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Decision Support System Application for Determining Nutritional Status of Toddlers at Winong Community Health Center Using the KNN Method

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ABSTRACT

Toddler nutrition issues are an important issue in public health because they affect children's physical and cognitive growth and development. The process of assessing nutritional status which is still done manually in health centers, such as in Winong Community Health Center, is often inefficient and prone to errors. This study aims to develop a web-based decision support system that can automatically classify toddler nutritional status based on age, weight, and height data. This system is built using the CRISP-DM approach as a development methodology and the KNN algorithm as a classification method. The benchmark data for nutritional status refers to the standards of the Ministry of Health of the Republic of Indonesia. The test results show that the system is able to classify nutritional status into categories of good nutrition, malnutrition, and excess nutrition with a satisfactory level of accuracy. The system also provides easy access and speed in the decision-making process for health workers. In conclusion, this system is effective in helping health centers monitor toddler nutritional status quickly, accurately, and efficiently based on valid data.

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1. INTRODUCTION

Toddler nutrition remains a major health concern, especially in developing countries like Indonesia. Toddlers are an age group particularly vulnerable to nutritional disorders due to their rapid growth [1]. According to the 2021 Indonesian Nutritional Status Survey (SSGI), the prevalence of stunting in Indonesia was 24.4%, a 6.4% decrease from 30.8% in 2018. However, this health problem has a serious impact on child growth and development, leading to irreversible suboptimal growth and development [2]. At the primary care level, such as community health centers, a major challenge is assessing nutritional status, which is often performed manually, is time-consuming, and prone to error. This can hinder decision-making for appropriate and timely nutritional interventions [3].

Nutritional status is typically determined based on anthropometric indicators such as weight, height, and age of the toddler, which are then compared to reference standards. The Winong Community Health Center currently uses reference data from the Ministry of Health, which contains a table of nutritional status based on a child's age, weight, and height [4]. However, this method requires a complex manual matching process and is inefficient when processing massive data. This problem becomes more pronounced when the number of toddlers being examined increases, while human resources and time are limited. This indicates the need for technology-based innovation to assist in the automated nutritional status classification process. With efficient, accurate, and easily accessible data through web platforms, data analysis becomes more in-depth and faster. Data visualization tools integrated into web platforms can help decision-makers see trends, patterns, and anomalies more clearly [5].

Several previous studies have shown that utilizing decision support system technology can improve the effectiveness of health data classification and analysis [6], [7]. DSS can process data automatically and provide recommendations with high speed and accuracy [8]. In developing data-driven systems, the CRISP-DM (Cross Industry Standard Process for Data Mining) approach is a systematic and widely used method due to its clear step-by-step process, from data understanding to implementation [9]. Meanwhile, the K-Nearest Neighbor (KNN) algorithm is often used in numerical data classification due to its simplicity and effectiveness in determining proximity between data points based on distance [10].

The use of web technology has revolutionized the way we process data. From simply a medium for information, the web has now become a powerful platform for collecting, storing, processing, analyzing, and presenting data in a much easier, faster, and more efficient manner than conventional methods [11]. This study proposes a solution in the form of developing a web-based decision support system that can automatically classify the nutritional status of toddlers using the CRISP-DM approach and the KNN algorithm. This system is designed to assist staff at the Winong Community Health Center in determining the nutritional status of toddlers based on input data of age, weight, and height, which are then compared to Ministry of Health standards. With this system, the nutritional status classification process is expected to be faster, more accurate, and more efficient, while minimizing reliance on manual processes.

The new value or innovation of this research lies in the integration of the CRISP-DM data mining method and the KNN algorithm within a web-based primary health information system. This system not only supports the digitization of the nutrition service process but also contributes to improving the quality of healthcare worker decision-making [12]. Compared with manual recording systems, this approach is capable of handling large amounts of data, producing visualizations of nutritional status, and can be further developed for ongoing monitoring and evaluation of toddler nutrition.

The objective of this research is to design and develop a web-based decision support system capable of automatically classifying the nutritional status of toddlers based on Ministry of Health standards. This research is expected to significantly contribute to government efforts to reduce the number of malnutrition disorders in toddlers and improve the quality of health services at the community health center level.

