SKIN CANCER DETECTION USING DEEP LEARNING PROJECT REPORT

Submitted to

NEHRU ARTS AND SCIENCE COLLEGE, COIMBAOTRE

(AUTONOMOUS)

in the partial fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE IN DATA SCIENCE

Submitted by

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(23PGDT001)

UNDER THE GUIDANCE OF

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NEHRU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

(Affiliated to Bharathiar University Reaccredited with "A+" Grade by NAAC,ISO 9001:2015 & 14001:2004 Certified Recognized by UGC with 2(f) &12(B),Under Star College Scheme by DBT, Govt. of India) Nehru Gardens, Thirumalayampalayam, Coimbatore - 641 105, Tamil Nadu,India.
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MARCH 2025

CERTIFICATE

NEHRU ARTS AND SCIENCE COLLEGE

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School of Computational Sciences

DEPARMENT OF COMPUTER SCIENCE & DATA SCIENCE

CERTIFICATE

This is to certify that Project report entitled "**SKIN CANCER DETECTION USING DEEP LEARNING**" is a bonafide work done by **ABISHEK R (Reg. No: 23PGDT005)** in partial fulfilment of the requirement of the award for the Degree of **MASTER OF DATA SCIENCE** in NEHRU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), COIMBATORE.

INTERNAL GUIDE HEAD OF THE DEPARTMENT

Certify that we examined the Candidate in the Project Work/Viva-Voice Examination held at **NEHRU ARTS AND SCIENCE COLLEGE** on 16-03-2025

Internal Examiner External Examiner

DECLARATION

DECLARATION

I hereby declare that the Project entitled "**SKIN CANCER DETECTION USING DEEP LEARNING**", submitted to Nehru Arts and Science College (Autonomous) Coimbatore, is a record of the original work done by **ABISHEK R** Under the guidance of **Dr. K. SELVAVINAYAKI, MCA, M.Phil., Ph.D.** Head of the Department, Department of Computer Applications, Nehru Arts and Science College during the Academic Year of 2024-2025.

PLACE : COIMBATORE Signature of the Candidate DATE : ABISHEK R

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

I solemnly take this opportunity to all the helping hands that made me accomplish this project. First and foremost, I thank the Almighty who is the source of knowledge and one who guided me for completing the Project Work successfully.

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I extend my sincere thanks to my parents all my friends for their moral support rendered to complete the Project Work in a grand success.

ABISHEK R

ABSTRACT

Now a day's skin cancer is major problem human beings are facing, to recognize skin cancer new methodology for the diagnosing skin cancer by images of dermatologic spots using image processing presented. Currently in skin cancer one the most frequent diseases humans. This methodology- ba s e d Fourier spectral analysis using filters such classic, inverse and to k-law nonlinear. The sample images are obtained by a specialist as a replacement spectral to techniqueis developed and quantitative measurement in the complex pattern found cancerous skin spots. Finally, in which spectral index calculated get a variety spectral index defined carcinoma. Our results show confidence of level in 95.4%. carcinoma mainly occurs thanks to exposure ofsunlight. Ozone is depletion and maintained chemical exposures in other factors involved precipitating carcinoma. Mutations of p53 gene involved UV- induced as carcinogenesis. P53 gene acts vital development in SCC. Skin Cancer alarming is disease for mankind, the need early diagnosis the skin cancer is increased due to the rapid climb rate of Melanoma skin cancer, its high treatment

Costs, and deathrate. The cancer cells are detected manually and it takes time to cure in most of the cases. This project proposed a man-made carcinoma detection system using image Processing and machine learning method. The features of the affected skin cells are extracted after the segmentation of the pictures using feature extraction technique. A deep learning-based method Convolutional neural network classifier is employed for the stratification of the extracted features. Skin Cancer is an alerting issue and it must be detected as early as possible. The diagnostic is a manual process that is time consuming as well as expensive. But, today's world science has become advanced by using machine learning make easy detecting cancerous cells to the machine learning specially convolution neural network is employed to detect cancerous cell more in quickly, and to efficiently.

ORGANIZATION PROFILE

INDTECHSOFT is an Information Technology Services Company that provides complete IT Solutions, Software, Training and HR Services. It was Started in the year 2018, by a team of highly experienced technology experts who has a rich experience in the IT industry for more than 25 Years.

COMPANY INFO:

indtechsoft

Website:https://www.indtechsoft.com/

Experience in Industry: 6 years

Clients Satisfied:125

Successful Projects:175

In Indtechsoft, they make sure people love coming to work. They shouldn’t dread Monday mornings. We create an environment where work shouldn’t feel like work. We want everyone to be learners, thinkers,innovators and problem solvers.

The truth is that software development requires a lot of creativity. While coding doesn't usually involve complete freedom of expression in the same way that art and music do, the creativity involved with coding is a technical creativity.

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i) WEB DEVELOPMENT:

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Mobile applications are turning into an essentialpart ofyour personal lives and business lives.

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iv) DIGITALMARKETING:

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v) PRODUCTS:

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CHAPTER 1

INTRODUCTION

Cancer forms when healthy cells in change in and grow out control, forming an the called the cancer. A cancer can cancerous r benign. A cancerous cancer is malignant, meaning that grow and spread over other parts of the body. As there begun as a cancer means that cancer can be grow but won't spread.

Doctors diagnose carcinoma additional than 3 million Americans annually, making in foremost common sort of cancer. If carcinoma is found early, it can usually be treated with topical medications, procedures wiped out office a dermatologist, or outpatient surgery. A dermatologist may doctor who focuses diseases and conditions of the skin. As a result, carcinoma is liable for but 1% all cancer deaths.

In some cases, carcinoma could also more advanced in need management to a

multidisciplinary team to always a dermatologist, surgical and oncologist, radiation oncologist, and to a medical oncologist. These are in doctors meet their patient, and together they're going recommend the simplest path forward treat cancer. In such instances, the surgical oncologist will recommend surgery be performed operating room because the procedure treat the cancer too extensive for an office setting.

1.1 MOTIVATION

Prior to the 1980s, melanoma detection was carried out by spotting the macroscopic features, as they were mostly recognized when they were considerable in size. This made the early detection unlikely and mortality rates continued to increase. In 1985, a research team at the New York University came up with the ABCD acronym which stands for Asymmetry, Border

irregularity, Color variegation, Diameter (ABCD) as a simple yet effective tool to educate the general public for the early recognition of melanoma. After 1990, screening conducted through the physicians and the use of baseline full-body imaging became the common approach to detect melanoma early. Later, computer augmented digital image analysis became the new trend due to its strong sensitivity and specificity of detection compared with the manual dermoscopy.

