

IMPLEMENTATION OF DATA MINING MODELS WITH ALGORITHMS K-NEAREST NEIGHBOR IN MONITORING THE NUTRITIONAL STATUS OF CHILDREN AND STUNTING

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ABSTRACT- *Information systems are needed in the development of children in the developmental period, especially in the world of Health. Monitoring children's nutritional status and stunting are necessary to determine children's weight and meet the criteria for children's nutritional status. Puskesmas Muara Satu, North Aceh District, is an implementing element or assistant to the duties of Poskesdes and Midwives in the Health of children's nutritional status and stunting in Paloh Punt Village, which is one of the agencies under the Ministry of Health. This study aims to monitor the growth and development of children, such as measuring weight and height, to detect early if unwanted things occur, such as malnutrition. The problem in this study is designing and monitoring an Information system for child nutritional status and stunting integrated with a web application. This study aims to find out staff and employees in managing, monitoring, and accessing data. So that the data at the puskesmas is recorded in the system and can quickly determine data on the nutritional status of children and stunting. The results of this study are to find an information system that can reduce problems that occur in managing data on the nutritional status of children and stunting at the Muara Satu Health Center. This system is critical because it can make it easier for staff to record the nutritional status of children and check at the Health Center. Then the KNN (K-Nearest Neighbor) model classification results with the recapitulation of the value of new cases with old cases in the first test section are 0.6944. The second test is 0.6388, the third is 0.555, and the fifth is 0.6388.*

Keywords: *Information Systems, Data mining, monitoring, KNN*

1. INTRODUCTION

It is essential to monitor the nutritional status of children and stunting in the health sector at the Health Office and the nearest Public health center. Data collection can be seen how rapidly Health is developing in an area, and monitoring of the patient's condition can be carried out [1]

Problems that arise in modern times like today, several agencies still collect data manually, this can also prevent stunting in children [1], [2].

The data needed now can be quickly done digitally, and the level of accuracy can be higher than using the manual method for the healing rate. This has an impact on the predictive results of the infant's recovery rate [3]

Stunting is a significant problem and is the subject of discussion in the world of Health; malnutrition will cause the baby to experience growth retardation. Sometimes, the baby is too short, whereas growth is old. This is a special concern of the health office and the government in overcoming the problem of stunting [4].

Furthermore, children's problems with stunting are a variable in seeing the lack of nutrition in infants and the lack of food quality in the intake of basic nutrients for a long time. The increase in body quality and height that only match for a short time is seen from body weight age [5].

The Muara Satu Health Center is one of the health sector institutions needing help in collecting data and monitoring patients in the Muara Satu area. No application can carry out work in agencies easily, and there is no complete trust in the application for making an application in the classification of stunting disease [6]. Furthermore, there is a classification in looking at the nutritional status of children and stunting along with the flow of searching for conditions using an expert system. Limited media about infectious diseases, especially diseases in children, is a significant problem. [7].

Limited information about infectious diseases, especially diseases in children, is the government's main problem in preventing stunting—classification modeling with the KNN model [8].

Berdasarkan data puskesmas Muara Satu, Based on data from the Muara Satu Health Center, Posyandu in Paloh Punt Village in 2022, it was recorded that children were suffering. This aims to collect data and make it easier for the staff and employees of the Muara Satu Health Center to obtain data on children's nutritional status and stunting.

So from this, there is prevention and looking for solutions by presenting information about stunting and monitoring stunting, which can be done quickly by parents at home or anywhere, namely by giving a "Web-based Information System for Child

Nutrition Status and Stunting in Paloh Punt Village." [9]. Then you can see the data collected at the puskesmas for the data collection on babies with low levels of constraints and reducing stunting babies [10].

With these problems, it is crucial to have an understanding of the dangers of stunting, and there is still a lack of knowledge about stunting and health sciences in providing data provided funds for giving nutrition and some research that has insight into the problem especially integration and interconnection between the Health Office and the Puskesmas which can be monitored [11].

