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Diagnostic App for Cats and Dogs Diseases using Neuro – Fuzzy Algorithm

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ABSTRACT: Dog and cat is considered as beloved pets of most people. But these animals are also prone to different diseases such as colds, ticks and fleas, worms, and fungal infections. Early detection leads to early prevention and cure. Detecting diseases at early stage will enable to overcome and treat them appropriately. Identifying the treatment accurately depends on the method that is used in diagnosing the diseases. This study entitled “Diagnostic App for Cats and Dogs Diseases using Neuro – Fuzzy Algorithm” a developed mobile-based application could recognized dogs and cats diseases using neuro-fuzzy algorithm. It aimed to test the accuracy performance of the neuro-fuzzy algorithm on the mobile app. The researchers use Android Studio as the coding platform and Java as the programming language. The developed mobile app run on android version KitKat or better versions. The researchers used experimental method of research which aimed to evaluate the accuracy performance of the mobile with neuro-fuzzy algorithm in diagnosing dog’s diseases, cat’s diseases in terms of precision, recall, and f-measure. The accuracy performance rate of the system was measured through series of experimentation and with the help of our expert. The researchers used 171 for dogs’ diseases and 124 diseases for cats to test the performance accuracy of the said mobile app with neuro-fuzzy algorithm. The study attained the overall accuracy performance rate of the mobile app with neuro-fuzzy with of 87% in diagnosing dogs’ diseases and 90% in diagnosing cats’ diseases. The overall accuracy performance is 88.50%. Hence, the researchers concluded that the Diagnostic App for Cats and Dogs Diseases using Neuro – Fuzzy Algorithm is very high. The developed mobile App can diagnosed dogs’ and cats’ diseases and could advise what proper treatment could be done for every illnesses. It could be a guide for the pet’s owner in taking good care of their loving animal. We, therefore recommend to use the said mobile app in diagnosing dogs’ and cats’ diseases.

Keywords: Neuro Fuzzy, Diagnostic Mobile App, Pet App

1. Introduction

According to Veterinary Pet Insurance, there are 10 common diseases that affects dogs and cats. Common diseases in dogs and cats are skin allergies, ear infection, non-cancerous skin mass, skin infection, arthritis, vomiting/upset stomach, periodontitis/dental disease, diarrhea/intestinal upset, bladder or urinary tract infection, soft tissue trauma (bruise or contusion), excessive thyroid hormone, upper respiratory infection, and lymphoma. (Association, 2016). Preventive healthcare involves a multi-faceted approach that includes veterinary evaluation of your pet's overall health and risks of disease or other health problems.

Most of the pet owners may turn to internet and try to diagnose and treat their pet’s conditions themselves (Zander, 2016). However, different sites provide thousands of different advices stored online and finding the right one can be difficult especially if it is coming from different sources. Applications on market like EasyVet is made especially for Veterinarians (Technologies, 2015).

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Diagnosing the diseases and identifying the right treatment can remedy the pets' illnesses. Detecting at early stage of pets diseases prevented serious illness and could be treated properly (Patra, Sahu, & Mandal, 2010). A Diagnosis Expert System (DExS) could be served as a guide in identifying diseases and suggests methods for curing diseases.

According to the study of (Andrews, et al., 2015), veterinarians believe there is a strong desire for mobile technology in veterinary medicine and the use of this technology will allow them to practice more effectively. Results showed mobile devices are prevalent and widespread among veterinarians with more than sixty percent surveyed strongly agreed mobile technology will advance patient care, client communication, and improve access to clinical data and medical literature.

2. Background and Its Problem

A Care for Animal Organization believes that animals are wonderful part of people's lives, they bring joy, happiness, and give unconditional love. They bring sorrow when they leave, but most of all, they leave with cherished memories of true friendship." (CFA, 2017)

Pet health care is one thing pet owners want to get right (Haight, 2013). Regular veterinarian visits are not only good for your pet, but can be good for the pet owner's wallet as well. Early detection of illness, like food allergies and urinary tract infections can help prevent or cure these problems, before they become serious or extremely expensive.

