

VISVESVARYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi-590018



Project Report on
“Lumpy Skin Disease in Cow and Intimation using Deep Learning Approach”

submitted in the partial fulfillment of the requirement for the award degree of

BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE & ENGINEERING

submitted by

Ms. ANKITHA N
Ms. DHANYATHA S
Ms. PRAGNA K P
Ms. PREETHU K

1AR19CS005
1AR19CS012
1AR19CS037
1AR19CS040

Under the guidance of

Dr. M S Patel
Designation,
Department of CS & E

AIEMS
BENGALURU

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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B.V.V. Sangha's
AMRUTA INSTITUTE OF ENGINEERING & MANAGEMENT SCIENCES
Bidadi Industrial Area, Bidadi, Bengaluru – 562109

Department of Computer Science & Engineering

AIEMS
BENGALURU

CERTIFICATE

This is to certify that the project work entitled **Lumpy Skin Disease in Cow and Intimation using Deep Learning Approach.** is a bonafide work carried out by

Ms. ANKITHA N	1AR19CS005
Ms. DHANYATHA S	1AR19CS012
Ms. PRAGNA K P	1AR19CS037
Ms. PREETHU K	1AR19CS040

in partial fulfilment of award of Degree of Bachelor of Engineering in Computer Science & Engineering of Visvesvaraya Technological University, Belagavi, during the academic year 2021-2022.

It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated. The project report has been approved as it satisfies the academic requirements associated with of Project Work (18CSP83) prescribed for the said degree.

Signature of the guide,

Guide Name,
Designation,
Dept. of CSE,
AIEMS

Signature of the HOD,

Dr. M S Patel
Professor & Head,
Dept. of CSE,
AIEMS

Signature of the Principal,

Dr. Santosh M Muralan
Principal,
AIEMS

External Viva

Name of the Examiners

Signature with Date

1.

2.

Certificate issued at the Organization where the project was carried out

(On a separate sheet, If applicable)

NAME OF THE INDUSTRY / ORGANIZATION

Address with pin code

CERTIFICATE

Certified that the project work entitled
carried out by Mr./Ms, USN....., a bonafied student
ofin partial fulfillment for the award of **Bachelor of
Engineering / Bachelor of Technology** in of the
Visveswaraiah Technological University, Belgaum during the year It is certified that,
he/she has completed the project satisfactorily

Name & Signature of the Guide

Name & Signature of the Head of organization

DECLARATION

We, student name1 students of VII semester B.E, Department of Computer Science & Engineering, AMRUTA INSTITUTE OF ENGINEERING & MANAGEMENT SCIENCES, Bengaluru, declare that the project work entitled “Project Name” has been carried out by me / us and submitted in partial fulfilment of the course requirements for the award of degree in Bachelor of Engineering in Computer Science & Engineering of Visvesvaraya Technological University, Belagavi during the academic year 2021-2022. The matter embodied in this report has not been submitted to any other university or institution for the award of any degree or diploma.

Place: Bengaluru

Date:

Student Name
(usn)

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Ms. ANKITHA N [1AR19CS005]

Ms. DHANYATHA S [1AR19CS012]

Ms. PRAGNA K P [1AR19CS037]

Ms. PREETHU K [1AR19CS040]

ABSTRACT

The most contagious diseases in the world for cattle include Foot and Mouth Disease (FMD), Lumpy Skin Disease (LSD), and Infectious Bovine Kerato conjunctivitis (IBK). For these disorders to be controlled, early diagnosis is essential. The most popular architecture in the most recent developments in image processing and computer vision is traditional convolutional neural networks. No other system for cattle illness identification in the husbandry farm has, to our knowledge, been introduced utilizing deep learning methods. This suggested model uses different CNN architectures, such as conventional deep CNN, a deep neural learning algorithm helps us to early detect the most prevalent external diseases. The document fully details every step required to carry out the illnesses detection model, starting with data collecting. to the procedure and result. The suggested approach has been demonstrated to be efficient, obtaining findings with a 95% accuracy rate, which may reduce human error in the identification process and will be useful to identify diseases for veterinarians and livestock farmers.

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CHAPTER 1

1.INTRODUCTION

The skin is a crucial component of an animal's body. A viral disease that affects cows and is spread by biting insects is lumpy skin disease. Large skin nodules spanning the entire body, fever, nasal discharge, disseminated lymph nodes, and lachrymation are the disease's hallmarks. The most common locations for lumpy skin disease are India, Russia, Egypt, Oman, and Africa. It was initially discovered in Egypt. The virus can also spread less frequently by direct contact with the saliva, nasal discharge, milk, or semen of infected animals. Unfortunately, Lumpy Skin Disease cannot yet be treated with any specific antiviral medications. The only treatment that is available is cow support. Additionally, we can consider treating skin lesions with wound care. Sprays and the use of medicines to stop Pneumonia and subsequent skin infections.