2. RESEARCH METHOD

This web application was developed using a combination of several integrated technologies. The database was built using MySQL, which runs through XAMPP as a local server, making it easier to manage toddler data, store classification results, and generate reports. For programming, Python was used as the primary language to implement the system logic, specifically the application of the K-Nearest Neighbor (KNN) algorithm for toddler nutritional status classification. Python was chosen because it has a rich library and supports data processing and machine learning. Meanwhile, HTML was used to build the web interface so that the application can be accessed interactively through a browser. With this combination of technologies, the application is able to present a toddler nutritional classification system that is not only accurate but also easily accessible to users.

2.1. CRISP-DM

This research uses a data mining approach with the CRISP-DM (Cross Industry Standard Process for Data Mining) process model. CRISP-DM was chosen because it provides a systematic and flexible workflow for developing data-driven systems. This approach is suitable for application in the context of health data processing, particularly in determining the nutritional status of toddlers based on numerical data such as age, weight, and height [13]. The system also implements the K-Nearest Neighbor (KNN) algorithm as the primary classification method due to its simple yet effective ability to handle numerical data and make decisions based on data similarity. The following system development stages according to the six CRISP-DM stages are shown in Figure 1.

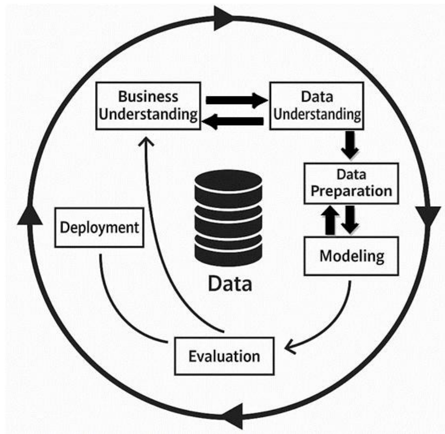

Figure 1. Stages of the Cross Industry Standard Process for Data Mining

2.1.1 Business Understanding

Business understanding is a crucial initial stage in any data mining or data analysis project. This stage aims to understand the business context and the needs of system users. The identified problem was the slow process of determining the nutritional status of toddlers at the Winong Community Health Center, which was still done manually. The primary need was an automated system capable of quickly and accurately classifying nutritional status based on age, weight, and height data. This system was also expected to assist community health center staff in reducing administrative workloads and avoiding human error.

2.1.2 Data Understanding

Data Understanding is the stage where we thoroughly understand the data before processing it. We need to understand the data content, its condition, and its strengths and weaknesses. At this stage, we explore and understand the structure and quality of the data used. The data used consisted of two sources:

- Toddler data, including age (in months), weight (kg), and height (cm), obtained from growth records at the Winong Community Health Center.
- Nutritional status benchmark data was obtained from the Indonesian Ministry of Health's standard anthropometric tables, which served as a reference for classification into normal, undernourished, and overnourished categories.

The data was analyzed to ensure completeness, consistency, and to identify potential anomalies or duplicate data before proceeding to the next stage.

2.1.3 Data Preparation

This stage aims to prepare toddler data for use in the nutritional status classification process. The raw data used were age (months), weight (kg), and height (cm) obtained from the Winong Community Health Center. The data was then compared with the nutritional status benchmark table from the Maternal and Child Health Handbook to determine nutritional status labels: normal, undernourished, or overnourished. The data was then cleaned of blank and duplicate values and normalized using the min-max method to achieve a uniform scale. Nutritional status category labels were also encoded numerically to facilitate processing. The prepared data was then divided into training and test data using the k-fold cross-validation technique.

2.1.4 Modeling

The modeling stage used the K-Nearest Neighbor algorithm. This algorithm calculates the distance between new data and the training data using Euclidean Distance, then determines nutritional status based on the majority of nearest neighbors. This classification process results in nutritional status categories: normal, deficient, or overweight. The model is evaluated based on the accuracy performance of each tested k value.

2.1.5 Evaluation

Evaluation in CRISP-DM is a thorough final check to ensure the model not only performs technically but is also useful and meets business expectations. Evaluation is conducted using pre-separated test data and compared against nutritional status standards established based on reference tables from the Ministry of Health. The KNN model with the highest accuracy will be used in the implementation phase.

2.1.6 Deployment

The final stage is the implementation of the system as a web-based application so that it can be accessed by community health center staff via computer devices. This application is equipped with a toddler data input form and an automatic nutritional status classification feature. Classification results are displayed live and can be stored in a database for monitoring and reporting purposes.