3. Research methodology

3.1 Data Collection Steps

The steps of this research are data mining k-nearest neighbors in monitoring the nutritional status of children and stunting in the form of primary data taken directly at the puskesmas in North Aceh. [12].

Retrieval of data to be included in the database, which will then be used for testing data for the classification of stunting. Especially in collecting data on the nutritional status of children and stunting. Next, design an information system to collect data on the nutritional status of children and stunting. The research subjects taken were some of the Posyandu staff and cadres in the village of Paloh Punt who was directly related to the design process of the Information System for the nutritional status of children and stunting, which included the team for collecting data on the nutritional status of children and stunting[13].

Secondary data includes data taken from the puskesmas regarding data mining k-nearest neighbors in monitoring the nutritional status of children and stunting. And the collection of documents and reports and data, and information obtained from other sources and literature supports the design [14]. The data for taking stunting are as follows:

Table 1 Data Child

No	Name	BB	TB	Age
1	Muhammad Kazim	11,5	86,5	Three year
2	Nur Nazmi	8,3	79	Two year
3	Ulya Aziz	9	80,1	Two year
4	Agustina	8,2	72,6	Two year
5	Fitria Syawali	8,8	79	Two year
6	Naura Khalisa	7,7	76	Two-year n
7	Zikra Mulyana	8,3	72	One year n

8	Ayza Azzikra	15,7	96	Four year
9	Muniratul Jannah	13	96	Four year
10	Farazilla	11,9	90,5	Three-year n
11	Muhammad Azzam	11,7	91,5	Three-year n
12	Nur Azizatul	11	95,5	Four year

(Processed Data, 2023)

3.2 Research Scheme

The k-nearest neighbor data mining research scheme in monitoring the nutritional status of children and stunting is as follows [15]:

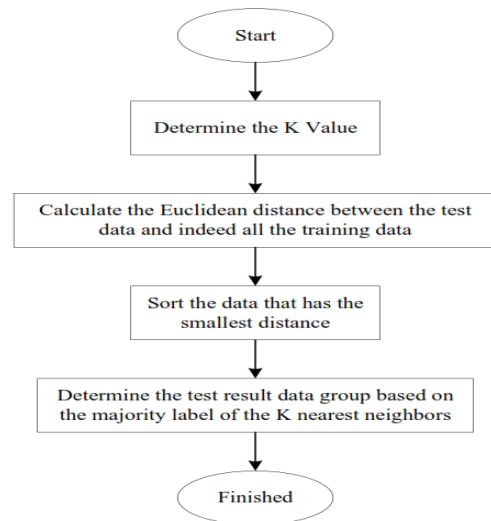


Figure 1 Skema Alur K-NN

4. RESULTS AND DISCUSSION

4.1 KNN Algorithm Manual

1. Giving Value Weight

Table 2 Weight Value of Each Criterion

Attribute	Bobot	Variable
Weight	1	a
Height	0,75	b
Age	0,5	c

(Processed Data, 2023)

2. Weight

Table 3 Weight Criteria Proximity Value

Old Case	Case new	Proximity Value
>7	>11 - >15	1

>8 - >10	>8 - >10	0.75
>11 - >15	>7	0,5

3. Height

Table 4 Value of Proximity Criteria for Height

Old Case	Case new	Proximity Value
>70	>80	1
>80	>90	0.75
>90	>90	0.5
>80	>80	0.75
>90	>70	1
>70	>90	0.75
>90	>90	0.5
>80	>70	0.75
>70	>80	1

(Processed Data, 2023)

4. Age

Table 5 Age Criteria Proximity Value

Old Case	Case new	Proximity Value
>1	>1	1
>1	>2	0.75
>1	>3	0.5
>2	>1	0.75
>2	>2	1
>3	>1	0.5
>3	>2	0.75
>3	>3	1

(Processed Data, 2023)

5. New Case

a. New case with old case No.1

Tabel 6 New Case by Case Calculation No.1

Pasien Name	Weight	High	Age
Muhammad Kazim	>8 - >10	>80	>3
M. Arsal	>11 - >15	>90	>3
Nilai Kedekatan	0.5	0.75	1
Variable	w	x	y

