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Jyothi Engineering College
NAAC Accredited College with NBA Accredited Programmes*
Approved by AICTE & affiliated to APJ Abdul Kalam Technological University
A CENTRE OF EXCELLENCE IN SCIENCE & TECHNOLOGY BY THE CATHOLIC ARCHDIOCESE OF TRICHUR
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NBA accredited B.Tech Programmes in Computer Science & Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering and Mechanical Engineering valid for the academic years 2016-2022. NBA accredited B.Tech Programme in Civil Engineering valid for the academic years 2019-2022.

Snakebite Detection & Identification With Snakebite Mark Using Machine Learning Approach

MAIN PROJECT REPORT

MARY JOSE (JEC17CS064)

SARANYA K (JEC17CS090)

SIJIN K (JEC17CS096)

YASHIF V S (JEC17CS104)

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY (B.Tech)

in

COMPUTER SCIENCE & ENGINEERING

of

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Under the guidance of

Dr. ASWATHY S U

CREATING TECHNOLOGY LEADERS OF TOMORROW

DECEMBER 2020

Department of Computer Science & Engineering

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THRISSUR 679 531

DECEMBER 2020

BONAFIDE CERTIFICATE

This is to certify that the main project report entitled **Snakebite Detection & Identification With Snakebite Mark Using Machine Learning Approach** submitted by **Mary Jose (JEC17CS064), Saranya K (JEC17CS090), Sijin K (JEC17CS096) and Yashif V S (JEC17CS106)** in partial fulfillment of the requirements for the award of **Bachelor of Technology** degree in **Computer Science and Engineering** of **A P J Abdul Kalam Technological University** is the bonafide work carried out by them under our supervision and guidance.

Dr. Aswathy S U	**Mr. Shaiju Paul**	**Dr. Vinith R**
Project Guide	Project Coordinator	Head of The Dept
Professor	Assistant Professor	Associate Professor
Dept. of CSE	Dept. of CSE	Dept. of CSE

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3. The graduates shall be able to communicate effectively and work in multidisciplinary teams with team spirit demonstrating value driven and ethical leadership.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. An ability to apply knowledge of data structures and algorithms appropriate to computational problems.
2. An ability to apply knowledge of operating systems, programming languages, data management, or networking principles to computational assignments.
3. An ability to apply design, development, maintenance or evaluation of software engineering principles in the construction of computer and software systems of varying complexity and quality.
4. An ability to understand concepts involved in modeling and design of computer science applications in a way that demonstrates comprehension of the fundamentals and trade-offs involved in design choices.

COURSE OUTCOMES (COs)

C410.1 The students will be able to analyse a current topic of professional interest and present it before an audience.

C410.2 Students will be able to identify an engineering problem, analyse it and propose a work plan to solve it.

C410.3 Students will have gained thorough knowledge in design, implementations and execution of Computer science related projects.

C410.4 Students will have attained the practical knowledge of what they learned in theory subjects.

C410.5 Students will become familiar with usage of modern tools.

C410.6 Students will have ability to plan and work in a team.

ACKNOWLEDGEMENT

We take this opportunity to express our heartfelt gratitude to all respected personalities who had guided, inspired and helped us in the successful completion of this interim project. First and foremost, we express my thanks to **The Lord Almighty** for guiding us in this endeavour and making it a success.

We take immense pleasure in thanking the **Management** of Jyothi Engineering College and **Dr Sunny Joseph Kalayathankal**, principal, Jyothi Engineering College for having permitted me to carry out this seminar. Our sincere thanks to **Dr Vinith R**, Head of the Department of Computer Science and Engineering for permitting us to make use of the facilities available in the department to carry out the interim project successfully.

We express our sincere gratitude to **Mr. Shaiju Paul & Mrs. Swapna B Sasi**, project coordinators for their invaluable supervision and timely suggestions. We are very happy to express our deepest gratitude to our mentor **Dr. Aswathy S U**, Professor, Department of Computer Science and Engineering, Jyothi Engineering College for her able guidance and continuous encouragement.

Last but not least, we extend our gratefulness to all teaching and non-teaching staff who directly or indirectly involved in the successful completion of this interim project work and to all friends who have patiently extended all sorts of help for accomplishing this undertaking.

ABSTRACT

Making inaccurate assumptions of snake bite from just observation of visual features is a dangerous thing. If the assumption turns out to be wrong, it would cost a person's life. Snakebite disease takes a huge toll on India partly because the subcontinent is home to so many different types of snakes. In India there are 270 types of venomous snakes, of which 60 are considered venomous and medically relevant, and with various levels of toxicity. In such a condition, if an ordinary person has been bitten by a snake they surely will panic and will not have much knowledge about what to do which may lead to panic driven heart attacks or such cases. Even a doctor can be wrong in identifying snake bites. This system helps a person to determine venomous and non venomous snake based on its bite pattern image using two methods i.e, image processing and machine learning. We expect that final result from this research to yield 90 percentage accuracy. Identification and recognition of distinct snake bite at the earliest, resulting in anti-venom administration. The doctors also can use our system to identify the snake and start administering medication which will help to decrease the snakebite envenoming deaths substantially.

Keywords: Convolutional Neural Network, Image processing, Machine learning, Detection, Identification, Deep learning.

CONTENTS

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List of Abbreviations

CNN	: *Convolutional Neural Network*
AI	: *Artificial Intelligence*
BPNN	: *Back Propagation Neural Network*
PIL	: *Plot Image Learning*
KNN	: *K Nearest Neighbour*
LBP	: *Linear Binary Pattern*
GA	: *Genetic Algorithm*
KWS	: *Keyword Spotting*
JSW	: *Joint Space Width*
SDLC	: *Software Development Life Cycle*
PCL	: *Passive Coherent Location*
DCT	: *Discrete Cosine Transformation*
UAV	: *Unmanned Aerial Vehicle*
FFT	: *Fast Fourier Transformation*
CT	: *Computed Tomography*
OA	: *Osteo Arthritis*
SVM	: *Support Vector Machine*
RBF	: *Radial Basis Function*
CFAR	: *Constant False Alarm Rate*
DoA	: *Direction of Arrival*
MUSIC	: *Multiple Signal Classification*
HHO	: *Harris – Hawks Optimization*
MTH	: *Multilevel Threshold*
MCET	: *Minimum Cross Entropy Thresholding*
DCT	: *Discrete Cosine Transformation*
EKF	: *Extended Kalman Filter*
MRI	: *Magnetic Resonance Imaging*

CHAPTER 1
INTRODUCTION

1.1 Overview

Snakes are one of the dangerous reptiles. They are divided into 2 groups,which are venomous and non- venomous snakes. If a person is bitten by a poisonous snake, it can cause local poisoning, hypertension, paralysis, blood clotting disorders, and even death. Antivenom is the only sure therapy for handling snakebites. However, in one type of antivenom that is given cannot neutralize all the toxins, so this creates a further risk to human health, making identification of snakes an critical problem. Snakes can be identified by looking at their shape of the head, scales and teeth. They can also be identified from the bite pattern. It is difficult to identify snakes by observing visual features directly, so we research by building a system that processes images to identify these problems. Our system is "Snakebite Detection and Identification with Snakebite Mark Using Machine Learning Approach". The system classifies snakes based on snake body image seen from 4 perspectives: upper, side, bottom and body. The system built demonstrates the use of taxonomic features in the classification of snakes with the nearest neighbor classification, the system uses a snake image database and is converted to extract the taxonomic base features of snakes. Based on research that has been done using snake body image, then we are creating a system that classifies snakes based on the image of snakes bite patterns. A machine language based feature extraction is used here. Capturing the snake bitten area and forming a digital image of that area. Using HHO segmentation method, this image is processed. Then it is compared with available data set. As a result the snake can be identified easily.

1.2 Objectives

The prime objectives of the system is to identify the snakebite from the bite image and giving symptoms that are experienced as a result is obtained that can help the person to get faster medical aid and altogether decrease the snakebite envenoming deaths to a certain length.

1.3 Data Description

As the data for this project is not publicly available the data for this project is taken from Inter net and the data set is created. As it is the case with a usual deep learning problem, we would be training the model using training dataset.

1.4 Organization of the project

The report is organised as follow:

- **Chapter 1:Introduction** Gives an introduction to "Snakebite Detection and Identification with Snakebite Mark Using Machine Learning Approach".
- **Chapter 2:Literature Survey** Summarizes the various existing techniques that helps in achieving the desired result.
- **Chapter 3: Problem Statement** Discuses about the need for the proposed system
- **Chapter 4:Project Management** Contains the effective project management model to be used for the project.
- **Chapter 5:Proposed System** Describes the various steps involved to produce this project.
- **Chapter 5:System Requirements & Specification**Describes the various technologies needed for implementation.
- **Chapter 6:Conclusion** Concludes with the future scope of implementation.
- **References** Includes the references for the project.

CHAPTER 2
LITERATURE SURVEY

2.1 Image processing for snake identification based on bite using Local Binary Pattern and Support Vector Machine method

Snakes are one of dangerous reptiles that are divided into 2 groups, namely venomous and nonvenomous snakes. If bitten by a poisonous snake, it can cause local poisoning, hypotension, paralysis, blood clotting disorders, and even death. Antivenom is the only sure therapy for handling snakebites . However, in one type of antivenom that is given cannot neutralize all the toxins, so this creates a further risk to human health, making identification of snakes an important problem. Snakes can be identified by looking at the shape of the head, scales and teeth . To distinguish venomous and non-venomous snakes can be seen from the bite pattern. Figure 2.1 is example of picture bite pattern.