EFSA[European food safety authority] has produced an interactive disease profile on **Lumpy skin disease**. The disease profile is updated through seven **living systematic reviews** covering: 1) Geographic Distribution, 2) Experimental Infections; 3) Vaccination Efficacy; 4) Pathogen Survival; 5) Diagnostic Test Accuracy; 6) Vector Control and 7) Treatment Efficacy. When sufficient studies are found and reviewed, a **meta-analysis** is carried out automatically on the extracted data and the results are visualized in the disease profiles. In addition, links to other risk assessments on the diseases carried out by EFSA are provided.

The 2022 lumpy skin disease outbreak in India resulted in the death of over 97,000 cattle in three months between July and 23 September. Starting from outbreaks in Gujarat and Rajasthan, in three months cattle in 15 states across India were affected. On 21 September, out of 18,50,000 cases over 65% of cases were from Rajasthan. Over 50,000 deaths were reported from Rajasthan. India's cattle population according to the last livestock census was 192.5 million.

The direct economic loss includes the value of the dead cattle, and associated losses such as decrease in the production of milk, including a decrease of yield in infected cattle. Movement restrictions add to the indirect losses. In August 2022 Gujarat reported a dip in milk collection amounting to approximately 1,00,000 liters per day in certain locations. Collection of milk in Rajasthan fell by over 20% in August 2022; by September collection had decreased by 500,000-

600,000 litres per day. In some places collection has fallen to zero in Rajasthan. This has not impacted the price of milk. On 12 September Mother Dairy's managing director said the impact on production was minor.

Indian laboratories have undertaken research on a domestic vaccine since 2019. Lumpi-ProVacInd was launched in August 2022. The vaccine has not been cleared for emergency use.

Goat pox vaccine has been found effective and is being administered. Veterinary Biological Research Institute, Telangana, Indian Immunologicals and Hester Biosciences are manufacturing the goat pox vaccine. India also has capabilities for manufacturing a sheep pox vaccine.

Testing has been expanded.

Public statements and explanations have been made related to the disease not impacting humans, and the impact of the disease on milk or meat. This includes statements by the Maharashtra animal husbandry commissioner, an Indian Council of Medical Research scientist, a joint director of the Indian Veterinary Research Institute, and head of department of veterinary medicine at a university in Punjab.

1.1 DEEP LEARNING

Deep learning is an important element of data science, which includes statistics and predictive modeling. It is extremely beneficial to data scientists who are tasked with collecting, analyzing and interpreting large amounts of data; deep learning makes this process faster and easier.

At its simplest, deep learning can be thought of as a way to automate predictive analytics. While traditional machine learning algorithms are linear, deep learning algorithms are stacked in a hierarchy of increasing complexity and abstraction.

1.2 DEEP LEARNING METHODS

Various methods can be used to create strong deep learning models. These techniques include learning rate decay, transfer learning, training from scratch and dropout.

1.2.1 Learning rate decay

The learning rate is a hyperparameter, a factor that defines the system or set conditions for its operation prior to the learning process that controls how much change the model

experiences in response to the estimated error every time the model weights are altered.

Learning rates that are too high may result in unstable training processes or the learning of a suboptimal set of weights. Learning rates that are too small may produce a lengthy training process that has the potential to get stuck. The learning rate decay method also called learning rate annealing or adaptive learning rates is the process of adapting the learning rate to increase performance and reduce training time.

The easiest and most common adaptations of learning rate during training include techniques to reduce the learning rate over time.

1.2.2 Transfer learning

This process involves perfecting a previously trained model; it requires an interface to the internals of a preexisting network. First, users feed the existing network new data containing previously unknown classifications. Once adjustments are made to the network, new tasks can be performed with more specific categorizing abilities. This method has the advantage of requiring much less data than others, thus reducing computation time to minutes or hours.

1.2.3 Training from scratch

This method requires a developer to collect a large labeled data set and configure a network architecture that can learn the features and model. This technique is especially useful for new applications, as well as applications with a large number of output categories. However, overall, it is a less common approach, as it requires inordinate amounts of data, causing training to take days or weeks.

1.2.4 Dropout

This method attempts to solve the problem of overfitting in networks with large amounts of parameters by randomly dropping units and their connections from the neural network during training. It has been proven that the dropout method can improve the performance of neural networks on supervised learning tasks in areas such as speech recognition, document classification and computational biology.