1.2 PROBLEM DESCRIPTION

High occurrence of skin cancer compared to other cancer types is a dominant factor in making it one of the most severe health issues in the world. Historically, melanoma is a rare cancer, but in the past five decades, the worldwide occurrence of melanoma has drastically risen. In fact, it is one of the prominent cancers in average years of life lost per death. Adding to the strain, the financial burden of melanoma treatment is also expensive. Out of the $8.1 Billion in all skin cancer treatment costs in the USA, $3.3 Billion are spent only on Melanoma. Squamous Cell Carcinoma and Basal Cell Carcinoma, are eminently curable if diagnosed and treated on in the early stages. The five-year survival rate of patients with early-stage diagnosis of melanoma is around 99%. Therefore, timely detection of skin cancer is the key factor in reducing the mortality rate.

1.3 OBJECTIVE

 To provide doctors good software to identify cancer and their causes.

 The main reason behind the development of this application is to provide proper treatment assoon as possible and protect the human life which is in danger. Provide a solution appropriately at early stages.

 The manual identification is not so fast, more accurate and efficient for user. To overcomethose problem this application is design.

 Get timely consultation.

1.4 SCOPE AND LIMITATIONS

1.4.1 SCOPE

The cardinal objective of this project is to develop state of the art Convolutional Neural Network (CNN) model to perform the classification of skin lesion images into respective cancer types. The model is trained and tested on the dataset made available by International Skin Imaging Collaboration (ISIC). The model can be used for analyzing the lesion image and find out if it's dangerous at early stage.

1.4.2 LIMITATIONS

 Skin cancer can be difficult to diagnose because they can sometimes be hard to detect.

 Imaging tests such as CT scans, Skin imaging scans, are often used to detect skin cancer, but they are not always 100% accurate.

 Early detection of skin cancer is essential for successful treatment, but this can be difficult.

1.5 SYSTEM SPECIFICATIONS

1.5.1 HARDWARE CONFIGURATION

Processor: 11th Gen Intel(R) Core (TM) i5-1135G7 @ 2.40GHz 2.42 GHzInstalled
Memory (RAM): 8.00 GB

1.5.2 SOFTWARE CONFIGURATION

In Skin Cancer Detection we use some libraries in python. The list of libraries are:

- • TensorFlow
- • Pandas
- • NumPy
- • OpenCV
- • Keras
- • PIP
- • Python

1.5.2.1 Python

Python is an interpreted, high-level, general purpose programming language created by Guido Van Rossum and first released in 1991, Python's design philosophy emphasizes code Readability with its notable use of significant Whitespace. Its language constructs and object oriented approach aims to help programmers write clear, logical code for small and large-scale projects. Python is dynamically typed and garbage collected. It supports multiple programming

paradigms, including procedural, object-oriented, and functional programming

1.5.2.2 PIP:

It is the package management system used to install and manage software packages written in Python.

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1.5.2.3 NumPy:

NumPy is a general-purpose array-processing package. It provides a high- performance multidimensional array object, and tools for working with these arrays. It is the fundamental package for scientific computing with Python. It contains various features including these important ones:

- A powerful N-dimensional array object
- Sophisticated (broadcasting) functions
- Tools for integrating C/C++ and Fortran code
- Useful linear algebra, Fourier transform, and random number capabilities

1.5.2.4 OpenCV:

OpenCV (Open-source computer vision) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by willow garage then Itseez (which was later acquired by Intel). The library is cross platform and free for use under the open source BSD license. OpenCV supports some models from deep learning frameworks like TensorFlow, Torch, PyTorch (after converting to an ONNX model) and Caffe according to a defined list of supported layers. It promotes Open Vision Capsules. which is a portable format, compatible with all other formats.

1.5.2.5 PIL:

The Python Imaging Library adds image processing capabilities to your Python interpreter. This library provides extensive file format support, an efficient internal representation, and fairly powerful image processing capabilities. The core image library is designed for fast access to data stored in a fewbasic pixel formats. It should provide a solid foundation for a general image processing tool.

1.5.2.6 Tensor Flow:

Tensor flow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. It is used for both research and production at Google.

1.5.2.7 Keras:

Keras is an open-source neural-network library written in Python. It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, R, Theano, or Plaid ML. Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible. Keras contains numerous implementations of commonly used neural-network building blocks such as layers, objectives, activation functions, optimizers, and a host of tools to make working with image and text data easier to simplify the coding necessary for writing deep neural network code.

1.5.2.8 Pandas:

Pandas is the most popular python library that is used for data analysis. It provides highly optimized performance with back-end source code is purely written in C or Python. We can analyze data in pandas with

1. Series

2. Data frames

1.5.2.9 Colab:

Colab is a free Jupyter notebook environment that runs entirely in the cloud. Most importantly, it does not require a setup and the notebooks that you create can be simultaneously edited by your teammembers - just the way you edit documents in

Google Docs. Colab supports many popular machine learning libraries which can be easily loaded in your notebook.

1.5.2.10 Kaggle:

Kaggle is an online community platform for data scientists and machine learning enthusiasts. Kaggle allows users to collaborate with other users, find and publish datasets, use GPU integrated notebooks, and compete with other data scientists to solve data science challenges. Images can be in the form of .csv (comma separated values), .dat (data) files in grayscale, RGB, or HSV or simply in

.zip file as was in the case of our online Kaggle dataset.

CHAPTER 2
SYSTEM STUDY

2.1 EXISTING SYSTEM

 This project may be a method for the detection of Melanoma carcinoma using the Imageas processing tools.

 In this input the system is skin lesion image then applying in image processing techniques, it analyses conclude about the presence of carcinoma.

 The Lesion is Image to analysis tools checks as varied Melanoma in parameters, Color, Area perimeter, diameter to texture, size to shape analysis for image segmentationand the feature stages. The extracted feature parameters that are wont to classify image as non Melanoma and also Melanoma cancer lesion.

2.1.1 LIMITATIONS

 Most of the approaches are validated with the fig share dataset, which is an imbalanced dataset and affects the performances of classification approaches. Hence, there is a need to validate Skin Cancer classification approaches on another balanced dataset. ML, in its traditional form,necessitates domain knowledge and experience

 Manual feature extraction necessitates time and effort, reducing the system's efficiency.

 On the other hand, employing DL, particularly CNN, in medical imaging is challenging, as it requires a significant amount of data for training. In contrast, deep TL- based algorithms can avoid these drawbacks by using automatic feature extraction and robust classification applications based on convolutional layers.

2.2 PROPOSED SYSTEM

 This project may be a method for the detection of Melanoma carcinoma using Image processing tools.

 In this input the system is that skin lesion image then applying image processing techniques, it analyses conclude about the presence carcinoma.

 In Lession to Image analysis tools checks in the varied Melanoma parameters, Color, Area perimeter, diameter etc. texture, size and shape analysis for image segmentation and the feature stages.

