

RESEARCH ARTICLE

Development of an Android-Based Expert System for Diagnosing Cat Skin Diseases at Cat's Petshop Depok Using the Certainty Factor Method with Android Studio and MySQL

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Abstract

Limited understanding among cat owners regarding skin diseases in cats can have significant implications for the well-being of both cats and humans in the future. Certain skin conditions in cats are not confined to the animals themselves but can be transmitted to humans and other animals. To address such challenges, the development of an expert system for diagnosing skin diseases in cats is proposed. The study was conducted at Cat's Petshop and Animal Clinic in Grand Depok City. Data were gathered through interviews with Drh. Atiek and Drh. Zeta, veterinarians at the location. The interviews identified six prevalent types of skin diseases in cats. Key issues include the manual recording system at the clinic, lengthy examination queues due to veterinarians' packed schedules, and the limited knowledge of pet owners regarding symptoms of skin diseases in cats, which delays the diagnostic process. A solution was implemented by designing an expert system for diagnosing skin diseases in cats using the certainty factor method, which quantifies the confidence level of experts in their diagnoses. The application assists cat owners in identifying the type of skin condition affecting their pets. The certainty factor method enhances accuracy by accounting for uncertainty in calculations. The expert system yields positive outcomes. Primarily, it accelerates the examination of skin diseases in cats at Cat's Petshop Depok. Additionally, it improves the precision of preliminary diagnoses. The deployment of the application saves time for pet owners and reduces waiting times at the clinic. The diagnostic accuracy aligns with the certainty factor calculation approach, addressing uncertainties in results. Overall, the expert system employing the certainty factor method offers an effective solution to overcome the lack of understanding among cat owners about skin diseases. The application facilitates early symptom recognition, enhances time efficiency, and improves diagnostic precision.

Keywords

Expert System; Cat Skin Diseases; Certainty Factor; Android Studio; MySQL.

1 | INTRODUCTION

The limited awareness among cat owners regarding skin diseases in felines presents a significant challenge with potential long-term consequences for both animal and human health. Certain dermatological conditions in cats are not confined to the affected animals but can be zoonotic, posing a risk of transmission to humans and other pets. Administering inappropriate treatments due to a lack of knowledge may exacerbate the condition of the cat, leading to severe health complications. Consequently, it is imperative for cat owners to possess a comprehensive understanding of feline skin diseases to ensure timely and accurate intervention. Addressing this knowledge gap, the development of a robust expert system designed to diagnose skin conditions in cats emerges as a viable solution, offering a structured approach to preliminary health assessments (Dwiramadhan *et al.*, 2022; Nurajizah & Saputra, 2018). Expert systems, often referred to as knowledge-based systems, are specialized software applications engineered to facilitate decision-making and problem-solving within specific domains. These systems operate by integrating predefined knowledge bases and analytical methodologies established by domain experts, thereby simulating human expertise in a computational framework (Hayadi, 2018; Rosnelly, 2012). In the context of veterinary science, such systems have demonstrated efficacy in diagnosing animal health issues by leveraging structured data and inference mechanisms to provide reliable preliminary assessments (Kurniati *et al.*, 2017; Widyaningsih & Gunadi, 2017). The application of expert systems in diagnosing feline skin diseases is particularly pertinent given the increasing prevalence of pet ownership and the corresponding demand for accessible veterinary diagnostic tools (Prayoga & Sibarani, 2020). This research was conducted through a case study at Cat's Petshop and Animal Clinic, located in Grand Depok City, Depok, West Java, hereafter referred to as Cat's Petshop Depok. The region has witnessed a notable rise in pet populations, particularly cats, while access to veterinary health services remains limited, creating a pressing need for innovative health solutions (Prakoso, 2023; Veronika, 2023). In response to this gap, Drh. Atiek, a veterinarian, established a veterinary practice and clinic in the area in 2015. Over the subsequent years, the clinic has experienced a steady increase in clientele, with pet owners entrusting their animals for examination and treatment. Presently, Cat's Petshop Depok operates three branches across Depok and its surrounding areas, reflecting its growing significance as a veterinary service provider in the region (Drimmer & Weitzman, 2020; Effendi & Budiana, 2014).

Data collection for this study focused on identifying prevalent symptoms and types of skin diseases in cats at Cat's Petshop Depok. This process involved in-depth interviews with Drh. Atiek, the founder, owner, and primary veterinarian, as well as Drh. Zeta, another practicing veterinarian at the clinic. The interviews revealed six common feline skin diseases frequently encountered at the facility: Scabies, Ringworm, Feline Acne, Abscess, Cat Fleas, and Alopecia. However, several operational challenges were identified during the study. The clinic continues to rely on manual, non-computerized data recording systems, which hinder efficiency in managing patient information. Additionally, the examination process, particularly for skin conditions in cats, is time-intensive due to the limited knowledge among pet owners regarding the symptomatic manifestations of these diseases. This often necessitates comprehensive re-examinations by veterinarians to ascertain the specific condition affecting each animal (KucingPedia, 2023). Compounding these issues is the constrained availability of veterinarians, whose schedules are densely packed, and who are not present at the clinic on a daily basis. As a result, long waiting times during consultation hours have become a persistent problem, further delaying critical diagnoses and treatments. To address these multifaceted challenges, the development of an expert system application tailored for Cat's Petshop Depok is proposed. This system aims to enable clients to conduct preliminary diagnoses of skin disease symptoms in cats using resources provided by the clinic. The expert system employs the certainty factor method, a probabilistic approach that quantifies the confidence level of expert-derived diagnoses by accounting for uncertainties in symptom-based assessments (Kusrini, 2006; Kusrini, 2008). This methodology has been effectively utilized in prior studies to enhance the accuracy of diagnostic systems in veterinary applications (Kurniati *et al.*, 2017; Sari *et al.*, 2020). By integrating factual symptom data provided by users, the system facilitates initial identification of potential skin conditions, thereby equipping pet owners with actionable insights prior to formal veterinary consultations. The anticipated outcome of this implementation is a streamlined examination process, wherein veterinarians can focus directly on the suspected conditions identified by the system, significantly reducing diagnostic time (Prayoga & Sibarani, 2020).

