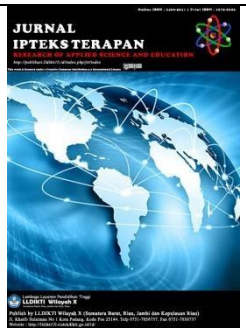

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OPTIMIZATION OF IT MANAGEMENT OF MEDICINE INVENTORY AT NARAS HEALTH CENTER WITH MACHINE LEARNING USING THE K-MEANS ALGORITHM

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Abstract

Naras Health Center is a community health center that provides health services located in North Pariaman District, Pariaman City. Naras Community Health Center has not been able to carry out pharmaceutical service activities according to plan. Data collection on drug use that has been recorded on computers also cannot provide useful information to assist in managing the amount of drug stock that must be provided. Some types of medicines sometimes experience overstocks and shortages of stock, although the quantity is not too much, this is enough to affect the Puskesmas' services to patients. The general aim of this research is to apply Machine Learning Analysis in the drug supply process at the Naras Community Health Center, North Pariaman District. Pharmacists are responsible for pharmaceutical management at the Naras Community Health Center in managing drug supplies so that they can maintain the stock of drugs needed by patients. The research dataset was obtained at the Naras Community Health Center for data on demand and supply of medicines for 2 years. If this is implemented, it will be able to carry out the research process of drug supplies. When this is implemented, it will be able to carry out a prediction process for drug supplies. Research also provides a need for a prediction process using Machine Learning to see the suitability of drugs that will occur in the next period. This update can result in precise and accurate prediction results based on the performance of Machine Learning analysis. The contribution of this research can make it easier for the Naras Community Health Center to manage drug supplies so that they can maintain the stock of drugs needed by patients.

Keywords: K-means algorithm, Machine Learning, Clustering, Naras Health Center, IT Management.

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INTRODUCTION

Along with the development of science and developments based on current user needs, developments in technology have occurred. Report data collection, which previously was still done manually, can now be made easier by utilizing technology (Taufik & Kom, nd) . The need for information technology is increasing, making the use of information technology the main factor in carrying out good planning in an organization. The existence of management information technology can of course prevent and reduce the level of errors followed by increasing the effectiveness of work. Inventory is an important part that influences the continuity of a company, inventory is carried out as part of a way to predict demand. One of the things included in the policy management that is notice need stock well by balancing needs as optimally as possible. The way to do this is by continuing to pay attention to the supply of raw materials so as not to experience excess stock or stock shortages (Gunung et al., 2020) . Naras Health Center which provides outpatient treatment services is located in North Pariaman District, Pariaman City. Currently, the Naras Community Health Center has not been able to carry out pharmaceutical service activities according to plan. Data collection on drug use that has been recorded on computers also cannot provide useful information to assist in managing the amount of drug stock that must be provided. Some types of medicines sometimes experience overstocks and shortages of stock, although the quantity is not too much, this is enough to affect the Puskesmas' services to patients. Remembering that the prediction process for the amount of drug stock procurement is only based on estimates without any mathematical calculation process. Making pharmaceutical management at the Naras Community Health Center feel quite constrained in predicting which drugs will be used most by patients. Software (software) is a computer program associated with software documentation such as requirements documentation, design models, and how to use it (user manual). A computer program without associated documentation cannot be called software. A software is also often called a software system. System means a collection of components that are interrelated and have one goal to be achieved. A software system means a system that has components in the form of software that relate to each other to meet customer needs . A customer is a person or organization who orders or buys software from a software developer or it can be considered that a customer is a person or organization who voluntarily spends money to order or buy software. Users or software users are people who have an interest in using or using software to make their work easier. (AS Rosa and Shalahudin.M, 2014). Currently, Information Technology (IT) has attracted the attention of business management practitioners from various types of businesses. Information technology determines and supports the smooth management of a company (Winata & Rahayu, 2019). Management Which Good Of course No Can free from role technology information Which offer profit Good internal nor external in processing data (Rahmanto et al., 2021). Information technology is very useful in management

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and managing data, especially in keeping up with developments in the computerized era (Saefudin, 2018). The following will explain things related to IT management.