2.2. K-Nearest Neighbor

The K-Nearest Neighbor (KNN) method is used as the primary algorithm to classify toddlers' nutritional status based on numerical data consisting of age (months), weight (kg), and height (cm). KNN was chosen because it is simple, does not require a complex model training process, and is capable of providing effective classification results for small to medium-sized data, as in this case.

2.2.1 KNN Formula

KNN works by finding the k closest training data points (neighbors) from the test data using a distance formula [14]. The distance between two data points is calculated using the following Euclidean Distance formula:

$$d\,(x, y) = \sqrt{\sum_{i=1}^{n} (xi - yi)^{2}}$$

Where:
1) x is the test data,
2) y is the training data,
3) n is the number of features (age, weight, height).

After the distance is calculated, the system selects the k data points with the closest distance. The nutritional status of the test data is then determined based on the majority category of these nearest neighbors.

The K-Nearest Neighbor algorithm is a classification method for a data set based on learning from previously classified data. It is a form of supervised learning, where new query instances are classified based on the majority of the distances between the categories in the K-NN algorithm [15].

The data proportions were divided into three categories: Undernutrition (2.13%), Normal Nutrition (97.87%), and Overnutrition (0%). To test the model, a 10-Fold Cross Validation method was used to provide more convincing results. This system is expected to assist healthcare workers by providing fast, accurate, and easy-to-use nutritional status classification results, particularly in supporting stunting prevention at the Winong Community Health Center.

3. RESULTS AND DISCUSSION

The data collection process was conducted by visiting the Winong Community Health Center (Puskesmas) for a field study. Data collection techniques included observations of the manual process for determining toddler nutritional status and interviews with nutrition officers. Based on the results of these observations and interviews, a systems analysis was conducted to identify challenges and formulate solutions through the development of a decision support system. This analysis served as the basis for designing a more efficient and accurate system for classifying toddler nutritional status, which is the novelty of this research.

3.1. Systems Analysis

Based on the observations and interviews conducted at the Winong Community Healt Center, it was discovered that the process for determining toddler nutritional status is still carried out manually. Nutrition officers must match toddler data, such as age, weight, and height, with graphs or tables contained in the Maternal and Child Health Handbook (KIA Handbook) to determine whether the toddler is well-nourished, undernourished, severely malnourished, or overweight.

This manual process is time-consuming, especially when dealing with a large number of toddlers. Furthermore, this process is prone to calculation or classification errors because it relies on the accuracy of staff when reading tables and entering data. As a result, there is the potential for inaccurate nutritional status assessments, which impact follow-up examinations or nutritional interventions.

Based on these issues, a decision support system is needed to assist community health center staff in determining the nutritional status of toddlers automatically, quickly, and accurately. This system is expected to manage toddler data, perform calculations based on reference tables from the Indonesian Ministry of Health, and present classification results directly.

Through observation, interviews, and document review, it was determined that the main parameters in nutritional status classification include: toddler age (in months), weight (kg), and height (cm). These three parameters are used as the main input in the classification system, which is based on the K-Nearest Neighbor method and designed using the CRISP-DM approach. This system not only accelerates the classification process but also stores the results digitally for periodic evaluation and reporting purposes.

3.2. System Flowchart

A system flowchart is a graphical representation of the steps or processes that occur within a system. It illustrates how data flows and is processed from one stage to the next, as well as who is involved in each step [16]. The following is a system flowchart illustration for a web representation of the toddler nutrition determinant SPK. This can be seen in Figure 2 below:

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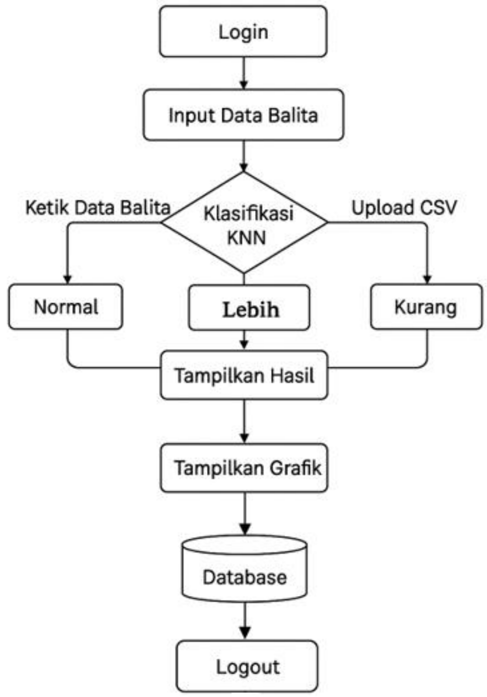