The technological framework for this expert system is designed to be Android-based, leveraging programming languages such as PHP and Java, with MySQL serving as the database management system. The development process utilizes tools like Android Studio, which is widely recognized for its efficacy in creating robust mobile applications (Enterprise, 2015; Hardiansyah & Suryono, 2020; Herlinah & Musliadi, 2019). Additional resources on Android programming and database integration have informed the technical design to ensure functionality and user accessibility (Kurniawan & Widodo, 2015; Purnomo *et al.*, 2020; Safaat, 2011; Safaat, 2012). Although the application operates offline and is connected to a local data server on a laptop, limiting its current scope to private use within the clinic, it represents a critical step toward modernizing veterinary diagnostics at Cat's Petshop Depok (Khasanah, 2022; Setiawan, 2009). The significance of this research extends beyond operational improvements at a single clinic. It aligns with broader trends in

the application of information technology to veterinary care, where mobile-based expert systems are increasingly recognized as tools for enhancing diagnostic efficiency and owner education (Dwiramadhan *et al.*, 2022; Nurajizah & Saputra, 2018). By focusing on feline skin diseases—a niche yet critical area of pet health—this study contributes to the growing body of knowledge on expert systems in animal healthcare. The system’s capacity to address diagnostic uncertainties through the certainty factor method further underscores its potential as a reliable preliminary diagnostic tool (Widyaningsih & Gunadi, 2017). Moreover, the initiative responds to the cultural and social context of pet ownership in Indonesia, where cats are among the most popular companion animals, necessitating accessible and effective health management solutions (Prakoso, 2023; Veronika, 2023; KucingPedia, 2023).

Based on the outlined background, the research is titled: “Development of an Android-Based Expert System for Diagnosing Cat Skin Diseases at Cat’s Petshop Depok Using the Certainty Factor Method with Android Studio and MySQL.” This title reflects the academic focus on system development, technological integration, and domain-specific application. The study’s problem statement is articulated through key research questions, including whether the certainty factor method can effectively support an expert system for diagnosing feline skin diseases, whether the application enables preliminary diagnosis based on owner-reported symptoms, whether it addresses diagnostic uncertainties, and whether it enhances time efficiency at Cat’s Petshop Depok. The scope of the research is delimited to the six identified skin diseases, with data sourced from two expert veterinarians at the clinic. The application is restricted to private use by clinic staff and clients, operates offline, and serves as a first-aid and initial diagnostic tool during non-consultation hours. This research endeavors to bridge the knowledge gap among cat owners while addressing operational inefficiencies in veterinary care through the implementation of an Android-based expert system. By incorporating established methodologies and leveraging contemporary programming tools, the study aims to provide a practical solution that enhances diagnostic precision, optimizes time, and ultimately improves the health outcomes for cats at Cat’s Petshop Depok. The integration of all referenced works ensures a comprehensive grounding in both theoretical and practical dimensions of expert systems, veterinary science, and mobile application development, paving the way for future advancements in accessible pet healthcare solutions.

2 | BACKGROUND THEORY

The intersection of veterinary science and information technology has paved the way for innovative solutions to address challenges in animal healthcare, particularly in the diagnosis and management of diseases in companion animals such as cats. Feline skin diseases represent a significant concern for pet owners due to their potential zoonotic nature and the complexity of accurate diagnosis without specialized knowledge. The development of expert systems, or knowledge-based systems, offers a promising approach to bridge this gap by providing accessible, reliable, and efficient diagnostic tools. This section elucidates the theoretical foundations underpinning the creation of an expert system for diagnosing feline skin diseases, drawing on a comprehensive array of scholarly resources and practical references to contextualize the research within the broader domains of veterinary care, artificial intelligence, and mobile application development. Expert systems are computational frameworks designed to emulate human expertise in specific domains by integrating structured knowledge bases and inference mechanisms. These systems are particularly valuable in fields requiring specialized decision-making, such as medicine and veterinary science, where they assist in problem-solving and diagnostic processes (Hayadi, 2018; Rosnelly, 2012). According to Kusriani (2006), expert systems operate by codifying expert knowledge into rules or probabilistic models, enabling non-experts to access insights that would otherwise require direct consultation with professionals. This capability is critical in veterinary contexts, where pet owners often lack the technical understanding to identify health issues in their animals, such as skin diseases in cats (Kusriani, 2008). Studies like those by Dwiramadhan *et al.* (2022) and Nurajizah & Saputra (2018) highlight the application of expert systems in diagnosing feline dermatological conditions, demonstrating their potential to enhance preliminary assessments through structured methodologies.

Various inference methods underpin the functionality of expert systems, with approaches such as Naive Bayes, Forward Chaining, Dempster-Shafer, and Certainty Factor being widely adopted in diagnostic applications. Dwiramadhan *et al.* (2022) utilized the Naive Bayes method in a web-based system for diagnosing cat skin diseases, leveraging probabilistic reasoning to handle uncertainty in symptom data. Similarly, Nurajizah & Saputra (2018) employed Forward Chaining in an Android-based expert system, focusing on rule-based reasoning to trace symptoms to specific conditions. Widyaningsih & Gunadi (2017) explored the Dempster-Shafer theory for diagnosing feline skin disease symptoms, emphasizing its capacity to combine evidence from multiple sources to reach a conclusion. However, the Certainty Factor method, as detailed by Kurniati *et al.* (2017) and Prayoga & Sibarani (2020), offers a robust framework for managing uncertainty by assigning confidence levels to diagnostic outcomes, making it particularly suitable for veterinary applications where symptom interpretation can be ambiguous. This method has been further validated in diverse contexts, including hardware diagnostics (Saputra *et al.*

al., 2022), counseling systems (Fakrurrozi *et al.*, 2022), and agricultural pest detection (Tyar & Wahyuddin, 2022), underscoring its versatility and reliability.