RESEARCH METHODS

K-means is a non- hierarchical data grouping method that works by partitioning or dividing existing data into two or more groups. The purpose of data grouping is to minimize the objective function set in the grouping process in order to minimize variation within a group and maximize variation between groups (Prasetyo, 2012) . K-means is used in non-hierarchical data grouping which divides data into two or more groups (Sovia, Mandala, et al., 2020) . K-means is a clustering algorithm whose process is carried out repeatedly (Vulandari, 2017). K-means is able to minimize the average distance of each data to its cluster by iterative partitioning (Novia et al., 2020).

The initial cluster center or centroid is obtained from the data, to determine the initial cluster it is assumed that:

a. Cluster center 1 : (240, 226)
b. Cluster center 2: (40 , 6)

To measure the distance between the data and the cluster center, Euclidian distance is used, the following distance matrix will be obtained.

Euclidean distance formula: D_11=√((M_1x-⟦C_1x)⟧^2+(M_1y-⟦C_1y)⟧^2)
With information:
M: Data coordinates
C : Centroid coordinates
D: Distance

From the 52 data used as samples, the initial cluster centers were selected , namely: C1=(600.540) and C2=(550.38). After that, the distance from the remaining data samples to the cluster center is calculated, for example M.

RESULTS AND DISCUSSION

Calculation of the distance from the data to the 1st cluster center.

C1 = (240,226)

Data Sample …… (1)

$$D_{11}=\sqrt{(M_{1x}-C_{1x})^2+(M_{1y}-C_{1y})^2}=\sqrt{(40-240)^2+(6-226)^2}=297.3214$$

$$D_{12}=\sqrt{(M_{2x}-C_{1x})^2+(M_{2y}-C_{1y})^2}=\sqrt{(100-240)^2+(78-226)^2}=203.7253$$

$$D_{13}=\sqrt{(M_{3x}-C_{1x})^2+(M_{3y}-C_{1y})^2}=\sqrt{(240-240)^2+(226-226)^2}=0$$

$$D_{14}=\sqrt{(M_{4x}-C_{1x})^2+(M_{4y}-C_{1y})^2}=\sqrt{(40-240)^2+(35-226)^2}=276.5520$$

$$D_{15}=\sqrt{(M_{5x}-C_{1x})^2+(M_{5y}-C_{1y})^2}=\sqrt{(48-240)^2+(38-226)^2}=268.7155$$

$$D_{16}=\sqrt{(M_{6x}-C_{1x})^2+(M_{6y}-C_{1y})^2}=\sqrt{(60-240)^2+(27-226)^2}=268.3300$$

$$D_{17}=\sqrt{(M_{7x}-C_{1x})^2+(M_{7y}-C_{1y})^2}=\sqrt{(100-240)^2+(87-226)^2}=197.2841$$

$$D_{18}=\sqrt{(M_{8x}-C_{1x})^2+(M_{8y}-C_{1y})^2}=\sqrt{(60-240)^2+(44-226)^2}=255.9766$$

$$D_{19}=\sqrt{(M_{9x}-C_{1x})^2+(M_{9y}-C_{1y})^2}=\sqrt{(140-240)^2+(119-226)^2}=146.4548$$

$$D_{110}=\sqrt{(M_{10x}-C_{1x})^2+(M_{10y}-C_{1y})^2}=\sqrt{(160-240)^2+(102-226)^2}=147.5669$$

$$D_{111}=\sqrt{(M_{11x}-C_{1x})^2+(M_{11y}-C_{1y})^2}=\sqrt{(80-240)^2+(56-226)^2}=233.4524$$

$$D_{112}=\sqrt{(M_{12x}-C_{1x})^2+(M_{12y}-C_{1y})^2}=\sqrt{(40-240)^2+(33-226)^2}=277.9370$$

$$D_{113}=\sqrt{(M_{13x}-C_{1x})^2+(M_{13y}-C_{1y})^2}=\sqrt{(160-240)^2+(126-226)^2}=128.0625$$

$$D_{114}=\sqrt{(M_{14x}-C_{1x})^2+(M_{14y}-C_{1y})^2}=\sqrt{(80-240)^2+(56-226)^2}=233.4524$$