(Processed Data, 2023)

$$\begin{aligned}
 \text{jarak} &= (w * a) + (x * b) + (y * c) / (a + b + c) \\
 &= (0,5 * 1) + (0,75 * 0,75) + (1 * 0,5) / (1 + 0,75 + 0,5) \\
 &= (0,5) + (0,5625) + (0,5) / (2,25) \\
 &= (0,5) + (0,5625) + (0,5) / (2,25) \\
 &= (0,5) + (0,5625) + (0,5) / (2,25) \\
 &= 0,6944
 \end{aligned}$$

b. Calculation of New Cases with Old Cases No.2

Table 7 New Case by Case Calculation Lama No.2

Nama Pasien	Weight	High	Age
Nur Nazmi	>8 - >10	>80	>2
M. Arsal	>11 - >15	>90	>3
Nilai Kedekatan	0.5	0.75	0,75
Variable	w	x	y

(Processed Data, 2023)

$$\begin{aligned}
 \text{jarak} &= (w * a) + (x * b) + (y * c) / (a + b + c) \\
 &= (0,5 * 1) + (0,75 * 0,75) + (0,75 * 0,5) / (1 + 0,75 + 0,5) \\
 &= (0,5) + (0,5625) + (0,375) / (2,25) \\
 &= 1,4375 / 2,25 \\
 &= 0,6388
 \end{aligned}$$

Table 8 Calculation of New Cases with Old Cases No.5

Nama Pasien	Weight	High	Age
Naura Khalisa	>7	>70	>2
M. Arsal	>11 - >15	>90	>3
Nilai Kedekatan	0.5	>91	0,75
Variable	w	>92	y

(Processed Data, 2023)

$$\begin{aligned}
 \text{jarak} &= (w * a) + (x * b) + (y * c) / (a + b + c) \\
 &= (0,5 * 1) + (0,75 * 0,75) + (0,75 * 0,5) / (1 + 0,75 + 0,5) \\
 &= (0,5) + (0,5625) + (0,375) / (2,25) \\
 &= 1,4375 / 2,25 \\
 &= 0,6388
 \end{aligned}$$

5. Value Recapitulation Results

Tabel 9 Value Calculation Recapitulation

No	Kasus	Nilai Kedekatan
1	New case with old case No.1	0,6944
2	New issue with old old case No.2	0,6388
3	New issue with old case No.3	0,5555
4	New issue with old case No.4	0,5555
5	New issue with old case No.5	0.6388

(Processed Data, 2023)

4.2 System Implementation

4.2.1 Main page

The dashboard is a page or form where the admin can directly select the menu he wants to work on. This form describes the features contained in the system [16].

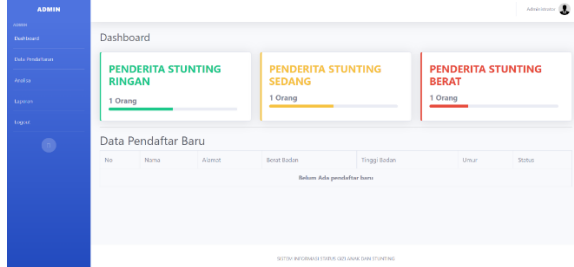
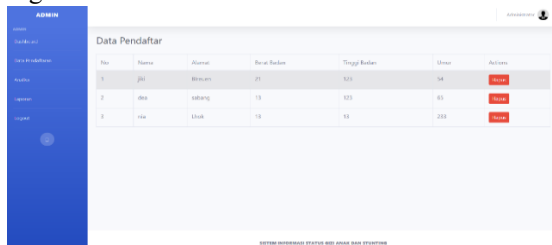


Figure 2 Dashboard

4.2.2 Registrant Data

The data page displays the registrant data for each patient, where the data displayed is registrant data such as 'Name,' 'Address,' 'Weight,' 'Height,' and 'Age.'