1.3 PYTHON

Python is a popular programming language. It was created by Guido van Rossum and

released in 1991. It is used for:

- Web development
- Software development
- Mathematics
- System scripting

What can Python do?

- Python can be used on a server to create web applications.
- Python can be used alongside software to create workflows.
- Python can connect to database system. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.
- Python can be used for rapid prototyping, or for rapid prototyping, or for production-ready software development.

Why Python?

- Python works on different platforms.
- Python has a simple syntax that allows developers to write programs with fewer lines than some other programming languages.
- Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.

Python was imagined in the late 1980s and its usage started in December 30, 1989 by Guido van Rossum at Centrum Wiskunde and Informatica (CWI) in the Netherlands as a successor to the ABC dialect (itself roused by SETL) capable of exemption dealing with and interfacing with the Amoeba working system. Van Rossum remains Python's chief creator. His proceeding with focal part in Python's advancement is reflected in the title given him by the Python people group.

1.4 PYTHON FEATURE

- Simple and easy to learn Python as only 33 keywords but JAVA as 83 keywords.
- High level programming language. Python is platform independent.
- Both object oriented and procedure oriented language.
- Interpreted language (It means not going to compile)
- Extensible
- Portability, moving from one platform to another without any change.
- Dynamically typed Programming Language. In python it is not required to declare type

- in python.
- Free ware (there is no license and cannot pay anything) furthermore, Open source (can able to see source code).

1.4.1 LIMITATIONS OF PYTHON

- Performance wise it is not up to the mark. Because its an interpreted language.

Interpreter able to see only one line (JAVA is better performance compare to python in java JIT (just in compiler)).

- Mobile applications it is not up to the mark python is not suitable large scale enterprise applications.

1.4.2 FLAVORS OF PYTHON

- Cpython: It can be standard, it ca be used to c language python.
- Jpython: It is for JAVA application.
- Iron python: to work with Microsoft .net platform.
- Py: Internally JIT (just in time complex) compiler is there so performance wise too good.
- Ruby python: To handle Big data happily go for Anaconda python.
- Stackless (python for concurrency)
- Parallely you execute (like multithreaded) go for stackless.

1.4.3 APPLICATIONS OF PYTHON

1. GUI-Based Desktop Applications:

Python has simple syntax., modular architecture, rich text processing tools and the ability to work on multiple operating systems which make it a desirable choice for developing desktop-based applications. There are various GUI toolkits like wxPython PyQt or PyGtk available which help developers create highly functional Graphical User Interface (GUI). The various applications developed using python includes.

- Image Processing and Graphic Design Applications:
Python has been used to make 2D imaging such as Inkscape, GIMP, Paint Shop Pro and Scribus. Further, 3D animation packages, like Blender, 3ds Max, Cinema 4D, Houdini, Lightwave and Maya, also use python in variable proportions.

- **Scientific and Computational Applications:**

The higher speeds, productivity and availability of tools, such as scientific python and numeric python, have resulted in python becoming an integral part of applications involved in computation and processing of scientific data. 3D modeling software, such as Free CAD and finite element method software, such as Abacus, are coded in python.

- **Games:**

Python has various modules, libraries and platforms that support development of games. For example, PySoy is a 3D game engine supporting Python 3, and PyGame provides functionality and a library for game development. There have been numerous games built using python including Civilization-IV, Disney's Toontown Online, Vega Strike etc.

2. Web Frameworks and Web Applications

Python has been used to create a variety of web-frameworks including CherryPy, Django, TurboGears, Bottle, Flask etc. These frameworks provide standard libraries and modules which simplify tasks related to content management, interaction with database and interfacing with different internet protocols such as HTTP,SMTP, XML-RFC, FTP and POP. Plone, a content management system; ERP5, an open source ERP which is used in Aerospace, apparel and banking; Odoo – a consolidated suite of business applications; and Google App engine are a few of the popular web applications based on Python.

3. Enterprise and Business Applications

With features that include special libraries, extensibility, scalability and easily readable syntax, python is a suitable coding language for customizing larger applications.

Reddit, which was originally written in Common lisp, was rewritten in python in 2005.

Python also contributed in a large part to functionality in You Tube.

4. Operating Systems

Python is often an integral part of Linux distributions. For instance, Ubuntu's Ubiquity Installer, Fedora's and Red Hat Enterprise. Linux's Anaconda Installer are written in Python. Gentoo Linux makes use of python for portage, its package management system.

5. Language Development

Python's design and module architecture has influenced development of numerous

languages. Boo language uses an object model, syntax and indentation, similar to python. Further, syntax of languages like Apple's Swift, Coffee Script, Cobra and OCaml all share similarity with Python.