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$D_{115}=\sqrt{(M_{15x}-C_{1x})^2+(M_{15y}-C_{1y})^2}=\sqrt{(60-240)^2+(19-226)^2}=274.3155$

$D_{116}=\sqrt{(M_{16x}-C_{1x})^2+(M_{16y}-C_{1y})^2}=\sqrt{(100-240)^2+(12-226)^2}=255.7264$

$D_{117}=\sqrt{(M_{17x}-C_{1x})^2+(M_{17y}-C_{1y})^2}=\sqrt{(100-240)^2+(87-226)^2}=197.2841$

$D_{118}=\sqrt{(M_{18x}-C_{1x})^2+(M_{18y}-C_{1y})^2}=\sqrt{(60-240)^2+(56-226)^2}=247.5884$

$D_{119}=\sqrt{(M_{19x}-C_{1x})^2+(M_{18y}-C_{1y})^2}=\sqrt{(80-240)^2+(37-226)^2}=247.6308$

$D_{120}=\sqrt{(M_{20x}-C_{1x})^2+(M_{20y}-C_{1y})^2}=\sqrt{(160-240)^2+(145-226)^2}=113.8464$

$D_{121}=\sqrt{(M_{21x}-C_{1x})^2+(M_{21y}-C_{1y})^2}=\sqrt{(120-240)^2+(98-226)^2}=175.4537$

$D_{122}=\sqrt{(M_{22x}-C_{1x})^2+(M_{22y}-C_{1y})^2}=\sqrt{(160-240)^2+(121-226)^2}=132.0038$

$D_{123}=\sqrt{(M_{23x}-C_{1x})^2+(M_{23y}-C_{1y})^2}=\sqrt{(140-240)^2+(98-226)^2}=162.4315$

$D_{124}=\sqrt{(M_{24x}-C_{1x})^2+(M_{24y}-C_{1y})^2}=\sqrt{(60-240)^2+(36-226)^2}=261.7250$

$D_{125}=\sqrt{(M_{25x}-C_{1x})^2+(M_{25y}-C_{1y})^2}=\sqrt{(200-240)^2+(158-226)^2}=78.8923$

$D_{126}=\sqrt{(M_{26x}-C_{1x})^2+(M_{26y}-C_{1y})^2}=\sqrt{(80-240)^2+(36-226)^2}=248.3948$

$D_{127}=\sqrt{(M_{27x}-C_{1x})^2+(M_{27y}-C_{1y})^2}=\sqrt{(80-240)^2+(67-226)^2}=225.5682$

$D_{128}=\sqrt{(M_{28x}-C_{1x})^2+(M_{28y}-C_{1y})^2}=\sqrt{(200-240)^2+(186-226)^2}=56.5685$

$D_{129}=\sqrt{(M_{29x}-C_{1x})^2+(M_{29y}-C_{1y})^2}=\sqrt{(200-240)^2+(176-226)^2}=64.0312$

$D_{130}=\sqrt{(M_{30x}-C_{1x})^2+(M_{30y}-C_{1y})^2}=\sqrt{(100-240)^2+(75-226)^2}=205.9150$

$D_{131}=\sqrt{(M_{31x}-C_{1x})^2+(M_{31y}-C_{1y})^2}=\sqrt{(60-240)^2+(57-226)^2}=246.9028$

$D_{132}=\sqrt{(M_{32x}-C_{1x})^2+(M_{32y}-C_{1y})^2}=\sqrt{(40-240)^2+(21-226)^2}=286.4001$

$D_{133}=\sqrt{(M_{33x}-C_{1x})^2+(M_{33y}-C_{1y})^2}=\sqrt{(200-240)^2+(179-226)^2}=61.7171$