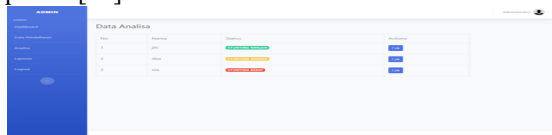


(Processed Data, 2023)

Figure 3 Registrant Data

4.2.3 Analysis

The data analysis page is a page that displays patient analysis data, where if there is a new registrant, you can immediately check the validation by nutritionists to find out what level of stunting the patient is suffering from. Then in the analysis form, there is a check button where there is data for patients such as 'Weight,' 'Height,' and 'Age,' where the data will be validated by the health center to determine the level of stunting suffered by the patient[16].



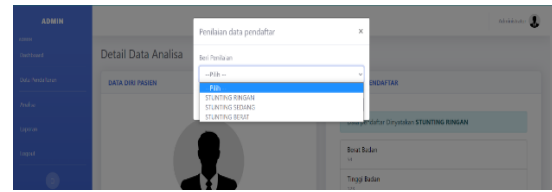
(Processed Data, 2023)

Figure 4 Data Analisa

4.2.4 Form Detail

Form Detail The analysis is to check the validation of patient data, aiming to find out the results of the examination by the Public health center ,posyandu, where later there will be 3 (three) stages

of patient suffering which will be determined based on the results of the validation check :



(Processed Data, 2023)

Figure 5 Analysis Detail Form

4.2.5 Cetak Laporan Pasien

After all, processes are carried out by the admin and user, such as data input, consisting of 'name,' 'TTL,' 'Type_kelamin,' 'Address,' 'Parent Name,' and 'Patient status.' For printed pages, admin and user logins can access all patient data.

No	Nama	TTL	JK	Alamat	Nama Orang Tua	Status
1	AGUSTINA	LHOKSEUMAWE, 2020-08-13	P	PALOH PUNTI	IDAWATI	Pendaftaran Belum Dinalai
2	FITRIA SYAWALI	LHOKSEUMAWE, 2020-05-27	P	PALOH PUNTI	AMIRUDDIN	Pendaftaran Belum Dinalai
3	NAURA KHAISHA	LHOKSEUMAWE, 2020-09-06	P	PALOH PUNTI	WAHYUNI	Pendaftaran Belum Dinalai
4	ZIKRA MULIYA	LHOKSEUMAWE, 2021-04-01	P	PALOH PUNTI	RAZALI	Pendaftaran Belum Dinalai
5	MUHAMMAD KAZIM	LHOKSEUMAWE, 2019-06-12	L	PALOH PUNTI	RINAWATI	STUNTING RINGAN
6	ULYA AZIZ	LHOKSEUMAWE, 2019-11-08	L	PALOH PUNTI	MUNTASIR	STUNTING SEDANG
7	NUR NAZMI	LHOKSEUMAWE, 2020-03-13	P	PALOH PUNTI	NURNADIA	STUNTING BERAT

Figure 6 Print Patient Report

5. Conclusions and recommendations

5.1 Conclusions

1. Test results for the closeness value of the new case with the old case in the second with a value of 0.6388, in the third data 0.5555, and finally with a value of 0.5555 to see the closeness value of the highest and lowest levels affected by stunting.
2. The results of implementing the KNN model system in nutritional status can provide convenience for nurses and officers in viewing the nutritional status of children who use a monitoring application in determining the search for the level of children in Paloh Punt Village.

3. 5.2 Suggestion

The conclusion of this study is the implementation of k-nearest neighbor data mining in monitoring the nutritional status of children and stunting as follows:

1. With a system for monitoring the nutritional status of children and stunting for officers in Paloh Punt Village, Muara Satu District, Lhokseumawe City, data collection on children's nutritional status and stunting. Can be done quickly and access patient data and is one of the effective solutions in assisting

officers in providing computerized information in determining stunting disease

2. The design of the Information System for Child Nutrition Status and Stunting in Paloh Pundi Village was built using PHP so that later it would have a more attractive appearance and uses MySQL so that data management for Child Nutrition Status and Stunting becomes more effective.

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