The Certainty Factor approach, central to many expert systems, quantifies the belief or disbelief in a hypothesis based on available evidence, providing a numerical measure of diagnostic confidence. Kusrini (2008) explains that this method allows for the integration of expert opinions with user-provided data, facilitating a nuanced assessment of uncertainty. In the context of feline health, Kurniati *et al.* (2017) and Yulianti & Saputri (2022) applied Certainty Factor to diagnose skin diseases in cats, achieving improved accuracy in preliminary assessments. This methodology's adaptability is further evidenced in non-veterinary applications, such as decision-making systems for educational majors (Sumito, 2021) and investment decisions (Rofi'i, 2023), as well as combined approaches with algorithms like K-Nearest Neighbor (Effendi *et al.*, 2021), demonstrating its broad utility in handling complex diagnostic challenges (Sari *et al.*, 2020; Setyawati, 2018). The relevance of expert systems in veterinary care is amplified by the growing popularity of cats as companion animals, particularly in regions like Indonesia, where diverse breeds and increasing pet ownership necessitate accessible health solutions. Resources such as Prakoso (2023), Veronika (2023), and KucingPedia (2023) catalog various feline breeds and their unique characteristics, highlighting the cultural significance of cats and the corresponding demand for effective care mechanisms. Comprehensive guides by Drimmer & Weitzman (2020), Effendi & Budiana (2014), and Suwed & Napitulupu (2011) provide detailed insights into feline health, emphasizing the prevalence of skin conditions and the need for owner education to prevent misdiagnosis or delayed treatment. These works collectively underscore the urgency of integrating technological interventions to support pet owners in managing their animals' health.

Technologically, the development of expert systems for veterinary diagnostics often leverages mobile platforms, particularly Android, due to its widespread accessibility and robust development ecosystem. Android programming, as detailed by Enterprise (2015), Hardiansyah & Suryono (2020), and Herlinah & Musliadi (2019), provides a flexible foundation for creating user-friendly applications tailored to specific needs. Tools like Android Studio, discussed in Kurniawan & Widodo (2015) and Yudhanto & Wijayanto (2017), enable developers to build sophisticated interfaces and integrate backend functionalities, ensuring seamless user experiences. Database management systems such as MySQL, explored by Solichin (2016) and Anhar (2010), are critical for storing and retrieving symptom and disease data, while frameworks like Firebase, as described by Purnomo *et al.* (2020), enhance data synchronization capabilities in Android applications. Additional resources on programming languages and tools, including Java (Conder & Darcey, 2022), JSON (BINAR, 2021), and PHP (Wali *et al.*, 2023), provide a comprehensive toolkit for constructing reliable expert systems (Safaat, 2011; Safaat, 2012; Wadi, 2018). The design and implementation of such systems also rely on structured methodologies like Unified Modeling Language (UML) for process analysis and visualization. Dharwiyanti & Wahono (2003) and Wicaksono (2023) emphasize UML's role in mapping system requirements and workflows, ensuring that the developed application aligns with user needs. Complementary tools like Figma for interface prototyping (Anendya, 2022) and Adobe Photoshop for graphical elements (Setiyaningsih, 2023) enhance the aesthetic and functional aspects of application development, while Adobe Dreamweaver supports web-based components if needed (Khasanah, 2022). Algorithmic design, as discussed by Setiawan (2009) and Purbasari *et al.* (2024), underpins the logical structure of diagnostic processes, ensuring accurate inference from user inputs. These technical foundations, combined with theoretical insights from expert system literature (Andriani, 2016), provide a holistic framework for creating effective diagnostic tools.

Moreover, the operational context of Android-based systems benefits from the platform's evolving features, such as those introduced in Android Marshmallow, which improve performance and user interaction (Sutiono, 2017). The integration of APIs, as explained by AWS (2023), facilitates connectivity between application components, enhancing functionality. Research operations and software engineering principles, as outlined by Alfariis *et al.* (2022) and Wali (2020), further guide the iterative development and testing phases, ensuring the system's reliability and scalability. These technological advancements align with the practical needs of veterinary clinics, where time efficiency and diagnostic accuracy are paramount. In synthesizing these theoretical and practical dimensions, it becomes evident that expert systems for diagnosing feline skin diseases rest on a robust foundation of interdisciplinary knowledge. The Certainty Factor method, supported by studies like Prayoga & Sibarani (2020) and Yulianti & Saputri (2022), emerges as a particularly effective approach for managing diagnostic uncertainties, a critical consideration given the variability in symptom presentation among cats. The cultural and social context of pet ownership, as illuminated by Prakoso (2023) and Veronika (2023), underscores the demand for accessible tools that empower owners with actionable health insights. Technologically, the Android platform, bolstered by resources from Hardiansyah & Suryono (2020) and Safaat (2012), offers a scalable medium for deploying such systems, ensuring broad reach and usability. This theoretical background not only contextualizes the development of an expert system for feline skin disease diagnosis but also highlights the convergence of veterinary needs with cutting-edge technology. By integrating established inference methods, mobile development frameworks, and a deep understanding of feline health challenges, this research aims to contribute to the growing field of veterinary informatics. The comprehensive referencing of works spanning expert systems, programming, and pet care ensures

a well-rounded approach, addressing both the technical intricacies and the practical imperatives of enhancing animal healthcare through digital innovation. Ultimately, this foundation supports the creation of a tool that promises to improve diagnostic efficiency, reduce owner uncertainty, and elevate the standard of care for cats in localized settings like veterinary clinics.

