A

PROJECT PAHSE-1

REPORT

On

Skin Cancer Detection System

Submitted in partial fulfillment of the requirements for the degree of

Bachelor of Technology in **Information Technology**

By

1) **Rahul Jeevan Patil (**T2054491246043**)**
2) **Rohan Ravindra Suryawanshi (**T2054491293048**)**
3) **Prathamesh Prakash Shinde (**T2054491293041**)**
4) **Ashish Rajesh Lulla (**1954491246023**)**

Under the guidance

of

Dr. Bhushan Chaudhari

DEPARTMENT OF INFORMATION TECHNOLOGY

SHRI VILE PARLE KELAVANI MANDAL'S

INSTITUTE OF TECHNOLOGY, DHULE

Survey No. 499, Plot No. 02, Behind Gurudwara, Mumbai-Agra National Highway, Dhule-424001, Maharashtra, India.

Office Phone: 02562-297801 / 297601, Fax : 02562-297801, Mail: IOTDhule@svkm.ac.in

Academic Year 2023 – 24

SHRI VILE PARLE KELAVANI MANDAL'S

INSTITUTE OF TECHNOLOGY, DHULE

Survey No. 499, Plot No. 02, Behind Gurudwara, Mumbai-Agra National Highway, Dhule-424001, Maharashtra, India.

Office Phone: 02562-297801 / 297601, Fax : 02562-297801, Mail: IOTDhule@svkm.ac.in

Academic Year 2023 – 24

CERTIFICATE

This is to certify that Mr. Rahul Jeevan Patil
Mr. Rohan Ravindra Suryawanshi
Mr. Prathamesh Prakash Shinde
Mr. Ashish Rajesh Lulla

students of Information Technology, bearing has successfully completed project phase-1 report on

Skin Cancer Detection System

to my satisfaction and submitted the same during the academic year 2023-2024 towards the partial fulfillment of Bachelor of Technology under Dr. Babasaheb Ambedkar Technological University, Lonere, under the guidance of Dr. Bhushan Chaudhari

Dr. Bhushan Chaudhari
Project guide

Ms. Rubi Mandal
Project Co-Ordinator

Dr. Bhushan Chaudhari
HOD

DECLARATION

We declare that this written submission represents ideas in our own words and where other's ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signatures

Mr. Rahul Jeevan Patil	-
Mr. Rohan Ravindra Suryawanshi	-
Mr. Prathamesh Prakash Shinde	-
Mr. Ashish Rajesh Lulla	-

Acknowledgement

We have immense pleasure in expressing our interest and deepest sense of gratitude towards our project guide and Head of the Department **Dr. Bhushan Chaudhari** for the assistance, valuable guidance and co-operation in carrying out this project successfully. It is a privilege for us to have been associated with our Project Guide, during our Project Phase 1 work. We have greatly benefited from his/her valuable suggestion and ideas. It is with great pleasure that we express our deep sense of gratitude to him/her for his/her valuable guidance, constant encouragement and patience throughout this work. We express our gratitude and are thankful to all people who have contributed in their way in making this final year project phase 1 success. Particularly we want to thank **Prof. Rubi Mandal**, Project Coordinator for our department for making this process seamless for us and arranging everything so perfectly. I take this opportunity to thank all the classmates for their company during the course work and for the useful discussion, I had with them. We take this opportunity to express our heartfelt gratitude towards the Department of Information Technology of Shri Vile Parle Kelvani Mandal's Institute of Technology, Dhule and **Dr. Nilesh Salunkhe,** Principal of Shri Vile Parle Kelvani Mandal's Institute of Technology, Dhule, that gave us an opportunity for the presentation of our project phase 1 in the esteemed organization and for providing the required facilities in completing this project. We are greatly thankful to our parents, friends and other faculty members for their motivation, guidance and help whenever needed.

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-based 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 technique is 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 of sunlight. 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 death rate. 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.

Table of Contents

LIST OF FIGURES

CHAPTER 1
Introduction

Introduction to Project

The skin is the most exposed region of our bodies, and it is come into contact with dust, pollution, microorganisms, and UV radiations. These may be the causes of any type of skin disease, and skin-related diseases are also caused by genetic instability, making skin diseases more complex [14]. The epidermis and dermis are the two major layers of human skin. The epidermis is the outer or top layer of the skin and is made up of three types of cells.

(1) Basal cell carcinoma - Every year, more than one million new instances of basal cell carcinoma are detected in the United States. Basal cell carcinoma comes in a variety of forms, including the superficial type, which is the least concerning; the nodular type, which is the most common; and the morph form, which is the most difficult to treat because the tumors often grow into the surrounding tissue (infiltrate) without a well-defined border[10].

(2) Squamous cell carcinoma - Its biologic behavior is similar to that of basal cell carcinoma in most cases, with a minor but significant risk of distant dissemination. It accounts for around 20% of all skin malignancies, however it is more common in immunocompromised individuals[10].

(3) Melanoma - It is usually made up of diverse colors ranging from brown to black. Amelanotic melanoma is a type of melanoma that is pink, red, or fleshy in color. It is more dangerous than other types of melanomas[10].

