

## EXPERT SYSTEM FOR DIAGNOSIS OF DISEASES IN CAT USING THE NAIVE BAYES METHOD

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### ABSTRACT

*Cats are animals that relieve stress. When a person spends time with a cat, the hormones serotonin, oxytocin and dopamine increase. One of the reasons why cats can relieve stress is purring, that has a frequency level of 25-50 hertz. But cats can also get sick. Researchers took the initiative to create an application to make it easier for users, to be able to diagnosed earlier. The purpose of this application was that it can be an option other than going to an expert, a good accuracy when compared to experts and providing the right solution. Making the application used the Naïve Bayes method as an analysis of cat data from expert sources that produced that symptoms produced appropriate disease with the solution. Implementation users starting from filling in biodata, symptoms, generating diseases and their solutions, and additional features such as disease info and messages. Meanwhile, admin requires a login to use the data management of symptoms, diseases, knowledge base, accounts and messages. The results of the application were explained from the results of the diagnosis which can detect the cats disease from the inputted symptoms, along with other disease options, with a disease comparison value of 91%.*

**Keyword** : Cats, purring, disease, symptoms, naïve bayes.

### I. INTRODUCTION

Humans currently have a high level of saturation or stress. Around 17.4 million people in the world experience stress and depression. One way to overcome this is by raising pets. Cats are animals that are widely used as pets because they are able to adapt well and can become friends for humans. Various types of cats are kept by humans, namely purebred cats and village cats. Maintenance of animals such as cats must be accompanied by maintaining the health of cats protected from various types of diseases.[1] [2]

Cats are animals that can really relieve stress. Reporting from *kumparan.com*, when a person spends time with a pet cat, the hormones serotonin, oxytocin and dopamine increase. That is what causes people who are with cats to feel calmer, relaxed and happy even when their hearts are under stress. One of the reasons why cats can relieve stress is purring. Purring is cat purr that has a frequency level of 25-50 hertz. It is at one of these sound levels that humans can improve and improve their mental health because they feel more relaxed.[3]

Despite their ability to improve the mental health of their owners, cats can still be detrimental. This point can be seen from the many cat disease problems that are increasingly prevalent nowadays. Reporting from *cnnindonesia.com*, cats can transmit the disease to humans. [4]. One of the potentially contagious diseases is FPV, cat disease that caused by an unsanitary environment and food and the cat can be infected if its immunity is weak and it has not been vaccinated. The disease is most likely death in cats if not treated quickly. [5]

With these facts, researchers took the initiative to create an application that is expected to make it easier for users, especially cat owners, to be able to diagnose the disease experienced by their pet cat from the start. In making the application the researcher will use the Naive Bayes method as a classification and ranking of data that will be visualized in the form of a website application.

The reason researchers use the Naive Bayes method is the ease and clarity in its application when used to create applications. Naive Bayes can be applied to creating website-based applications. Website applications have the advantage of being flexible and can be used on mobile phones or computers. [6]

### II. RESEARCH METODOLOGY

#### A. Literature Study

The literature study in this research includes literature studies and previous research related to disease diagnosis expert systems and the Naïve Bayes method. In this way, researchers can obtain data, information, theoretical concepts from journals, lecture books and references from the internet related to the topic.[7]

### B. Observations

From the observations made it was found that from the researcher's background is selling cat food, there is an increase sales during the Covid-19 pandemic until now. This matter according to researchers, most buyers experience stress over work From Home policy during the last pandemic. This experience is important for research in formulating problems so as to find out what needs to be planned for this research. [8]

### C. Interview

Interviews were conducted with experts who are experts in the field cat animal. The purpose of this step to get accurate information. With interviews, it is hoped that what the researchers research can be completed easily.[9]. What will be asked is about cats, symptoms,cat diseases and solutions. This data collection done by Dr. Fikri Fahmi Udin as a cat animal expert at Petshop Trois Clinic Jl. Mastrip No. 100, Sukomulyo, District Lamongan, Lamongan.

### D. Data analysis

According to the approach, this research is included in quantitative method, because it analyzes problems with using parameters that can be calculated or measured (quantified). Research quantitative is an approach to testing objective theories by examining the relationship between variables. This variable is on turn can be measured using instruments, so quantity data can be analyzed using statistical procedures.[10]

### E. Expert system

An expert system is a type of artificial intelligence that is applied to solve human problems. This expert system will solve complex problems based on the knowledge entered into the system. This is applied in various fields to help solve human problems without having to meet with experts. Only use technologies that are already represented in the knowledge base of experts. The use of expert systems is considered efficient in today's modern era. So, humans can perform analysis/diagnosis like an expert with the help of technology.[11][12]

### F. Naïve Bayes Method

The Naive Bayes method is a method for calculating the probability of an event occurring based on the influence obtained from observation. Bayesian probability is a method that uses the Bayesian formula to deal with data threats.