 The extracted to feature parameters wont of classify the image as Non- Melanoma and

Melanoma cancer lesion. Through poll we are getting to collect patient after treatment

CHAPTER – 3

METHODOLOGY

3.1 DATA PREPROCESSING

Dataset used for this are extracted from kaggle towards skin cancer Detection . It consists of 10000 images of skin cancer. The training data consists of 8000 images and testing data consists of

Fig 2.3.1 IMAGES OF SKIN CANCER DATASET

3.1.1 IMAGE PREPROCESSING:

Image preprocessing is done by using OPEN CV and NUMPY

3.1.2 OpenCV:

- OpenCV-Python library of Python bindings in designed unravel computer vision problems.
- OpenCV-Python makes use Num py, by which may highly optimized library numericaloperations a MATLAB-style syntax.
- All tin Open CV array are structures converted a and from Num py arrays.

- This also makes it easier to integrate other a libraries is that use Num py SciPy andMatplotlib.
- OpenCV to be capable image analysis and processing.

3.1.2 NumPy:

Import- numpy :as np

- NumPy, that stands Numerical Python, be a library consisting of multidimensional as

arrayobjects and set a routine for processing those arrays.

- Using as Num Py, mathematical and logical on operations are arrays in often performed.
- The array object in NumPy is named ndarray, it provides tons of supporting functions that make working with ndarray very easy.
- NumPy is an open-source numerical Python library. Num Py an extension of Numeric and Numarray.
- Num py contains random number generators. NumPy may wrapper around library implemented in C.
- Pandas is objects reply heavily NumPy objects. Essentially, Pandas extends Numpy

3.2 IMAGE SEGMENTATION & FEATURE EXTRACTION:

Image segmentation is a process of dividing image into regions or categories. In the dermoscopic images two types of fabric things first normal skin and second is lesion area so here we have done segmentation with Otsu thresholding technique. Using Texture-Based segmentation extracting the features from the image. GLCM (Gray Level Co-occurrence Matrix) is the

statistical method examining the spatial relationship between the pixel. This technique works by creating the co- occurrence matrix were to calculate the frequency of occurrence of a pixel with the

grey-level value is adjacent to a pixel with grey-level value j in any given direction and selected separatingdistance The GLCM matrix gives four statistics Correlation, Contrast, Energy, Homogeneity. There some problem in segmentation of dermoscopic images due to the contrast of images like under segmentation and over-segmentation so we are concentrating on segmentation based on texture features.

3.2.1 IMAGE CLASSIFICATION :

Deep learning is one of the best techniques for image classification. Based on the texture featureswe are training the dataset for classification. Here first we are giving Extracted feature to

the Neural network for checking performance of image classification then we are using CNN (Convolutional Neural Network) it is one of the deep learning techniques for classification, Dermoscopic images classification is done in 7 classes. ‘Melanocytic nevi','Melanoma','Benign keratosis’, ‘Basal cell carcinoma', 'Actinic keratoses', 'Vascular lesions', ' Dermatofibroma ' it is done by using automated extracted features by CNN images. In this step, we are passing Preprocess Images to the CNN classification.

3.2.2 SYSTEM ARCHITECTURE

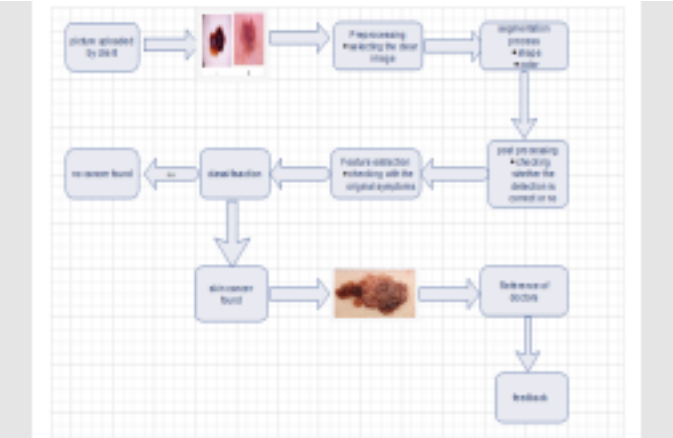
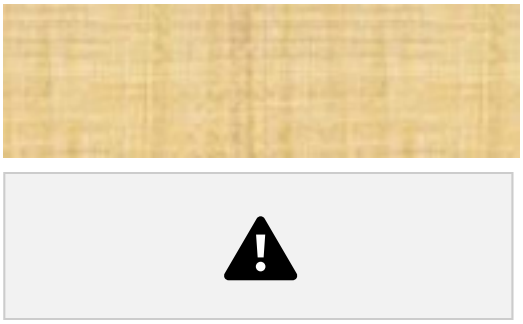


Fig 5 system architecture diagram

In this figure of system architecture diagram we have clearly explained the steps for detecting 7 types of skin cancer. First step comes here is taking picture from the client or customer for detecting. After this next step is preprocessing which is used to convert the picture to gray scale and reshaping is also done and the next step is segmentation process in which the shape and color of the symptom or the patch will be identified. Next step is post processing in which the detectionsdone in the before steps are correct or not, after his feature extraction is done in which the symptoms given in the picture by client is compared with the original cancer symptoms. Next stephere comes is classification in which the website gives whether it is cancer or not.

CHAPTER – 4

MODULES



Modules

Testing **Fig.4**

Modules

Detection

We have 3 modules in Skin Cancer Detection.

They are: - ✧ Detection

✧ Testing

✧ Reference & Feedback

feedback

4.1 DETECTION:

Reference and

Detection module used them detect the image of skin cancer. In this we detect images from skincancer by using “FEED FORWARD NEURAL NETWORK ALGORITHM **“.**

- A feed forward neural network has bimologically inspired by classification which algorithm. It consists of number of simple to neuron-like as processing in units, organized layers. Every unit in a layer connected with in the units in the previous layer. This is they are called feedforward neural networks.
- The feed forward neural network is the in first and simplest type of artificial neural network devised. In the network, the information in one direction—forward—from a input nodes, through the hidden to nodes and to the output nodes. There non cycles in loops in the network.
- Two basic feed-forward neural networks (FFNNs) created using TensorFlow in deep learninglibrary in Python.
- Steps required build a simple feed-forward neural network to Tenso r Flow by explaining each step details. For before actual building a neural network, some preliminary steps recommended to discussed. The summarized steps are as follows:

1. Reading the training data (inputs and outputs)

2. Building to connect an neural networks layers
3. Building a loss function to assessthe prediction error
4. Create the training loop for training network and updating parameters
5. Applying some testing data to assess the network prediction accuracy

This module briefly introduces the core concepts employed in modern convolutional neural networks, with an emphasis on methods that have been proven to be effective for tasks such as object detection and semantic segmentation. Basic network architectures, common components and helpful tools for constructing and training networks are described.

4.2 TESTING:

Testing module is used to test and predict the image of skin cancer. For testing we used "Evaluation function from keras ".

 Evaluation a is process during development to the model check whether this model fit for given problem and corresponding data.

 Keras provides a function, evaluate which does evaluation of the model.

 There are three main arguments,

1. Test data
2. Test label
3. verbos T/F

Keras separate a portion of your training data to validation of dataset and evaluate that performance of your model on validation dataset to each epoch. You can do this by setting the validation split argument on the fit () function to a percentage of the size of your training dataset.