6. Prototyping

Besides being quick and easy to learn. Python also has the open source advantage of being free with the support of a large community. This makes it the preferred choice for prototype development. Further, the agility, extensibility and scalability and ease of refactoring code associated with Python allow faster development from initial prototype. Since its origin in 1989, Python allow faster development from initial prototype. Since its origin in 1989, python has grown to become part of a plethora of web-based, desktop based, graphic design, scientific and computational applications. With python available for Windows, Mac OS X and Linux/UNIX, it offers ease of development for enterprises. Additionally, the latest release Python 3.4.3 builds on the existing strengths of the language, with drastic improvement in Unicode support, among other new features.

1.5 OBJECTIVES

- The objective is to detect the lumpy nodes by using convolutional Neural Network
- This is done by giving image dataset as input and then the prediction are made as healthy cows and lumpy cows.
- We have explored deep learning techniques first and foremost for the extraction of lumpy nodes from the cow's skin
- Then consequently to segment the lesions from cow's skin.
- After this predict whether the cow is defected by lumpy or not.

1.6 SCOPE OF PROJECT

This project is proposed to identify the disease in the cow, this will predict and give intimation to respective hospital. In future this could be implemented to identify other major diseases and which would help the researchers to study on it.

1.7 PROBLEM STATEMENT

-
- Lumpy skin disease (LSD) is an important viral disease causing significant economic losses in commercial livestock production. In mid2019, an outbreak of LSD has been reported in cattle population from different parts of Bangladesh including Chattogram division. A cross sectional surveillance study was undertaken from August 2019 to December 2019 to investigate the prevalence and associated risk factors of LSD in cattle in Chattogram district.
 - The disease is having dramatic effects on rural livelihoods, which are strongly dependent on cattle, with significant income losses for affected farmers. Consequences are also devastating at national level since the presence of the disease has triggered strict trade restrictions. The risk of imminent contagion of neighbouring countries is very high.

1.8 PROBLEM IDENTIFICATION

- Identifying the LSDV and predicting the percentage of disease spread
- If cattle has disease it intimates to the nearby hospital.
- This project is to detect the LSD in the cattle primarily, so that the cattle can receive the better diagnosis from the nearby veterinary doctors.

1.9 EXISTING SYTEM

The pox virus of lumpy skin disease can be demonstrated by electron microscopy in the early skin lesions. The two diseases can be distinguished by PCR. Dermatophilus congolensis also causes skin nodules in cattle.

1.10 APPLICATIONS

- Create the awareness of LSD
- Helpful for veterinary professionals and laboratory diagnosticians.
- Early detection of disease.
- Easy access to contact number.
- To have the quick response.

CHAPTER 2**2.LITERATURE SURVEY**

Literature review on different techniques given by various researchers is being presented.

1]Seminal Transmission of Lumpy Skin Disease Virus in Heifers.

The aim of this study was to investigate whether LSDV, transmitted through semen, can infect cows and their embryos. Two controlled trials were performed simultaneously.

Eleven young beef heifers, naïve to LSDV, were synchronized using an OvSynch protocol and inseminated on Day 0 with fresh semen spiked with a field strain of LSDV on day 0. Six of the heifers were super ovulated on Day 1 using pregnant mare serum gonadotropin, and embryos were flushed from these heifers on Day 6.

Blood and serum samples were collected from Day 4 until Day 27 to determine the presence of LSDV by PCR and virus isolation, and the presence of antibodies against LSDV by SNT. The first clinical signs of LSD were noticed on Day 10, followed by severe generalized LSD in three heifers and mild LSD in two more heifers.

Two heifers were humanely euthanized due to severe unresponsive stranguria. LSDV was detected by PCR, virus isolation or electron microscopy in blood, embryos and organs of experimentally infected animals; and eight heifers had seroconverted by Day 27. Two control animals were not affected. This is the first report of experimental seminal transmission of LSDV in cattle.

2] Epidemiology of Lumpy skin disease.

The vector competence for LSDV of some African tick species has been described: interrupted feeding is a natural behavior of male ticks of the African species *Rhipicephalus appendiculatus* (brown ear tick) and *Amblyomma hebraeum* (African bont tick).

In an experimental setting, *R. appendiculatus* males were capable of mechanical transmission of LSDV from infected to naïve hosts (Tuppurainen et al., 2013a). There is less evidence with regard to *Amblyomma hebraeum* males (Lubinga et al., 2015; Tuppurainen et al., 2011), but it is likely that they are equally important mechanical vectors for LSDV.

Infected African blue tick (*R. [Boophilus] decoloratus*) females have been shown to transfer the virus via eggs to subsequent larvae, which were in turn able to infect naïve recipient cattle

(Tuppurainen et al., 2013b); this mode of transmission can also occur mechanically during venereal transmission.

