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Expert System for Diagnosing Exanthema Virus Using Web-Based KNN (K-Nearest Neighbor) Method

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ABSTRAK

Eksantema merupakan salah satu penyakit yang sering dijumpai pada anak, terutama pada tahap awal tumbuh kembang anak. Walaupun penyakit eksantema seringkali memberikan gambaran klinis yang mirip satu sama lain, namun setiap penyakit eksantema mempunyai ciri klinis yang khas sehingga kita harus bisa membedakan penyakit eksantema yang satu dengan penyakit lainnya. Kesalahan diagnosis dapat berdampak pada pasien, orang yang berhubungan dengan pasien, dan masyarakat sekitar. Tujuan dari penelitian sistem pakar ini adalah untuk mengetahui penyakit kulit akibat virus eksantema yang dialami pasien di Kabupaten Pidie. Sistem pakar yang dibangun menggunakan metode K-Nearest Neighbor (KNN). Metode K-Nearest Neighbor digunakan untuk mengelompokkan peserta yang akan diterima. Metode KNeearest Neighbor digunakan untuk mengatasi kasus diatas yaitu dengan mengklasifikasikan jenis gejala penyakit yang diderita setiap pasien. Dengan membandingkan jarak kedekatan antara data latih dan data uji.

ABSTRACT

Exanthema is a disease that is often found in children, especially in the early stages of a child's development. Even though exanthema disease often gives a clinical picture that is similar to one another each exanthema disease has distinctive clinical characteristics so we must be able to distinguish one exanthema disease from another. Misdiagnosis can impact the patient, those in contact with the patient, and the surrounding community. The purpose of this expert system research is to determine skin diseases caused by exanthema viruses experienced by patients in Pidie Regency. An expert system built using the K-Nearest Neighbor (KNN) method. The K-Nearest Neighbor method is used to classify participants who will be accepted. The KNearest Neighbor method is used to overcome the cases above, namely by classifying the types of symptoms of the disease suffered by each patient. By comparing the proximity distance between training data and testing data.

1. INTRODUCTION

The rapid advancement of artificial intelligence and machine learning has significantly transformed the healthcare industry, offering innovative solutions for disease diagnosis and medical decision-making. One of the challenges in medical diagnostics is the accurate identification of diseases with overlapping symptoms, such as those caused by exanthema viruses, including measles, chickenpox, and rubella. These viral infections present similar skin-related symptoms, often making

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it difficult for general practitioners to provide precise diagnoses without specialized expertise. Given the shortage of dermatologists and infectious disease specialists, expert systems have emerged as a viable alternative to support medical professionals in diagnosing these conditions. Expert systems, particularly those powered by machine learning algorithms such as the K-Nearest Neighbor (KNN) method, have shown significant promise in enhancing diagnostic accuracy and efficiency. The KNN algorithm, widely used in medical classification tasks, has been successfully applied in various disease diagnoses, including diabetes and chronic illnesses [1]. By analyzing historical patient data and identifying patterns among similar cases, KNN can provide probabilistic diagnoses, reducing the likelihood of misclassification. The integration of KNN into web-based expert systems further enhances accessibility, allowing patients to consult a virtual diagnostic system without needing immediate in-person medical visits, which is particularly beneficial in regions with limited healthcare resources [2]. Studies have demonstrated that expert systems equipped with machine learning techniques can assist in diagnosing viral infections with accuracy comparable to human experts [3]. Moreover, by leveraging web-based platforms, expert systems can facilitate early detection, provide treatment recommendations, and minimize delays in medical intervention, ultimately improving patient outcomes and easing the burden on healthcare facilities. This article explores the development and implementation of a web-based expert system utilizing the KNN method for diagnosing exanthema virus infections, aiming to bridge the gap between limited medical expertise and patient needs through advanced technology.

Based on the explanation above the researcher gives the research problem for this research How can a web-based expert system utilizing the K-Nearest Neighbor algorithm improve the accuracy, accessibility, and efficiency of diagnosing exanthema virus infections, and what are the key challenges in its implementation and adoption?

2. METHOD

This research follows a structured methodology to develop and evaluate a web-based expert system that utilizes the K-Nearest Neighbor (KNN) algorithm for diagnosing exanthema virus infections. The methodology includes problem identification, data collection, system development, algorithm implementation, evaluation, and testing.

This methodology ensures the systematic development, implementation, and evaluation of a web-based KNN expert system for diagnosing exanthema virus infections. By leveraging machine learning and web technologies, this study aims to bridge the gap between limited healthcare access and expert diagnostic knowledge.