4.3 REFERNCE & FEEDBACK:

We have used a website named as 'Aida Form' for creating feedback form. This helps to create a form and generates a hyperlink so that we can send it to our customersvia mail or we can directly paste in our website.

 Aida Form let do that is a blank template in we the add form elements with as simple

ondrag-and-drop in motions. Plan within out what to evaluate and fill custom.

- Review response in the summaries as if statistics with average to ratings in frequently yeschosen to options gain because insights and improve.
- Export responses to data sheets of Excel for deeper evaluation and their feedback dataefficiently.

CHAPTER 5
SYSTEM DESIGN AND DEVELOPMENT

5.1 INPUT DESIGN

Input design is one of the most expensive phases of the operation of computerized system and is often the major problem of a system. A large number of problems with the system can usually be traced back to fault input design and method. Needless to say, therefore that the input data is the life block of a system and has to be analyzed and designed with the most consideration.

The decision made during the input design are:

- To provide cost effective method of input.
- To achieve the highest possible level of accuracy.
- To ensure that input is understood by the user.

System analysts decide the following input design details like, what data item to input, what

medium to use, how the data should be arranged or coded data items and transaction needing validations to detect errors and at last the dialogue to guide users in providing input. Input data of a system may not be necessarily a raw data captured in the system from scratch. These can also be the output of another system or sub – system. The design of input covers all phases of input from the certain of initial data to actual entering the data to the system for processing.

5.2 OUTPUT DESIGN

Output design generally refers to the results and information that are generated by the system. For many end users, output is the main reason for developing the system and the basis on whichthey evaluate the usefulness of the application. The analysis of the objective of a system leads to determination of outputs. Outputs of a system can take various forms.

The output from a system is the justification for its existence. If the outputs are inadequate in anyway, the system itself is inadequate. The basic requirements of output are that it should be accurate, timely and appropriate, in terms of content, medium and layout for its intended purpose. Hence it is necessary to design output so that the objectives of the system are met in the best possible manner. Theoutputs are in the form of reports.

When designing output, the system analyst must accomplish things like, to determine what information to be present, to decide whether to display or print the information and select the output medium to distribute the output to intended recipient External outputs are those, whose destination will be outside the organization and which require special attention as the project image of the organization.

5.3 DATABASE DESIGN

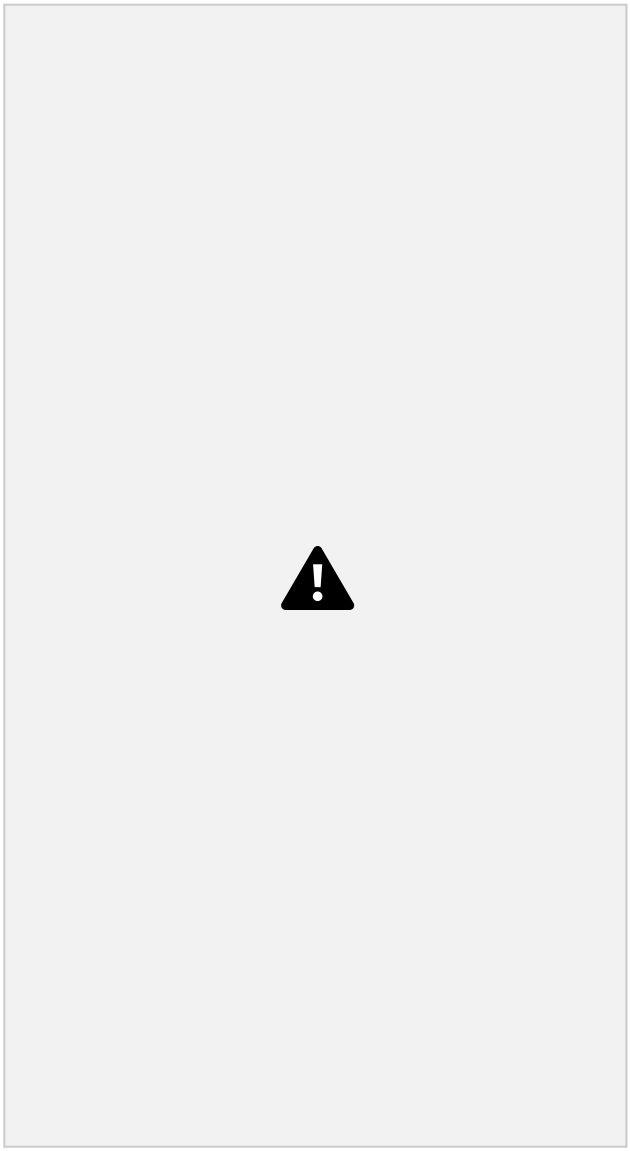
Database design is the process of designing, developing, implementing, and maintaining a datastorage system. It involves the development of data models and the use of software tools to define and maintain the structure of the data. The goal of the design process is to create a data model that defines the data elements, the relationships between them, and the rules and constraints that govern their use. The data model is then used to create a database that stores and retrieves data in an efficient and securemanner.

5.3.1 Kaggle:

Kaggle is an online community platform for data scientists and machine learning enthusiasts. Kaggle allows users to collaborate with other users, find and publish datasets, use GPU integrated notebooks, and compete with other data scientists to solve data science challenges. Images can be in the form of .csv (comma separated values), .dat (data) files in grayscale simply in.zip file as was in the case of our online Kaggle dataset. In any project first comes collecting of dataset so here we have taken dataset from the famous website known as “Kaggle” which consists of 10000 images and from that we have taken 8000 images training and the a remaining images for testing .so this project mainly have 7 class ofclassification for skin cancer:

5.4 SYSTEM FLOW DIAGRAM

A System Flow Diagram is a graphical representation of the process flow of information and material through a system. It is used to show the flow of inputs and outputs, their sources and destinations, and the interrelationships among them. System flow diagrams are useful for analyzing and improving any system, from simple to complex. They can be used to identify areas for improvement, to plan for future changes, and to document existing systems.



5.6 DEVELOPMENT ENVIRONMENT

5.6.1 VISUAL STUDIO CODE:

VSCode (Visual Studio Code) is a free, open-source code editor developed by Microsoft for Windows, Linux, and macOS. It includes support for debugging, embedded Git control, syntax highlighting, intelligent code completion, snippets, and code refactoring. It is highly customizable, allowing users to change the theme, keyboard shortcuts, preferences, and install extensions that add additional functionality.