$D_{134}=\sqrt{(M_{34x}-C_{1x})^2+(M_{34y}-C_{1y})^2}=\sqrt{(40-240)^2+(16-226)^2}=290,0000$

$D_{135}=\sqrt{(M_{35x}-C_{1x})^2+(M_{35y}-C_{1y})^2}=\sqrt{(20-240)^2+(4-226)^2}=312.5444$

$D_{136}=\sqrt{(M_{36x}-C_{1x})^2+(M_{36y}-C_{1y})^2}=\sqrt{(60-240)^2+(11-226)^2}=280.4015$

$D_{137}=\sqrt{(M_{37x}-C_{1x})^2+(M_{37y}-C_{1y})^2}=\sqrt{(100-240)^2+(56-226)^2}=220.2272$

$D_{138}=\sqrt{(M_{38x}-C_{1x})^2+(M_{38y}-C_{1y})^2}=\sqrt{(40-240)^2+(17-226)^2}=289.2767$

$D_{139}=\sqrt{(M_{39x}-C_{1x})^2+(M_{39y}-C_{1y})^2}=\sqrt{(16-240)^2+(5-226)^2}=314.6697$

$D_{140}=\sqrt{(M_{40x}-C_{1x})^2+(M_{40y}-C_{1y})^2}=\sqrt{(100-240)^2+(87-226)^2}=197.2841$

$D_{141}=\sqrt{(M_{41x}-C_{1x})^2+(M_{41y}-C_{1y})^2}=\sqrt{(300-240)^2+(157-226)^2}=91.4385$

$D_{142}=\sqrt{(M_{42x}-C_{1x})^2+(M_{42y}-C_{1y})^2}=\sqrt{(50-240)^2+(32-226)^2}=271.5437$

$D_{143}=\sqrt{(M_{43x}-C_{1x})^2+(M_{43y}-C_{1y})^2}=\sqrt{(60-240)^2+(34-226)^2}=263.1805$

$D_{144}=\sqrt{(M_{44x}-C_{1x})^2+(M_{44y}-C_{1y})^2}=\sqrt{(24-240)^2+(19-226)^2}=299.1739$

$D_{145}=\sqrt{(M_{45x}-C_{1x})^2+(M_{45y}-C_{1y})^2}=\sqrt{(40-240)^2+(12-226)^2}=292.9095$

$D_{146}=\sqrt{(M_{46x}-C_{1x})^2+(M_{46y}-C_{1y})^2}=\sqrt{(150-240)^2+(102-226)^2}=153.2188$

$D_{147}=\sqrt{(M_{47x}-C_{1x})^2+(M_{47y}-C_{1y})^2}=\sqrt{(40-240)^2+(38-226)^2}=274.4886$

$D_{148}=\sqrt{(M_{48x}-C_{1x})^2+(M_{48y}-C_{1y})^2}=\sqrt{(200-240)^2+(157-226)^2}=79.7559$

$D_{149}=\sqrt{(M_{49x}-C_{1x})^2+(M_{49y}-C_{1y})^2}=\sqrt{(120-240)^2+(79-226)^2}=189.7604$

$D_{150}=\sqrt{(M_{50x}-C_{1x})^2+(M_{50y}-C_{1y})^2}=\sqrt{(200-240)^2+(179-226)^2}=61.7171$

$D_{151}=\sqrt{(M_{51x}-C_{1x})^2+(M_{51y}-C_{1y})^2}=\sqrt{(200-240)^2+(159-226)^2}=78.0320$

$D_{152}=\sqrt{(M_{52x}-C_{1x})^2+(M_{52y}-C_{1y})^2}=\sqrt{(100-240)^2+(37-226)^2}=235.2042$

Calculation of the distance from the data to the 2nd cluster center

C2 = (40.6)