Current research like Virtua-Vet done by (Floresca, Jaymalin, Taguba, & Zapanta, 2010) is a big help in preventing diseases on cats and dogs, this research uses Natural Language Understanding Techniques in determining keywords on user input questions. However, data available are very limited since it only focused in determining common diseases. This research is very useful to the pet owners who seek expert advice for their pet but unable to afford the potential costs for veterinary consultation.

Almost same study has been found but it focus on the diagnosis of diabetes. In the study of (Morales & Tomines, 2016), they developed a mobile application that runs on an android operating system. It calculates a user's risk in having diabetes through a set of risk factors and symptoms. This study aims to provide self-awareness and early detection of diabetes to avoid further complications. This study uses fuzzy logic algorithm and genetic algorithm.

This research aimed the following objectives:

1. Developed a mobile application that can diagnosed dogs and cat's diseases.
2. Implemented the Neuro-Fuzzy Algorithm in developing the mobile application.
3. Tested the accuracy performance of the Neuro-Fuzzy Algorithm in the developed mobile application to diagnosed dogs and cat's diseases in terms of Precision, Recall and F-Measure.
4. Attained the overall accuracy performance of the Neuro-Fuzzy Algorithm in the developed mobile application to diagnosed dogs and cats diseases

This study will be a great help to pet owners and veterinarians. Pet owners specifically those who have dogs and cats as their home pets will be the one who will highly benefited in this system. It can help them to save money because they don't need to visit a veterinary clinic in case their pets are sick. For veterinarians, this developed system will help them to serve as a tool in diagnosing pet's diseases. It also makes their work easier when giving a diagnosis about pet disease.

Future Researchers who want to make a study about an android based expert system in diagnosing a pet disease can use this study as their basis. This study can also be improved by other researchers for better development of the system. In the field of Computer Science, this study is beneficial because due to the continuous trend of technology today, having an expert system in diagnosing different pets' diseases will be a great contribution.

3. Methodology

3.1. Research Methodology

This study used experimental research design. The experimental research approach is a collection of research designs which use manipulation and controlled testing to understand causal processes. Generally, one or more variables are manipulated to determine their effect on a dependent variable. This is an experiment where the researcher manipulates one variable, and control/randomizes the rest of the variables. It has a control group, the subjects have been randomly assigned between the

groups, and the researcher only tests one effect at a time. It is also important to know what variable(s) you want to test and to measure.

Experiments are conducted to be able to predict phenomenon. Typically, an experiment is constructed to be able to explain some kind of causation. Experimental research is important to society - it helps us to improve our everyday lives. (Blakstad, 2008). The researcher to maintain control over all factors that may affect the result of an experiment. In doing this, the researcher attempts to determine or predict what may occur.

3.2. System Architecture

In the system architecture that was presented in Figure 6, the first part is the user must select the type of pet, choose from list of symptoms and answers the question. All the selected symptoms and the answers in the Q & A will then go to the neuro-fuzzy model. The output of the developed system will be the recognized name of disease, its description and suggestion.