Because current diagnostic classifications do not adequately represent the diversity of the disease, they are insufficient for accurate prediction and treatment. Skin cancer is the deadliest sort of disease seen in humans among all types of skin diseases [9]. This can be discovered in the fair skinned are the most usually affected. There is a link between skin cancer and Malignant Melanoma and Non-Melanoma, Melanoma are the two forms of cancer. Skin cancer detection systems play a pivotal role in modern healthcare, leveraging advanced technologies to enhance the early identification of potentially malignant skin lesions. With the rising incidence of skin cancer globally, these systems provide a proactive approach to diagnosis, offering timely intervention and improved patient outcomes[10]. Employing sophisticated machine learning algorithms, such systems analyze dermatological images, aiding in the identification of subtle indicators and patterns indicative of various types of skin cancers. By amalgamating computer vision and medical expertise, these systems not only augment the efficiency of dermatologists but also extend healthcare accessibility, particularly in regions facing a shortage of specialized practitioners. The integration of such technology into telemedicine platforms further enables remote consultations and promotes preventive skin health practices. As an educational tool, skin cancer detection systems empower both healthcare professionals and the general public by disseminating knowledge about skin lesions and fostering awareness. Through their ability to reduce false negatives and positives, these systems contribute to accurate clinical decision-making. Ultimately, skin cancer detection systems represent a technological frontier in healthcare, playing a crucial role in the global efforts to combat the growing burden of skin cancer[15].

1.1 Motivation

The detection of cancer, located in different part of human body, is not a new problem. From the previous decades, doctors use innovates machines to capture the potentially part of body in which can exist abnormality. Doctor examines the abnormality and determine if it is cancer using their knowledge and experience. To detect skin cancer, which is one of the most common types of cancer, doctors examine the lesion and decide the type (malignant or benign). If the lesion evaluated as malignant, the patient follows the biopsy process, which is a painful process. Its trigger our mind to think how the current technology and especially machine learning can provide humans an easily access application which classify the lesion given an affordable second option before follow the infallible biopsy process.

Skin cancer is a very difficult problem with a lot of challenges since it is associated with visual media and medical science. The possible solutions are limited by the current technology and the deficit of thermoscopic images. In the future, the new knowledge in the field of image processing and machine learning algorithms, and also the expansion of the skin cancer dermoscopic image dataset can help us tackle the problem more efficiently and accurately, making right and proper decisions. But the enrich of image dataset is the most challenging task since this record are privacy so our model need to fulfill this need and does not reveal any information which can be used to identify the person. we deal with the problem of the Skin Cancer detection by examining different approaches related with image pre-processing, feature extractions, and classification models. features for our predicted model, Support-Vector-Machine and decision trees to classify the input image

1.2 Aim and Objectives

Aim:

The aim of developing a skin cancer detection model is to provide a reliable, efficient, and accessible tool for early identification of skin lesions indicative of cancerous growth.

Objectives:

Early detection:
Enables early detection of possible skin cancer lesions, as early detection significantly improves the chances of successful treatment and reduces mortality.

Improve accuracy:
Improve diagnostic accuracy with advanced image analysis techniques and machine learning algorithms that can outperform traditional visual exams.

Objective analysis:
Reduces the subjectivity associated with human visual inspection by providing an objective and standardized method for evaluating skin lesions. This can lead to a more consistent and reliable diagnosis.

Assisting dermatologists:
Act as a support tool for dermatologists and healthcare professionals, providing them with additional information and knowledge to make decisions when diagnosing skin cancer.

Better accessibility:
Improves the detection of skin cancer in areas with limited access to specialized health professionals, facilitating early screening and intervention in underserved populations.

Reduced healthcare costs:
Help reduce healthcare costs associated with skin cancer treatment by identifying potential cases at earlier, more treatable stages.

Impact on public health:
Contribute to public health initiatives addressing the increasing incidence of skin cancer and promoting prevention through early detection and education.

User-friendly interface:
Develop a user-friendly interface for both health professionals and, where appropriate, the general public so that the tool is easily accessible and easy to use.

Integration into clinical practice:
Ensure seamless integration of the skin cancer detection model into existing clinical workflows to facilitate adoption in healthcare settings and by professionals.

Continuous improvement:
Create a framework for continuous improvement and refinement of the model, taking into account feedback from real world use and keeping in mind technology and medical knowledge.

1.3 Scope:

Image Analysis: Implementing computer vision algorithms to analyze skin images for early signs of skin cancer. This may involve the use of machine learning and deep learning techniques to detect patterns and anomalies in skin lesions. Dermoscopy Integration: Integrating dermoscopy, a technique that involves examining the skin under a specialized magnifying lens, into the detection system to enhance accuracy. Patient History Integration: Incorporating patient history, risk factors, and other relevant information into the system to improve accuracy in diagnosis. Biopsy Data Integration: Connecting with pathology databases to integrate biopsy results for a comprehensive analysis. Remote Consultations: Facilitating remote consultations between patients and healthcare professionals for preliminary assessments of skin lesions. Monitoring Changes Over Time: Implementing systems that allow for the monitoring of skin lesions over time, enabling the detection of changes that may indicate malignancy. Mobile Applications and Wearables: Mobile Apps for Self-Examination: Developing mobile applications that allow users to perform self-examinations and receive preliminary assessments. Wearable Devices: Integrating skin cancer detection features into wearable devices equipped with imaging capabilities. Algorithm Development: Creating advanced algorithms that can analyze various types of skin lesions and provide accurate assessments. Training on Diverse Datasets: Ensuring the AI models are trained on diverse datasets to improve generalization across different skin types, ethnicities, and conditions. Integration with Electronic Health Records (EHR): Seamless Information Flow: Integrating the skin cancer detection system with electronic health records for seamless information flow between the detection system and the patient's medical history.