5.6.1.1 FEATURES:

i) IntelliSense:

IntelliSense is a code-completion tool that helps you write code faster and with fewer errors. It can provide a list of available variables, functions, and other code elements you can use to complete aline of code.

ii) Code Navigation:

Code navigation helps you quickly jump to any file, symbol, or line in your code. You can opena file, search for symbols or lines, and access definitions and references with just a few clicks

iii) Debugging:

VS Code has built-in debugging capabilities for Node.js, TypeScript, JavaScript, and other languages. You can set breakpoints, step through code, and use the console to execute code and inspect variables.

iv) Extensions:

VS Code has an extensive library of extensions that we can use to customize our development environment and add extra functionality. You can add support for new languages, themes, linters, andother tools

v) Source Control:

VS Code integrates with Git and other source control systems, allowing you to commit and push changes directly from the editor. You can also review changes and resolve merge conflicts withoutleaving the editor.

vi) Task Automation:

The editor can help you automate common development tasks

vii) Multi-Language Support:

VS Code supports a wide range of languages and frameworks, including JavaScript, TypeScript, Python, Go, and more.

5.6.2 HTML:

HTML (HyperText Markup Language) is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading StyleSheets (CSS) and scripting languages such as JavaScript. HTML describes the structure of a website semantically along with cues for presentation, making it a markup language rather than a programming language. It is used for creating web pages and web applications. With HTML, web developers can create content, structure, and style information for webpages and applications. HTML is used to create and format documents, and to define the structure and layout of a webpage.

5.6.2.1 USES:

- Creating web pages and web applications Developing web content
- Adding structure, layout, and style to web pages
- Creating forms, tables, and other interactive elements
- Creating and linking to JavaScript, CSS, and other files
- Inserting multimedia and other objects
- Creating navigation menus and links

- Validating code to meet web standards
- Enhancing search engine optimization (SEO)

5.6.3 CSS:

CSS (Cascading Style Sheets) is a style sheet language used for describing the presentation of a document written in a markup language like HTML. CSS is used to define styles for your web pages,including the design, layout and variations in display for different devices and screen sizes.It is used used for describing the look and formatting of a document written in a markup language. It is most often used for styling webpages written in HTML and XHTML, but can be used with any kind of XMLdocument, including SVG and XUL. CSS is designed to enable the

separation of document content from document presentation, including elements such as the layout, colors, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting by specifying the relevant CSS in a separate file, and reduce complexity and repetition in the structural content.

5.6.4 JAVASCRIPT:

JavaScript is a programming language used to make web pages interactive. It is used to createand control dynamic website content, such as changing content on the page, responding to user input, and controlling multimedia. It is commonly used alongside HTML and CSS. The purpose of JavaScript is to create interactive web pages and dynamically display content to users. It can be used to validate user input, create games and animations, and much more. JavaScript is also used to create mobile and desktop applications, as well as back-end server applications.

The main objective of JavaScript is to enable web developers to create dynamic web pages that can interact with the user, control the browser, and dynamically alter the content and structure of web pages. It is also used to add interactivity and create rich, dynamic web applications.

CHAPTER – 6
SYSTEM TESTING

6.1 TESTING:

Testing is vital to the success of the system. System testing makes a logical assumption that if all the parts of the system are correct, the goal will be successfully achieved. Inadequate

testing or non- testing leads to errors that may not appear until months later. This creates two problems. The time lag between the cause and appearance of the problem. The effect of system errors on files and records within the system. A small system error can conceivably exploded into much larger problem. Effective early in the process translates directly into long term cost savings from a reduced number of errors.

Testing is the process of executing a program with the intent of finding any errors. A good test of source has the high probability of finding a yet undiscovered error. A successful testing is the one that uncovers a yet undiscovered error. The purpose of this test is to evaluate the performance of a product or system. This includes measuring the accuracy, reliability, responsiveness, usability, and other aspects of the product or system. The test may also include the evaluation of the user experience. It is important to ensure that the test is conducted in a controlled environment, so that the results obtained are accurate and reliable. Additionally, it is important to ensure that the test is conducted in amanner that is safe and secure for the users. Finally, it is important to ensure that the test is conducted in a way that is consistent with the product or system's design and requirements.

6.2 UNIT TESTING:

Unit testing is a process that verifies that a given piece of code is working as expected, and is an important part of software development. In the case of skin cancer detection, unit testing would involve testing the code that is used to detect cancers, such as the algorithms used to analyze

the images.Unit tests should be written to ensure that the code correctly detects cancers and correctly reports whether or not a cancer is present. The tests should also check that the code correctly handles any errorsthat may occur during the analysis process. The test cases should be designed to ensure that the algorithms are producing the expected results and that the system is correctly detecting cancers in the images. The tests should also be designed to check for edge cases, such as images with very low contrast or other conditions that could affect the accuracy of the detection.

Design the set of tests:

The language used for the development of the product is python, so that we can go

through andtest every action and hope that we get the expected response. Here we will create a template for everytest. So, the two test sets are GUI bases tests.

- **Test set 1 for windows:**
    1. Are all functions related to the window operational?
    2. Are all relevant controls, dialog boxes and buttons available and properly displayed for the window?

- **Test set 2 for mouse operations:**
    1.Are all functions properly addressable by the mouse?
    2.Does each function perform as advertised?
    3.Do multiple or incorrect mouse picks within the window caused unexpected side effects?

- **Test set 1:**
    1. Yes, all functions relate to that window.
    2. Yes, all controls and objects are displayed at their appropriate places.
- **Test set 2:**
    1. Yes,all are addressable by the mouse.
    2. Yes, functions perform as advertised.

6.3 FUNCTIONAL TESTING:

Functional testing of a skin cancer detection system should include testing of the accuracy of the system's detection algorithms, as well as its ability to identify and diagnose different types of cancer.

6.4 NON-FUNCTIONAL TESTING:

Non-functional testing is any type of testing that is done to ensure that the system meets non functionalrequirements such as usability, performance, scalability, security, etc. For a skin cancer detection system, non-functional testing could include:

6.4.1 Usability Testing:

This type of testing is done to ensure that users can easily interact with the system and understand its features. Usability testing for skin cancer detection would involve testing a system or device used to detect skin cancer. This could be done using a combination of user interviews, surveys, and observation. The user experience while using the system, such as how easy it was to use, how satisfied with the results, and what suggestions they had for improvement. Surveys could be used to gather dataon the user's experience with the system, such as how often they use it, what features they find most useful, and what features they think could be improved. This data can then be used to identify any usability issues and make changes to the system to improve its usability.

6.4.2 Performance Testing:

Performance testing is a type of testing that measures the speed, scalability, and stability of a system or application under a particular workload. Performance testing for skin cancer detection should measure the accuracy rate of the system or application in identifying skin cancer. This could be done by testing the system or application with a variety of skin scans with known cancer locations and comparing the results to the actual locations. The system or application should also be tested for its ability to detect cancer of various sizes and types, as well as its ability to scale up to higher workloads. Additionally, its stability should be tested to ensure it can remain operational for extended periods of time

6.5 Integration Testing:

Integration testing for skin cancer detection involves combining the various elements of the system and ensuring that the components interact with each other as expected. This testing also involves verifying that the system as a whole meets the user's requirements. The user interface should be testedto ensure it is intuitive and easy to use. Integration testing should also be done to ensure that the system is accurate and reliable. This involves testing the system with multiple datasets and comparing the results against the expected outcomes. The system should also be tested to verify it is able to detect a range of skin cancer and that it is not producing false positives or false negatives. Finally, integrationtesting should be done to ensure the system is secure and that confidential data is protected. This involves verifying that the system is correctly encrypting data and that the authentication protocols aresecure.

