



Multi-Criterion Disease Detection for Canines using Unsupervised Machine Learning

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Abstract:

It Focuses on recent development on machine learning have made significant impact in detection and diagnosis of diseases in canines. Deep learning architecture which is used in health care domain for the diagnosis of diseases. We will analyses the disease by symptoms and also verify the scan image for determining the diseases in canine. Diagnosing animal disease quickly and accurately has the economic effectiveness. It requires veterinary experts a lot of experience and theoretical knowledge to diagnose the disease. With the help of deep learning, it makes veterinary experts to diagnose the diseases accurately.

Keywords: Machine Learning, KNN, CNN, Deep Learning, Image Processing.

I. INTRODUCTION

The main purpose is to diagnosis of canine disease using deep learning. We will analyse the disease by symptoms and also verify the scan image for determining the diseases in canine. Diagnosing animal disease quickly and accurately has the economic effectiveness. It requires veterinary experts a lot of experience and theoretical knowledge to diagnose the disease. With the help of deep learning, it makes veterinary experts to diagnose the diseases accurately. A huge data sets are accessible in different data repositories which are used in real world applications. Using Deep Learning, Data Mining, and Disease interference can increase the performance and accuracy. Deep learning uses algorithms known as Neural Networks, which are inspired by the way biological nervous systems, such as the brain, to process information. It enables computers to identify every single data of what it represents and learn patterns. The primary software tool of deep learning is Tensor Flow.

II. RELATED SURVEY

[1] Relational Model Based Multi-Diagnosis Expert System Chandra Prakash Rathore, Swati Rathore, Jyoti Rathore, Chandra Kala Rathore

In paper [1], the author presented a generic relational model based biomedical expert system for diagnosis of multiple diseases in human beings, which can also assist patients in identification of preferred doctors for further confirmation and real treatment of the disease. The system can be used by doctors as well as their personnel assistant in disease diagnosis and by medical students in training purposes. The expert system encompasses 31 different symptom categories and total 166 symptoms under them to diagnose 30 specified common human diseases. The system has been tested on a close data set and recognition efficiency is 100%, and a positive feedback was received from the users when tested on an open dataset.

[2] A Design and Implementation of U-health Diagnosis System using Expert System and Neural Network Jang- Jae Lee, Byuong-Ho Song In paper [2], the author diagnosis of the

high hazard group patient and an emergency situation quickly and in dangerous condition of the patient the monitoring which is continuous leads and recognizes appropriately, disposes with will be able to prevent a dangerous situation beforehand. Currently the sensor which attaches in the body leads and are measuring the bio signal of the user this on period of measurement to give a disruption to the life which is ordinary, inconvenient.

[3] Disease Diagnosis System by Exploring Machine Learning Algorithms Allen Daniel SunnySajal Kulshreshtha, Satyam Singh, Srinabh, Mr. Mohan Ba, Dr. Sarojadevi H

In paper [3] author discusses aspects of the design of a system for diagnosis of common disease that can be detected by the Doctor and patient on entering the symptoms into the system. Based on the analysis the most accurate algorithm is used in the system to achieve the reliability can possibly help doctors and patients as well, as early detection is beneficial for right treatment and early recovery. Naive Bayes and Apriori algorithms that were used for disease diagnosis.

[4] Animal Disease diagnosis Expert System Based on SVM Long Wan, Wenxing Bao

In paper [4] author diagnose animal disease quickly and accurately by the animal disease diagnoses expert system. This paper proved the practicality of support vector machine (SVM) which is used in the animal disease diagnoses expert system in theory by studying the disease diagnosis expert system based on SVM. According to this paper experimental results showed that the model can be carried out animal diseases diagnosis more accurately, rapidly on the condition In this experiment, They have used some data of cow disease to test. Cow disease symptoms categories, the symptoms were classified as 26 categories, corresponding to 26 components of the support vector machine.