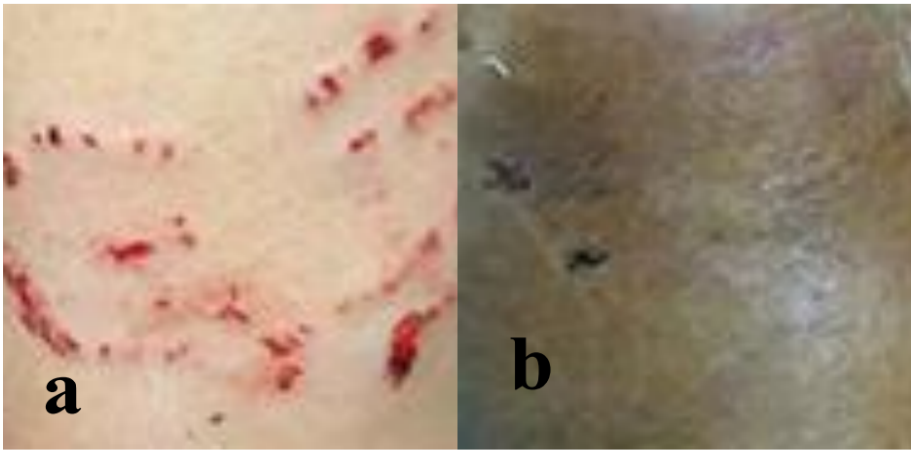

Figure 2.1: Example of picture (a) bite of snake not venomous and (b) venomous

It is difficult to identify snakes by observing visual features directly.The system classifies snakes based on snake body image seen from 4 perspectives: upper, side, bottom and body. The system built demonstrates the use of taxonomic features in the classification of snakes with the nearest neighbor classification, the system uses a snake image database and is converted to extract the taxonomic base features of snakes.

Based on research that has been done using snake body image, then in this study a system was built that classifies venomous and non-venomous snakes based on the image of snake(‘s) bite patterns. The method used is Local Binary Pattern (LBP) for feature extraction and uses the Support Vector Machine classification method or commonly abbreviated SVM.LBP is a method that labels pixels by threshing and considering the results as binary numbers. The nature of the LBP operator is a simple computing process and has a fast computing time. SVM is one of the classification methods with the advantage of being able to minimize errors in training sets, find the best hyperplane that separates 2 classes in feature space.In this research, an image processing system for bite identification based on bites using the LBP and SVM methods was built. The system is created using Matlab R2016a. Input to the system is an image with jpg format (* .jpg) measuring 96 × 96 pixels with a picture of someone who has bitten by a snake and the image has been cropped on the wound area. In this system only classifies venomous and non-venomous snakes without knowing the type of snake.

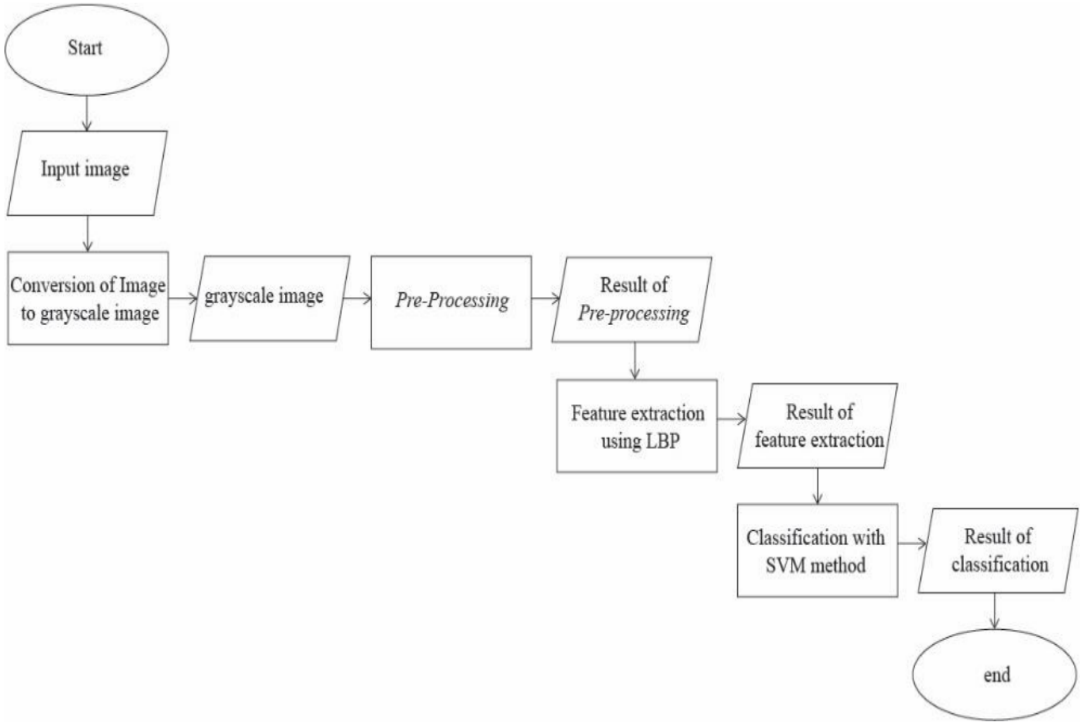

Figure 2.2: Flowchart

The thing that will be done on this system is starting with the image input, then the image is converted into a grayscale image, after that the image enters the pre-processing stage. In the pre-processing stage, morphology is carried out, namely erosion and dilation. The erosion process is done by reducing the pixels on the contour of the object with a 3 × 3 element

structure that has a value of 1 whose function is to eliminate the noise in the image, the noise is a pixel that is white but not an object of that image, this process causes pixels the object becomes thinner. Whereas dilation is processed by adding pixels to the object's contours according to the 3 × 3 element structure which is 1 to thick the pixels of After the pre-processing stage is carried out, the next is feature extraction using LBP, the end result of which is a characteristic of the image input in the form of a histogram, which is then represented as a 1 × n matrix. with the values generated in the normalized feature vector into the range 0-1. And finally the classification with the SVM method uses the RBF kernel. For more details, figure 2.2 is a flowchart or flow chart of this system.

Image data that has images with wrinkled or hairy skin or bruising on the bite or wound area that is still not dry and blood clots on the bite marks causes classification errors, errors in this classification because the system incorrectly detects snake bites, which should not snake bites but the system detects it is a snake bite resulting in poor accuracy. Conversely, if the image data does not have an image with the conditions previously explained, the system detects and classifies the image correctly. With 89% accuracy, it can be said that the system is good at recognizing the bite of a poisonous and nonvenomous snake. [6]

2.2 A Development of Snake Bite Identification System (N'viteR) using NEURO-GA

Globally, it is estimated that 5·4-5·5 million people are bitten by snakes each year resulting in about 400 000 amputations, 2.5 million envenoming and between 20 000 and 125 000 lost their life from snake bites. There are different types of bites even for venomous snakes and non venomous ones. Some bites from venomous ones may not be life threatening. It is crucial to differentiate between venomous and non-venomous snake whereby an immediate and effective medical care can be instituted to the victims. However, early identification is not easy. This was the reason to develop a snake bite identification system (N'viteR) to differentiate the snake using Neuro-GA technique. Based on 200 cases, this work had revealed that Neuro-GA has yield a high accuracy in identifying the snake. A number of experiments have been done which based on number of epoch, momentum, learning rate, number of generation, population and chromosome. This hybrid technique has achieved 97.6% of accuracy which enables early identification of snake and immediate specific antivenom can be administration. Hence, reduces the rate of morbidity and mortality. This paper proposed the snake bite identification system N'viteR based on the combination of two Artificial Intelligence (AI) techniques:

- Back Propagation Neural Network (BPNN)

- Genetic Algorithm (GA)

which coined the term Neuro-GA.

In order to develop N'viteR, there were multiple objectives to be considered the main ones among them were

1. To collect snake bite cases and identify the clinical effects of snake bites
2. To design and develop N'viteR using Neuro-GA
3. To evaluate N'viteR based on number of epoch, values of momentum and value of learning rate.

The Neuro-GA technique is proposed in N'viteR since it has an element of learning and optimization. The learning element owned by BPNN will possible the system to learn the data (cases) while the GA will help to chose the best (optimum) weight of cases to be tested with.