6.6 Validation Testing:

Validation testing is the process of testing a model to ensure that it is working as expected. It is an important step in the development of any machine learning system, as it helps to ensure that the modelis doing what it is intended to do. In the case of skin cancer detection, validation testing would involve testing the model on a dataset that contains instances of both skin cancer and normal skin scans. The model would then be evaluated on how accurately it can differentiate between the two. This could include metrics such as accuracy, specificity, and sensitivity. The performance of the model on this dataset can then be compared to that of a human expert to determine how closely the model is performing.

CHAPTER 7
SYSTEM IMPLEMENTATION

Implementation is the stage in the stage in the project where the theoretical design is turned into a working system. The most critical stage is achieving a successful system and giving confidence on the new system for the users that it will work efficiently. It involves careful, planning, investing of the current system, and its constraints on its implementation, design of methods to achieve the change over, and evaluation of the change over methods.

The coding step translates the detail design representation into a programming language realization. The coding should have some characteristics

 Ease of design to code translation

- Code efficiency
- Memory efficiency
- Maintability

Software maintenance is a set of software engineering activities that occur after software has beendelivered for the customer and put into operation. The success of software and the project relies and the maintenance procedure performed. As with the venture of human, not a single one is perfect. The further modification is left to the followers. It is because, the opinion or vision of a thing differs fromindividual to individual. The maintenance is performed at regular intervals to keep the project safe and reliable. Every time changes attempted on the software will cause serious and unexpected side effects.so the maintenance of the software should be considered seriously. Software maintenance is of course far than fixing mistakes.

Maintenance can be described as the activities that are to be undertaken after software is released for the use. The system implementation of skin cancer detection is an important part of modern medical care. This process not only helps doctors to diagnose and treat patients, but it can alsohelp to save lives.

The different types of the maintenance are

- Corrective Maintenance
- Adaptive Maintenance
- Perfective Maintenance

The Corrective Maintenance deals with the problems that may occur to the software and what sort of corrective measures can be provided to the user on such situations. The 80% is spent adapting existing systems to change in their external environment, since I have used a platform independency the software will be adaptive to all the hardware and software

environments.

CHAPTER 8

RESULT AND DECISION

Here is the output screenshot where we can know whether a person has cancer or not This picture is for detecting Melanoma cancer which is one of the types of skin cancer.

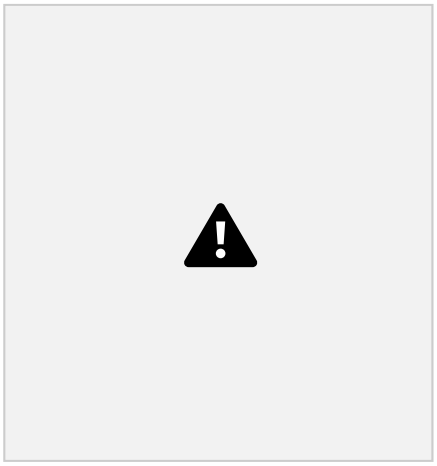


Fig 8.1 detection of melanoma

This picture is for detecting Melanoma cancer which is one of the types ofskin cancer. 

This is the picture where we can find the reference of doctors

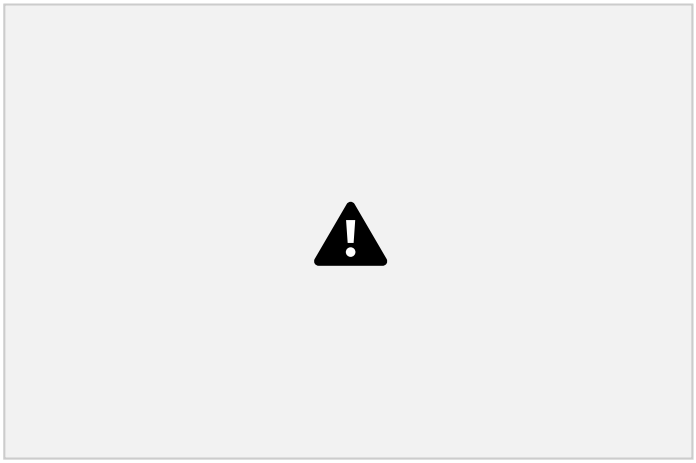


Fig 8.3 reference of hospitals

CHAPTER 9

CONCLUSION

In the proposed system, Image Pre-Processing, Image Segmentation and Image Classification steps are performed for categorizing skin lesion images into melanoma or benign. Data augmentation technique is used in Convolutional Neural Network for increasing the number of images which leads to better performance of proposed method. Experimental results show an accuracy of CNN algorithm developed with data augmentation is higher than the CNN algorithm created without data augmentation. The proposed method detects melanoma faster than the biopsy method. The proposed method can be extended to identify different types of skin related diseases. In this projectwe also designed for the reference of doctors and a feedback form which is used to know the experience of the patients.

CHAPTER 10
SCOPE OF FUTURE ENHANCEMENT

Future enhancements to the skin cancer detection using deep learning could include improved detection accuracy, increased scalability of the model, and improved performance in low resourced settings. Additionally, methods to reduce the training and testing time of the model, as well as techniques to interpret and explain the model's output could be further explored. Furthermore, further development of the model could be explored to detect different types of skin cancer, such as Basal cell carcinoma, Squamous cell carcinoma**,** Merkel cell cancer and Melanoma. Additionally, methods to better identify and classify small cancers could be explored to make the model more accurate and reliable. Finally, future research could also be done to investigate the potential applications of the model in clinical settings.

Future enhancements can also include: Incorporating 3D convolutional neural networks (3D CNNs) for better accuracy. 3D-CNNs are better suited for medical image analysis as they can take into account the spatial relationships between pixels, Leveraging transfer learning to train the model on larger datasets with more data samples. This can help the model better identify and classify skin cancer, Exploring cutting-edge deep learning methods such as Generative Adversarial Networks(GANs) and Capsule Networks to further improve accuracy, Incorporating a heatmap to visualize the regions in an image where the model had the highest confidence when predicting a cancer. This can help radiologists better understand the model’s predictions, Exploring ensemble methods to further improve the model’s performance. Ensemble methods combine the predictions of multiple models forbetter accuracy, Incorporating attention mechanisms to allow the model to focus on important features.This can help the model better identify cancers.

In the future, the proposed model can be trained for multimodal images. The time complexity is one of the drawbacks of the proposed method which can be reduced in the future.

