Stunting Analysis Using The K-Means Algorithm

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Abstract: Good nutrition is very necessary for the human body, especially in toddlers whose development process is very fast. Monitoring growth and development in toddlers is very important to determine the quality of life, psychology and time in front of the toddler. The monitoring process can be carried out through cooperation between parents and the government, especially midwives and Posyandu cadres on a regular basis every period**.** The growth and development of toddlers can be seen using indicators BB/TB, TB/U, BB/U, then stored in the Towards Health Card (KMS) data as an illustration for parents to really pay attention to their toddlers. In the case of nutritional stunting in toddlers, the Clustering process is used The K-Means method has low accuracy so it is not precise ifused. It would be more effective if you used another Clustering method so that the accuracy value obtained is higher to facilitate performance Midwives or Posyandu cadres in the process of grouping toddler data experiencing good nutrition, moderate nutrition, lack of nutrition and poor nutrition.

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INTRODUCTION

Stunting is a physical growth disorder characterized by a decrease in the speed of growth and is the impact of an imbalance nutrition, where stunting is based on body length index compared to age (PB/U) or height compared to age (TB/U) with a limit (z-score) of less than -2. Stunting is still a nutritional problem in Indonesia that has not been resolved. Stunting will cause long-term impacts, namely disruption physical, mental, intellectual and cognitive development. Children affected by stunting up to the age of 5 years it will be difficult to repair so it will continue until adults and may increase the risk of offspring with low birth weight low (Tobing, 2015).

Globally, stunting is one of the goals of Sustainable Development Goals (SDGs). Indonesia is in the process of realizing sustainable development goals or the 2nd SDGs, namely ending hunger, achieving food and nutritional security better, and supports sustainable agriculture. The target included in this is overcoming the problem of

stunting which is being sought to decrease in 2025. This second goal is closely related to the third goal, namely ensuring a healthy life and supports well-being for all at all ages (Nirmalasari, 2020).

Stunting is still the main nutritional problem facing Indonesia. Based on data from Basic Health Research (Riskesdas) in 2018, the stunting rate in Indonesia it is 30.8%. This figure is still relatively high compared to The National Medium Term Development Plan (RPJMN) target is: 19% in 2024. Stunting has the highest prevalence compared to other nutritional problems such as malnutrition, thinness and obesity (Nirmalasari, 2020).

Stunting has a bad impact on children. The short-term negative impacts that can be caused byStunting is disruption of brain development, decreased intelligence, impaired physical growth and metabolism in the body. Meanwhile, in the long term, stunting will result in a decline cognitive abilities, decreased learning achievement, decreased immunity, risk of experiencing overweight (Obesity), very susceptible to non-communicable diseases and degenerative diseases such as diabetes mellitus, heart and blood vessel disease, cancer, stroke, and disability, as well as decline productivity in adulthood (Ramdhani et al., 2020).

The K-Means clustering algorithm is one of the most widely used cluster algorithms because of its simplicity and performance. This research is supported by the Knowledge Discovery in Databases (KDD) method, which is a whole non-trivial process for searching and identifying patterns in data, where the patterns found are valid, new, can be useful and understandable (Apriyani et al., 2023).

RESEARCH METHODS

Data In the data analysis stage, it is carried out by direct observation. The data taken and collected is studied and grouped, resulting in results From that grouping, problems will later be found and will be solved solve it, then look for the solution.

Several data collection techniques must be used to be able to do this complete research and obtain research requirements. Method Data collection was carried out by researchers as follows:

1. Observation

   This observation is used to make it easier for researchers to carry out 32

observation. This observation looks at the field conditions and system planning will be designed at the posyandu located in Klambir V Kebun Village, District Hamparan Perak, Deli Serdang Regency, North Sumatra.

2. Interview

   The interviews were carried out in a semi-structured manner. Semi interview This structured question can still include other questions outside the list that has been determined in order further capture the necessary data through existing questions prepared. This interview consists of collecting information regarding the toddler's name, toddler's age, toddler's weight, toddler's height and toddler's head circumference and things others related to the system to be designed.

RESULTS AND DISCUSSION

Data mining is the search for trends or patterns that will be searched in large database for future decision making. An important characteristic of data mining is that the volume of data is large It is very large even though ideas from related study areas can be applied on data mining problems, scalability related to data size becomes an important new criterion (Wahyuni et al., 2018)

Data mining is the process of analyzing data from different perspectives and concluding that it contains important information that can be used to improve useful calculations. Data mining includes several activities including the use and collection of historical data to find regularities, patterns or relationships in large data and then turning the data into information that can later be utilized. In data mining there are several methods for classifying data. Data classification is the process of identifying objects in a category, group or class through several predetermined procedures (Nuranisah & Yanti Yusman, 2023).

The K-Means algorithm is an iterative clustering algorithm that partitions a data set into a number of K clusters that have been determined at the beginning. The K-Means algorithm is simple to implement and run, relatively fast, easy to adapt, common in practice. Historically, K-Means has been one of the most important algorithms in the field of Data Mining.(Sari et al., 2023a)

The basis of the K-Means algorithm is as follows (Sari et al., 2023b):

1. Initialization: determine the K value as the desired number of clusters and the desired dissimilarity (distance) metric. If necessary, set the objective function change threshold and centroid position change threshold.
2. Select K data from data set X as centroid.
3. Allocate all data to the nearest centroid with a predefined distance metric distance.

$$D=\sqrt{(m1x-c1x)2+(m1y-c1y)2}$$

4. Recalculate the centoid C based on the data following each cluster.

$$Ck=(1Ck)\Sigma di$$

5. Repeat steps 3 and 4 until convergent conditions are reached, namely:

a. The change in objective function is already below the desired threshold.
b. No data moves clusters.
c. The change in centroid position is below the specified threshold.