3 | METHOD

This research was conducted on Wednesday, March 29, 2023, at 17.00 WIB, at Cat's Petshop and Veterinarian located in Grand Depok City, Depok, West Java. This location was chosen because it is one of the animal health service centers that has many clients with a need for cat health information, especially related to skin diseases. This study aims to produce a technology-based solution that can be useful as an information medium regarding the diagnosis of early symptoms of skin disease in pet cats at home. With this solution, it is hoped that users, namely cat owners, can make an early diagnosis of the symptoms of skin disease experienced by their pet cats according to the visible manifestations, especially when there is no doctor's schedule or when the doctor is not at the clinic. This is very relevant considering the limited access to veterinary services in several areas, as stated in a study by Prakoso (2023) and Veronika (2023), which highlighted the increasing population of pet cats in Indonesia and the need for easily accessible health solutions. In the data collection process, this study adopted a comprehensive approach by combining literature studies and direct observation. Literature study was conducted by reviewing various sources such as books, e-books, journals, scientific articles, and relevant websites to obtain a theoretical basis for skin diseases in cats and the development of expert systems. These sources include important references such as Dwiramadhan *et al.* (2022) and Nurajizah & Saputra (2018), which discuss the application of expert systems in diagnosing skin diseases in cats using methods such as Naive Bayes and Forward Chaining. In addition, primary data collection was carried out through direct interviews with two veterinarians who practice at Cat's Petshop Depok, namely drh. Atiek and drh. Zeta. This interview focused on three main aspects: symptoms of skin diseases in cats, types of skin diseases that are often encountered, and recommended treatment solutions. This approach ensures that the data collected reflects the reality in the field and can be integrated into the expert system being developed, as supported by a similar approach in the research of Kurniati *et al.* (2017) which used data from veterinary practitioners to build a knowledge base. In addition to data collection, the system design stage is an important part of this research methodology. The system design is designed using the Unified Modeling Language (UML), a visualization method that is widely used to design application flows and functionality, as explained by Dharwiyanti & Wahono (2003). UML helps in mapping the interaction between users and the system, and ensures that each function is designed according to user needs. The following is a detailed explanation of the UML design used, which includes Use Case Diagrams and Activity Diagrams for various functions in the expert system application for diagnosing skin diseases in cats.

Use Case Diagram is designed to describe the main functionality of the system with a focus on "what" the system does, not "how" it does it. Use Case Diagram User, as shown in Figure 1. Usecase Diagram User, illustrates that all user activities can only be done after successfully logging into the application. Users have access to register, diagnose diseases, view disease data, access diagnosis history, open the help menu, view the about menu which includes information about cats and the application, and log out. Meanwhile, Use Case Diagram Admin, as seen in Figure 2. Usecase Diagram Admin, shows that the admin must also log in first to access certain functions. The admin is tasked with managing symptom data (adding, changing, deleting), disease data (adding, changing, deleting), and rule data by rearranging symptoms according to the disease. The admin can also log out of the application after finishing.

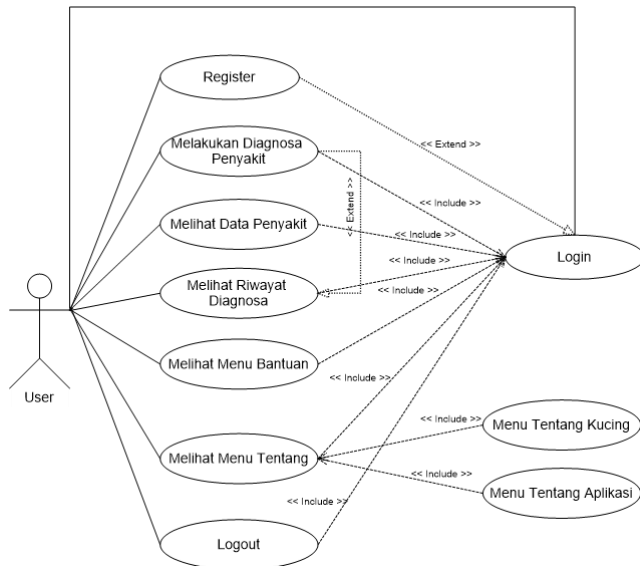


Figure 1. Usecase Diagram User

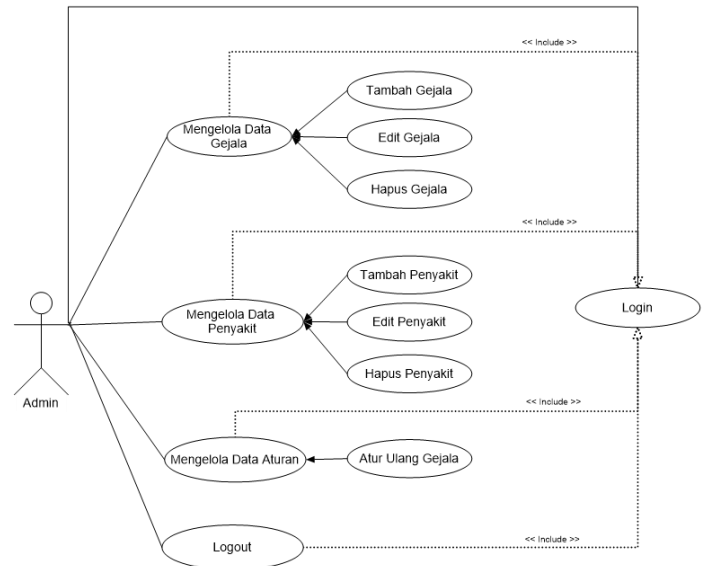


Figure 2. Admin Usecase Diagram

Activity Diagram is used to describe the flow of activities in a system, including the start of the activity, possible decisions that may arise, and how the activity ends. For users, several activity diagrams are designed, starting with Figure 3. Activity Diagram Register User, which explains the registration process starting from opening the application, selecting the registration menu, filling in data such as full name, username, and password, to receiving notification of success or failure of registration. The user login process is illustrated in, which shows the steps to enter the application by entering a username and password, followed by data verification to access the main menu. Furthermore, Figure 4. Activity Diagram Disease Data User shows how users access disease information through the main menu by selecting a specific type of disease to see its details.