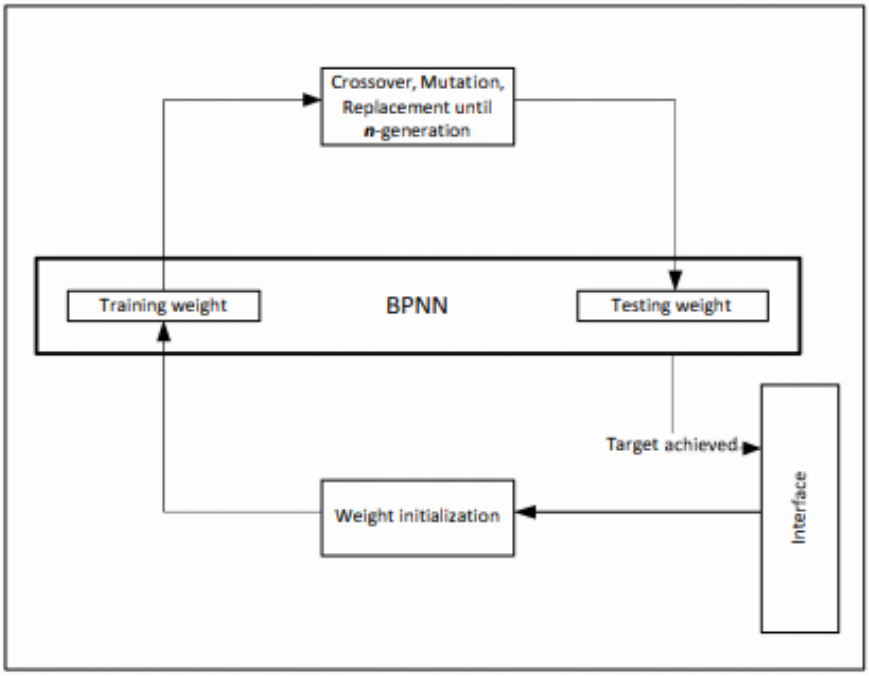

Figure 2: Architecture of N'viteR

Figure 2.3: N'viteR

The architecture of BPNN which consists of 32 input nodes which are the symptoms of snake bite and five hidden nodes that have been adjusted to produce a better result. The output node represents venomous and non-venomous snakes.

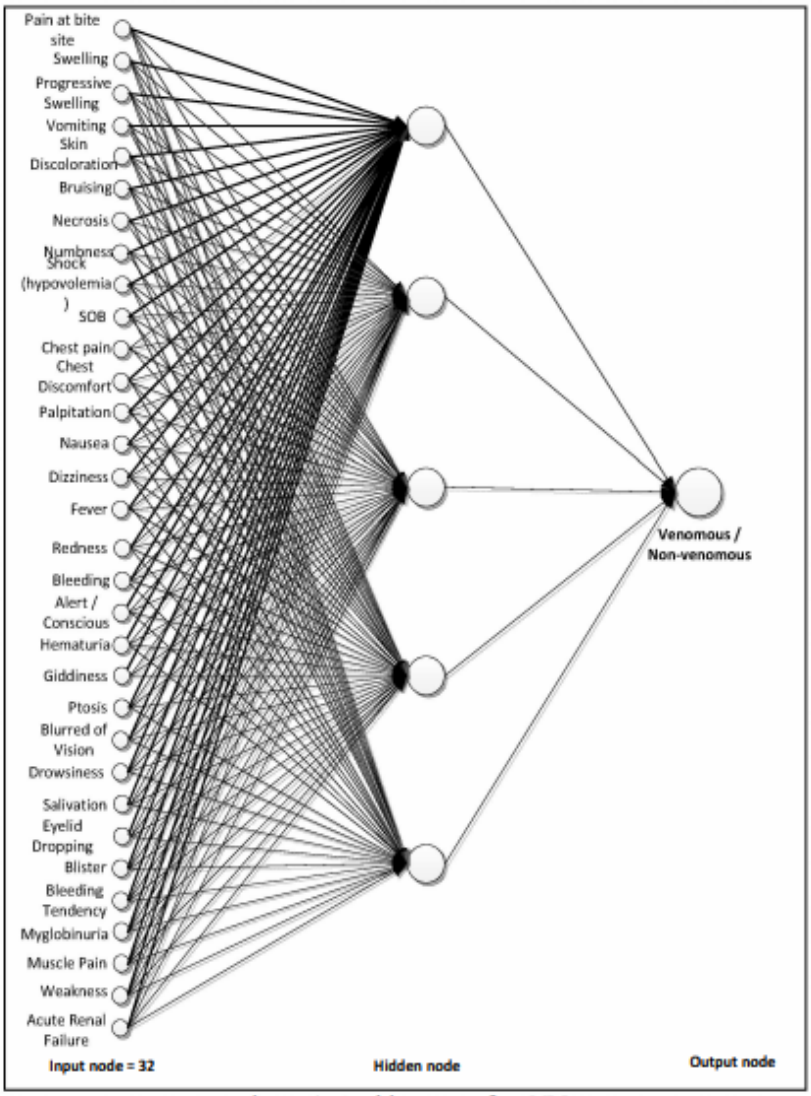

Figure 1: Architecture of BPNN

Figure 2.4: Back Propagation Neural Network

Even though BPNN is the best-known method to deal with classification problem through learning process, a combination with GA yields a high accuracy to identify a venomous and non-venomous snake based on cases provided. This hybrid technique may give higher accuracy if it involves large number of data (cases), generation and populations even it will take a longer time to finish the training process. [7]

2.3 Detection of Knee Osteoarthritis Using X-Ray

We describe a method to detect osteoarthritis (OA) from knee X-ray images. The detection is based on the thickness of cartilage in knee bone, which correspond to possibility of osteoarthritis. Using our approach better diagnosis treatment can be applied to the patient since a computed automated measurements leads to accurate values so the image segmentation and mathematical morphological operation is applied to extract the border of cartilage by covering the boundary of cartilage. If cartilage thickness is lesser than 1.69 mm the patient has OA, otherwise not for this analysis we considered dataset of 100 X-ray image both with and without OA. Human body has many bone joints which play a major role in physical working. Among them knee joint is one of the most important joints of our body, which allows the leg to bend, straighten, rotate and to carry the weight of body. In the stage infant stage of conventional knee cap is no well-developed. But as the human growing age the conventional knee cap developed with required cartilage. Knee is a complicated joint structure of lower leg with two important joints, one joint between femur and tibia and another joint is between femur and patella

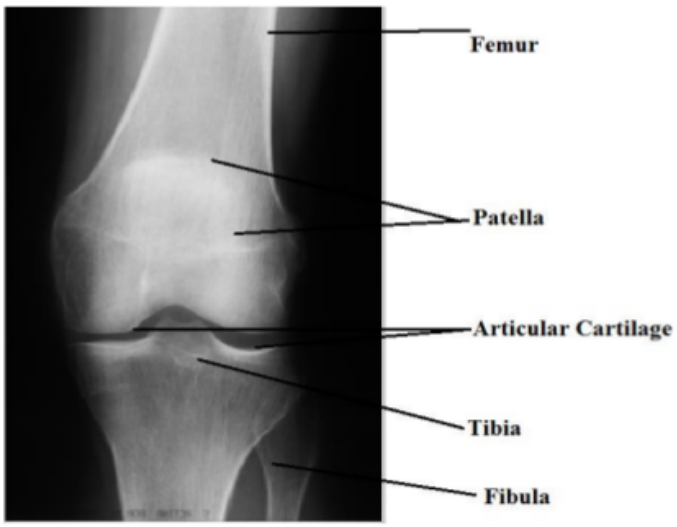

Figure 2.5: Anatomy of Knee

Osteoarthritis is a common disease in human under various joints such as knee, hips, hand and wrist. It is the stage of human bone in which the joints of human body become damaged and stop moving freely which causes pain. As the cartilage become thin and gap between the bones become narrows. The main causes of osteoarthritis are greater than age of 40 years, overweight, previous joint injury and by genetic hereditary. Knee osteoarthritis can make sitting and walking extremely painful. Knee osteoarthritis also varies between male

female genders as per the survey shown by Arthritis Research UK Primary care Centre, Keele University,some of those result are shown in table1.The survey shows that female has higher ratio to get osteoarthritis.

In clinical diagnosis, for a human body X-ray imaging is best tool for detecting abnormalities in bone painful, and deformed areas of bone. MRI(Magnetic Resonance Imaging) and CT(Computed Tomography) will give more details compared to X-ray, to determine the exact location of injured bone. X-ray is relatively less expensive compared to MRI and CT and the cartilage can be clearly seen. X-Rays used to examine broken bones and detect diseased cartilage. In recent years, due to the rapid development of computer technology, computer vision, image processing and pattern recognition, the related technologies have become increasingly important in medical image analysis. To solve our problem, image processing tool is one of the best tool for the detecting the disease .We proposed an automated system for osteoarthritis assessment, which is applied on X-ray images for identifying the characteristics of osteoarthritis. Image segmentation and edge detection method are applied to determine the thickness of the joint space.KL grades 0(normal), 1(doubtful) , 2(minimal) and 3(moderate).The KL method is is possible only when we have many X-ray image of knee of a patient with osteoarthritis and after. Unfortunately, this KL grade is not effective in the early period since X-rays show joint space narrowing. KL grade does not specify criteria for OA using cartilage thickness. In 1995 J Christopher Buckland-Wright et al. proposed a method of measurement of cartilage thickness using JSW (Joint Space Width) technique .This method used to approach such as plain film macro radiography and double contrast macroarthography for X-ray image generation then finally they compared with the sum of the tibial and femoral cartilage.For this analysis they used a hectic process is being done for osteoarthritis detection. Philipp Peloschek et al. given a RAQuantify software, this software use joint measurement in four steps and joint be selected at manually . This method that is measurement is based on web based technique ,for this they only measured the thickness with the RAQuantify and how to detection of knee osteoarthritis and how the identified this disease . Tati et al.in 2005 proposed a technique to automatically determine the region of interest needed for knee osteoarthritis assessment to horizontal and vertical translation to place the axis and locate the joint. Boundary detection between femur and joint space, for some image boundary appears discontinuously. Lior et al. in 2008 developed an automated approach for the detection of OA according to Kellegren-Lawrence method which show the probability of OA in different stage i.e. KL grade 0,1,2,3 .Their work on 20 preselected image ,each image is a 150*150 window of center of joint, then these image downgraded by factor of 10 into 15*15 images. Schmidt et al. proposed a semi-automated method of JSW in knee X-ray that identifies the femoral and tibial edges by first adjusting the image intensity. Then use of canny edge detection algorithm determine the distal edge of the medial and lateral femoral condyles. Define the extent of the medial and lateral compartments by the user. The

inner boundary was defined at that point where the slope of the tibial spine began to increase and the outer boundary was defined as the outer edge of the tibial plateau. The cortical bone interface of the tibia was found by determining the brightest pixels in each vertical scan line. This proposed method was replicated across the entire medial and lateral tibial compartment to detect femoral and tibial edges. [9]

2.4 An efficient Harris hawks-inspired image segmentation method

Image segmentation is an essential preprocessing step in computer vision, pattern recognition, and image processing in various fields of applications such as medical images Basically, image segmentation is the process of dividing an image into several non-overlapping regions or structures of interest based on grayscale, color, texture, shape, size, or position of image.Segmentation is a crucial phase in image processing because it simplifies the representation of an image and facilitates its analysis.The multilevel thresholding method is more efficient for segmenting digital mammograms compared to the classic bi-level thresholding since it uses a higher number of intensities to represent different regions in the image[10].