CHAPTER - 11
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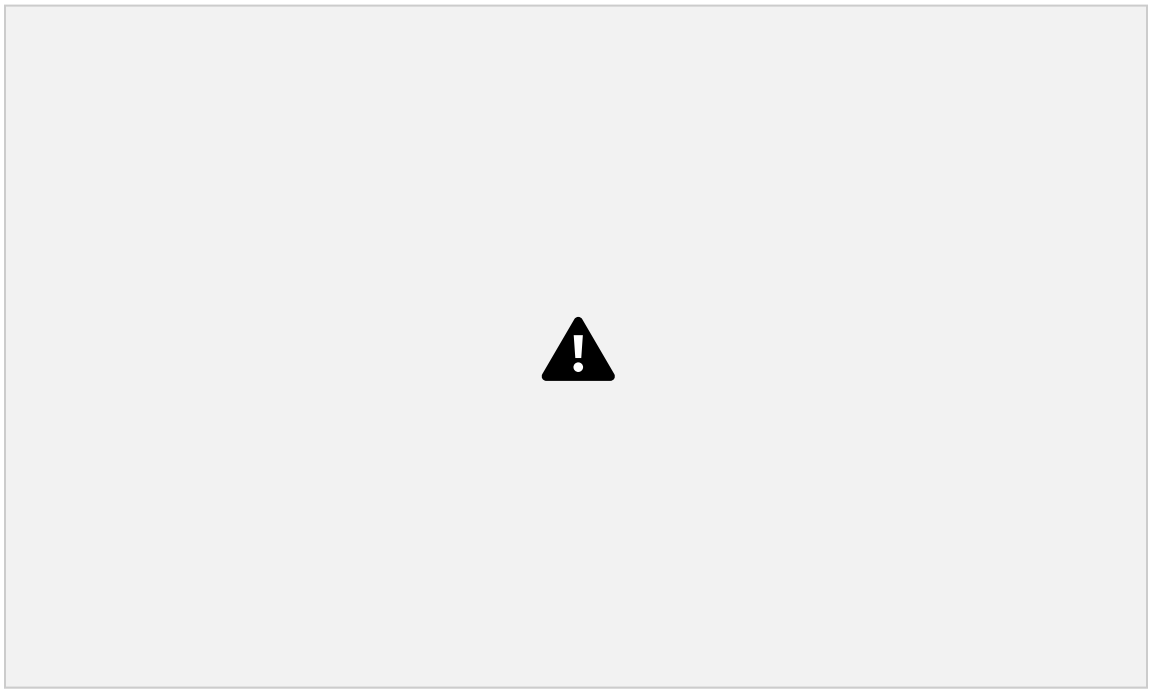
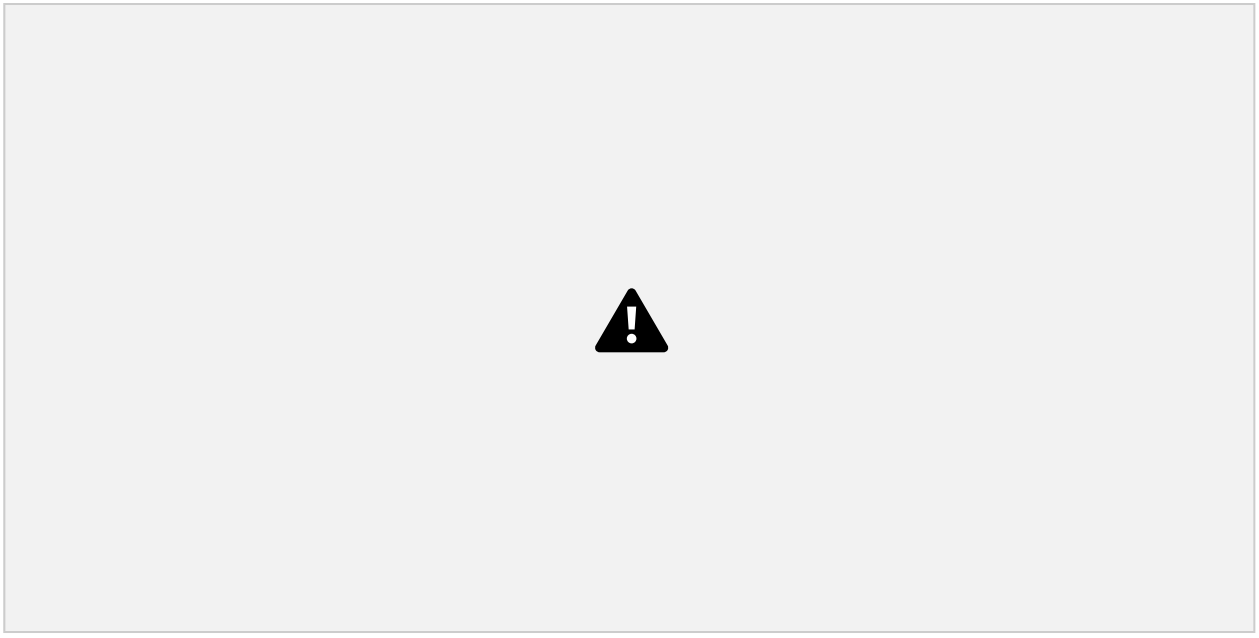
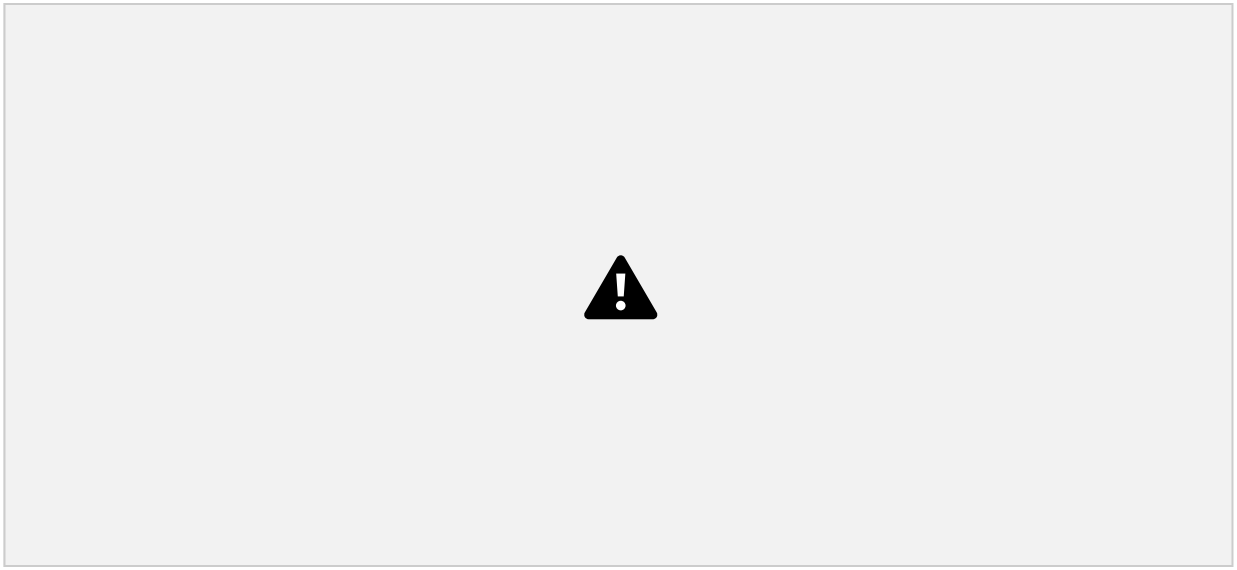
CHAPTER – 12