3]A Deep Learning Approach for Classification of Onychomycosis Nail Disease.

Onychomycosis, also known as “Tinea Unguim”, is a very common fungal infection of nail. Fingernail as well as toenail gets affected due to this fungal infection. Common signs that may be noticeable around the nail are discoloration of nail to black, white, yellow or green, thickening of nail, dry or scaly skin around the nail, and foul smell can be observed.

This disease affects about 10% of the adult population, mostly in which old people gets affected. Treatment of onychomycosis includes both oral as well as topical agents such as anti-fungal medications and its main purpose is to eradicate the organism as demonstrated by microscopy and culture.

This paper contend a deep convolutional network to classify onychomycosis disease from images. The framework uses Visual Geometry Group (VGG)-19 for feature extraction. Due to the unavailability of a diligent dataset, a new dataset was built for testing the accuracy of our contended framework. This work has been tested on our dataset and has also been compared with other state-of-the-art algorithms (SVM, ANN, KNN, Tree, RF, Adaboost) that results in great performance in feature extraction.

4] Assessing machine learning techniques in forecasting lumpy skin disease occurrence based on meteorological and geospatial features.

Lumpy skin disease virus (LSDV) causes an infectious disease in cattle. Due to its direct relationship with the survival of arthropod vectors, geospatial and climatic features play a vital role in the epidemiology of the disease.

The objective of this study was to assess the ability of some machine learning algorithms to forecast the occurrence of LSDV infection based on meteorological and geological attributes. Initially, ExtraTreesClassifier algorithm was used to select the important predictive features in forecasting the disease occurrence in unseen (test) data among meteorological, animal population density, dominant land cover, and elevation attributes.

Some machine learning techniques revealed high accuracy in predicting the LSDV occurrence in test data (up to 97%). In terms of area under curve (AUC) and F1 performance metric scores, the artificial neural network (ANN) algorithm outperformed other machine learning methods in

predicting the occurrence of LSDV infection in unseen data with the corresponding values of 0.97 and 0.94, respectively.

Using this algorithm, the model consisted of all predictive features and the one which only included meteorological attributes as important features showed similar predictive performance. According to the findings of this research, ANN can be used to forecast the occurrence of LSDV infection with high precision using geospatial and meteorological parameters. Applying the forecasting power of these methods could be a great help in conducting screening and awareness programs, as well as taking preventive measures like vaccination in areas where the occurrence of LSDV infection is a high risk.

3.SYSTEM REQUIREMENTS

3.1 SOFTWARE REQUIREMENT SPECIFICATION

This chapter describes about the requirements. It specifies the hardware and software requirements that are required in order to run the application properly. The Software Requirement Specification (SRS) is explained in detail, which includes overview of dissertation as well as the functional and non-functional requirement of this dissertation.

A SRS document describes all data, functional and behavioural requirements of the software under production or development. SRS is a fundamental document, which forms the foundation of the software development process. It is the complete description of the behaviour of a system to be developed. It not only lists the requirements of a system but also has a description of its major feature. Requirement Analysis in system engineering and software engineering encompasses those tasks that go into determining the need or conditions to meet for a new or altered product, taking account of the possibly conflicting requirements of the various stakeholders, such as beneficiaries or users. Requirement Analysis is critical to the success to a development project. Requirement must be documented, measurable, testable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.

The SRS functions as a blueprint for completing a project. The SRS is often referred to as the “parent” document because all subsequent project management documents, such as design specifications, statements of work, software architecture specification, testing and validation plans, and documentation plans, are related to it. It is important to note that an SRS contains functional and non-functional requirements only.

Thus the goal of preparing the SRS document is to

- To facilitate communication between the customer, analyst, system developers, maintainers.
- To serve as a contrast between purchaser and supplier.
- To firm foundation for the design phase.
- Support system testing facilities.
- Support project management and control.
- Controlling the evolution of the system.

3.2 FUNCTIONAL REQUIREMENTS

Functional Requirement defines a function of a software system and how the system must behave when presented with specific inputs or conditions. These may include calculations, data manipulation and processing and other specific functionality. In this system following are the functional requirements :-

Input test case must not have compilation and runtime errors.

- The application must not stop working when kept running for even a long time.
- The application must function as expected for every set of test cases provided.
- The application should generate the output for given input test case and input parameters.
- The application should generate on-demand services.