In this paper, an efficient methodology for multilevel segmentation is proposed using the Harris Hawks Optimization (HHO) algorithm and the minimum cross- entropy as a fitness function One of the most widespread techniques for image segmentation is the histogram thresholding, which is widely used due to its simplicity, high accuracy, and robustness against the other methods. It extracts the data of the histogram from an image and defines the optimal threshold values (th) to classify the pixels in different regions. Image thresholding techniques can be classified into two different types: bilevel and multilevel. If the objects of interest are clearly distinguished from the background of an image by a single threshold value, it is termed as bilevel thresholding, while dividing an image into sev- eral different regions by multiple threshold values is known as a multilevel threshold (MTH). Regarding the implementations, MTH is more accurate than the classic bi-level threshold method for the segmentation of digital mammograms due to its diverse number of intensities used to represent regions in the image.

This article introduces the HHO algorithm as an alternative method for multilevel image thresholding. The HHO algorithm is a swarm-based method to handle continuous optimization tasks. This method develops new exploratory and exploitative trends in the field based on the simulation of hawks and rabbits. The results initially presented reveal that the HHO is among the efficient methods proposed recently, and the solutions are of high quality. The HHO is selected due it has not been tested over real problems like image segmentation. Moreover, its use permits to handle with the drawback of MTH avoiding to fail in sub-optimal values. MTH then is a multidimensional problem that increases its complexity with the amount of th values.

Considering the above, the aim is to present an alternative efficient multilevel thresholding approach based on the HHO for digital images. Since HHO is new, it has not been extensively used or tested in many implementations. Finally, to verify the flexibility of the proposed MTH method based on HHO, it has been used to segment digital mammograms.The motivation of this paper then is related to two directions. The first is to test the HHO in an image processing application. Meanwhile, the second direction is to use the segmentation proposal on a real problem related to medical images. Considering such motivations, we develop an efficient tool that can be used as a preprocessing step in different image processing systems. The proposed approach is called MCET-HHO, where the HHO algorithm is used to find the best configuration of thresholds that segment an image by considering the Minimum Cross Entropy Thresholding (MCET) as a fitness function. In the HHO, each solution is a set of thresholds that is part of a population. Using the operators that mimics the behavior of Harris hawks, the algorithm evolves the solutions until finding the optimal.

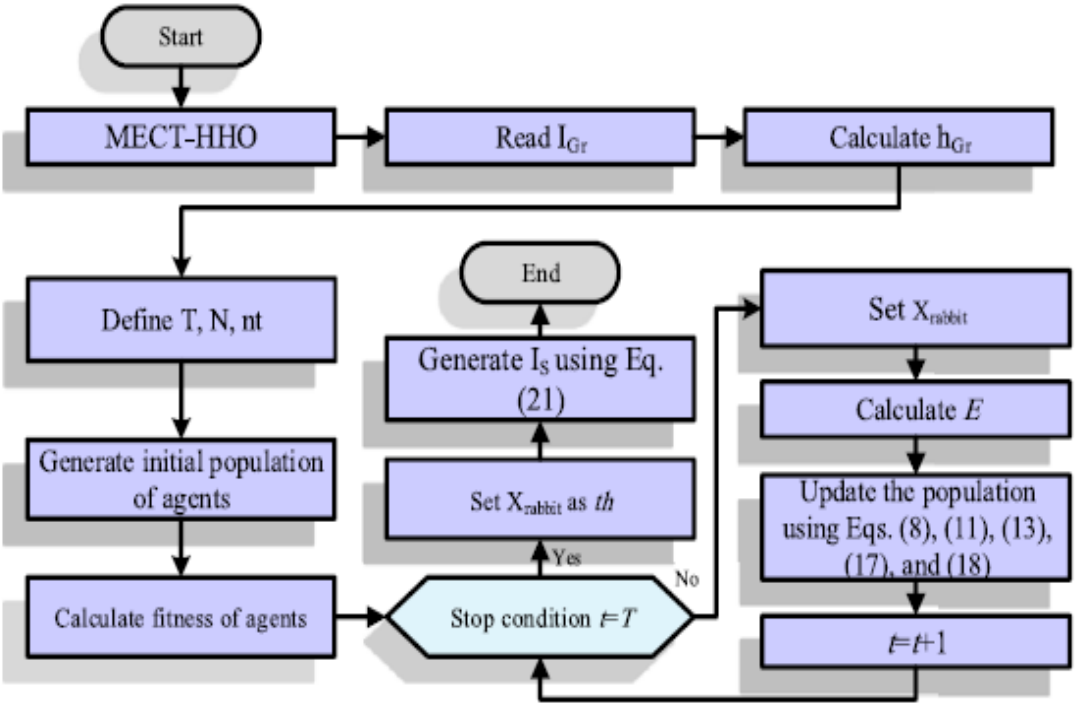

Figure 2.6: The flowchart of MCET-HHO.

The main contributions of this paper are summarized as follows:

- Substantiating the HHO in dealing with a real multidimensional application related to image processing.
- Proposing an efficient method for multilevel thresholding by using the minimum cross-

entropy.

- Applying the proposed technique to the segmentation of digital mammograms; this approach is utilized in CADx systems.

This work proposes the application of a new approach based on the HHO metaheuristic algorithm for multilevel segmentation called MCET-HHO. The proposed method optimizes the search for the best solution of a function inspired by the behavior of the Harris hawks, based on the technique of the minimization of cross- entropy. For the development of this proposal, a comparison of the multilevel segmentation of three benchmarks is performed, one that presents images with different characteristics in the intensities of their gray levels, another in the Berkeley segmentation database, and finally in Medical images of digital mammograms. In order to validate the behavior of the MCET-HHO algorithm, the segmentation of the images is carried out with four different levels, obtaining a series of metrics that allow measuring the quality of the segmentation for each of the levels. In addition, the multi-level segmentation of these images is also carried out with a series of different algorithms, allowing the results obtained in this work to be compared with those currently found in the literature.

Finally, the MCET-HHO algorithm shows an improvement in multilevel segmentation applied to images compared to the different algorithms reported in the literature included in this work, presenting a new approach that can be used for different applications as a complement to the different techniques that are currently used. The proposed approach is adequate to improve digital mammograms, as evidenced by the results. Since medical imaging is crucial for the diagnosis of many diseases

2.5 Deep Learning Model for Identifying Snakes by using Snakes' Bite Marks

Identifying snakes by using their bite marks may help the doctors to diagnose the victim with proper anti venoms for saving patients. It is very important step for doctors to help the patients who suffered by snakes bites. Hence here a study was done on processing images to classify them as different family of snakes using CNN (Convolution Neural Network) model in Deep Learning techniques. The CNN model needs different snakes and their bite marks images to classify them as venomous and non-venomous snakes and by processing venomous snakes bite marks images it can able to find the venomous snakes family. To give accurate results the proposed Deep learning model has to be trained periodically with all possible different images of same snake's family and different snakes' families. The performance of the CNN model is

on its knowledge and finding patterns on the input images to find the family of the snakes. If the input images are huge in numbers and size then the system may take time to give results. That has to be considered to give results in less duration execution time.

The main problem in snake's bites is identifying the family of the snake which attacked the prey[7]. If survivors know the family of the snakes then easily doctors will take perfect antivenom and clinical procedures to cure the patient. But if the family of the snake is unknown then it will be a problem to doctors to give treatment to the survivor. Research works are going on in this area to find the snake is attacked the patient and what is the anti-venom have to be injected to the patient. Here, a Deep Learning based approach is proposed to find the family of the snake by using 'Convolution Neural Network (CNN)' model.

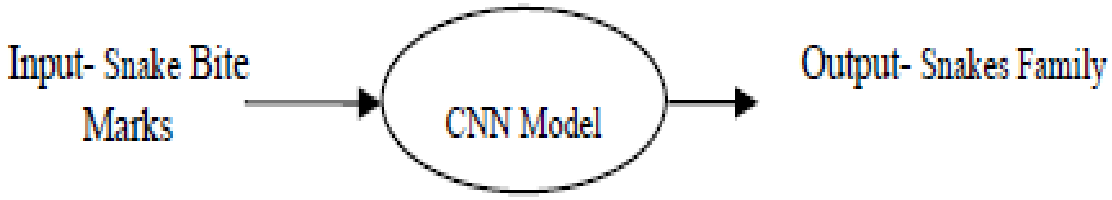

Figure 2.7: Context Flow Model of CNN on Snake Identification

The input to the CNN model is snake bite marks photos or images. The output of the model will be the family of the snake.This kind of bite marks pictures or data set are essential to train the CNN model to detect the family of the supplied snakes' bites photos.