$D_{21}=\sqrt{(M_{1x}-C_{2x})^2+(M_{1y}-C_{2y})^2}=\sqrt{(40-40)^2+(6-6)^2}=0$

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$$D_{22}=\sqrt{(M_{2x}-C_{2x})^2+(M_{2y}-C_{2y})^2}=\sqrt{(100-40)^2+(78-6)^2}=93.7230$$

$$D_{23}=\sqrt{(M_{3x}-C_{2x})^2+(M_{3y}-C_{2y})^2}=\sqrt{(240-40)^2+(226-6)^2}=297.3214$$

$$D_{24}=\sqrt{(M_{4x}-C_{2x})^2+(M_{4y}-C_{2y})^2}=\sqrt{(40-40)^2+(35-6)^2}=29,0000$$

$$D_{25}=\sqrt{(M_{5x}-C_{2x})^2+(M_{5y}-C_{2y})^2}=\sqrt{(48-40)^2+(38-6)^2}=32.9848$$

$$D_{26}=\sqrt{(M_{6x}-C_{2x})^2+(M_{6y}-C_{2y})^2}=\sqrt{(60-40)^2+(27-6)^2}=29,0000$$

$$D_{27}=\sqrt{(M_{7x}-C_{2x})^2+(M_{7y}-C_{2y})^2}=\sqrt{(100-40)^2+(87-6)^2}=100.8018$$

$$D_{28}=\sqrt{(M_{8x}-C_{2x})^2+(M_{8y}-C_{2y})^2}=\sqrt{(60-40)^2+(44-6)^2}=42.9418$$

$$D_{29}=\sqrt{(M_{9x}-C_{2x})^2+(M_{9y}-C_{2y})^2}=\sqrt{(140-40)^2+(119-6)^2}=150.8940$$

$$D_{210}=\sqrt{(M_{10x}-C_{2x})^2+(M_{10y}-C_{2y})^2}=\sqrt{(160-40)^2+(102-6)^2}=153.6750$$

$$D_{211}=\sqrt{(M_{11x}-C_{2x})^2+(M_{11y}-C_{2y})^2}=\sqrt{(80-40)^2+(56-6)^2}=64.0312$$

$$D_{212}=\sqrt{(M_{12x}-C_{2x})^2+(M_{12y}-C_{2y})^2}=\sqrt{(40-40)^2+(33-6)^2}=27,0000$$

$$D_{213}=\sqrt{(M_{13x}-C_{2x})^2+(M_{13y}-C_{2y})^2}=\sqrt{(160-40)^2+(126-6)^2}=169.7056$$

$$D_{214}=\sqrt{(M_{14x}-C_{2x})^2+(M_{14y}-C_{2y})^2}=\sqrt{(80-40)^2+(56-6)^2}=64.0312$$

$$D_{215}=\sqrt{(M_{15x}-C_{2x})^2+(M_{15y}-C_{2y})^2}=\sqrt{(60-40)^2+(19-6)^2}=23.8537$$

$$D_{216}=\sqrt{(M_{16x}-C_{2x})^2+(M_{16y}-C_{2y})^2}=\sqrt{(100-40)^2+(12-6)^2}=60.2993$$

$$D_{217}=\sqrt{(M_{17x}-C_{2x})^2+(M_{17y}-C_{2y})^2}=\sqrt{(100-40)^2+(87-6)^2}=100.8018$$

$$D_{218}=\sqrt{(M_{18x}-C_{2x})^2+(M_{18y}-C_{2y})^2}=\sqrt{(60-40)^2+(56-6)^2}=53.8516$$

$$D_{219}=\sqrt{(M_{19x}-C_{2x})^2+(M_{18y}-C_{2y})^2}=\sqrt{(80-40)^2+(37-6)^2}=50.6063$$

$$D_{220}=\sqrt{(M_{20x}-C_{2x})^2+(M_{20y}-C_{2y})^2}=\sqrt{(160-40)^2+(145-6)^2}=183.6328$$

$$D_{221}=\sqrt{(M_{21x}-C_{2x})^2+(M_{21y}-C_{2y})^2}=\sqrt{(120-40)^2+(98-6)^2}=121.9180$$

$$D_{222}=\sqrt{(M_{22x}-C_{2x})^2+(M_{22y}-C_{2y})^2}=\sqrt{(160-40)^2+(121-6)^2}=166.2077$$