[5] Medical Diagnosis Learning Dhaval Raval1, Dvijesh Bhatt, Malaram K Kumhar, Vishal Parikh, Daiwat Vyas In paper [5] author, the issue of current medical diagnosis system

and used for the medical prediction is explained. The focus is on using different algorithms and consolidation of certain target attributes to predict swine flu effectively using Machine Learning Algorithm svm ,navie bayes, BPA data mining and neural network. Main purpose of this system is to assist in medical diagnosis of Swine Flu. Swine flu is the disease of applicability and wide spread of swine flu in the Country. It is very effortless and on time process for patients to analyse disease based on clinic and laboratory symptoms and data to give the more accurate result of Swine Flu disease. Also it will help to detect the dieses in primary stage.

[6] Image Processing Techniques For Identification Of Fish Disease Shaveta Malik, Tapas Kumar, A.K. Sahoo

In paper [6] author concludes that the proposed combination gave better accuracy after applied the Machine learning algorithm [i.e K-NN and Neural Network]. PCA helped in increase the accuracy. The Experimentation has been applied on the real images of the EUS infected fish images dataset. The implementation has been done in MATLAB software. It automatically detects or diagnoses the Fish EUS disease. The main drawback is the Machine learning algorithms does not applied on different feature Descriptors.

[7] Animal Recognition System Based on Convolutional Neural Network Tibor TRNOVSZKY, Patrik KAMENCAY, Richard ORJESEK, Miroslav BENCO, Peter SYKORA

In paper [7] author mainly proposes CNN for the classification of the input animal images. And also to compare the overall recognition accuracy of the PCA, LDA, LBPH and SVM with proposed CNN method. The proposed CNN was evaluated on the created animal database. This database consists of 500 different subjects (5 classes / 100 images for each class). The experimental result shows that the LBPH algorithm provides better results than PCA, LDA and SVM for large training set. On the other hand, SVM is better than PCA and LDA for small training data set. The obtained experimental results of the performed experiments show that the proposed CNN gives the best recognition rate for a greater number of input training images (accuracy of about 98 %).

[8] Learning to recommend descriptive tags for Health Seekers using Deep Learning Ms. Vidhi L. Chawda ,Vishwanath S.Mahalle

In paper [8] author presents idea of deep learning architecture which is used in health care domain for the diagnosis of diseases. In this first analyze and categorize needs of health seekers and ask for manifested symptoms for disease prediction. Then user will search for their query. Then the query gets processed to give prediction of disease to the user or health seekers. Here concept of hidden layers is get used. The biggest stumbling block of automatic health system is disease inference. So if the communication between doctors that is added in this system is not done then there is same need of manual data updating as in the existing system. So in our system also, the data updating is also depend on doctor communication. In future, we will pay more attention on this.

[9] Machine Learning In Medical Imaging Maryellen L. Gier,Phd

In paper [9] author tells CNN to distinguish trabecular bone structure or lung diseases involves subtle changes in texture-type patterns, which are quite different from everyday photos of cats

and dogs. The terminology deep learning causes black box for medical tasks. Design And Development Of Online Dog Diseases Diagnosing System Munirah M. Y., Suriawati S., and Teresa P. P. In paper[10] author objective is to develop a set rules that focus on diagnosing seven common dogs diseases which are Distemper, leptospirosis, Glaucoma, Colitis, Kennel Cough, Parvo Virus and Jaundice Diagnosing System that used the concept of expert system to user in detecting the diseases, provide treatment and useful suggestion. Online Dogs Diseases Diagnosing System was developed based on Knowledge Engineering (KE) methodology. An expert system based on rules which are the individual steps in a decision making process. The set of rules used IF / THEN structure where the information contained in the IF related to other information contained in the THEN part.

II. ARCHITECTURE DIAGRAM Tensor Flow Architecture

Tensor Flow for large-scale distributed training and inference, but it is also flexible enough to support experimentation with new machine learning models and system-level optimizations. This document describes the system architecture that makes possible this combination of scale and flexibility. It assumes that you have basic familiarity with Tensor Flow programming concepts such as the computation graph, operations, and sessions.