The idea proposed here is based on 'Deep Learning' model to train the system periodically for processing the new input image to identify the kind of snake family to initiate proper treatment to the victim. The CNN model is specifically for processing images to find objects present in the input images. This model can help to find the appropriate snakes bites patterns when the system is trained already by providing sufficient set of input images about the snakes bite marks.

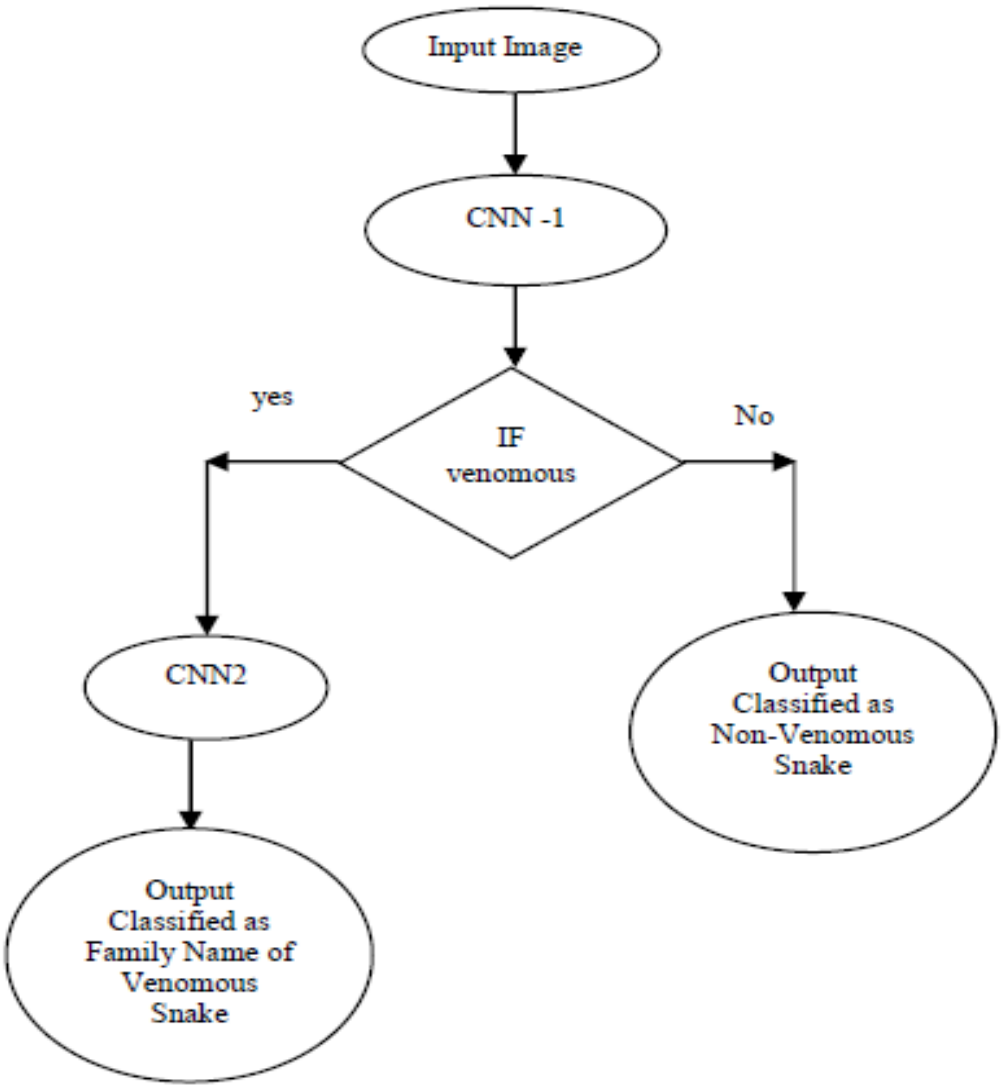

Figure 2.8: Actions flow the Proposed Model

CHAPTER 3

PROBLEM STATEMENT

The project "Snakebite Detection & Identification With Snakebite Mark Using Machine Learning Approach" aims at providing an efficient solution in the field of snakebite envenomation. In contrast to previous systems, our motivation is identification and recognition of distinct snake bite at the earliest, resulting in faster antivenom administration. This can in turn narrow the mortality rate due to the envenomation by utilizing more efficient and accurate machine learning approach. Classification is done by the covolution neural network. One of the main advantages is the ability to identify the snake and provide the faster medical aid Hence substantially reducing the death rate. This property distinguishes this methodology from the rest since this property helps the training model to extract all those relevant features which can lead to more accurate and precise classification. Thus, the image processing helps to get snake bite identification that can overcome the limitations of the existing system is implemented.

CHAPTER 4
PROJECT MANAGEMENT

4.1 Introduction

Project management is the discipline of planning, organizing, securing, managing, leading, and controlling resources to achieve specific goals. A project is a temporary endeavor with a defined beginning and end (usually time-constrained, and often constrained by funding or deliverables), undertaken to meet unique goals and objectives, typically to bring about beneficial change or added value. The temporary nature of projects stands in contrast with business as usual (or operations), which are repetitive, permanent, or semi-permanent functional activities to produce products or services. In practice, the management of these two systems is often quite different, and as such requires the development of distinct technical skills and management strategies.

In our project we are following the typical development phases of an engineering project

1. Initiation
2. Planning and Design
3. Execution and Construction
4. Monitoring and Controlling Systems
5. Completion

4.1.1 Initiation

The initiating processes determine the nature and scope of the project. The initiating stage should include a plan that encompasses the following areas :

1. Analysing the business needs/requirements in measurable goals
2. Reviewing of the current operations
3. Financial analysis of the costs and benefits including a budget
4. Stakeholder analysis, including users, and support personal for the project

5. Project charter including costs, tasks, deliverables, and schedule

4.1.2 Planing and design

After the initiation stage, the project is planned to an appropriate level of detail (see example of a flow-chart). The main purpose is to plan time, cost and resources adequately to estimate the work needed and to effectively manage risk during project execution. As with the initiation process, a failure to adequately plan greatly reduces the project's chances of successfully accomplishing its goals.

- Determining how to plan
- Developing the scope statement
- Selecting the planning team
- Identifying deliverables and creating the work breakdown structure
- Identifying the activities needed to complete those deliverables
- Developing the schedule
- Risk planning

4.1.3 Execution

Executing consists of the processes used to complete the work defined in the project plan to accomplish the project's requirements. The execution process involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan. The deliverables are produced as outputs from the processes performed as defined in the project management plan and other frameworks that might be applicable to the type of project at hand.

4.1.4 Monitoring & controlling

Monitoring and controlling consists of those processes performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project. The key benefit is that project performance is observed and measured regularly to identify variances from the project management plan.

4.2 System Development Life Cycle

The Systems development life cycle (SDLC), or Software development process in systems engineering, information systems, and software engineering, is a process of creating or altering information systems, and the models and methodologies that people use to develop these systems. In software engineering, the SDLC concept underpins many kinds of software development methodologies. These methodologies form the framework for planning and controlling the creation of an information system.

The SDLC phases serve as a programmatic guide to project activity and provide a flexible but consistent way to conduct projects to a depth matching the scope of the project. Each of the SDLC phase objectives is described in this section with key deliverables, a description of recommended tasks, and a summary of related control objectives for effective management. The project manager must establish and monitor control objectives during each SDLC phase while executing projects. Control objectives help to provide a clear statement of the desired result or purpose and should be used throughout the entire SDLC process.

4.2.1 Spiral Model

We have used the Spiral model in our project. The Spiral model incorporates the best characteristics of both- waterfall and prototyping model. In addition, the Spiral model also contains a new component called Risk Analysis, which is not there in the waterfall and prototype model. In the Spiral model, the basic structure of the software product is developed first. After the basic structure is developed, new features such as user interface and data administration are added to the existing software product. This functionality of the Spiral model is similar to a spiral where the circles of the spiral increase in diameter. Each circle represents a more complete version of the software product. The spiral is a risk-reduction oriented model that breaks a software project up into main projects, each addressing one or major risks. After major risks have been addressed the spiral model terminates as a waterfall model. Spiral iteration involves six steps:

1. Determine objectives, alternatives and constraints.
2. Identify and resolve risks.
3. Evaluate alternatives.
4. Develop the deliverables for the iteration and verify that they are correct.
5. Plan the next iteration.