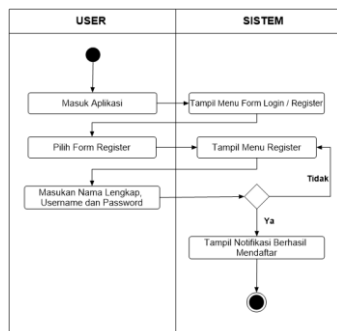


Figure 3. User Register Activity Diagram

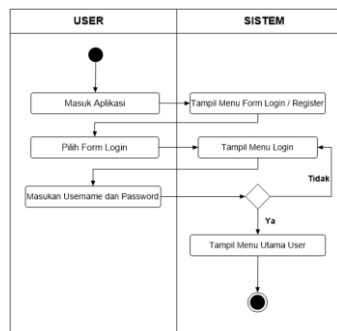


Figure 4. User Login Activity Diagram

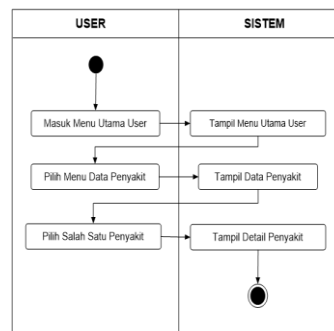


Figure 5. Activity Diagram of User Disease Data

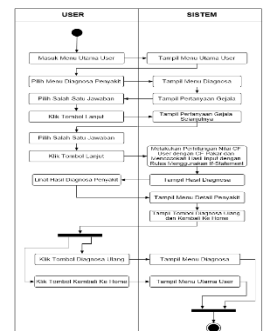


Figure 6. Disease Diagnosis Activity Diagram

The disease diagnosis process, which is the core of this application, is explained in Figure 5. Disease Diagnosis Activity Diagram. This diagram illustrates the steps starting from selecting the diagnosis menu, answering symptom questions sequentially, until the system calculates the Certainty Factor (CF) value of the user and expert to display the diagnosis results. Users can also view disease details and choose to re-diagnose or return to the main menu. The diagnosis history can be accessed as shown in Figure 6. Diagnosis History Activity Diagram, which allows users to view previous diagnoses with details. The additional information menu as in Figure 7. About Activity Diagram includes two sub-menus, namely about cats (definition and type) and about the application (creator information), while Figure 8. Help Activity Diagram provides guidance on using the application. Finally, the user logout process is illustrated in Figure 9. User Logout Activity Diagram, which involves confirmation before exiting the application.

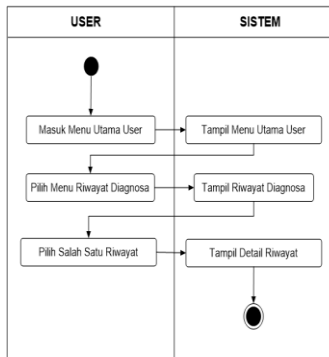


Figure 7. Activity Diagnostic History Diagram

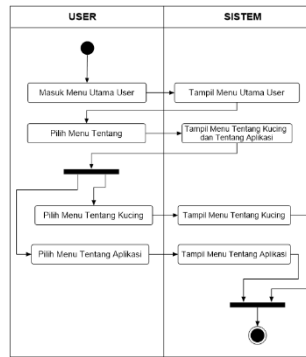


Figure 8. Activity Diagram About

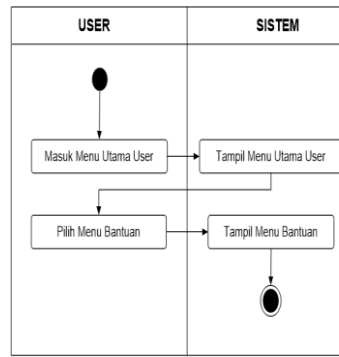


Figure 9. Activity Diagram Help

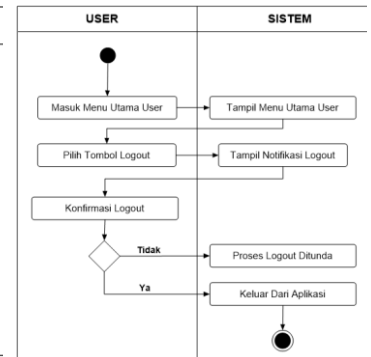


Figure 10. User Logout Activity Diagram

For the admin side, the login process is described in Figure 10. Activity Diagram Login Admin, which is similar to the user process but leads to the admin main menu. Management of disease data by the admin is shown in Figure 11. Activity Diagram Disease Data Admin, includes the functions of adding, changing, and deleting disease data. Management of rule data, which allows the admin to rearrange symptoms according to disease, is illustrated in Figure 12. Activity Diagram Rule Data Admin. Meanwhile, Figure 13. Activity Diagram Symptom Data Admin shows the process of managing symptom data with similar functions, namely adding, changing, and deleting. Finally, the admin logout process is described in Figure 14. Activity Diagram Logout Admin, which also involves confirmation before exiting the application.