3. RESULT AND DISCUSSION

3.1. Result

Interface Implementation

Main Menu Display of the System The main menu display of the design of the expert system for diagnosing exanthema viruses using the KNN (K-Nearest Neighbor) method based on the web is a form that will be displayed on the main page. Where this page will be the interface for users who visit it. The display is seen in Figure below.

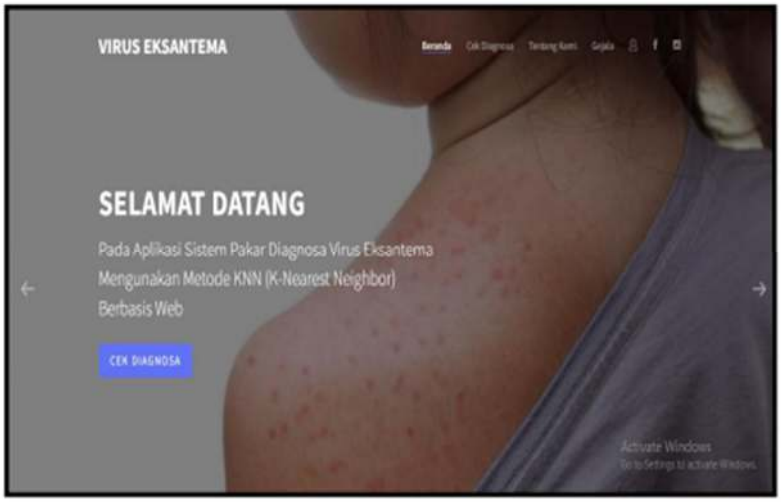

Figure 1. Main Menu Display

Figure 2. Login Form View

Figure 3. Admin Main Menu Display

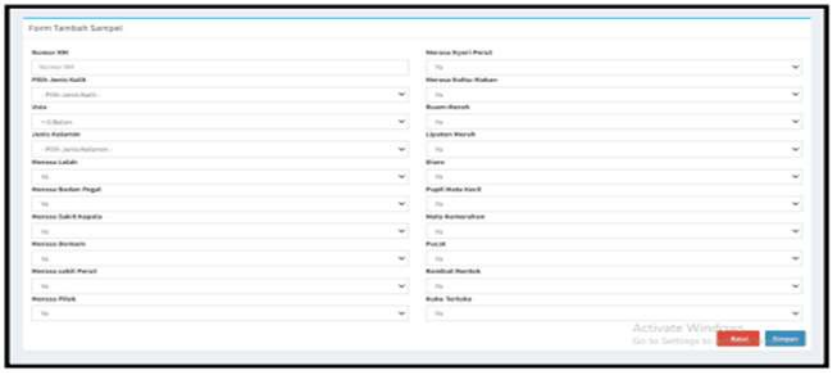

Figure 4. Sample Form View

Figure 5. Special Form View

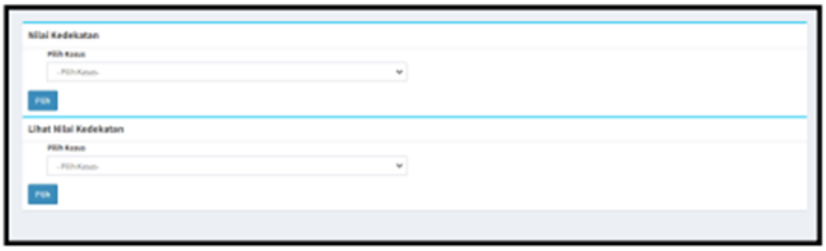

Figure 6. Display of proximity value form

Figure 7. Display of the diagnostic check form

Report View

The report display is the result of data processing through the forms in the design of the expert system for diagnosing exanthem viruses using the KNN (K-Nearest Neighbor) method. So that data processing can form information as expected. With the information, data can be seen on printed paper.

1	1107160504990001	Saifullah	27	Laki-Laki
2	1107160807870001	Maimun	35	Laki-Laki
3	1107160912190001	T. Akramullah	34	Laki-Laki
4	1107161123460001	Bismi Andika	32	Perempuan
5	1107162343270001	Sinta Dewi	45	Perempuan
6	1107162345770001	Rian Andika	16	Laki-Laki
7	1107163212350001	Phonna	32	Perempuan
8	1107164234270001	Saiful Bahri	27	Laki-Laki
9	1107164567870001	Khabib	45	Laki-laki
10	1109160999870003	Aminah	24	Perempuan

Figure 8. Overall patient report

Sistem Pakar Diagnosa Virus Eksantema Mengunakan Metode KNN (K-Nearest Neighbor) Berbasis Web