Figure 2. System Flowchart

The following is an explanation of the flowchart in the image:

1) Login: The flow begins with the login process, which will likely require the user to enter credentials to access the system.
2) Input Toddler Data: After successfully logging in, the user will be prompted to enter the toddler's data.
3) KNN Classification: The entered toddler data will then undergo a classification process using the KNN algorithm. At this stage, there are two possible ways the data is entered into the classification process:
   - Type Toddler Data: The user manually types the toddler's data.
   - Upload CSV: The user uploads a CSV file containing the toddler's data.
4) Classification Results: Based on the KNN classification, the toddler's data will be categorized into one of three possible categories: normal, overweight, or underweight.
5) Display Results: Once the classification is complete, the system will display the results to the user.
6) Display Graph: The system will then display a graph based on the classification results, possibly for better data visualization.
7) Database: a place to store data on toddler nutritional status. Winong Community Health Center
8) Logout: The flow ends with a logout process, which allows the user to exit the system.

3.3. Application Design

A web application is a program or software that runs in a browser and can be accessed via the internet or an intranet. Web applications allow users to interact directly with the system, such as filling out forms, managing data, conducting transactions, uploading files, or using other features as needed [17].

3.3.1. Login

The login page is the initial gateway to access the system. This interface is designed to be simple and secure, consisting of two main input fields: "Username" and "Password," and a "Login" button [18]. Only registered health center staff can access the system. If the login is successful, the user will be directed to the main dashboard. The system is also equipped with validation features and notifications in the event of an error in the login data input. This can be seen in Figure 3 below:

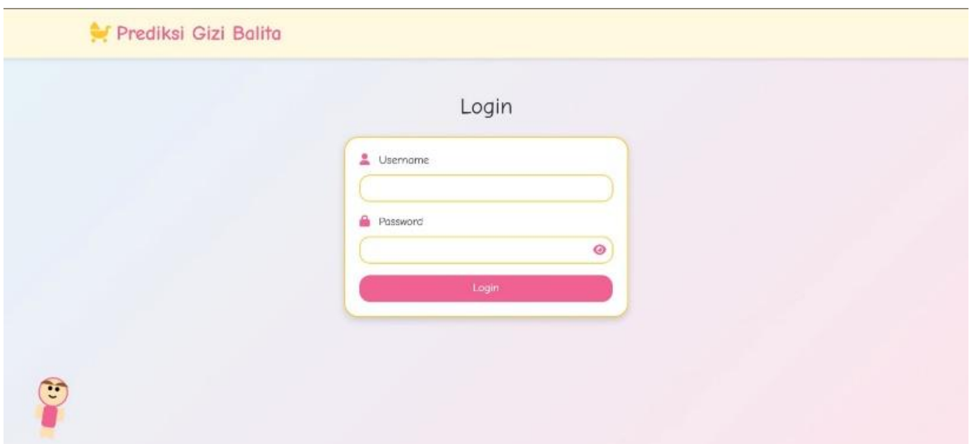


Figure 3. Login Page

3.3.2. Data Input Section

After successfully logging in, users will be directed to the Toddler Data Input page. On this page, staff can enter toddler data, including name, age, weight, and height. This form is validated to ensure the data entered is formatted correctly and contains no blanks. Once all data is entered, users can click the "save & process" button to send the data to the classification system. The classification results will appear automatically after processing is complete. These can be seen in Figure 4 below:

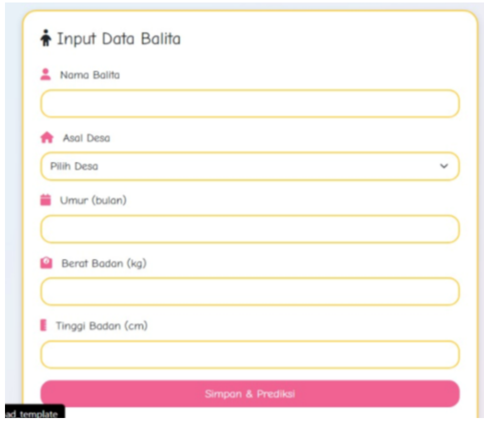


Figure 4. Data Input

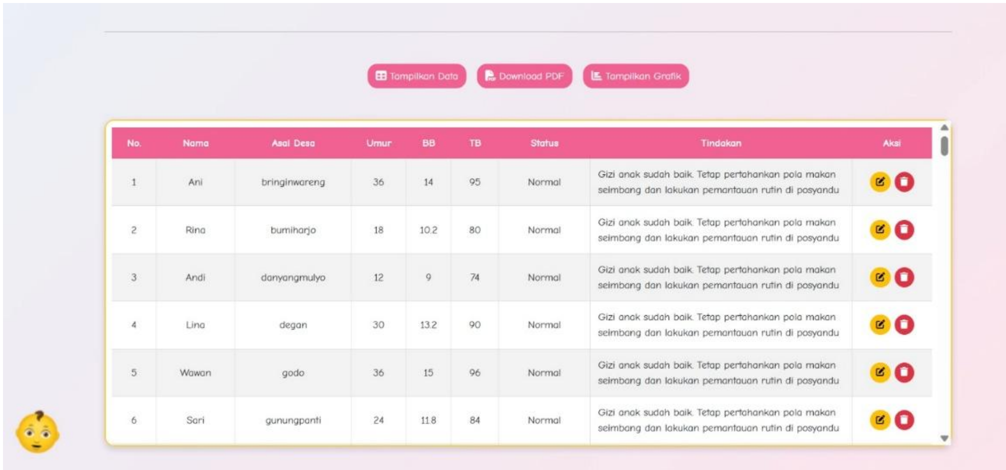
3.3.3. Download and upload CSV templates

To simplify inputting large amounts of data, the system provides a feature to download and upload CSV templates. Users can download pre-prepared template files with the appropriate column format. These templates can be filled out offline using a spreadsheet or Excel application, then uploaded back into the system for batch processing. This feature is useful when processing data from multiple toddlers simultaneously. This can be seen in Figure 5 below:

Figure 5. Download and Upload CSV Template

3.3.4. Displaying calculation results

After the classification process is carried out using the KNN algorithm, the system will display the results of the toddler's nutritional status directly. These results include the toddler's name, village of origin, age, weight, height, nutritional status, and comments or suggestions based on nutritional status. The results are presented in a neat, easy-to-read table. The data can also be downloaded in PDF format. This can be seen in Figure 6 below:



No.	Nama	Asal Desa	Umur	BB	TB	Status	Tindakan	Aksi
1	Ani	bringinwareng	36	14	95	Normal	Gizi anak sudah baik. Tetap pertahankan pola makan seimbang dan lakukan pemantauan rutin di posyandu	
2	Rina	bumiharjo	18	10.2	80	Normal	Gizi anak sudah baik. Tetap pertahankan pola makan seimbang dan lakukan pemantauan rutin di posyandu	
3	Andi	danyangmulyo	12	9	74	Normal	Gizi anak sudah baik. Tetap pertahankan pola makan seimbang dan lakukan pemantauan rutin di posyandu	
4	Lina	degan	30	13.2	90	Normal	Gizi anak sudah baik. Tetap pertahankan pola makan seimbang dan lakukan pemantauan rutin di posyandu	
5	Wawan	godo	36	15	96	Normal	Gizi anak sudah baik. Tetap pertahankan pola makan seimbang dan lakukan pemantauan rutin di posyandu	
6	Sari	gunungpanti	24	11.8	84	Normal	Gizi anak sudah baik. Tetap pertahankan pola makan seimbang dan lakukan pemantauan rutin di posyandu	

Figure 6. Calculation Results Display

3.3.5. Graphical Display

The system is equipped with visualization in the form of a bar graph. This graph helps staff visually view the overall nutritional status of toddlers and supports the creation of reports or evaluations of nutrition programs at the Community Health Center. This can be seen in Figure 7 below:

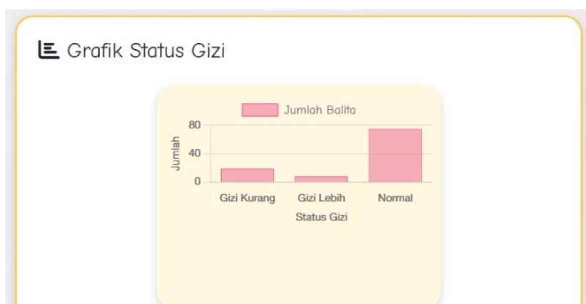


Figure 7. Graphic Display

3.4. Analysis of Conventional Methods to the KNN Method

3.4.1. Conventional z-score calculation

The conventional Z-score method involves a series of time-consuming manual or semi-manual steps. This process requires human intervention at every step, making it longer and prone to human error, especially when searching for data in tables or when performing calculations. The method for calculating the Z-Score is as follows:

$$Z - score = \frac{Xi - Mi}{SBi}$$

Calculating SBI
1. If Xi > Mi, SBI = 1SD – Median
2. If Xi < Mi, SBI = Median - (-1SD)

Xi : Observed value or actual measurement result
Mi : Median Reference Value
SBi : Z-Score (standard) of the reference population

The nutritional status of toddlers is measured based on age, weight (BW), and height (H). Children's weight is measured using a Dacin scale with a precision of 0.1 kg, body length is measured using a length-board with a precision of 0.1 cm, and height is measured using a microtoise with a precision of 0.1 cm. The variables of child BW and HH are presented in the form of three anthropometric indicators, namely: weight for age (BW/A), height for age (BH/A), and weight for height (BW/H). The following is a picture of Growth Indicators According to Z-Score:

Garis Z-Score	Indikator Pertumbuhan			
	PB/U atau TB/U	**BB/U**	**BB/PB atau BB/TB**	**IMT/U**
Diatas +3	**Lihat Catatan 1**		Sangat Gemuk (*Obes*)	Sangat Gemuk (*Obes*)
Diatas +2		**Lihat Catatan 2**	Gemuk (*Overweight*)	Gemuk (*Overweight*)
Diatas +1			Risiko Gemuk **(Lihat Catatan 3)**	Risiko Gemuk **(Lihat Catatan 3)**
0 (Median)				
Dibawah -1				
Dibawah -2	Pendek (*Stunted*) **(Lihat Catatan 4)**	BB Kurang (*Underweight*)	Kurus (*Wasted*)	Kurus (*Wasted*)
Dibawah -3	Sangat Pendek (*Severe Stunted*) **(Lihat Catatan 4)**	BB Sangat Kurang (*Severe Underweight*)	Sangat Kurus (*Severe Wasted*)	Sangat Kurus (*Severe Wasted*)

Figure 8. Growth Indicators According to Z-Score

3.4.2. Auomatic calculation of the knn method

The KNN method, implemented in a system, works automatically and is much faster. Once the system is trained on a large dataset, the process of determining the nutritional value for new data takes only a short time. Here's an example of Python code using the KNN method:

1) Import Library

```
import pandas as pd
from sklearn.model_selection import train_test_split
```

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import classification_report, accuracy_score
```

2) Prepare Data

```
# Contoh data sederhana
data = pd.DataFrame({
    'umur': [24, 18, 30],
    'berat': [10.5, 8.7, 12.3],
    'tinggi': [82, 76, 90],
    'status': ['normal', 'kurang', 'lebih']
})
X = data[['umur', 'berat', 'tinggi']]
y = data['status']
```

3) Train the KNN Model

```
model = KNeighborsClassifier(n_neighbors=3)
model.fit(X, y)
```

4) New Data Prediction