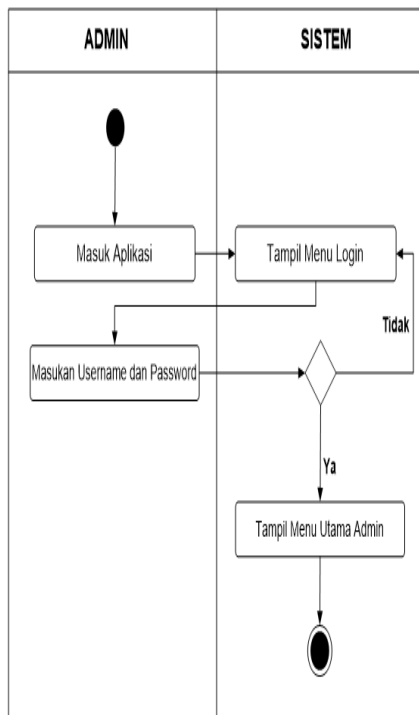


Figure 11. Activity Diagram Admin Login

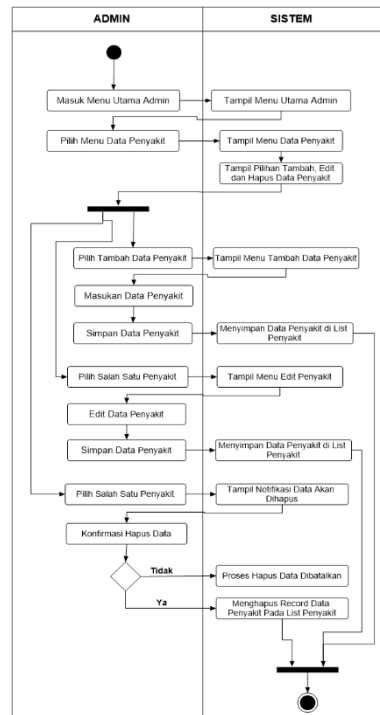


Figure 12. Activity Diagram of Admin Disease Data

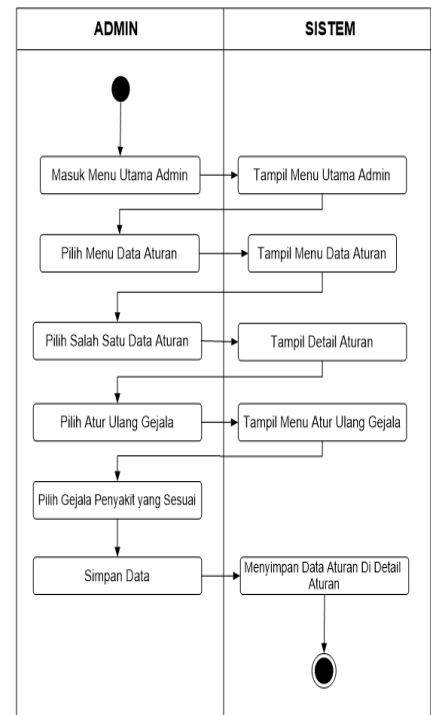


Figure 13. Activity Diagram Admin Rules Data

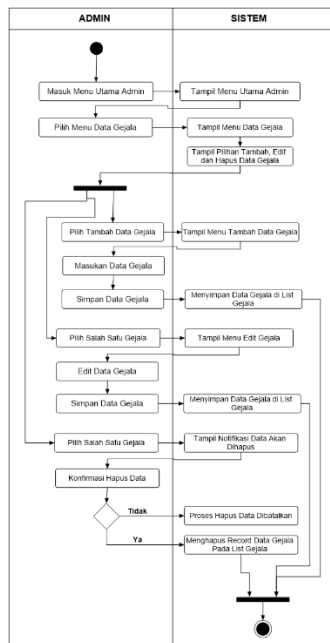


Figure 14. Admin Symptom Data Activity Diagram

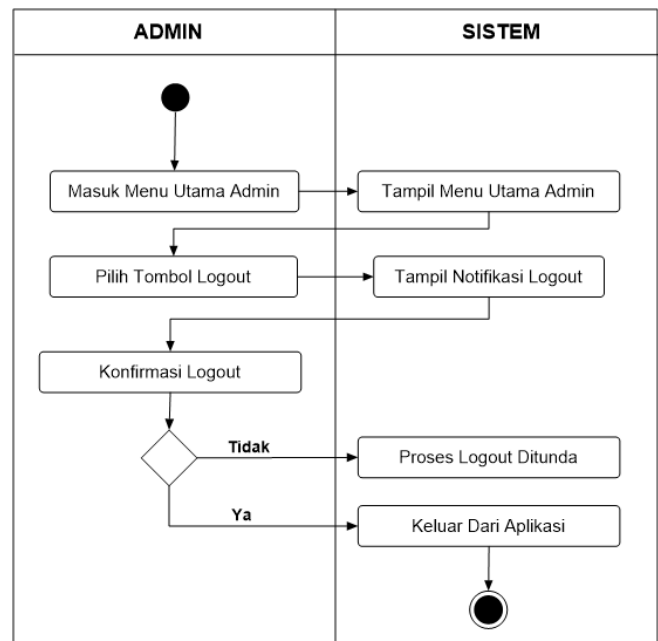


Figure 15. Activity Diagram Admin Logout

This methodological approach is supported by technology references such as Hardiansyah & Suryono (2020) and Safaat (2012), which emphasize the importance of structured system design in Android application development. By utilizing UML, this study ensures that each application function is clearly designed to meet the needs of users and admins, as recommended by Wicaksono (2023). The in-depth data collection process and detailed system design are the foundation for creating an effective expert system application in diagnosing cat skin diseases, while providing practical solutions for cat owners at Cat's Petshop Depok. This methodology not only aims to produce a diagnostic tool, but also to improve the efficiency of animal health services by reducing waiting times and providing accurate initial information to users. Thus, this study is expected to make a significant contribution to the application of information technology in the veterinary field, in accordance with the trends outlined by Prayoga & Sibarani (2020).

4 | RESULTS AND DISCUSSION

4.1 Results

The central role in designing a computerized system is held by the interface, which functions as a bridge between the user and the application being developed. The interface allows users to run various computer application programs with an intuitive and easy-to-use graphical approach. In the context of an expert system application for diagnosing skin diseases in cats, interface design is a key element to ensure accessibility and usability for users, both cat owners and system administrators. This application is designed with two different main menus, namely the User Menu and the Admin Menu, each of which has specific functions according to the needs of users and system managers. With a structured design, this application aims to provide a practical solution in diagnosing cat skin diseases and facilitating the management of relevant data.



Figure 16. Splash Screen View



Figure 17. Login Menu Display



Figure 18. Register Menu Display



Figure 19. Main User Menu Display

For users, the application provides a variety of features designed to help cat owners diagnose early symptoms of skin disease in their pets. Users can identify the type of skin disease their cats may be suffering from and get information on appropriate early treatment solutions. The user interface begins with the initial display or splash screen, which is the first page that appears when the application is opened. This page usually displays the application's identity such as the name and logo, giving a professional impression while introducing the application to users before they proceed to the main function. After the initial display, users are directed to the login page, which allows them to enter the application by entering a username and password. For new users, there is a registration page that allows them to create an account by filling in data such as full name, username, and password. This process is designed to ensure that only registered users can access the application's features, thus maintaining the security of user data and privacy. After successfully logging in, users will be directed to the main menu page, which is the navigation center for accessing various application features. This main menu includes several options, such as a menu for diagnosing diseases, viewing disease data, accessing diagnosis history, getting help using the application, viewing information about cats and the application, and the option to log out. The design of this main menu aims to provide easy navigation so that users can quickly find the features they need without confusion.