1.4 Report organization:

The thesis is organized into eight chapters including the introduction. Each chapter is unique on its own and is described with necessary theory to comprehend it.

1.4.1: Introduction to Project:

The skin is the most exposed region of our bodies, and it is come into contact with dust, pollution, microorganisms, and UV radiations. These may be the causes of any type of skin disease, and skin-related diseases are also caused by genetic instability, making skin diseases more complex [14]. The epidermis and dermis are the two major layers of human skin. The epidermis is the outer or top layer of the skin and is made up of three types of cells.
(1) Basal cell carcinoma - Every year, more than one million new instances of basal cell carcinoma are detected in the United States. Basal cell carcinoma comes in a variety of forms, including the superficial type, which is the least concerning; the nodular type, which is the most common; and the morph form, which is the most difficult to treat because the tumors often grow into the surrounding tissue (infiltrate) without a well-defined border[10].
(2) Squamous cell carcinoma - Its biologic behavior is similar to that of basal cell carcinoma in most cases, with a minor but significant risk of distant dissemination. It accounts for around 20% of all skin malignancies, however it is more common in immunocompromised individuals[10].
(3) Melanoma - It is usually made up of diverse colors ranging from brown to black. Amelanotic melanoma is a type of melanoma that is pink, red, or fleshy in color. It is more dangerous than other types of melanomas. Because current diagnostic classifications do not adequately represent the diversity of the disease, they are insufficient for accurate prediction and treatment. Skin cancer is the deadliest sort of disease seen in humans among all types of skin diseases [9]. This can be discovered in the fair skinned are the most usually affected. There is a link between skin cancer and Malignant Melanoma and Non-Melanoma, Melanoma are the two forms of cancer[10].

1.4.2: Literature survey:

The skin lesion is detected and classified into Melanoma skin cancer type or normal skin type. To detect cancer part the region of interest is extracted from the images. The various images of skin as well as images of cancer are used to detect and classify Melanoma skin cancer. Initially pre-processing is done on image using median filtering. With the help of median filtering the unwanted part of skin image is removed. After applying median filtering smooth image is obtained. Segmentation is applied on smoothed image [10]. Median filtering is necessary because unwanted portion of an image can reduce the accuracy of classification. For pre-processing histogram equalization technique can be used. In histogram equalization there are two methods one is global histogram equalization and another is local histogram equalization. Global histogram equalization considers overall image while in Local Histogram technique small portion of an image is considered. In Histogram Equalization technique intensity values are mapped into definite intensity levels. To have contrast enhancement of an image histogram equalization technique is used. But here rather than histogram equalized image on original histogram of an image Thresholding method is used because for original histogram the higher accuracy results are obtained than the histogram equalized image [15]. After segmentation features are extracted using wavelet transform and then skin cancer portion is detected and classified accordingly. One of the most deadly and fatal types of cancer is malignant melanoma. Despite the fact that only 4% of the population is diagnosed with cancer, this is a problem which accounts for 75% of all deaths caused by it. Cancer of the skin if melanoma is detected early enough, it can be treated. Treatment can be administered if the disease is detected early. Melanoma is treatable if caught early, but it is fatal if caught late. Melanoma has the potential to spread deeper into the skin and cause serious complications. It can also affect other regions of the body, making it an extremely dangerous situation. treatment is challenging the presence of melanin causes melanoma.

1.4.3: Problem statement:

Skin cancer, among the most prevalent and potentially fatal forms of cancer, poses a significant public health challenge globally. The current methods for skin cancer detection heavily rely on visual examination by healthcare professionals, often leading to delays in diagnosis and treatment. There exists a critical need for a robust and efficient skin cancer detection system that leverages advanced technologies, such as artificial intelligence and computer vision, to enhance early detection, improve accuracy, and facilitate timely intervention.

1.4.4: High level design of project:

The high-level design section of the milk purity detection system using IoT provides an overview of the proposed system's architecture, components, and interactions. Describes the overall architecture of the IoT-based milk purity detection system, including its hardware and software components. Illustrates the data flow through the system, from sensor data acquisition to real-time analysis and visualization. Explains the communication protocols and data exchange mechanisms between different system components. Describes the user interface design principles and user experience considerations for the system. Explains the features and functionalities of the user interface for displaying real-time milk quality data, generating alerts, and accessing historical data. Emphasizes the user-friendliness and accessibility of the user interface for various stakeholders. The high-level design provides a clear understanding of the overall structure, components, and functionalities of the IoT-based milk purity detection system, laying the foundation for detailed system design and implementation.