6. Commit to an approach for the next iteration.

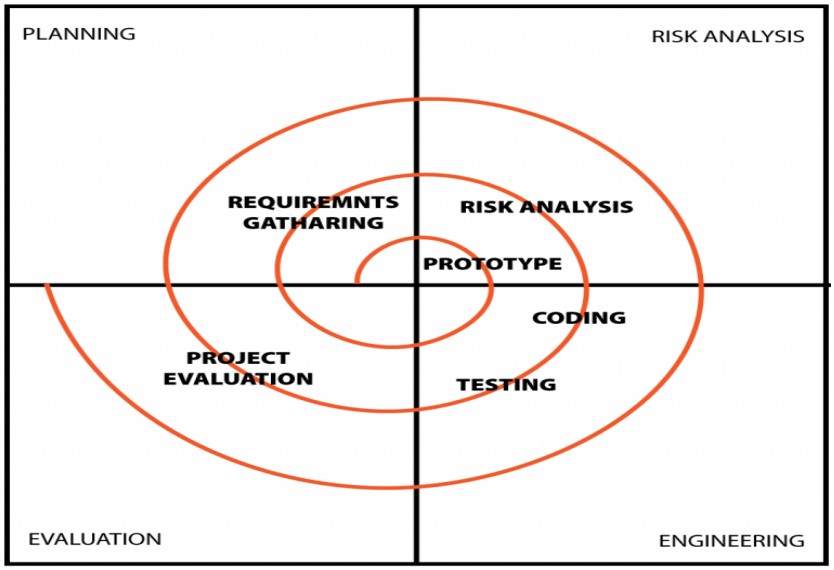

Figure 4.1: Spiral Model

CHAPTER 5
METHODOLOGY

5.1 System Requirements & Specifications

5.1.1 Spyder

Spyder is an open-source cross-platform integrated development environment (IDE) for scientific programming in the Python language. Spyder integrates with several prominent packages in the scientific Python stack, including NumPy, SciPy, Matplotlib, pandas, IPython, SymPy, and Cython, as well as other open-source software. It is released under the MIT license.

5.1.2 Windows 10

Windows 10 is a series of personal computer operating systems produced by Microsoft as part of its Windows NT family of operating systems. It is the successor to Windows 8.1 and was released to manufacturing on July 15, 2015, and to retail on July 29, 2015. Windows 10 receives new builds on an ongoing basis, which are available at no additional cost to users. Mainstream builds of Windows 10 are labeled version YYMM with YY representing the year and MM representing the month of release. For example, the latest mainstream build of Windows 10 is Version 1809. There are additional test builds of Windows 10 available to Windows Insiders. Devices in enterprise environments can receive these updates at a slower pace, or use long-term support milestones that only receive critical updates, such as security patches, over their ten-year lifespan of extended support.

5.1.3 Python 3.6.2

Python is a dynamic object-oriented programming language that can be used for many kinds of software development. It offers strong support for integration with other languages and tools, comes with extensive standard libraries, and can be learned in a few days. Many Python programmers report substantial productivity gains and feel the language encourages the development of higher quality, more maintainable code.

Python runs on Windows, Linux/Unix, Mac OS X, OS/2, Amiga, Palm Handhelds, and

Nokia mobile phones. Python has also been ported to the Java and .NET virtual machines. Python is distributed under an OSI-approved open source license that makes it free to use, even for commercial products.

5.1.4 SCIKIT-learn

Scikit-learn provides a range of supervised and unsupervised learning algorithms via a consistent interface in Python. It is licensed under a permissive simplified BSD license and is distributed under many Linux distributions, encouraging academic and commercial use. The library is built upon the SciPy (Scientific Python) that must be installed before you can use scikit-learn. This stack that includes:

1. NumPy: Base n-dimensional array package
2. SciPy: Fundamental library for scientific computing
3. Matplotlib: Comprehensive 2D/3D plotting
4. IPython: Enhanced interactive console
5. Sympy: Symbolic mathematics
6. Pandas: Data structures and analysis

Extensions or modules for SciPy are conventionally named SciKits. As such, the module provides learning algorithms and is named scikit-learn.

5.1.5 Pandas

In computer programming, pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series. The name is derived from the term "panel data", in econometrics term for data sets that include observations over multiple periods for the same individuals. Pandas is an open-source, BSD-licensed Python library providing high-performance, easy-to-use data structures and data analysis tools for the Python programming language. Python with Pandas is used in a wide range of fields including academic and commercial domains including finance, economics, statistics, analytics, etc

5.1.6 PyTorch

PyTorch is an open-source machine learning library for Python, based on Torch, used for applications such as natural language processing. It is primarily developed by Facebook's artificial-intelligence research group, and Uber's "Pyro" software for probabilistic programming is built on it. PyTorch provides two high-level features: Tensor computation (like NumPy) with strong GPU acceleration Deep Neural Networks built on a tape-based autodiff system

5.1.7 Jupyter Environment

JupyterLab is a web-based interactive development environment for Jupyter notebooks, code, and data. JupyterLab is flexible: configure and arrange the user interface to support a wide range of workflows in data science, scientific computing, and machine learning. JupyterLab is extensible and modular: write plugins that add new components and integrate with existing ones.

5.2 Proposed System

Modules

In this system, we are not just retrieving the bite image description as venomous or non venomous[8]. Whereas, we are also considering the further species recognition as well as symptoms retrieval. Based on this we can divide this system into two modules which are :

- Image Processing Module
- Symptoms Analyser Module

5.2.1 Image Processing Module

As said earlier we have two modules which will do two different types procedures so that we get an accurate output. In the first module the input i.e., we are expecting the bite images from the user to be of different scales and pixels which will be inconvenient for the proceedings of the system. So, we have to change its image quality after that, the bite images are converted into a gray scale image. As RGB images are not accepted by Harris-Hawks Optimization segmentation method. Further the image enters the pre-processing stage. After the pre-processing stage is completed, the next step is the feature extraction.

In this stage the converted images are considered for all the uses which is to compare the image with the images in the database so that we get a close resembling outcome from the newly formed gray scale image[2].

5.2.2 Symptoms Analyzer Module

In the second module, the obtained result from the previous module will be taken as the current input. The input will be the snake species or detection purely based on the gray image that we compared with the already available dataset[3]. This output will be used by the system to fetch the relevant data such as symptoms of the input species. This step ensures that the species which we derived as output from the first module is undeniably the same where the user can compare it with their own symptoms[4]. Finally, the most accurate output will be displayed.

NEURAL NETWORK IDENTIFIED

Neural network identified for classification is Convolutional Neural Network (CNN).

CNN

Convolutional Neural Networks or covnets are neural networks that share their parameters. Imagine an image which can be represented as a cuboid having its length, width (dimension of the image) and height (as image generally have red, green, and blue channels)[1].

A covnet is a sequenc e of layers, and every layer transforms one volume to another through differentiable function.

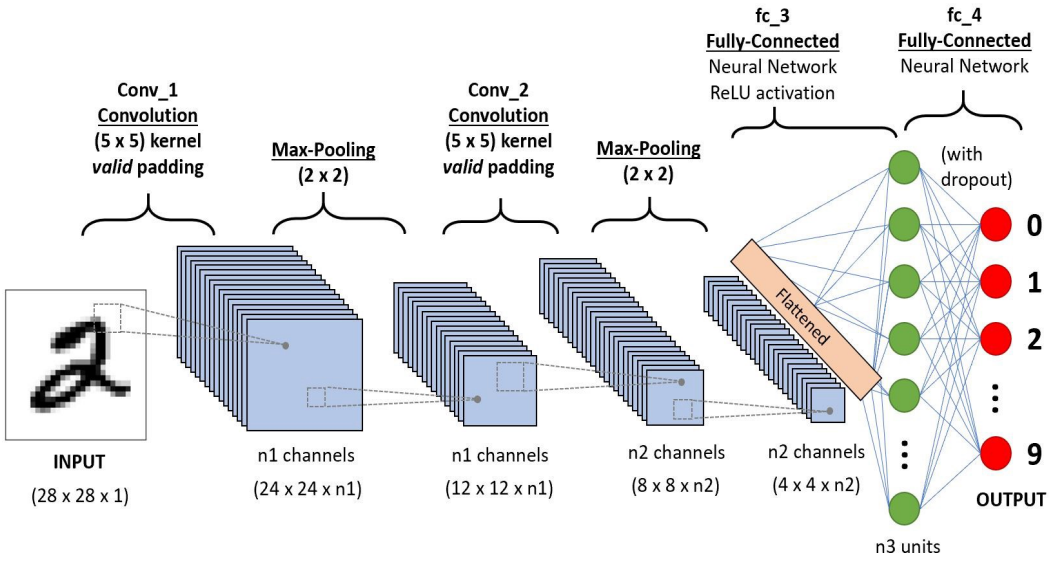

Figure 5.1: Convolutional Neural Network

Types of layers in CNN:

Consider a convnet on an image of dimension 32 x 32 x 3.

1. **Input Layer**: This layer holds the raw input of image with width 32, height 32 and depth 3.

2. **Convolution Layer**: This layer computes the output volume by computing dot product between all filters and image patch. Suppose we use total 12 filters for this layer we'll get output volume of dimension 32 x 32 x 12.

3. **Activation Function Layer**: This layer will apply element wise activation function to the output of convolution layer. Some common activation functions are RELU: max(0,

x), Sigmoid: 1/(1+e÷x), Tanh, etc.

4. **Pool Layer**: This layer is periodically inserted in the covnets and its main function is to reduce the size of volume which makes the computation fast reduces memory and also prevents from overfitting. Two common types of pooling layers are max pooling and average pooling. If we use a max pool with 2 x 2 filters and stride 2, the resultant volume will be of dimension 16x16x12.