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

Information:

$P(A|B)$  : Probability that A occurs with evidence that B has occurred (superior probability)

$P(B|A)$  : The probability that B will occur given the evidence that A has occurred

$P(A)$  : The probability that A occurs

$P(B)$  : The probability that B occurs [13]

## III. RESULT AND DISCUSSION

The research will begin with searching data, through 2 methods, namely observation and interviews. Observations were made using a literature approach through books, journals, and other literary sources. Interviews were conducted with experts related to the problem of treating and curing diseases from cat pets. [14] The applications used for making application designs are as follows:

Designing the data flow work system in the application, namely for usecase using yEd Graph Editor, activity diagrams and sequence diagrams using Power Designer.

The application/framework used for coding is Visual Studio using the PHP language. The database will be created using MySQL.

The application created requires complementary data, therefore the required data can be obtained from interviews. Data collection was carried out from related literature and journals by giving an interview form containing symptoms, diseases and solutions to drh. Fikri Fahmi Udin as an expert in cat diseases. From this data, symptoms, cat diseases and solutions can be obtained that are right on target and accurate. The following is the data obtained from the interview:

A. *Data used*

Here the data is taken from interviews with experts, Drh. Fikri Fahmi Udin.

Table I. Class

<b>Cat Disease</b>
P01 : Helminthiasis worms
P02 : Skin disease "Scabies"
P03 : Gastritis (stomach irritation)
P04 : Coccidiosis (Coccidal parasitic infection)
P05 : Rhinitis (inflammation of the mucous membranes)
P06 : Enteritis (inflammation of intestinal infection)
P07: FPV “Feline Panleukopenia Virus” (Red blood cell infection)
P08 : Ear mites
P09 : FLUTD "Feline Lower Urinary Tract Disease" (urinary disorder)
P10 : FRV “Feline Rinotracheitis Virus” (Respiratory tract infection)

Table II. Variable

<b>Symptoms of cat disease</b>		
G01 : Anemia (white gums)	G11 : Itching	G21 : Weak
G02 : Anorexia	G12 : Nasal festering	G22 : Scab wound
G03 : Bad breath	G13 : Limping	G23 : Vomiting
G04 : Bad ear odor	G14 : Fungus	G24 : Breath through the mouth
G05 : Swollen eyes	G15 : Drooling	G25 : Big belly
G06 : Feather Loss	G16 : Tears come out	G26 : Cold
G07 : Sneezing	G17 : Redness of the skin	G27 : Thrush
G08 : Fever	G18 : Dandruff	G28 : Urinate frequently but little
G09 : Diarrhea	G19 : Difficulty walking	G29 : Ears are held in pain
G10 : Diarrhea accompanied by blood	G20 : Skinny	G30 : Doesn't want to eat

Table III. Rule as a knowledge base

<b>Relationship between disease and symptoms</b>
P01 = G01, G09, G10, G16, G23, G25
P02 = G06, G11, G17, G22
P03 = G02, G03, G08, G09, G10, G15, G21, G23
P04 = G01, G02, G08, G09, G15, G23
P05 = G08, G16
P06 = G02, G08, G09, G10, G21
P07 = G01, G02, G06, G08, G09, G10, G15, G16, G21, G23, G24
P08 = G04, G11, G29
P09 = G02, G03, G08, G19, G21, G23, G28, G30
P10 = G01, G03, G06, G08, G09, G12, G15, G16, G21, G27

B. *System design*

The Use Case Diagram explains that the system admin can manage and utilize the system created. This diagram can also describe what the system does.

Traced from the beginning, the application was planned to be created with a home page as a start. Therefore, users can use the application directly via the diagnostic form without the usual login as application security. It contains requirements for filling in user and pet biodata for administration. Then proceed with filling in the symptoms, which are ultimately used as supporting data to obtain appropriate disease results and solutions. Users can also use other features such as disease information and messages in this application. The data used by users from these features will be integrated with the data management carried out by the admin in admin data management.