3.3 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are the requirements which are not directly concerned with the specific function delivered by the system. They specify the criteria that can be used to judge the operation of a system rather than specific behaviours. They may relate to emergent system properties such as reliability, response time and store occupancy. Non-functional requirements arise through the user needs, because of budget constraints, organizational policies, the need for interoperability with other software and hardware systems or because of external factors such as:-

- Product Requirements
- Organizational Requirements
- User Requirements
- Basic Operational Requirements

In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours. This should be contrasted with functional requirements that define specific behaviour or functions. The plan for implementing non-functional requirements is detailed in the system architecture. Broadly, functional requirements define what a system is supposed to do and non- functional requirements define how a system is supposed to be. Functional requirements are usually in the

3.4 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company.

For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- Operational Feasibility
- Economical Feasibility
- Technical Feasibility
- Social Feasibility

3.5 HARDWARE REQUIREMENTS

System Requirement for training the Model:

- Operating System: Linux or MacOS
- RAM: 16GB Minimum.
- Internal storage: 500 MB.
- GPU: Nvidia
- VRAM: 6GB

3.6 SOFTWARE REQUIREMENTS

System Requirement for training the Model:

- Operating System: Linux or MacOS
- Coding Language: Python 3.0
- Tools: PyCharm or Visual studio code
- Library: DLib, Keras, numpy, Tinker.

CHAPTER 4**4.SYSTEM DESIGN**

Design is a meaningful engineering representation of something that is to be built. It is the most crucial phase in the developments of a system. Software design is a process through which the requirements are translated into a representation of software. Design is a place where design is fostered in software Engineering. Based on the user requirements and the detailed analysis of the existing system, the new system must be designed. This is the phase of system designing. Design is the perfect way to accurately translate a customer requirement in the finished software product. Design creates a representation or model, provides details about software data structure, architecture, interfaces and components that are necessary to implement a system. The logical system design arrived at as a result of systems analysis is converted into physical system design.

4.1 SYSTEM ARCHITECTURE

A system architecture is a representation of a system in which there is a mapping of functionality onto hardware and software components, a mapping of the software architecture onto the hardware architecture, and human interaction with these components.

The purpose of system architecture activities is to define a comprehensive solution based on principles, concepts, and properties logically related to and consistent with each other.

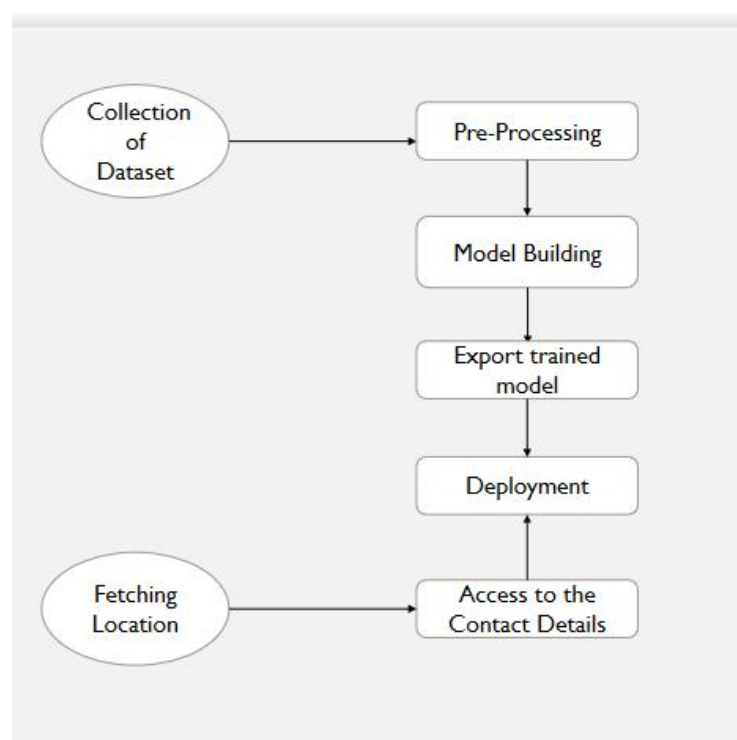


Fig 4.1 System Architecture Design

4.2 METHODOLOGY

System development method is a process through which a product will get completed or a product gets rid from any problem. Software development process is described as a number of phases, procedures and steps that gives the complete software. It follows series of steps which is used for product progress. The development method followed in this project is convolutional neural network.

By loading the dataset and pre-processing the images to get the clean and augmented data.

Building the model to classify the images.

Providing the access to location and contact details of nearby veterinary hospitals.

Finally deploying the model into the GUI.

4.2.1 DATA SET PREPARATION

Data is the foundation for any deep learning project. The first stage of project implementation involves data collection, selection, preprocessing, and transformation.

4.2.1.1 Data Collection

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.