$$D_{223}=\sqrt{(M_{23x}-C_{2x})^2+(M_{23y}-C_{2y})^2}=\sqrt{(140-40)^2+(98-6)^2}=135.8823$$

$$D_{224}=\sqrt{(M_{24x}-C_{2x})^2+(M_{24y}-C_{2y})^2}=\sqrt{(60-40)^2+(36-6)^2}=36.0555$$

$$D_{225}=\sqrt{(M_{25x}-C_{2x})^2+(M_{25y}-C_{2y})^2}=\sqrt{(200-40)^2+(158-6)^2}=220.6898$$

$$D_{226}=\sqrt{(M_{26x}-C_{2x})^2+(M_{26y}-C_{2y})^2}=\sqrt{(80-40)^2+(36-6)^2}=50,0000$$

$$D_{227}=\sqrt{(M_{27x}-C_{2x})^2+(M_{27y}-C_{2y})^2}=\sqrt{(80-40)^2+(67-6)^2}=72.9452$$

$$D_{228}=\sqrt{(M_{28x}-C_{2x})^2+(M_{28y}-C_{2y})^2}=\sqrt{(200-40)^2+(186-6)^2}=240.8319$$

$$D_{229}=\sqrt{(M_{29x}-C_{2x})^2+(M_{29y}-C_{2y})^2}=\sqrt{(200-40)^2+(176-6)^2}=233.4524$$

$$D_{230}=\sqrt{(M_{30x}-C_{2x})^2+(M_{30y}-C_{2y})^2}=\sqrt{(100-40)^2+(75-6)^2}=91.4385$$

$$D_{231}=\sqrt{(M_{31x}-C_{2x})^2+(M_{31y}-C_{2y})^2}=\sqrt{(60-40)^2+(57-6)^2}=54.7814$$

$$D_{232}=\sqrt{(M_{32x}-C_{2x})^2+(M_{32y}-C_{2y})^2}=\sqrt{(40-40)^2+(21-6)^2}=15.0000$$

$$D_{233}=\sqrt{(M_{33x}-C_{2x})^2+(M_{33y}-C_{2y})^2}=\sqrt{(200-40)^2+(179-6)^2}=235.6459$$

$$D_{234}=\sqrt{(M_{34x}-C_{2x})^2+(M_{34y}-C_{2y})^2}=\sqrt{(40-40)^2+(16-6)^2}=10,0000$$

$$D_{235}=\sqrt{(M_{35x}-C_{2x})^2+(M_{35y}-C_{2y})^2}=\sqrt{(20-40)^2+(4-6)^2}=20.0998$$

$$D_{236}=\sqrt{(M_{36x}-C_{2x})^2+(M_{36y}-C_{1y})^2}=\sqrt{(60-40)^2+(11-6)^2}=20.6155$$

$$D_{237}=\sqrt{(M_{37x}-C_{2x})^2+(M_{37y}-C_{2y})^2}=\sqrt{(100-40)^2+(56-6)^2}=78.1025$$

$$D_{238}=\sqrt{(M_{38x}-C_{2x})^2+(M_{38y}-C_{2y})^2}=\sqrt{(40-40)^2+(17-6)^2}=11,0000$$

$$D_{239}=\sqrt{(M_{39x}-C_{2x})^2+(M_{39y}-C_{2y})^2}=\sqrt{(16-40)^2+(5-6)^2}=\mathbf{24.020}$$

CONCLUSION

With the existence of an *IT Management system* with the *K-Means algorithm* at the Naras Community Health Center, it will help manage drug data such as inventory quantity data and usage data into

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information that can be utilized by the Naras Community Health Center in managing medication supplies. So that data on drug supplies and stocks is not just stored without further use to obtain useful information for the Naras Health Center. By implementing a system that can cluster using the *K-Means algorithm*, it helps the Naras Community Health Center determine drug supplies that suit patient needs by using data on the number of supplies and the number of drug uses which are processed on the *clustering page* and produce drug clusters which are divided into two, namely the high use cluster. and the cluster has little patient use at the Naras Health Center.

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