1.4.5: Feasibility Study:

Conducting a feasibility study for the implementation of a skin cancer detection system involves evaluating various aspects such as technical, economic, legal, operational, and scheduling considerations. From a technical standpoint, the feasibility hinges on the availability and reliability of advanced imaging technologies, artificial intelligence algorithms, and secure data storage systems. Economically, the study must assess the cost-effectiveness of developing and maintaining the system compared to potential benefits, including healthcare cost savings and improved patient outcomes. Legal considerations involve compliance with healthcare regulations, data protection laws, and ethical standards. Operationally, the feasibility study must examine the practicality of integrating the system into existing healthcare workflows and ensuring accessibility for both healthcare professionals and patients. Additionally, scheduling considerations involve estimating the time required for development, testing, and deployment. A comprehensive feasibility study will inform stakeholders about the viability of implementing a skin cancer detection system, guiding decision-making and ensuring the successful realization of this innovative healthcare solution.

1.4.6: Conclusion:

The detection of cancer, located in different part of human body, is not a new problem. From the previous decades, doctors use innovates machines to capture the potentially part of body in which can exist abnormality. Doctor examines the abnormality and determine if it is cancer using their knowledge and experience. To detect skin cancer, which is one of the most common types of cancer, doctors examine the lesion and decide the type (malignant or benign). If the lesion evaluated as malignant, the patient follows the biopsy process, which is a painful process. Its trigger our mind to think how the current technology and especially machine learning can provide humans an easily access application which classify the lesion given an affordable second option before follow the infallible biopsy process.

CHAPTER 2
Literature Survey

The skin lesion is detected and classified into Melanoma skin cancer type or normal skin type. To detect cancer part the region of interest is extracted from the images. The various images of skin as well as images of cancer are used to detect and classify Melanoma skin cancer. Initially pre-processing is done on image using median filtering. With the help of median filtering the unwanted part of skin image is removed. After applying median filtering smooth image is obtained. Segmentation is applied on smoothed image [1]. Median filtering is necessary because unwanted portion of an image can reduce the accuracy of classification. For pre-processing histogram equalization technique can be used. In histogram equalization there are two methods one is global histogram equalization and another is local histogram equalization. Global histogram equalization considers overall image while in Local Histogram technique small portion of an image is considered. In Histogram Equalization technique intensity values are mapped into definite intensity levels. To have contrast enhancement of an image histogram equalization technique is used. But here rather than histogram equalized image on original histogram of an image Thresholding method is used because for original histogram the higher accuracy results are obtained than the histogram equalized image [2]. After segmentation features are extracted using wavelet transform and then skin cancer portion is detected and classified accordingly. One of the most deadly and fatal types of cancer is malignant melanoma. Despite the fact that only 4% of the population is diagnosed with cancer, this is a problem which accounts for 75% of all deaths caused by it. Cancer of the skin if melanoma is detected early enough, it can be treated. Treatment can be administered if the disease is detected early. Melanoma is treatable if caught early, but it is fatal if caught late. Melanoma has the potential to spread deeper into the skin and cause serious complications[3]. It can also affect other regions of the body, making it an extremely dangerous situation. treatment is challenging the presence of melanin causes melanoma. Melanocytes are pigment-producing cells found throughout the human body [4]. Melanoma is caused by skin exposure to UV radiation, which is one of the main causes. [6]Dermo copy is a technique for examining the structure of the skin. An approach based on observation can be used to detect dermo copy images of melanoma the precision of the dermo copy is dependent on the dermatologist's training [8]. The Melanoma detection accuracy can range between 75% and 85%. Despite the fact that dermo copy is used by skin professionals as a procedure for diagnosis. The system's diagnosis is going to be accurate [5]. Assist in improving the diagnostic' speed and accuracy. The computer will be able to retrieve some data, such as asymmetry, color variation, and texture characteristics are all examples of minute details. Human eyes may not be able to recognize certain parameters. An automated dermo copy image analysis has three stages[9].
(a) Image Pre-processing (b) Segmentation (c) Extraction

The most important aspect is segmentation significant and also plays an important part because it influences the process of future phases. It appears that supervised segmentation is simple. to put into practice by taking into account criteria such as shapes, sizes, and colors and hues, as well as skin types and textures [12]. This system-based analysis will shorten diagnosis time and improve accuracy. The precision Dermatological diseases have a significant mortality rate. One of the most challenging aspects is the complexity, variety, and scarcity of knowledge. tough terrains in order to make a rapid, simple, and accurate diagnostic Particularly in developing and developing countries with a limited healthcare budget Furthermore, it is widely knowledge that the. In many diseases, early detection minimizes the odds of death of grave consequences recent environmental issues have influenced worked as a stimulant for the development of various skin disorders [11]. The following are the stages of these diseases in general: STAGE 1- in situ diseases have a survival rate of 99.9%, STAGE 2- diseases with a high-risk level have a survival rate of 45- 79 percent, STAGE 3-regional metastasis has a survival rate of 24-30 percent, and STAGE 4- distant metastasis has a survival rate of 7-19 percent. Skin is the largest organ of the integumentary system and consisted of seven layers of tissues. The skin is the outer part of the human body forming a shield which helps to cover the different system of human structure such as the muscular, skeletal (bones and ligaments) and internal organ system. Skin cancer is one of the most common cancers in the world, and the medical record deduce that skin cancer is the most common type of cancer in many countries.[7] Sun can easily harm our skin and as a result skin cancer is primarily detected on areas of skin which highly exposed to The sun, but it is also formed on areas that seldom see the light of day. The functions of skin are very important for the survival of human, so the development of abnormal cells on any skin layer can be harmful for the organism and might affect other parts of the body since it is detached to other organs and tissues and cancer can be spread more easily[13]. Compared to the other two types of skin cancer, melanoma is the deadliest cancer although it is the least common type. Melanoma reported as the deadliest form of skin cancer since it is responsible for 75% of all skin cancer deaths. The early detection of the melanoma is essential, since it can be treated and finally cured in its early stages [16]. However, if the diagnosis becomes late, it is difficult to cured and can be hazardous to the health, since it grows deeper into the skin and spread to other tissues and organs. So, it is important to examine our existing moles, freckles, bumps, and birthmarks to detect possible abnormality in early stage.