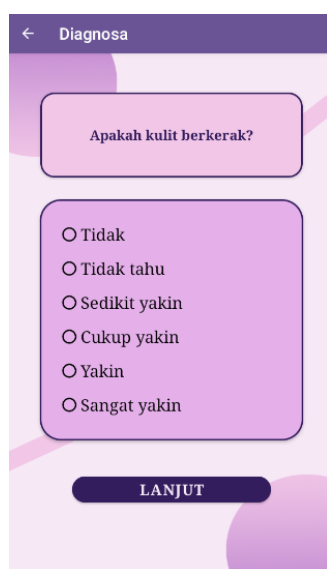


Figure 20. Display Menu Diagnosa



Figure 21. Diagnostic Results Menu Display

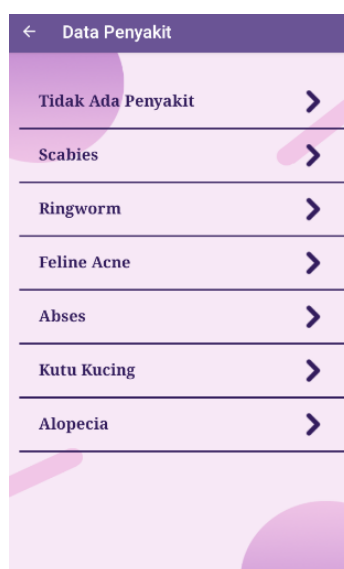


Figure 22. Disease Data Menu Display

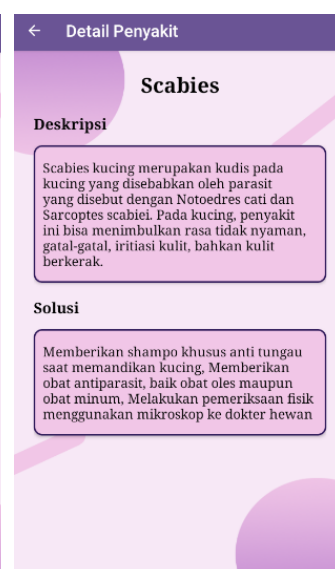


Figure 23. Disease Detail Menu Display

One of the main features of this application is the disease diagnosis menu, which allows users to select answers based on the symptoms experienced by their cats with options such as "no", "don't know", "quite sure", "sure", to "very sure". After answering a series of questions related to symptoms, users will be directed to the diagnosis results page, which displays the name of the disease that the cat is likely to suffer from along with the percentage of the certainty factor value of the diagnosis. This feature is designed to provide users with an accurate initial picture, as supported by the Certainty Factor methodology approach in the research of Kurniati *et al.* (2017). In addition, users can also access the disease data menu, which contains information about various types of skin diseases in cats. From this menu, users can select a particular disease to see its details, including the definition of the disease and recommended treatment solutions. This feature aims to improve users' understanding of their cat's health condition, in line with the educational needs expressed in the study by Prakoso (2023). There is also a diagnosis history menu, which records the results of previous diagnoses along with the dates of their implementation, allowing users to track the development of their cat's condition over time. This application also provides a help menu that contains a guide to using the application, explaining the function of each menu so that users can make maximum use of the available features. The about menu is divided into two sub-menus, namely information about cats which includes the definition, brief history, and types of cats, and information about the application that lists the name of the creator, supervising lecturer, animal expert, and practice location such as Cat's Petshop and Animal Clinic. Finally, the logout menu allows users to exit the application safely, keeping their data secure after they have finished using the application. Meanwhile, for the Admin role, this application provides a special interface that can only be accessed by the system manager. The admin is responsible for inputting and managing data required by the application, such as symptom data, diseases, and diagnostic rules. The admin login page has a similar design to the user, where the admin must enter a username and password to enter the system. After successfully logging in, the admin is directed to the main admin menu, which includes options for managing symptom data, disease data, rule data, and logout options.

In the symptom data menu, the admin can view a list of symptoms of skin diseases in cats and perform actions such as adding or editing symptom data. When adding or editing symptoms, the admin is asked to enter information such as symptom code, symptom name, and relevant Certainty Factor (CF) values. Likewise, the disease data menu allows the admin to manage disease information by adding or editing data such as disease code, disease name, description, and treatment solutions. This feature ensures that the application's knowledge base remains updated and accurate, as recommended by the expert system approach in the study by Dwiramadhan *et al.* (2022). The rule data menu is designed to help admins manage the relationship between diseases and their corresponding symptoms. Admins can view a list of existing rules, display details such as disease name and symptom code, and rearrange symptoms to ensure that each disease is associated with the correct symptoms. This process is very important to maintain the accuracy of the diagnosis produced by the system, in accordance with the principles of data management in expert systems explained by Nurajizah & Saputra (2018). The interface design of this expert system application is designed to meet the needs of users and admins with a user-friendly approach. With a clear menu structure and organized functions, this application not only makes it easier for cat owners to diagnose their pets' skin diseases, but also supports admins in maintaining the quality of data used for diagnosis. This approach is in line with the principles of Android-based application design outlined by Hardiansyah & Suryono (2020), which emphasizes the importance of an intuitive interface to improve user experience. This application is expected to be an effective solution in supporting cat health, especially in areas with limited access to veterinary services, as a need identified by Veronika (2023). Thus, the results of this study indicate that the integration of information technology in the veterinary field can have a significant positive impact on pet owners and animal health system managers.

4.2 Discussion

The development of a computerized system, particularly in the context of an expert system for diagnosing skin diseases in cats, hinges significantly on the design and functionality of the user interface. The interface serves as a critical bridge between the user and the application, facilitating seamless interaction through a graphical approach that enhances usability. In this study, the application is structured into two primary interfaces: one for regular users (pet owners) and another for administrators (system managers). This bifurcation ensures that each user group accesses functionalities tailored to their specific needs, aligning with the principles of user-centered design as discussed by Hardiansyah and Suryono (2020), who emphasize the importance of intuitive interfaces in Android application development. The findings from this research demonstrate that a well-designed interface not only improves user experience but also enhances the effectiveness of the expert system in delivering accurate diagnostic information. For regular users, the application provides a comprehensive set of features aimed at assisting cat owners in identifying and addressing skin diseases in their pets. The user journey begins with an initial splash screen, which introduces the application through its branding elements, setting a professional tone for the interaction. Following this, users encounter the login and registration pages, which are essential for securing access