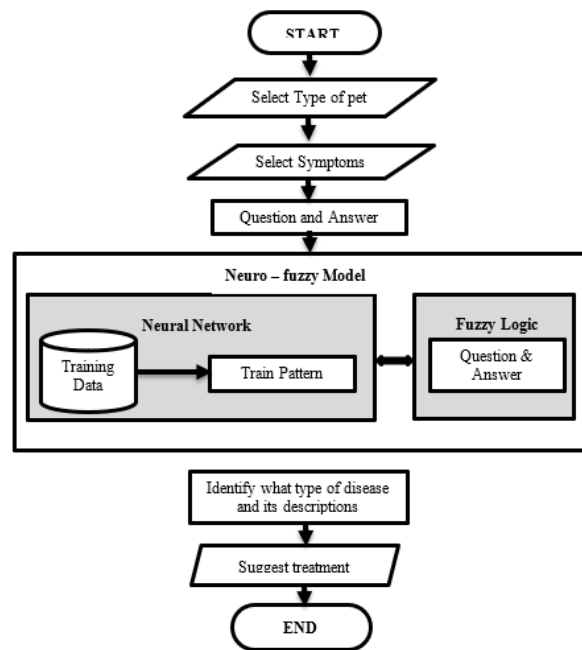


Figure 2 – System Architecture

4. Results and Discussions

Name of Disease	True Value	TP	FP	FN	Precision	Recall	F - Measure
Canine Parvovirus	18	15	5	3	75%	83%	79%
Kennel Cough	17	15	2	2	88%	88%	88%
Distemper	17	15	0	2	100%	88%	94%
Demodectic Mange	17	16	4	1	80%	94%	86%
Sarcoptic Mange	17	15	3	2	83%	88%	86%
Leptospirosis	17	14	6	3	70%	82%	76%
Ehrlichiosis	17	13	1	4	93%	76%	84%
Pyoderma	17	14	0	3	100%	82%	90%
Ear Mites	17	17	0	0	100%	100%	100%
Seborrhea	17	15	1	2	94%	88%	91%
AVERAGE					88%	87%	87%

Table 4.1 above is the depicted the performance of the mobile app in diagnosing common dog's illnesses in terms of precision, recall and F-Measures. Earmites got the rate of 100% in terms of Precision, Recall and F-measure. Diseases Distemper and Pyoderma got the 100% rating in terms of Precision, while the second highest in terms of recall is Demodectic Mange disease. Distemper got the second highest score in F measure with a rate of 94%. Leptospirosis got the lowest rate of 70% and 76% in precision and F-Measure respectively. The Ehrlichiosis disease obtained the low rate of 76% in terms of Recall. The average for precision recall and measure of the mobile app for diagnosing dog's diseases is 88%, 87% and 87% respectively.

Name of Disease	True Value	TP	FP	FN	Precision	Recall	F - Measure
Urinary Tract Infection	21	19	5	2	79%	90%	84%
Poisoning	21	16	4	5	80%	76%	78%
Feline Worms	21	19	0	2	100%	90%	95%
Fungal Dermatitis	21	21	1	0	95%	100%	98%
Ear Mites	20	19	0	1	100%	95%	97%
Respiratory Infection	20	18	2	2	90%	90%	90%
AVERAGE					91%	90%	90%

The performance of the mobile app in diagnosing common cat's illnesses in terms of precision, recall and F-Measures showed in table 4.2. Feline worms and Ear mites with the rate of 100% are precisely identified by the mobile app while Fungal Dermatitis got 100% rate in Recall. The highest F-Measure is Earmites with the rate of 97%. The performance of the mobile app in diagnosing cat's diseases is 91%, 90% and 90% for precision, recall and F Measure respectively.

5. Conclusions and Recommendations

Table 5.1 shows the overall accuracy performance of the Mobile App with the Neuro-Fuzzy Logic Algorithm in diagnosing the dogs' and cats' diseases. Having an accuracy of 87% in diagnosing dogs' diseases and an accuracy of 90% in diagnosing cats' diseases, the researchers attained an overall accuracy of 88.50%. Also, the Neuro-Fuzzy Logic Algorithms performs well in determining the pets' diseases. Hence, researchers concluded that the accuracy of the system in diagnosing a disease is very high [Artigo et al. 2015].

PET	Percentage
Dog's Diseases	87.00%
Cat's Diseases	90.00%
Average	88.50%

The developed mobile App with Neuro-Fuzzy Algorithm can diagnosed dogs' and cats' diseases and could advise what proper treatment could be done for every illnesses. It could be a guide for the pet's owner in taking good care of their loving animal. We therefore recommend to use the said mobile app in diagnosing dogs' and cats' diseases

Lastly the researchers also recommend the following:

1. Provide if necessary a specific/unique symptom for every disease to correctly recognize a disease.
2. Put an algorithm that will automate the adding of rules based on the patterns provided.
3. Make the symptoms of every disease more specific and should be understand by the user.
4. For future studies, researchers may improve the system and test the significant difference of the experts' diagnosis and systems' diagnosis.

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