4.2.1.2 Data visualization

A large amount of information represented in graphic form is easier to understand and analyze. Some companies specify that a data analyst must know how to create slides, diagrams, charts, and templates.

4.2.1.3 Data selection

After having collected all information, a *data analyst* chooses a subgroup of data to solve the defined problem. For instance, if you save your customers' geographical location, you don't need to add their cell phones and bank card numbers to a dataset. But purchase history would be

necessary. The selected data includes attributes that need to be considered when building a predictive model.

4.2.2 DATA PRE-PROCESSING

The purpose of preprocessing is to convert raw data into a form that fits machine learning. Structured and clean data allows a data scientist to get more precise results from an applied machine learning model. The technique includes data formatting, cleaning, and sampling.

4.2.2.1 Data Augmentation

Data augmentation in data analysis are techniques used to increase the amount of data by adding slightly modified copies of already existing data or newly created synthetic data from existing data. It acts as a regularizer and helps reduce overfitting when training a machine learning model.

4.2.3 DATASET SPLITTING

A dataset used for machine learning should be partitioned into three subsets — training, test, and validation sets.

Training set. A *data scientist* uses a training set to train a model and define its optimal parameters — parameters it has to learn from data.

Test set. A test set is needed for an evaluation of the trained model and its capability for generalization. The latter means a model's ability to identify patterns in new unseen data after having been trained over a training data. It's crucial to use different subsets for training and testing to avoid model overfitting, which is the incapacity for generalization we mentioned above.

Validation set. The purpose of a validation set is to tweak a model's hyperparameters — higher-level structural settings that can't be directly learned from data. These settings can express, for instance, how complex a model is and how fast it finds patterns in data.

The proportion of a training and a test set is usually 80 to 20 percent respectively. A training set is then split again, and its 20 percent will be used to form a validation set.

4.2.4 MODEL BUILDING

We will start developing a convolutional neural networks to classify images for correct labels.

The architecture of our CNN model

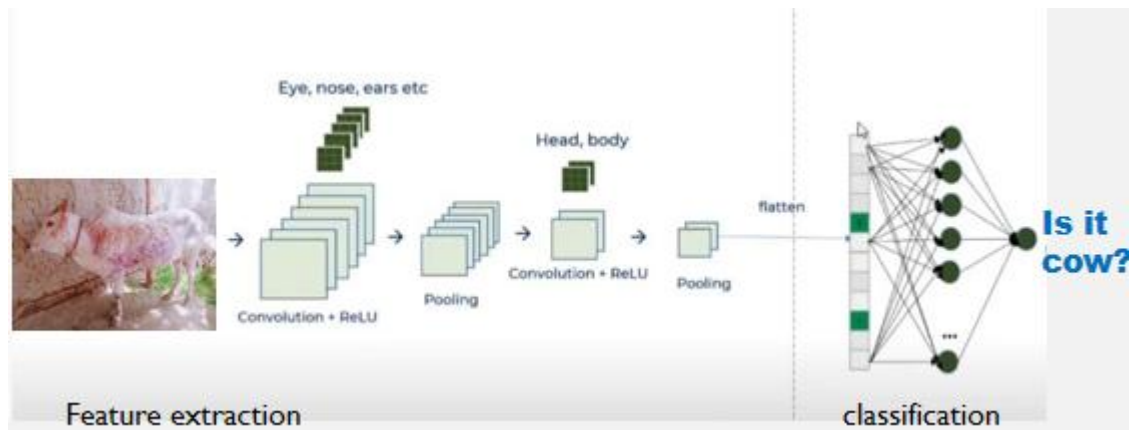


Fig 4.2.4 CNN MODEL ARCHITECTURE

There are layers in CNN

1. Input layer
2. Convo layer
3. Pooling layer
4. Connected layer
5. Output layer

1. Input layer- image data is represented in 3D matrix.

2. In convo layer we are using two layers of 32 filters of some size and activation as relu

3. Max pooling is done to reduce the size of images (because the images are in large size the computation time is more if so.) it is used b/w two convolutional layer.

From these two process we can extract the features.

4. Flatten the layers to squeeze the layers into 1 dimension and join.

After joining makes a fully connected dense neural network which gives the classified model.

4.2.5 TRAIN AND VALIDATE MODEL

First we need to compile the model.

Need to describe the loss function and optimizer to use.

Loss Function – to calculate the loss done by model. we will use categorical cross-entropy.

Optimizer – Optimize to optimize the loss function

Need to fit the train and test data to model and start training the convolutional model.

we need to define a number of epochs to train and batch size to consider while training the model.

4.2.6 TEST THE MODEL

we will test the model by loading the data using pandas and resize it to the shape of 30*30 pixels and convert it to a NumPy array. After processing test images we will check the accuracy of the model against actual labels.