and personalizing the user experience. These authentication mechanisms ensure data privacy and user-specific interactions, a practice supported by Safaat (2012), who highlights the importance of secure access in mobile applications. Upon successful login, users are directed to the main menu, which serves as the central hub for navigation. This menu offers access to critical features such as disease diagnosis, disease information, diagnosis history, help resources, information about cats and the application, and a logout option. The structured layout of the main menu aligns with the usability principles outlined by Kurniawan and Widodo (2015), ensuring that users can easily locate and utilize the desired functionalities without unnecessary complexity. The core functionality for users lies in the diagnosis feature, where they can input symptoms observed in their cats by selecting from a range of confidence levels, from "not at all" to "very certain." This input mechanism is rooted in the Certainty Factor (CF) method, which calculates the likelihood of a specific skin disease based on user responses. The results page subsequently displays the probable disease along with a confidence percentage, providing users with actionable insights. This approach is corroborated by Kurniati *et al.* (2017), who successfully implemented the CF method in diagnosing cat skin diseases, noting its effectiveness in handling uncertainty in user inputs. Additionally, users can access detailed information on various skin diseases, including definitions and initial treatment solutions, through a dedicated menu. This educational component is vital, as highlighted by Prakoso (2023) and Veronika (2023), who underscore the growing need for accessible pet health information amid the rising population of domestic cats in Indonesia.

Further enhancing user engagement, the application includes a history feature to track past diagnoses, allowing owners to monitor their cat's health over time. A help menu provides guidance on using the application, while an informational section offers insights into cat breeds and the application's background, including credits to developers and veterinary experts. These features collectively create a holistic user experience, supporting the findings of Dwiramadhan *et al.* (2022), who advocate for comprehensive user interfaces in web-based expert systems for cat skin disease diagnosis using methods like Naive Bayes. Similarly, Nurajizah and Saputra (2018) emphasize the value of Android-based expert systems with Forward Chaining for accessible pet diagnostics, a principle reflected in this application's design. On the administrative side, the application offers a distinct interface for system managers to maintain the integrity and accuracy of the underlying data. Administrators access their functionalities through a dedicated login portal, leading to a main menu tailored for data management tasks. This menu includes options to manage symptom data, disease information, diagnostic rules, and logout capabilities. The ability to add, edit, or delete symptom and disease data ensures that the knowledge base remains current, a critical aspect supported by Widyaningsih and Gunadi (2017), who discuss the importance of up-to-date data in diagnostic systems using the Dempster-Shafer method. Administrators can also adjust the rules linking symptoms to diseases, ensuring diagnostic accuracy, as reinforced by Prayoga and Sibarani (2020), who applied the CF method in Android-based systems for Persian cat disease diagnosis.

The dual-interface design of this application addresses the distinct needs of users and administrators, enhancing both usability and system reliability. The user interface prioritizes accessibility and education, empowering cat owners to make informed decisions about their pets' health, while the admin interface focuses on data integrity and system maintenance. This aligns with broader trends in veterinary technology integration, as noted by Yulianti and Saputri (2022), who highlight the potential of CF-based systems in public animal health centers. Moreover, the application's design adheres to best practices in Android development, as outlined by Herlinah and Musliadi (2019), ensuring compatibility and performance on mobile platforms. The use of structured navigation and secure access protocols also reflects the guidelines provided by Purnomo *et al.* (2020) on building robust Android applications with Firebase integration. The findings from this research underscore the significance of tailored interfaces in expert systems for veterinary applications. By integrating user-friendly design with robust data management capabilities, the application not only facilitates early diagnosis of skin diseases in cats but also contributes to the broader adoption of technology in pet healthcare. This is particularly relevant in regions with limited access to veterinary services, a concern raised by Veronika (2023). Future improvements could focus on incorporating machine learning algorithms, as suggested by Dwiramadhan *et al.* (2022), to enhance diagnostic precision, and expanding the educational content to cover more aspects of feline health, aligning with resources like Drimmer and Weitzman (2020). Ultimately, this study demonstrates that well-designed expert systems can bridge the gap between pet owners and veterinary expertise, fostering better health outcomes for domestic cats through accessible and reliable technological solutions.

5 | CONCLUSIONS AND FUTURE WORK

The research on the Expert System for Diagnosing Skin Diseases in Cats yields several key insights. An expert system utilizing the Certainty Factor (CF) method has been successfully developed and implemented, providing users with a valuable tool to conduct preliminary diagnoses of skin conditions in their cats. This

application effectively enables pet owners to identify the type of skin disease their cats may be experiencing based on observed symptoms, thereby enhancing accessibility to initial veterinary insights without the immediate need for professional consultation. Furthermore, by employing the CF method, the system adeptly addresses uncertainty in diagnostic outcomes, quantifying the likelihood of specific diseases with a confidence percentage to offer users a clearer understanding of the results. Additionally, the application significantly boosts time efficiency in diagnosing early symptoms of skin diseases in cats, reducing delays in identifying potential health issues and facilitating prompt action or further consultation with veterinarians.

Looking ahead, there are several avenues to further enhance the functionality and reach of this expert system. One potential direction is the integration of advanced machine learning algorithms to improve diagnostic precision by training the system on larger datasets of feline skin disease cases, allowing it to adapt and refine predictions over time. Expanding the scope of the application to cover other common feline health issues, such as respiratory or digestive disorders, would transform it into a more comprehensive health management tool for cat owners. Adding multilingual support and accessibility features for users with disabilities could broaden the application's audience and ensure inclusivity. Another promising enhancement is the incorporation of real-time veterinary consultation features, such as chat or video calls, to connect users with professionals for immediate guidance, especially in areas with limited veterinary access. Implementing a user feedback mechanism would also be beneficial, enabling users to report diagnostic accuracy or suggest improvements, thereby continuously refining the system's reliability and user experience. Lastly, enriching the educational content within the app, with detailed guides on preventative care and first-aid for cats, could empower users with essential knowledge to better care for their pets. These future developments aim to evolve the application into a more robust and indispensable resource in feline healthcare, ultimately contributing to improved pet well-being and owner awareness.

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