This led us to invest more time to improve skin cancer detection algorithms, which is more advantageous to patients compared to the traditional biopsy method [15]. The cases of this disease show that skin cancer can affect people of all races, including those with darker complexions. Current research in the discipline of skin cancer detection using artificial intelligence has a limitation affiliated with the nonwhite population. This restriction leads us to expand the current skin cancer classification models using dermoscopic images from people with different skin tones to train the models. This improvement generates an application which appeal to the whole population. Over the years, a continuous evolution related to cancer research has been performed. Scientists used various methods, like early-stage screening, so that they could find different types of cancer before it could do any damage . With this research, they were able to develop new strategies to help predict early cancer treatment outcome.[14] With the arrival of new technology in the medical field, huge amount of data related to cancer has been collected and is available for medical research. But physicians find the accurate prediction of the cancer outcome as the most interesting yet challenging part. For this reason, machine learning techniques have become popular among researchers. These tools can help discover and identify patterns and relationships between the cancer data, from huge datasets, while they are able to effectively predict future outcomes of a cancer type[16].

CHAPTER 3
Problem Statement

The current problem is that people do not know several things about their skin care. The people only know their problem from their naked eye but the actually happen in their skin is more serious from that. In this project, we will be using different machine learning techniques to analyses the data given in the datasets. This analysis will help us predict whether the cancer is benign or malignant. Benign cancer is the cancer which doesn't spread whereas malignant cancer cells spread across the body making it very dangerous. Machine learning algorithms will help with this analysis of the datasets. These techniques will be used to predict the outcome.

3.1 SOFTWARE REQUIREMENTS :

Operating System: Windows, Mac OS, Linux
Application: Spyder with Python 2.0 or above

3.2 LIBRARIES USED :

In Skin Cancer Detection we use some libraries in python.
The list of libraries are :-
TensorFlow, Pandas, NumPy, OpenCV

3.2.1 TensorFlow: TensorFlow is a free and open-source software library for machine learning. It is often across the range of tasks but features a particular specialize to training on inference of deep neural in networks. Tenso r flow may a symbolic math library supported data flow differentiable with programming. GPU/CPU computing where an equivalent code are often executed to do both architectures. High on scalability computation across in machines and large data sets import TensorFlow import TensorFlow as tf.

3.2.2 Pandas: Pandas is a popular Python a library on data analysis. It directly in related Machine Learning. As all we have the dataset to be prepared before the training. In this case, Pandas are handy it as a developed \\to data extraction and preparation. It provides the implementation is high-level find data structures a wide variety tools for data analysis. It provides many methods for as groping, combining and filtering data. import pandas as pd.
3.2.3 NumPy: NumPy means for Numerical Python, in a library of multidimensional array an object to collection of routines for processing those arrays. Using NumPy, mathematical and logical operations we in arrays can be performed. NumPy to open-source numerical Python library. import NumPy as np.

3.2.4 OpenCV: OpenCV-Python to have library Python bindings designed and s computer vision problems. Open CV is capable in image analysis and processing.

.
3.2.5 Karas: Karas is a popular Machine Learning library for Python to do. It high-level neural networks (API) capable in the running top on Tensor Flow, CNTK, a Theano. Karas makes really to ML beginners a build a design a Neural Network. One in best thing about Karas that allows easy to fast prototyping**.**

CHAPTER 4

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 Lesion 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. Before starting the analysis of our project, a diagram of the process which is follow in order to complete our design, is represented. The following diagram can help us describe more clearly the functions that were implemented at each stage to reach our goal. It is obvious, that the stage of Data Understanding is the most vital. Da Understanding combines the subdivided stages of Data Requirements, Data Collection al Data Understanding. Before starting the collection of data, we need to clearly understand t problem that is needed to tackle, and specify all the requirements for our project. The requirements help us to determine the sources and the methods that we have to use in order collect the appropriate data. At this first stage of the process, the creation of the database started, by collecting all data needed, which consist of the initial data. Following this, u have to clearly understand the content of the input data and identify noise that may include. For our implementation, it is obvious that dermoscopic images are the necessary input that must be obtained in order to move to the next stage. It is important that, the images should be labeled and confirmed from expert as benign and malignant to ensure the correctness of the project. Furthermore, these images needed to be captured with.