```
# Prediksi status gizi balita baru
data_baru = [[24, 9.5, 80]]  # umur, berat, tinggi
prediksi = model.predict(data_baru)
print("Status gizi:", prediksi[0])
```

From the Python code example above, we only need to input the data, and the results for determining the nutritional status of toddlers at the Winong Community Health Center will be ready. This automatic calculation will make it easier to determine the nutritional status of toddlers. The analysis of the conventional method with the KNN method yields several comparisons, as can be seen in the following table:

Table 1. Comparison table of the KNN method with conventional methods

Aspect	Conventional Method	Method KNN
Data Processing Process	Manually, by matching data to the Ministry of Health's graphs/tables	Automatic, using a classification algorithm based on historical data from the KIA book
Analysis Speed	Relatively slow, especially if there is a lot of data	Fast and efficient, suitable for large scale data
Human resource dependency	High, requires trained and thorough health workers	Low, enough to be operated by users with basic understanding of the system
Accuracy	Depends on the accuracy and understanding of the officer	Consistent and can be optimized with appropriate training data
Potential Errors	High, especially if there is a misreading of the graph or table.	Relatively low if the input data is valid
Scalability	It is difficult to handle large amounts of data	Easily scalable and integrated with integrated databases
Output Generated	Usually only nutritional status without additional analysis	Can be equipped with visualizations, automatic comments, and results reports.
Decision-making	Subjective, can vary between officers	Objective, based on distance calculations and data patterns
Infrastructure Needs	Simple (just paper, measuring tools, and graphs)	Requires computer system and software
Suitability for Digitalization	Less suitable because it is not automated	Perfect for web based systems

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3.5. Results

This study developed a classification system for toddler nutritional status using the CRISP-DM approach and the K-Nearest Neighbor algorithm. The system was tested using data from 94 toddlers from one village in Winong District, including age, weight, and height. The results revealed that five toddlers were identified as having stunting based on the KIA anthropometric table. The KNN algorithm demonstrated 92% accuracy at k=5, making it a good model. Overall, this system is expected to be a fast, accurate, and easy-to-use tool for health workers in monitoring and preventing stunting in the Winong Community Health Center area.

4. CONCLUSION

This research successfully produced a web-based toddler nutritional status classification system that utilizes the K-Nearest Neighbor algorithm with the CRISP-DM approach. The primary objective of this research, which was to design a system capable of assisting community health center staff in determining toddler nutritional status more quickly, accurately, and systematically, has been successfully achieved. This system not only classifies nutritional status based on age, weight, and height data but also provides visualization of the results. Implementation of the system on real data obtained from a village in Winong District demonstrated efficient classification and high accuracy.

This indicates that the developed system has the potential for adoption in the community health center environment, particularly to support toddler growth and development monitoring and early stunting prevention efforts. Beyond simply meeting the technical requirements of classification, this system also demonstrates potential for further development. In the future, the system's scope can be expanded by integrating more variables such as medical history, nutritional intake, or environmental conditions, thus providing a more comprehensive and holistic analysis.

Furthermore, the system's implementation is not limited to the Winong Community Health Center, but can also be implemented more broadly in various other healthcare facilities, both at the village, sub-district, and district levels. With these prospects, this research provides a relevant contribution to efforts to improve the quality of child healthcare services through the use of information technology, while also serving as a basis for further research in the development of artificial intelligence-based decision support systems in the field of public health.

REFERENCES