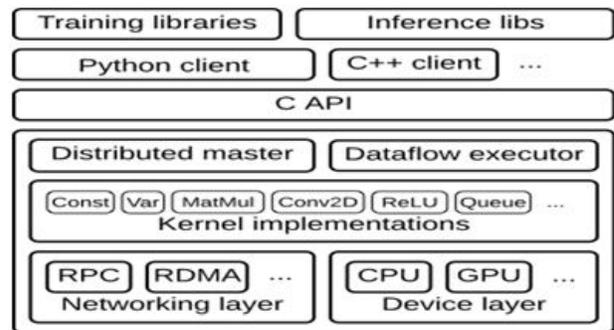


Figure.1. Tensor Flow Architecture

This diagram focuses on the following layers:

Client:

- Defines the computation as a dataflow graph.
- Initiates graph execution using a session.

Distributed Master:

- Prunes a specific sub graph from the graph, as defined by the arguments to Session. run().
- Partitions the sub graph into multiple pieces that run in different processes and devices.
- Distributes the graph pieces to worker services.
- Initiates graph piece execution by worker services.
- Worker Services (one for each task)
- Schedule the execution of graph operations using kernel implementations appropriate to the available hardware (CPUs, GPUs, etc).
- Send and receive operation results to and from other worker services.

Kernel Implementations:

- Perform the computation for individual graph operations.

Description & Working

Machine Learning (ML) is scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model of sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in a wide variety of applications, such as email filtering, detection of network intruders, and computer vision, where it is infeasible to develop an algorithm of specific instructions for performing the task. Machine learning is closely related to computational statistics, which focuses on making predictions using computers.

Image Recognition Process

Image Recognition is the process of identifying and detecting an object or the features in a digital image.

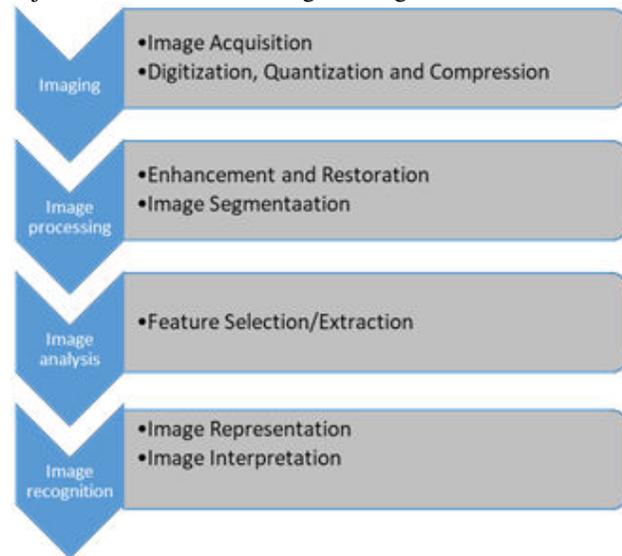


Figure.2. Image Recognition Process

The steps involved in the image recognition process are as follows:

(1) Image Acquisition

Image acquisition is the action of retrieving an image from some source, usually an hardware-based source for processing. It is the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement. Here we are using camera as a sensor to scan the images of canine brain images.

(2) Digitization, Quantization and Compression Digitization is the process of converting information into a digital format. In this format, information is organized into discrete units of data called bits. Digitization is the process of converting analog signals or information of any form into a digital format that can be understood by computer systems or electronic devices. The term is used when converting information, like text, images or voices and sounds, into binary code. Digitized information is

easier to store, access and transmit, and digitization is used by a number of consumer electronic devices.

(3) Image Enhancement and Restoration

Image enhancement is the process of digitally manipulating a stored image using software. The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide 'better' input for other automated image processing technique.

(4) Image Segmentation

Image segmentation is the process of partitioning a digital image into multiple segments, sets of pixels. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyse. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images.

(5) Feature Selection

In machine learning and statistics, feature selection, also known as variable selection, attribute selection or variable subset selection, is the process of selecting a subset of relevant features (variables, predictors) for use in model construction.

(6) Image Interpretation

To derive useful spatial information from images is the task of image interpretation. It includes

Detection: such as search for hot spots in mechanical and electrical facilities and white spot in x-ray images.

Identification: Recognition of certain target or pattern. The higher the spatial/spectral resolution of an image, the more detail we can derive from the image.

Algorithm Used In Tensor flow Image Recognition. Tensor Flow provides multiple Algorithms for Image recognition process. The algorithms that are majorly used for image recognition are described below.