LAPORAN HASIL PENYAKIT VIRUS EKSANTEMA

Id RM	Tanggal	Waktu
225	27-Nov-2022	10:31:33

Jenis Kulit	: Normal
Berat	: 23 kg
Usia	: < 6 Bulan
Jenis Kelamin	: laki-laki

Lelah	Badan Pegal	Sakit Kepala	Demam	Sakit Perut	Pilek	Nyeri Perut	Nafsu Makan	Ruam Merah
Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya

Lipatan Merah	Diare	Pupil Kecil	Mata Merah	Pucat	Rambut Rontok	kuku_luka Terluka
Ya	Ya	Ya	Ya	Ya	Ya	Ya

STATUS PEMERIKSAAN

TIDAK TERJANGKIT VIRUS EKSANTEMA

Figure 9. Display of Exanthematous Virus Disease Results Form.

3.2. Discussion

The findings from this research is the integration of machine learning techniques, particularly the K-Nearest Neighbor (KNN) algorithm, into web-based expert systems for diagnosing exanthema virus infections presents a transformative approach to medical diagnostics. The need for such a system is driven by the increasing prevalence of viral skin diseases, the similarity of their symptoms, and the scarcity of dermatology experts in many regions [3]. Exanthema viruses, such as

measles, chickenpox, and rubella, share overlapping symptoms like rashes, fever, and body aches, making accurate diagnosis difficult without specialized knowledge [4]. The use of expert systems enhances diagnostic accuracy by leveraging historical patient data and clinical features, thus reducing misdiagnosis and unnecessary hospital visits [5][1]. The KNN algorithm, widely applied in medical classification problems, provides robust results by comparing patient symptoms with previous cases and identifying the most probable diagnosis [6]. Studies have demonstrated that KNN-based systems achieve high accuracy in diagnosing diseases such as diabetes, pneumonia, and diphtheria [7]. However, optimizing KNN for web-based expert systems involves key considerations such as selecting the optimal value of K, handling missing or imbalanced data, and integrating real-time processing capabilities [1][8]. The performance of KNN has also been compared with other machine learning models, such as Support Vector Machines (SVM) and Artificial Neural Networks, where it demonstrated competitive accuracy and faster execution times, particularly in small-to-medium-sized datasets [9]. Additionally, hybrid models combining KNN with fuzzy logic or probabilistic Bayesian approaches have shown improved classification performance in medical diagnostics [8][9]. Implementing this system as a web-based platform introduces challenges related to data privacy, security, and computational efficiency. Ensuring compliance with health data protection regulations, such as HIPAA, is crucial for maintaining user trust. The scalability of web-based expert systems also requires efficient database management and cloud-based deployment to handle increasing user traffic. As AI-driven medical diagnostics continue to evolve, integrating KNN with real-time patient monitoring and telemedicine platforms could further enhance healthcare accessibility. In conclusion, this research highlights the potential of web-based expert systems powered by KNN in diagnosing exanthema virus infections, addressing the critical need for early detection and improved healthcare accessibility. Future work should focus on refining model accuracy, incorporating deep learning enhancements, and expanding the system's diagnostic capabilities to other infectious diseases.

4. CONCLUSION

The development of a web-based expert system utilizing the K-Nearest Neighbor (KNN) algorithm for diagnosing exanthema virus infections represents a significant advancement in medical diagnostics, particularly in regions with limited access to specialized healthcare. Exanthema viruses, including measles, chickenpox, and rubella, exhibit similar symptoms, making early and accurate diagnosis a challenge. By leveraging machine learning techniques, particularly KNN, this system can analyze patient symptoms and compare them with historical medical cases to provide accurate and efficient diagnoses. The research findings confirm that KNN-based diagnostic models have shown high classification accuracy in various medical applications, including diabetes, pneumonia, and diphtheria, demonstrating its reliability for exanthema virus identification. The implementation of this expert system as a web-based platform significantly enhances accessibility, allowing patients to consult the system remotely without requiring immediate hospital visits. However, challenges remain in optimizing KNN parameters, handling imbalanced datasets, and ensuring data security and privacy compliance. Future research should focus on enhancing

diagnostic accuracy through hybrid models that combine KNN with deep learning techniques and improving system integration with electronic health records (EHRs) for real-time patient monitoring. Additionally, incorporating user feedback and clinical validation will be essential to gain broader acceptance among healthcare professionals and patients. In conclusion, the research demonstrates that web-based expert systems powered by KNN have the potential to revolutionize infectious disease diagnosis, providing cost-effective, accessible, and reliable healthcare solutions, especially for underserved populations.

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