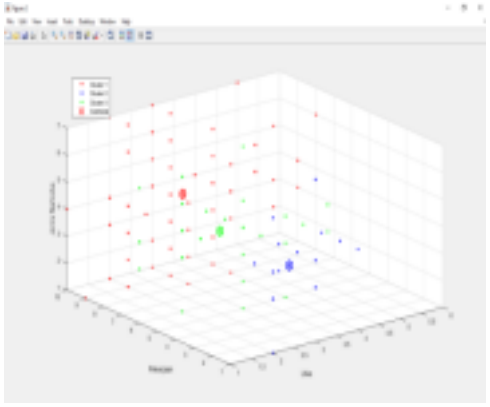

Figure 5. Graph of Central Data Grouping Process:

C1 : 3,3043 9,0373 3,8727 (3 9 4)
C2 : 2,5062 1,284 3,9506 (3 1 4)
C3 : 2,6598 5,4536 3,866 (3 5 4)

Information :

a. C1 = 3 9 4

Based on the calculations above, it can be seen that *cluster* 1 is centered on *centroid* with an age group (X) of 26-35 years, with a job (Y) being self-employed, and the type of drug (Z) being shabu.

b. C2 = 3 1 4

Based on the calculations above, it can be seen that *cluster* 2 is centered on *centroid* with an age group (X) of 26-35 years, with a job (Y) that is not working, and the type of drug (Z) is methamphetamine.

c. C3 = 3 5 4

Based on the calculations above, it can be seen that *cluster*r 3 is centered on *centroid* with an age group (X) of 26-35 years, with a job (Y) being private employees, with a type of drug (Z) namely crystal meth. Based on the analysis that has been done on the grouping of drug user data method *clustering*, it is necessary to do the *cluster* several times to get the same results according to the first process. In this process, the process is carried out 10 times so that the results *1* are *of cluster* 3 9 4, *cluster* 2 is 3 1 4 and *cluster* 3 is 3 5 4 with the number of members *of cluster* 1 as much as 322 data, *cluster* 2 as much as 81 data and *cluster* 3 with 97 data.

4. CONCLUSION

From the results of the analysis based on the clustering of data on grouping drug users based on age, a conclusion can be drawn, from 500 data there are 3 clusters which are grouped. . In cluster 1 which is 3 9 4, cluster 2 is 3 1 4, cluster 3 is 3 5 4 with the number of cluster members as much as 322 data, cluster 2 is 81 data and cluster 3 is 97 data. Based on the cluster process that has been carried out, the data grouping of drug users is based on the type of age at C1 = 3, 9, 4 with the age of 26-35 years old with self-employed work and with the type of narcotic, namely shabu. C2 = 3, 1, 4 with the age of 26-35 years, with a job that has not worked and with the type of drug, namely methamphetamine, C3 = 3.5, 4, namely with the age of 26-35 years with a private employee and with the type of narcotic, namely shabu. With data on drug users, it is known that the age of drug users is from the age of 26-35 years with self-employed jobs and types of shabu drugs.

REFERENCES

[1] D. M. Sari, D. Promosi, I. Perilaku, F. K. Masyarakat, and U. Airlangga, "PERAN KADER ANTI PENYALAHGUNAAN NARKOBA BERBASIS PELAJAR OLEH BADAN NARKOTIKA NASIONAL SURABAYA THE ROLE OF DRUGS ABUSED STUDENT-BASED CADRE BY BNN SURABAYA," pp. 128–140, 2005.

[2] B. N. Nasional and N. Sintetis, "ARTIKEL NARKOBA : BAHAYA PENYALAHGUNAAN DAN PENCEGAHANNYA Oleh : Joyo Nur Suryanto Gono," pp. 81–84.

[3] A. A. Hasibuan, "Narkoba dan Penanggulangannya," vol. 11, no. 1, pp. 33–44, 2017.

[4] L. Terhadap, P. Siswa, and S. Loa, "PENGARUH PENDIDIKAN KESEHATAN TENTANG NARKOBADENGAN MEDIA LEAFLETTERHADAP PENGETAHUAN SISWASMPN1 LOA JANAN," pp. 132–140, 2014.

[5] Kurniawan, "Definisi & Pengertian Narkoba Dan Golongan/Jenis Narkoba Sebagai Zat Terlarang.," 2008.

[6] G. Gustientiedina, M. H. Adiya, and Y. Desnelita, "Penerapan Algoritma K-Means Untuk Clustering Data Obat-Obatan," *J. Nas. Teknol. dan Sist. Inf.*, vol. 5, no. 1, pp. 17–24, 2019, doi: 10.25077/teknosi.v5i1.2019.17-24.

[7] A. Ikhwan and N. Aslami, "Implementasi Data Mining untuk Manajemen Bantuan Sosial Menggunakan Algoritma K-Means," *JurTI (Jurnal Teknol. Informasi)*, vol. 4, no. 2, 2020, [Online]. Available: http://jurnal.una.ac.id/index.php/jurti/article/view/2103.

[8] S. Rahayu, D. T. Nugrahadi, and F. Indriani, "CLUSTERING PENENTUAN POTENSI KEJAHATAN DAERAH DI KOTA BANJARBARU DENGAN METODE K-MEANS," vol. 01, no. 01, pp. 33–45, 2014.

[9] R. Setiawan and N. Tes, "PENERAPAN DATA MINING MENGGUNAKAN ALGORITMA K-MEANS CLUSTERING UNTUK MENENTUKAN STRATEGI PROMOSI MAHASISWA BARU (Studi Kasus : Politeknik LP3I Jakarta)," vol. 3, no. 1, pp. 76–92, 2016.

[10] A. Almira, S. Suendri, and A. Ikhwan, "Implementasi Data Mining Menggunakan Algoritma Fp-Growth pada Analisis Pola Pencurian Daya Listrik," *J. Inform. ...*, vol. 6, no. 2, pp. 442–448, 2021, [Online]. Available: http://www.openjournal.unpam.ac.id/index.php/informatika/article/view/12278.

[11] A. Ikhwan, "Analisis Cluster Jarak Antar Kecamatan Dengan Menggunakan Metode Euclidean Di Untuk Penetapan Zona Pengoperasian Mobil Mplik Di Kota Medan," no. August, 2016.