5. **Fully-Connected Layer**: This layer is regular neural network layer which takes input from the previous layer and computes the class scores and outputs the 1-D array of size equal to the number of classes. [5]

5.3 Data Flow Diagrams

5.3.1 Data Flow Diagram- Level 0

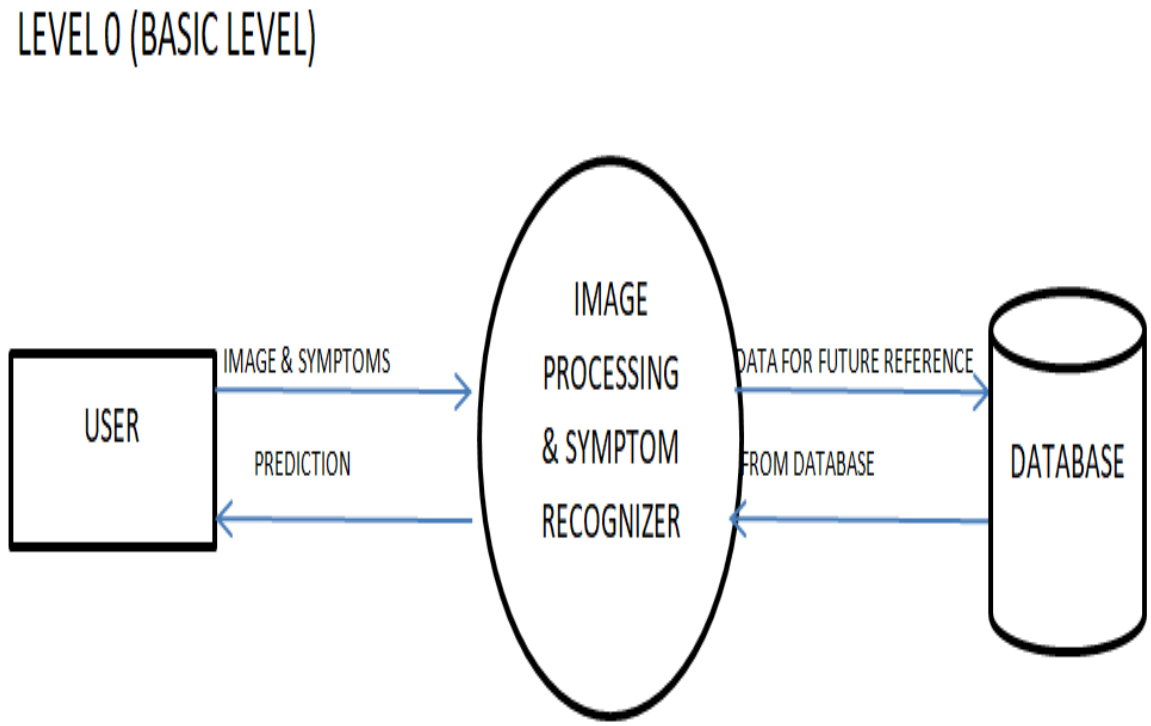

Figure 5.2: DFD- Level 0

5.3.2 Data Flow Diagram- Level 1.1

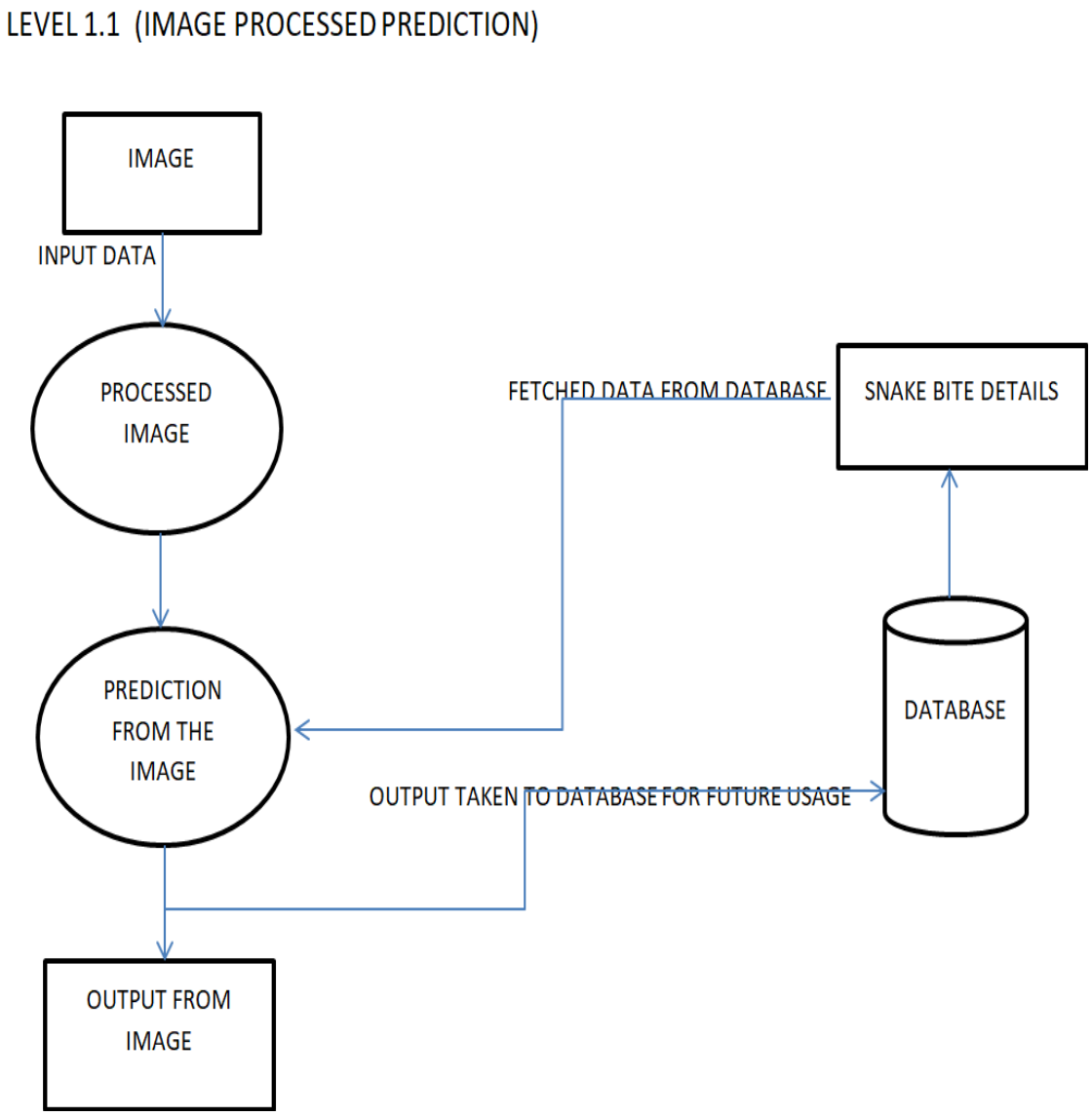

Figure 5.3: DFD- Level 1.1

5.3.3 Data Flow Diagram- Level 1.2

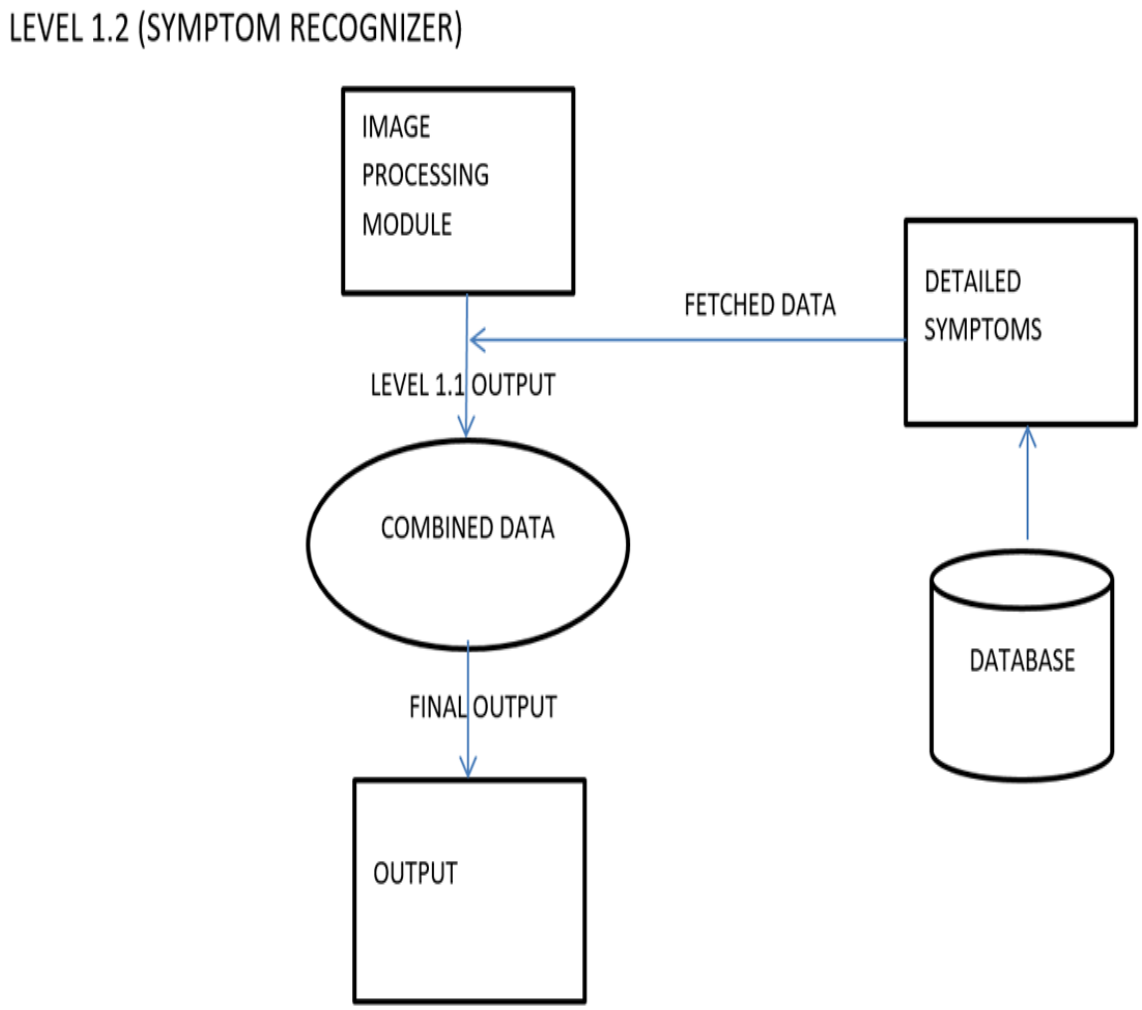

Figure 5.4: DFD- Level 1.2

5.4 Structural Chart

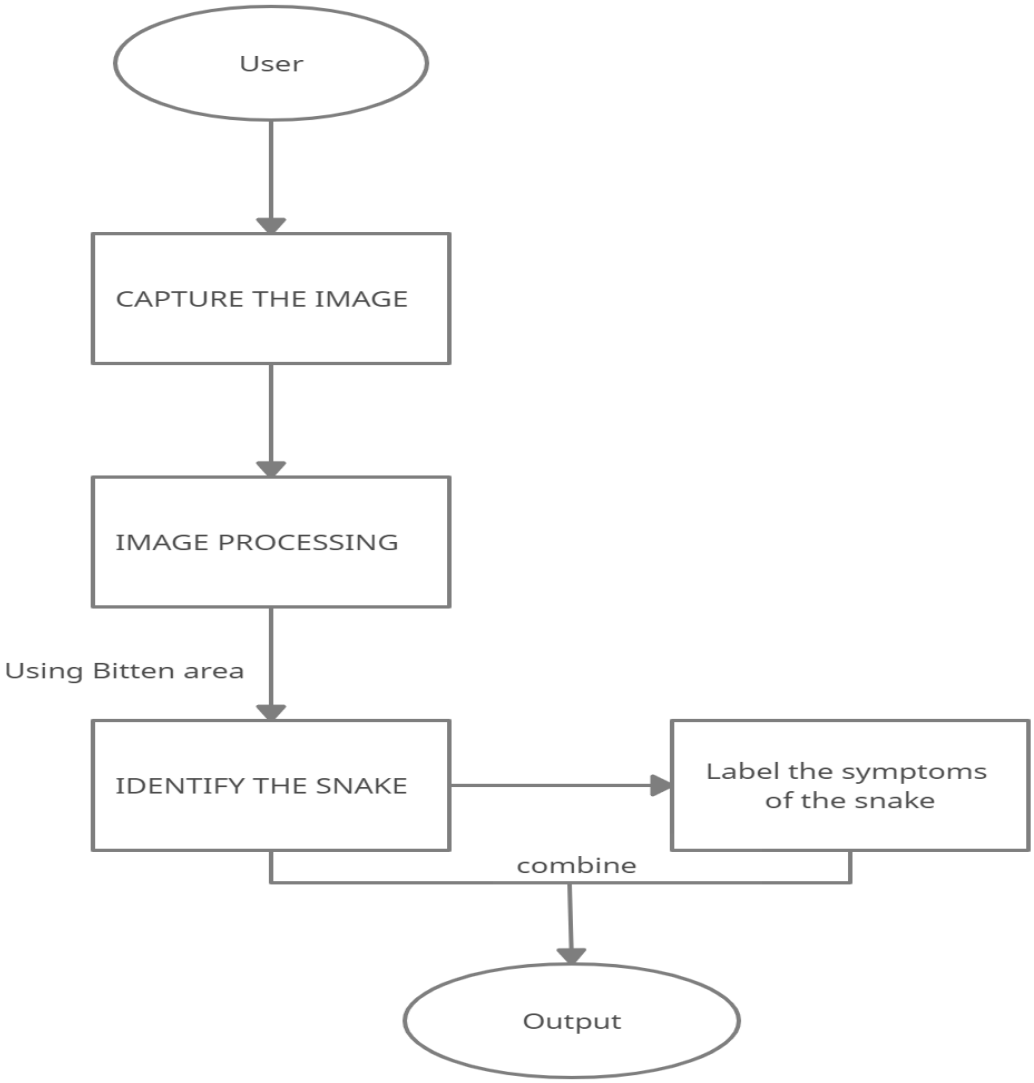

Figure 5.5: Structural Chart

5.5 Unified Modelling Language

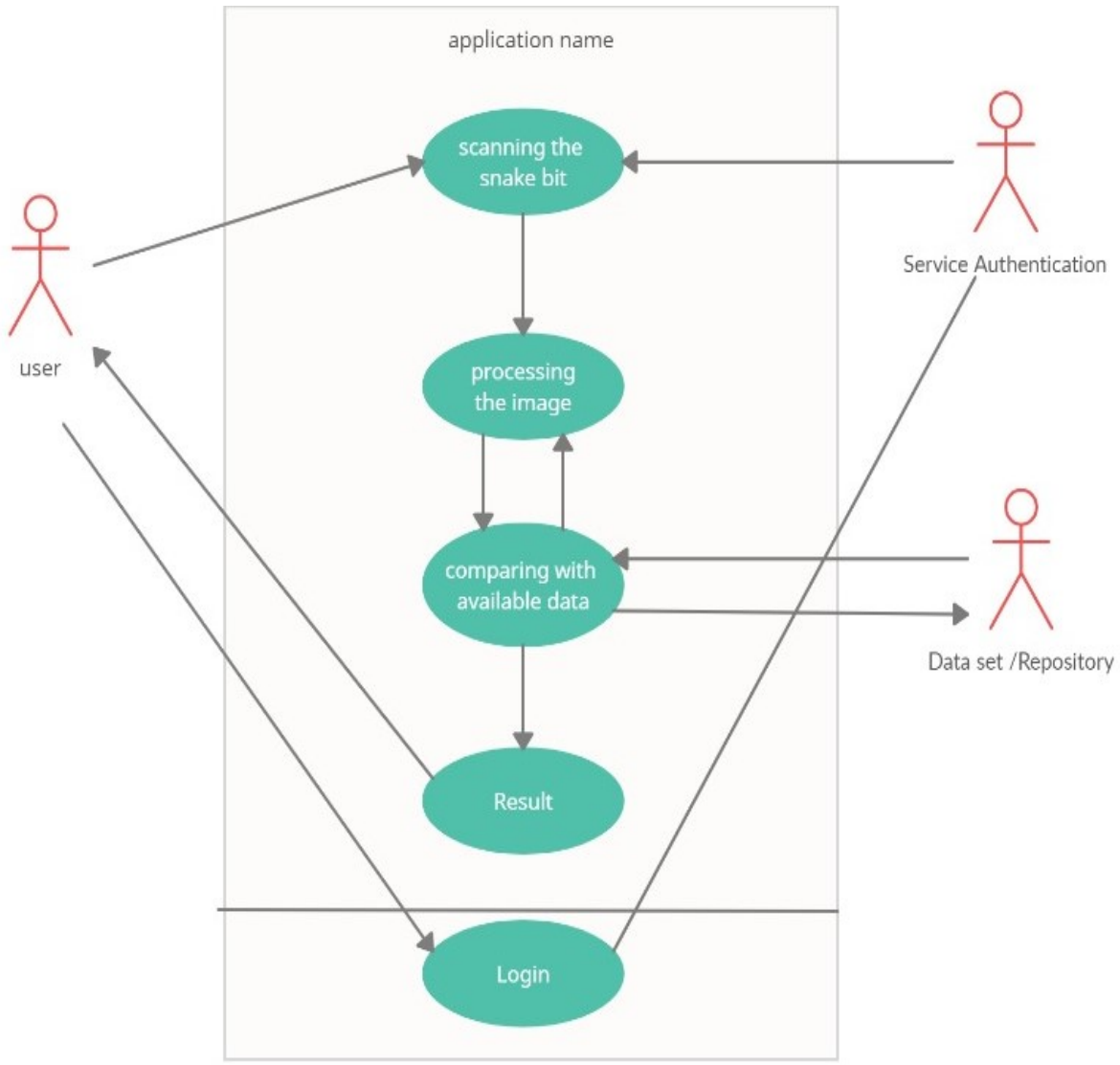

Figure 5.6: UML Diagram

CHAPTER 6

RESULTS

In the first experiment, the effectiveness of the model in detecting snake using the bite mark are examined. The digital image is processed and classified. The programming language used for implementing the model is Python. For the model, an accuracy of 90% was obtained.

The main goal is to identify the snakebite from the bite image and giving out the symptoms and the time that the poison takes to spread that can help the person to get faster medical aid and altogether decrease the snakebite envenoming deaths to a certain length. The deep learning method is used for an accurate result.

CHAPTER 7

CONCLUSION AND FUTURE WORKS

Image data that has images with wrinkled or hairy skin or bruising on the bite or wound area that is still not dry and blood clots on the bite marks causes classification errors, errors in this classification because the system incorrectly detects snake bites, which should not snake bites but the system detects it is a snake bite resulting in poor accuracy. Conversely, if the image data does not have an image with the conditions previously explained, the system detects and classifies the image correctly. The research obtained the highest accuracy of 90 percentage. System automatically detected the snake.we can add some more features like automatic antivenom prescription etc in future.

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