The K-Means algorithm tries to partition existing data into two or more classes and is a way of grouping non-hierarchical data (constraints). This approach divides data into classes, with data with the same characteristics grouped together and data with different characteristics divided into different groups.

At this stage what will be carried out is the calculation stage, which is carried out manually, namely as follows:

Table 1 Sample Data from Posyandu Matahari 2

NO	NAME	AGE	WEIGHT	HEIGHT
1	Raka	33 bulan	10	85
2	M.Nazril	25 bulan	9,5	82
3	Adzam	10 bulan	7	72
4	M. Alkaysan	19 bulan	9,5	81
5	Khaniya	21 bulan	6,5	70
6	Barra	10 bulan	6,4	74
7	Ezhar	23 bulan	9,5	82
8	Abian	18 bulan	9	78
9	Almayra	17 bulan	8,5	78
10	Attarraska	16 bulan	8,5	74
11	Lula	12 bulan	7,5	72
12	Amar	15 bulan	7	77
13	Nessa	15 Bulan	8	76

14	Kalisa	17 Bulan	6	72
15	Naura	11 Bulan	6,5	70

Tabel 2 Iterasion 1

NO	NAME	AGE	WEIGH	HEIGHT	C1	C2	C3
1	Raka	33 bulan	10	85	13,6	9,2	7,1
2	M.Nazril	25 bulan	9,5	82	10,6	6,2	4,0
3	Adzam	10 bulan	7	72	1,0	4,1	6,3
4	M. Alkaysan	19 bulan	9,5	81	9,7	5,2	3,0
5	Khaniya	21 bulan	6,5	70	2,1	6,2	8,4
6	Barra	10 bulan	6,4	74	2,0	2,6	4,8
7	Ezhar	23 bulan	9,5	82	10,6	6,2	4,0
8	Abian	18 bulan	9	78	6,7	2,2	0,0
9	Almayra	17 bulan	8,5	78	6,5	2,1	0,5
10	Attarraska	16 bulan	8,5	74	3,2	2,1	4,0
11	Lula	12 bulan	7,5	72	1,5	4,0	6,2
12	Amar	15 bulan	7	77	5,1	1,4	2,2
13	Nessa	15 Bulan	8	76	4,5	0,0	2,2
14	Kalisa	17 Bulan	6	72	0,0	4,5	6,7
15	Naura	11 Bulan	6,5	70	2,1	6,2	8,4

Tabel 3 Iterasion 2

NO	NAMA	AGE	WEIGH	TINGGI BADAN	C1	C2	C3
1	Raka	33 bulan	10	85	13,3	9,2	4,1
2	M.Nazril	25 bulan	9,5	82	10,3	6,2	1,1
3	Adzam	10	7	72	0,0	4,1	9,2

		bulan					
4	M. Alkaysan	19 bulan	9,5	81	9,3	5,2	0,5
5	Khaniya	21 bulan	6,5	70	2,1	6,2	11,3
6	Barra	10 bulan	6,4	74	2,1	2,6	7,5
7	Ezhar	23 bulan	9,5	82	10,3	6,2	1,1
8	Abian	18 bulan	9	78	6,3	2,2	3,0
9	Almayra	17 bulan	8,5	78	6,2	2,1	3,0
10	Attarraska	16 bulan	8,5	74	2,5	2,1	7,0
11	Lula	12 bulan	7,5	72	0,5	4,0	9,1
12	Amar	15 bulan	7	77	5,0	1,4	4,5
13	Nessa	15 Bulan	8	76	4,1	0,0	5,1
14	Kalisa	17 Bulan	6	72	1,0	4,5	9,5
15	Naura	11 Bulan	6,5	70	2,1	6,2	11,3

Tabel 4 Iterasion 3

NO	NAMA	AGE	WEIGH	HEIGHT	C1	C2	C3
1	Raka	33 bulan	10	85	13,7	8,6	2,5
2	M.Nazril	25 bulan	9,5	82	10,7	5,6	0,5
3	Adzam	10 bulan	7	72	0,4	4,8	10,8
4	M. Alkaysan	19 bulan	9,5	81	9,7	4,6	1,5
5	Khaniya	21 bulan	6,5	70	1,7	6,8	12,9
6	Barra	10 bulan	6,4	74	2,3	3,2	9,1
7	Ezhar	23 bulan	9,5	82	10,7	5,6	0,5
8	Abian	18 bulan	9	78	6,7	1,6	4,5
9	Almayra	17	8,5	78	6,6	1,4	4,6

		bulan					
10	Attarraska	16 bulan	8,5	74	2,9	2,6	8,6
11	Lula	12 bulan	7,5	72	0,9	4,7	10,7
12	Amar	15 bulan	7	77	5,3	1,3	6,1
13	Nessa	15 Bulan	8	76	4,5	0,6	6,7
14	Kalisa	17 Bulan	6	72	0,8	5,1	11,1
15	Naura	11 Bulan	6,5	70	1,7	6,8	12,9

The results of the second and third iterations are the same, so conclusions can be drawn. Of the three clusters formed, we can classify them as follows:

1. First cluster: from 15 data on toddlers, 6 data on toddlers were well-nourished
2. Second cluster: from 15 data on toddlers, 5 data on toddlers with moderate nutrition were obtained
3. Third cluster: from 15 data on toddlers, 4 data on toddlers with poor nutrition were obtained

CONCLUSION

As a result of the research that has been carried out, the following conclusions can be drawn. From 15 toddler data at Posyandu Matahari 2, it can be formed into 3 clusters. By grouping toddler nutrition data, it can help posyandu cadres to pay more attention to toddlers who fall into the malnourished cluster. It is hoped that in the future research can be carried out using other data mining methods and can be developed using the latest software to get more accurate results.

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