1. Decision Tree Algorithm: Decision tree is one of the most popular machine learning algorithms used all along. Decision trees are used for both classification and regression problems, this story we talk about classification. Decision trees often mimic the human level thinking so it's so simple to understand the data and make some good interpretations. A decision tree is a tree where each node represents a feature (attribute), each link(branch) represents a decision(rule) and each leaf represents an outcome (categorical or continuous value). The whole idea is to create a tree like this for the entire data and process a single outcome at every leaf (or minimize the error in every leaf).

Decision Tree Algorithm Pseudocode

1. Place the best attribute of the dataset at the root of the tree.
2. Split the training set into subsets. Subsets should be made in such a way that each subset contains data with the same value for an attribute.
3. Repeat step 1 and step 2 on each subset until you find leaf nodes in all the branches of the tree.

2. KNN Algorithm

K nearest neighbors is a simple algorithm that stores all available cases and classifies new cases based on a similarity measure.

We can implement KNN model using KNN by these steps:

1. Load the data
2. Initialise the value of k
3. For getting the predicted class, iterate from 1 to total number of training data points
 - A. Calculate the distance between test data and each row of training data. Here we will use Euclidean distance as our distance metric since it's the most popular method. The other metrics that can be used are Chebyshev, cosine, etc.
 - B. Sort the calculated distances in ascending order based on distance values
 - C. Get top k rows from the sorted array
 - D. Get the most frequent classes of these rows.
 - E. Return the predicted class.

IV. CONCLUSION

We will develop a framework for diagnosis of the disease based on symptoms of different parameters and scanned images. So it helps the pet Owners to diagnosis the disease, which minimizes the risk and in minor cases there is no need to contact veterinary. In major cases it will be helpful for dog owners to consult veterinary expert.

V. REFERENCES

- [1]. Learning to recommend descriptive tags for Health Seekers using Deep Learning Ms. Vidhi L. Chawda VishwanathS. Mahalle Systems and Control (ICISC-2017)
- [2]. Jang-Jae Lee, Byuong-Ho Song, Tae-Yeun Kim, Dae-Woong Seo, Sang-Hyun Bae¹ 1375, Seosuk-Dong, Dong- Gu, Kwangju, South Korea { Jang-Jae Lee, Byuong-Ho Song, Tae-Yeun Kim, Sang-Hyun Bae } A Design and Implementation of U-health Diagnosis System using Expert System and Neural Network
- [3]. Dhaval Ravall¹, Dvijesh Bhatt², Malaram K Kumhar³, Vishal Parikh⁴, Daiwat Vyas⁵ 12345Nirma University, Computer Science and Engineering Department, Ahmedabad, India] Medical Diagnosis Using Machine Learning 11 September 2015-March 2016 p pp p. .1 17 77 7-1 18 82 2
- [4]. Munirah M. Y., Suriawati S., and Teresa P. P. Design and Development of Online Dog Diseases Diagnosing System International Journal of Information and Education Technology, Vol. 6, No. 11, November 2016
- [5]. Long Wan, Wenxing Bao Animal Disease Diagnoses Expert System Based on SVM 12 Aug 2014
- [6]. Tibor TRNOVSZKY, Patrik KAMENCAY, Richard ORJ ESEK, Miroslav BENCO, Peter SYKORA Animal Recognition System Based on Convolutional Neural Network 2017 | SEPTEMBER
- [7]. Chandra Prakash Rathore¹, Swati Rathore², Jyoti Rathore³, Chandra Kala Rathore⁴ Relational Model Based Multi-Disease Diagnosis Expert System Issue-03, May 2016
- [8]. Shaveta Malik, Tapas Kumar A.K.sahoo Image Processing Techniques for Identification of Fish Disease 2017 IEEE 2nd International Conference on Signal and Image Processing

[9]. Allen Daniel Sunny¹, Sajal Kulshreshtha², Satyam Singh³, Srinabh⁴, Mr. Mohan Ba⁵, Dr. Sarojadevi H.⁶ Disease Diagnosis System By Exploring Machine Learning Algorithms ISSN: 2319-1058 2 May 2018

[10]. Maryellen L Giger, PhD. Machine Learning in Medical imaging February 25, 2018.