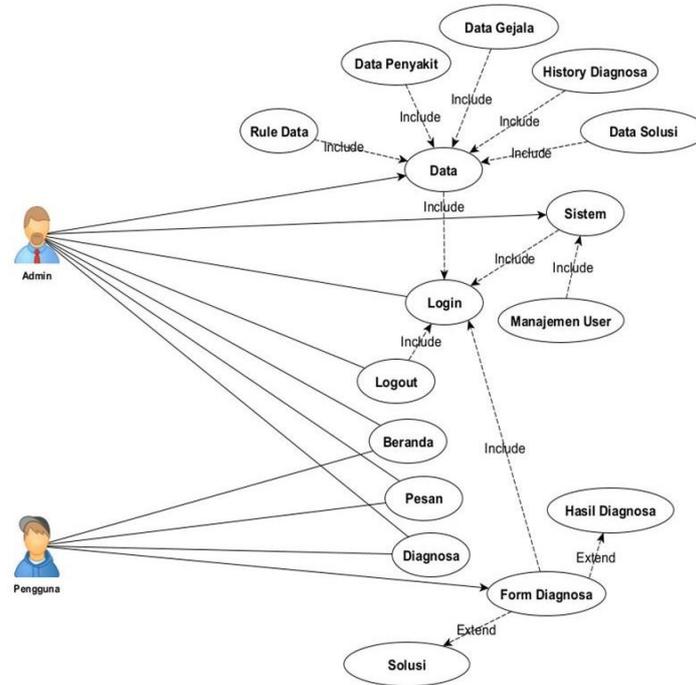


Figure 1. Use case diagram

For admins, a login is required to enter the application. This is used to secure data, so that the data in it is not changed by irresponsible parties. Data management here it is used to organize data on symptoms, diseases, knowledge bases, messages and user data. The most important feature in admin data management is the knowledge base. Next, proceed with creating an application using this design.

*C. Application Implementation*

The implementation of the design that was made begins with making it using the Visual Studio Code application using the Php programming language.

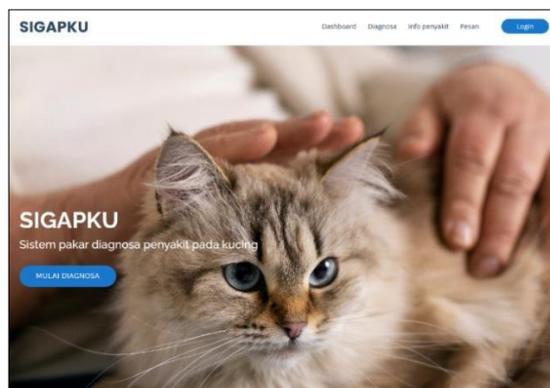


Figure 2. Application homepage

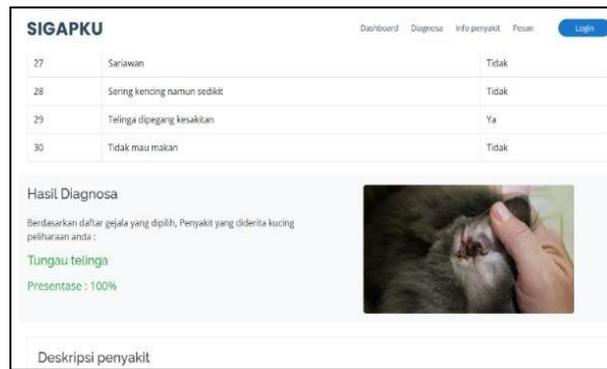


Figure 3. Diagnostic results

The data used for the application is connected to admin data management. From symptoms, diseases, knowledge base, diagnoses performed, messages and accounts.



Figure 4. Data management

System testing aims to test whether all elements the software created is as expected. Several trials have been carried out from the application that has been implemented to test the comparison between manual excel calculations and the application, which is explained in the following black box test in Table IV. [15]

Table IV  
Blackbox test table for diagnosing disease applications (Sigapku)

Excel Calculation (EC)					Final Result
NO	Diagnosis symptom	Disease value (Dv)	Conclusion	Results	
1	G23, G24, G25	P1 44%, P7 40%, P3 7%, P4 7%, P9 2%	P001 has greatest value	Helminthiasis Disease	<b>Total Dv EC</b> =5+4+2 =11
2	G4, G6, G17	P8 46%, P2 35%, P7 12%, P10 8%	P008 has greatest value	Ear Mite Disease	<b>Total Dv SAR</b> =4+4+2 =10
3	G28, G29, G30	P8 36%, P9 64%	P009 has greatest value	FLUTD Disease	
Sigapku application result (SAR)					
1	G23, G24, G25	P1 44%, P7 40%, P3 7%, P4 7%	P001 has greatest value	Helminthiasis Disease	<b>Accuracy Dv</b> = 10/11 =91%
2	G4, G6, G17	P8 46%, P2 35%, P7 12%, P10 8%	P008 has greatest value	Ear Mite Disease	
3	G28, G29, G30	P8 36%, P9 64%	P009 has greatest value	FLUTD Disease	

#### IV. CONCLUSION

This research develops the Sigapku application, an expert system for diagnosing diseases in cats, that uses PHP and MySQL, as well as the Naïve Bayes method for analyzing symptom and disease data. It was concluded that Naïve Bayes applied as an expert system application can diagnose cat diseases from the entered symptoms. The resulting diagnosis is also accompanied by a description and solution as an initial treatment. And data management is also running and well connected to the diagnostic application. From these results, the application can be used and utilized by cat owner users in detecting their cat's disease. The comparison value between manual calculations and applications is 91%.