microscope or a high resolution camera in order to depict the lesion in detail. It is an evidence that these images can contain noise. The most common type of noise, is hairs, which exist i many part of human skin. Data Preparation is the most necessary stage of the process, since the input image is transformed to useable data. Once the data has been collected, we need t process the data, to reduce the existing noise and extract information, to create the final database for modeling stage. The data preparation is a very time-consuming procedure since the implementation of different algorithms needed to improve and transform the initial database. In this stage some features are extracted, in order to classify the lesion and as : consequence, existing noise can corrupt the final decision. It is prerequisite to build an efficient image processing stage, stacking many image filters to reduce the noise. Modeling refers to the purpose of data mining. After the stage of data collection and preparation, the data must be handled by an appropriate model. Depending on the data mining problem a different appropriate model exists. The selection of the appropriate model is a demanding task, while the usage of the final result depends on it. The correct models reveal patterns and structures that provide meaningful insights and new knowledge. For our project, these patterns and structures can lead to a classification of the lesion into two categories: benign and malignant. Evaluation is the last and most important stage. During this stage, the selected model is tested by a preselected part of the database. This, allow one to see the effectiveness and the accuracy of the model. Results from this stage, are used to determine if it is mandatory to return in one of the previous stages in order to follow a different approach and alter the requirements of our project. This feedback can lead to more appropriate results. The results of this stage lead us to spend more time in data pre-processing stage applying additional filter to reduce noise and to improve the accuracy of the models.

4.1 Image Acquisition

The process of collecting or obtaining an image from a camera so that it may be transmitted through other processes that must occur later is known as image acquisition. In image processing, picture acquisition is the initial stage in the workflow sequence because no further processing is feasible without an image.

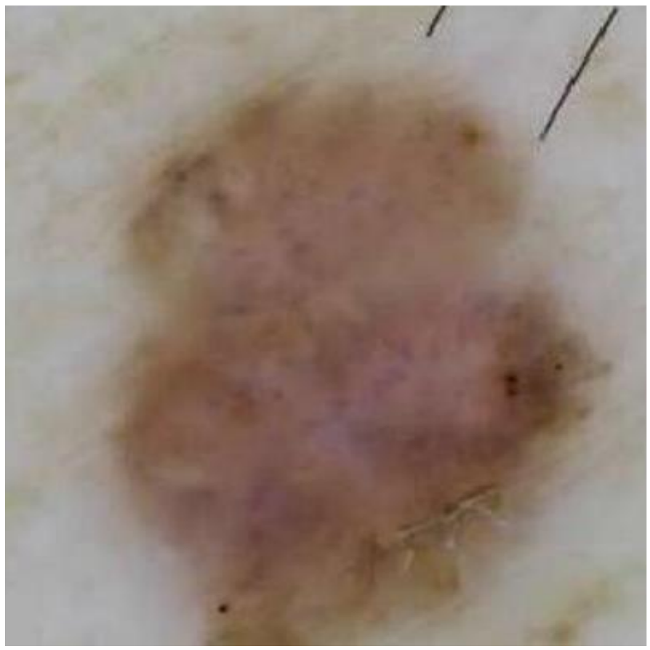

Fig 4.1 Image Acquisition

4.2 Image Preprocessing

1) The first step in pre-processing is the enhancement of the image by modification of both Contrast and Brightness (reduce light illumination). Contrast is described as the modification in color or luminance that marks an object making it distinct and unique in the image. The higher the difference between a pixel and its neighbors the higher the contrast is in that area. Brightness can be described as the sensitivity produced as a result of the luminance of a visual mark. In image processing of pixels, a bright pixel is characterized by a higher value. We therefore modified our images by applying a scale factor and delta to the scaled values to perform enhancements,

2) Color Space: The HSV (Hue, Saturation, and Value) color space, unlike the RGB (Red, Green and Blue) color space which is the format of the acquired image from a standard camera, is a cylindrical color space. The Hue values are across a circle. So, after completing one rotation across the circle, we get the same color i.e. the Hue values at 0 and 360 represent the same color as illustrated in Fig. below.