[1] J. Jusliani and S. Syamsuddin, “Tinjauan Efektivitas Intervensi Gizi terhadap Stunting dan Masalah Gizi pada Anak Balita,” *Jurnal Riset Sains dan Kesehatan Indonesia*, vol. 1, no. 3, pp. 124–129, Aug. 2024, doi: 10.69930/jrski.v1i3.156.

[2] L. Asra Laily, S. Indarjo, J. Ilmu Kesehatan Masyarakat, F. Ilmu Keolahragaan, and U. Negeri Semarang, "354 HIGEIA 7 (3) (2023) HIGEIA JOURNAL OF PUBLIC HEALTH RESEARCH AND DEVELOPMENT Literature Review: Dampak Stunting terhadap Pertumbuhan dan Perkembangan Anak," 2023, doi: 10.15294/higeia/v7i3/63544.
[3] S. Nugroho and N. A. Sudibyo, "Sistem Pakar Gizi Balita: Kerangka Kerja Konseptual Untuk Deteksi Gizi Buruk," *Decode: Jurnal Pendidikan Teknologi Informasi*, vol. 4, no. 3, pp. 1045–1056, Nov. 2024, doi: 10.51454/decode.v4i3.810.
[4] Dewi Marfuah, Siti Sarifah, Siti Khusnul Khotimah, and Dhinda Kusuma Hatifah, "Pengukuran Antropometri dan Penentuan Status Gizi Balita di Posyandu Balita Bina Sejahtera Kadipiro Banjarsari Surakarta," *ALKHIDMAH: Jurnal Pengabdian dan Kemitraan Masyarakat*, vol. 2, no. 3, pp. 138–149, Jul. 2024, doi: 10.59246/alkhidmah.v2i3.983.
[5] S. Permana Ratumanan and A. Feinisa Khairani, "SUPLEMEN Volume 15, Suplemen, 2023 https://myjurnal.poltekkes-kdi.ac.id/index.php/hijp e704 HIJP : HEALTH INFORMATION JURNAL PENELITIAN Metode Antropometri Untuk Menilai Status Gizi : Sebuah Studi Literatur." [Online]. Available: https://myjurnal.poltekkes-kdi.ac.id/index.php/hijp
[6] S. Nadriati, "Sistem Pendukung Keputusan Untuk Menentukan Tipe Rumah Idaman Sesuai Kebutuhan Konsumen Menggunakan Metode Analytical Hierarchy Process (Ahp) Dengan Software Super Decision," 2016.
[7] N. Extise Putri and T. Saleh, "Sistem Pendukung Keputusan Pemilihan Mahasiswa Berprestasi Menggunakan Metode Profile Matching Pada Stmik Indonesia Padang," 2016.
[8] L. Budiarti, "Journal Of Information System Sistem Pendukung Keputusan untuk Klasifikasi Penyakit Kuning dengan Algoritma Decision Tree," 2023.
[9] M. R. Amalsyah *et al.*, "Sistemasi: Jurnal Sistem Informasi Analisis Sentimen Ulasan Pengguna Aplikasi Fintech menggunakan Framework CRISP-DM dalam Penentuan Prioritas Pengembangan Produk Sentiment Analysis of Fintech Application User Reviews Using the CRISP-DM Framework for Product Development Prioritization." [Online]. Available: http://sistemasi.ftik.unisi.ac.id
[10] H. Jurnal, L. Nuril Mukarromah, Z. Fatah, and I. Yunita, "Jurnal Riset Teknik Komputer Klasifikasi Penyakit Diabetes Menggunakan Metode K-Nearest Neighbors (KNN)", doi: 10.69714/jgq41610.
[11] R. Sukma Rupawan and Z. Fadilah, "Pemanfaatan Teknologi Informasi dalam Manajemen Pelayanan Publik di Era Digital : Studi Kasus Pendaftaran Online di Puskesmas Pasiran Jaya Universitas Muhammadiyah Lampung," *Jurnal Komsospol*, vol. 5, no. 1, 2025, doi: 10.47637/komsospol.v5i1.1570.
[12] A. Halim, F. Maulana Teknik Informatika, and S. Sony Sugema Jalan Raya Lemahmulya Karawang, "Perancangan Sistem Informasi Berbasis Website Pada Posyandu Tunggakjati," 2025.
[13] R. R. Aria, "Implementasi Algoritma K-Means untuk Pengelompokan Data Imunisasi Balita dengan Metode CRISP-DM," *remik*, vol. 9, no. 1, pp. 189–197, Jan. 2025, doi: 10.33395/remik.v9i1.14391.
[14] S. Nadia Bakri and L. Sofinah Harahap, "Analisis klasifikasi Algoritma K-Nearest Neighboar (K-NN) pada struktur Daerah di Kota Medan Classification analysis of K-NN (K-Nearest Neighbor) Algorithm on Regional structures in Medan City," 2025. [Online]. Available: https://jurnal.unity-academy.sch.id/index.php/jirsi/index

P.ISSN: 2086 – 4981
E.ISSN: 2620 – 6390
tip.ppj.unp.ac.id

[15] F. Santi Wahyuni and H. Zulfia Zah, "Agung Panji Sasmito 3) , Mukhammad Zainul Musyafa 4) 1),2),3)4) Teknik Informatika", [Online]. Available: https://stanfordmlgroup.github.io/projects/forestnet/
[16] I. Burhanuddin, "Pengembangan Media Pembelajaram Interaktif Berbasis Augmented Reality Untuk Meningkatkan Pemahaman Flowchart," 2024. [Online]. Available: https://jurnaldidaktika.org
[17] I. P. Sari and F. Alfarisi, "Perancangan Sistem Aplikasi Pendataan Membership Gym Menggunakan Metode Unified Software Development Process (USDP) Berbasis Web," *Hello World Jurnal Ilmu Komputer*, vol. 3, no. 1, pp. 37–48, Jun. 2024, doi: 10.56211/helloworld.v3i1.523.
[18] S. Supriyatna and S. Farizy, "Perancangan dan Implementasi Aplikasi Monitoring Berkas Pencairan Dana Berbasis Web Menggunakan Metode Rapid Application Development," *SAINSTECH: JURNAL PENELITIAN DAN PENGKAJIAN SAINS DAN TEKNOLOGI*, vol. 34, no. 3, pp. 1–8, Sep. 2024, doi: 10.37277/stch.v34i3.2078.