APPENDIX A

SAMPLE SCREEN







APPENDIX B

CODING

App.py:

```
from _future_ import division, print_function
import sys
import os
import glob
import re
from pathlib import Path
from io import BytesIO
import base64
import requests

# Import fast.ai Library
from fastai import *
from fastai.vision import *

# Flask utils
from flask import Flask, redirect, url_for, render_template, request
from PIL import Image as PILImage

# Define a flask app
app = Flask(_name_)

NAME_OF_FILE = 'model_best' # Name of your exported file
PATH_TO_MODELS_DIR = Path('') # by default just use /models in root dir
```



```
    classes = ['Actinic keratoses', 'Basal cell carcinoma', 'Benign keratosis',
     'Dermatofibroma', 'Melanocytic nevi', 'Melanoma', 'Vascular lesions']

def setup_model_pth(path_to_pth_file, learner_name_to_load, classes):
   data = ImageDataBunch.single_from_classes(
      path_to_pth_file,classes,zds_tfms=get_transforms(),
size=224).normalize(imagenet_stats)
```

```
    learn = cnn_learner(data, models.densenet169, model_dir='models')
    learn.load(learner_name_to_load, device=torch.device('cpu'))
    return learn

learn = setup_model_pth(PATH_TO_MODELS_DIR, NAME_OF_FILE, classes)

def encode(img):
    img = (image2np(img.data) * 255).astype('uint8')
    pil_img = PILImage.fromarray(img)
    buff = BytesIO()
    pil_img.save(buff, format="JPEG")
    return base64.b64encode(buff.getvalue()).decode("utf-8")

def model_predict(img):
    img = open_image(BytesIO(img))
    pred_class,pred_idx,outputs = learn.predict(img)
    formatted_outputs = ["{:.1f}%".format(value) for value in [x * 100 for x in
torch.nn.functional.softmax(outputs, dim=0)]]
    pred_probs = sorted(
            zip(learn.data.classes, map(str, formatted_outputs)),
            key=lambda p: p[1],
            reverse=True
        )
```



```
    img_data = encode(img)
    result = {"class":pred_class, "probs":pred_probs, "image":img_data}
    return render_template('result.html', result=result)


@app.route('/', methods=['GET', "POST"])
def index():
```

```
    # Main page
    return render_template('index.html')


@app.route('/upload', methods=["POST", "GET"])
def upload():
    if request.method == 'POST':
        # Get the file from post request
        img = request.files['file'].read()
        if img != None:
        # Make prediction
            preds = model_predict(img)
            return preds
    return 'OK'

@app.route("/classify-url", methods=["POST", "GET"])
def classify_url():
    if request.method == 'POST':
        url = request.form["url"]
        if url != None:
            response = requests.get(url)
            preds = model_predict(response.content)
```



```
            return preds
    return 'OK'


if _name_ == '_main_':
    port = os.environ.get('PORT', 8008)

    if "prepare" not in sys.argv:
```

app.run(debug=True, host='0.0.0.0', port=port)**Main.js**

: $(document).ready(function () {

$('.image-section').hide();

$('.loader').hide();

$('#result').hide();

function readURL(input) {

if (input.files && input.files[0]) {var
reader = new FileReader();
reader.onload = function (e) {
$('#imagePreview').css('background-image', 'url(' + e.target.result +

')'); $('#imagePreview').hide();

$('#imagePreview').fadeIn(650);

}

reader.readAsDataURL(input.files[0]);

}

}

```
$("#imageUpload").change(function ()

{$('.image-section').show(); $('#btn-predict').show();

$('#result').text('');

$('#result').hide();
readURL(this);
});

$('#btn-predict').click(function () {

var form_data = new

FormData($('#upload-file')[0]); $(this).hide();

$('.loader').show();

$.ajax({

type: 'POST', url:
```



```
'/predict', data:
form_data,
contentType: false,
cache: false,
processData: false,
async: true,
success: function (data) {
```

```
$('.loader').hide();

$('#result').fadeIn(600);

$('#result').text(' Result: ' + data);
console.log('Success!');
}
}
);
}
);
}
);
```

Skin Cancer cropping of

Images :

```
import numpy as np from tqdm import tqdm import
cv2 import os
import imutils
def crop_img(img):
```



```
gray = cv2.cvtColor(img, cv2.COLOR_RGB2GRAY) gray
= cv2.GaussianBlur(gray, (3, 3), 0)
thresh = cv2.threshold(gray, 45, 255, cv2.THRESH_BINARY)[1]thresh
= cv2.erode(thresh, None, iterations=2)
thresh = cv2.dilate(thresh, None, iterations=2)

cnts = cv2.findContours(thresh.copy(), cv2.RETR_EXTERNAL,
cv2.CHAIN_APPROX_SIMPLE)
```

```
cnts = imutils.grab_contours(cnts)

c = max(cnts, key=cv2.contourArea) extLeft
= tuple(c[c[:, :, 0].argmin()][0])
extRight = tuple(c[c[:, :, 0].argmax()][0])

extTop = tuple(c[c[:, :, 1].argmin()][0])

extBot = tuple(c[c[:, :, 1].argmax()][0])
ADD_PIXELS = 0
                    new_img = img[extTop[1]-ADD_PIXELS:extBot[1]+ADD_PIXELS,
extLeft[0]-ADD_PIXELS:extRight[0]+ADD_PIXELS].copy()

if_name_== "_main_":

training = "brain_tumour/Training"
testing = "brain_tumour/Testing"
training_dir = os.listdir(training)
testing_dir = os.listdir(testing)
IMG_SIZE = 256

for dir in training_dir:
```



```
save_path = 'brain_tumour/cropped/Training/'+ dir path =
os.path.join(training,dir)
image_dir = os.listdir(path) for img in
image_dir:
image = cv2.imread(os.path.join(path,img)) new_img =
crop_img(image)
new_img = cv2.resize(new_img,(IMG_SIZE,IMG_SIZE)) if not
os.path.exists(save_path):
```

```
os.makedirs(save_path) cv2.imwrite(save_path+'/'+img,
new_img)
for dir in testing_dir:

save_path = 'brain_tumour/cropped/Testing/'+ dir path =
os.path.join(testing,dir)
image_dir = os.listdir(path) for img in
image_dir:
image = cv2.imread(os.path.join(path,img))
new_img = crop_img(image)

new_img = cv2.resize(new_img,(IMG_SIZE,IMG_SIZE)) if not
os.path.exists(save_path):
os.makedirs(save_path) cv2.imwrite(save_path+'/'+img, new_img
}
```


APPENDIX C SCREENSHOTS