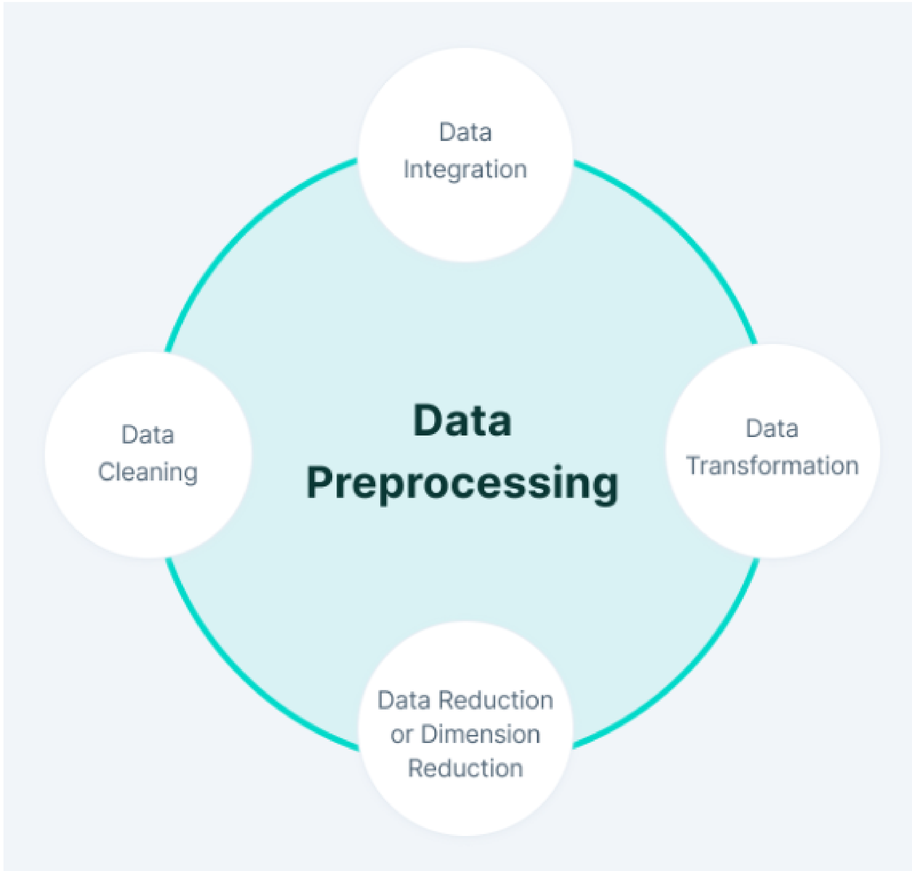

Fig 4.2 Image Preprocessing

HSV color space usually gets better information for image processing. This is because it splits color data (Chroma) from intensity or lighting (Luma). Therefore, generating a histogram or thresholding procedures is likely using only saturation and hue as a result of the value being divided through color data splitting. We used the first channel which represents luminance is the HSV format converted images. This format of the image is al so a type of grayscale that makes it possible to extract contours by double thresholding.

4.3 Image Enhancement

The purpose of this stage is to increase visibility of the feature of interest, based on our project, the adjustment and enhancement of the contrast is needed. Image enhancement techniques change the pixels' intensity of the image so as the output images to looks better. It iS an important step to prepare the image for threshold stage and the GLCM method. The result of this stage is to make more sharpen the image border and improve the brightness.

After applying this filter, it is easier to separate the background and the object of interest which is depicted. Nowadays, there are many image enhancement techniques suitable for different tasks with specific requirements. The most used methods are classified into Linear and Non-Linear contrast enhancement techniques. In our implementation, the histogram equalization method to improve the image enhancement is selected. The above images are an example where the result of this filter to the histogram of the image can be observed.

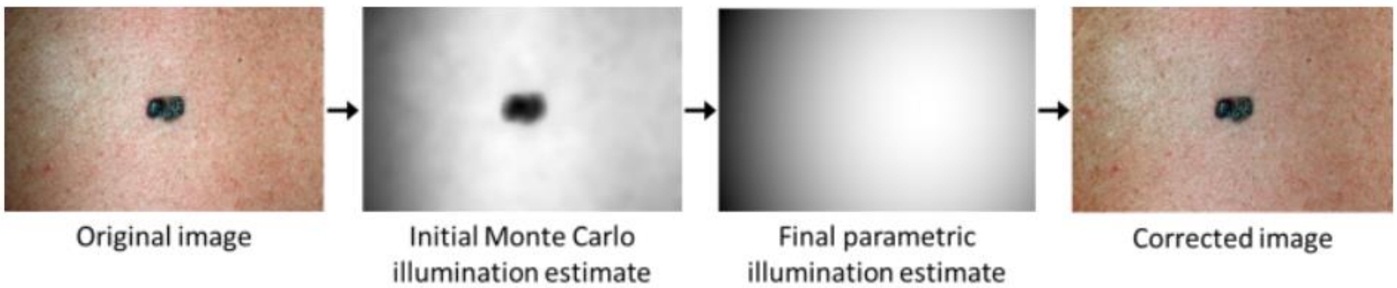

Fig 4.3 Image Enhancement

The histogram equalization is the most common method for image enhancement, since its simplicity and better performance with all types of images, compared to other existing methods. Histogram equalization replaces the output image with uniform distribution of pixel and it flattens and stretches the image. The operations of the Histogram Equalization are performed by remapping the gray levels using the cumulative distribution of the input gray levels. The step of the implementation of this algorithm is simple. The first step is to calculate the histogram of the image. After that we use the cumulative distribution function and the normalization of this function gives the output image. The general histogram equalization formula is the following:

$$h(v) = round(cdf(v) - cdf(min)\ M * N - cdf(min)) * (L - 1)$$

where cdf(min) is the minimum value which occur from the cumulative distribution function, M*N is equal to the pixel of image and the L is equal to the number of gray levels. In our case the L take the value of the 256 since the initial image converted to grayscale and the pixels' value range is from 0 to 256. The equalization formula scales the values of the grayscale pixels from 0 to 255.