4. Save the Model

Save the model for future use as well, we will use the dump model to create a GUI for Our Project.

4.2.7 PROVIDING ACCESS TO LOCATION AND CONTACTNUMBER OF NEAR BY VETERINARY HOSPITAL

We are accessing the location using Geolocation. Geolocation is a simple application which uses google maps API. Geocode Module is used. Geocode Module returns

Here the browser call get CurrentLocation(). Which passes a call back function as an respective argument.

- Country,
- Country Short forms,
- City,
- Routes, longitude, latitude,
- Street numbers, postal codes, etc.

Geolocation will ask the visitor for permission to use their location.

If the user gives permission, then geolocation gets browser's location using the get method it can.

If geolocation determines the browser's location, it will call the call back function and will pass it as a position object.

phonenumbers is one of the modules that provides numerous features like providing basic information of a phone number, validation of a phone number etc. Here, we will learn how to use phonenumbers module just by writing simple Python programs. This is a Python port of Google's libphonenumber library.

And the Phone Number is given and parsing. It with corresponding location.

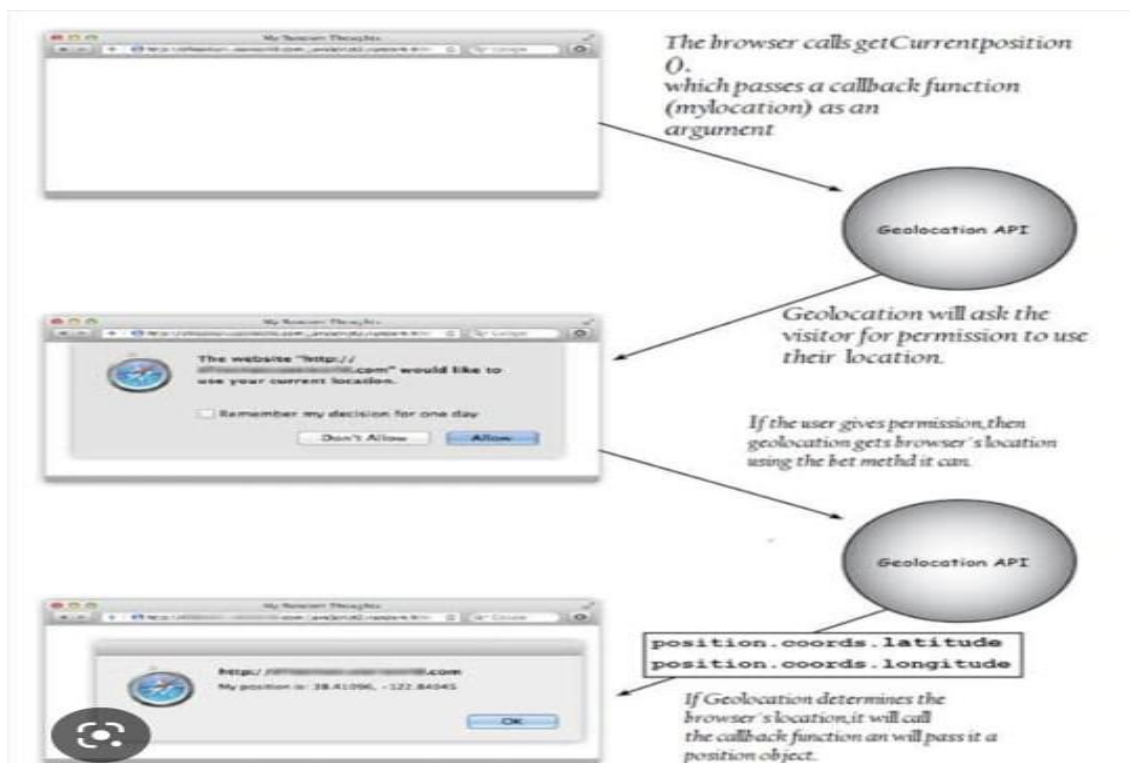


Fig 4.2.7 Working of Geo Location API.

4.2.8 DEPLOYMENT

User Interface Design (GUI)

Tkinter is the standard GUI library for Python. Python when combined with Tkinter provides a fast and easy way to create GUI applications. Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit.

Creating a GUI application using Tkinter is an easy task. All you need to do is perform the following steps –

- Import the Tkinter module.
- Create the GUI application main window.
- Add one or more of the above-mentioned widgets to the GUI application.
- Enter the main event loop to take action against each event triggered by the user.

We will load and deploy the model then we will define class names in the dictionary.

And also deploy location and phone no.

And then we will create one by one functions to upload and classify images