#### BIBLIOGRAPHY

- [1] Gunaawan, Indra, and Yusra Fernando. 2021. "Sistem Pakar Diagnosa Penyakit Kulit Pada Kucing Menggunakan Metode Naive Bayes Berbasis Web." *Jurnal Informatika dan Rekayasa Perangkat Lunak (JATIKA)*, Vol. 2, No. 2 239-247.
- [2] Ridwansyah, Jajang Jaya Purnama, Hermanto, Suhardjono, and Abdul Hamid. 2020. "Aplikasi Mobile Sistem Pakar Dalam Mengidentifikasi Diagnosis Penyakit Kucing." *INFORMATICS FOR EDUCATORS AND PROFESSIONALS*, Vol. 5, No. 1 23-32.
- [3] Temali. 2020. *Mau Stres Berkurang dan Tidur Nyenyak? Coba Pelihara Kucing!* 5 Februari. <https://kumparan.com/temali/mau-stres-berkurang-dan-tidur-nyenyak-coba-pelihara-kucing-1smSxNtpzte/1>.
- [4] CNN Indonesia. 2022. *7 Penyakit yang Ditularkan Kucing ke Manusia*. 22 Mei. <https://www.cnnindonesia.com/gaya-hidup/20220520130004-289-798963/7-penyakit-yang-ditularkan-kucing-ke-manusia>.
- [5] Royal canin. 2023. *Kenali, Virus Panleukopenia Pada Kucing dan Cara Mencegahnya*. 3 Januari. <https://www.royalcanin.com/id/cats/kitten/distemper-in-cats>.
- [6] algoritma. 2022. *TUJUAN&CONTOH PENERAPAN NAIVE BAYES*. 30 Maret. <https://algoritma.blog/naive-bayes-2022/>.
- [7] Lutfi, Muhammad, Sarif Surejo, and Pinky Septiana. 2022. "SYSTEMATIC LITERATURE REVIEW : PENERAPAN ALGORITMA NAIVES BAYES DALAM SISTEM PAKAR." *JurnalMinfo Polgan* Volume 11, Nomor 02 7-13.
- [8] Wiguna, Yolanda, Taufik Faisal, and Asyahri Hadi Nasyuha. 2022. "Sistem Pakar Mendiagnosa Penyakit Batu Karang Menggunakan Metode Dempster Shafer." *J-SISKO TECH (Jurnal Teknologi Sistem Informasi dan Sistem Komputer TGD)* 66-75.
- [9] Fuad, and Nurul. 2022. "IMPLEMENTASI ALGORITMA LEAST SQUARE UNTUK FORECASTING PADA TOKO MABEL ." *Jurnal SPIRIT* Vol. 14 No. 1 24-29.
- [10] Creswell, John W. 2014. *Research design : qualitative, quantitative, and mixed methods approaches*. Singapore: Sage Publication.
- [11] M. R. Mufid, A. Basofi, S. Mawaddah, K. Khotimah and N. Fuad. 2020. ""Risk Diagnosis and Mitigation System of COVID-19 Using Expert System and Web Scraping." *International Electronics Symposium (IES)* 577-583.
- [12] Fuad, Nurul. 2016. "PENERAPAN METODE CERTAINTY FACTOR UNTUK MENDIAGNOSA DAN PENCEGAHAN PENYAKIT CACINGAN PADA ANAK BALITA." *Jurnal SPIRIT* Vol. 8 No. 1 12-16.
- [13] Hadi, Hilman, Ucuk Darusalam, and Andrianingsih. 2021. "Penerapan Metode Forward Chaining dan Naïve Bayes Untuk Mendiagnosa Penyakit Tanaman Kakao." *JURNAL MEDIA INFORMATIKA BUDIDARMA* Vol. 5, No. 3 979-986.
- [14] Prasetyo, Gusti Ari, and Wiwien Hadikurniawati. 2021. "Sistem Pakar Menggunakan Metode Case Based Reasoning (CBR) Untuk Mendiagnosa Penyakit Kucing." *MISI (Jurnal Manajemen informatika & Sistem Informasi)* Vol. 4, No. 2 78-83.
- [15] Putra, Fajar R B, Abdul Fadlil, and Rusydi Umar. 2021. "Analisis Metode Forward Chaining Pada Sistem Pakar Diagnosa Penyakit Hewan Sapi Berbasis Android." *Jurnal Sains Komputer & Informatika (J-SAKTI)* 1034-1044.