4.4 Image Segmentation

The purpose of image segmentation stage is to separate the background and the lesion by converting the image to binary and depict the area of interest. This stage is dominant for our implementation, since the binary image is used for extracting the most features from the ABCD rule. There are many approaches to implement this filter. Some of them combine machine learning algorithms in order to locate the region of interest, separating from the background and other more simply methods, called thresholding algorithms, segment the image. There are many thresholding algorithms. Among them, the Otsu's and global thresholding method have been distinguished. The main difference between these two approaches, is that the Otsu's algorithm performs automatic image thresholding. It searches for the most efficient thresholding value that minimizes the intra-class variance instead of the global algorithm which requires a predefined value of the threshold. Finding the global thresholding value could be an easy task, if the background and the area of interest have distinguished values of brightness in the grayscale image. The global thresholding method is quite easy for implementation. In this method the value of each pixel is checked and replaced with a white pixel if the intensity is greater than the global thresholding value or with a black pixel if the pixel's value is less. From the thresholding process the output is a white background and a black area for the lesion. Another essential step in the stage of segmentation, is the inversion of the pixel's values of the image. The inverted image is necessary for the implementation of the morphological filter. In order to extract some of the features of the ABCD rule, some functions of the OpenCV library are used. Black background to locate the region of interest with white color is required by these functions.

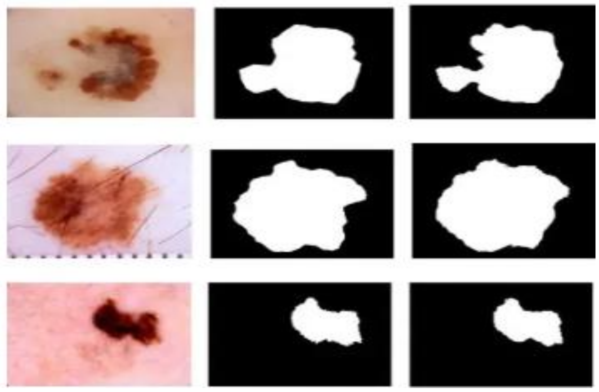

Fig. 4.4 Image Segmentation

4.5 Noise Removal

This stage focuses on the removal of noises which arisen in the process of capture and the hairs that exist on human body. The detection and removing of unwanted noise is a highly demanding process since an algorithm is needed for separating the real features of an image and the features which are create the noise. The noise can corrupt true information of the image, having serious affect to final result. In bibliography, different filters to reduce noises from dermoscopic images are used. The first filter called Gaussian blur and smooths an image using a Gaussian function. It is a low-pass filter which removes the noise level and insignificant details by blurring the image. This is achieved be applying a Gaussian keel. The second filter is called Median filter which is widely used in projects related with skin cancer since it can prevent edges. In these projects, the Median Filter is selected, since edges invariant is a key factor to extract correct features from ABCD rule. The median filter is a non-linear filter and it is commonly used in image processing. The appealing characteristic of this filter is the conservation of the edges and the ability of reducing impulse noise. The median filter sorts the pixel's values and take the median value under the kernel area and replace the central pixel with this median value.

Different approaches use kernel with different size and shape since the reduction of noise depends on these. This is an important disadvantage. If the number of pixels which is characterize as a noise is greater than N(N+N)/2 and the kernel size is NxN, then the noise cannot be deleted, as a result we need to increase the size of the kernel. On contrast, if the number of noise pixels is smaller than N(N+Ny2 and the kernel size is NxN, then the pixel's values can corrupt since the algorithm assign irrelevant values, as a result we need to decrease the size of the kernel. To clearly understand the algorithm, we illustrate below an analytic example of a median filter using a 3x3 kernel.

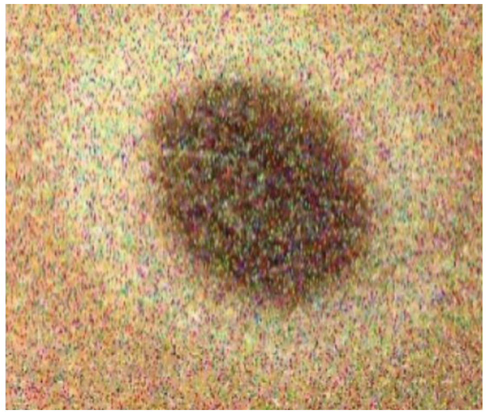

Fig 4.5.1 Before noise removal

Fig 4.5.2 After noise removal

4.6 Feature extraction

For Melanoma cancer Features resides within the border of lesion. These features are applied on classification algorithm to classify cancer images and skin images. It is essential to extract important features so that the classification results will be improved. The features are extracted using two dimensional wavelet. An original image is divided into four parts at firs level of decomposition (8J. Each part represents feature and two level of decomposition is done to obtain the features. In second level of decomposition out of four parts again each part is divided into four parts so total 16 parts are generated. Six parameter are used for features generation so total 96 features are generated. From Figure it has been observed that high pass and low pass filters are applied on image. Output of low pass filter gives approximation of an original image. At second level of decomposition an output of low pass filter contains finer details than first level of decomposition. The different types of wavelets are used and results are obtained. The features are obtained using parameters like mean, median, standard deviation, minimum, variance and maximum. The accuracy depends on type of wavelet. The features in one dimension cannot be detected while in second dimensions important data can be revealed. Fourier transform gives only frequency information of an image while wavelet is used to get information about frequencies as well as temporal information of it.

Using two dimensional wavelet information about how the frequencies are used as well as when exactly they have to use is obtained.

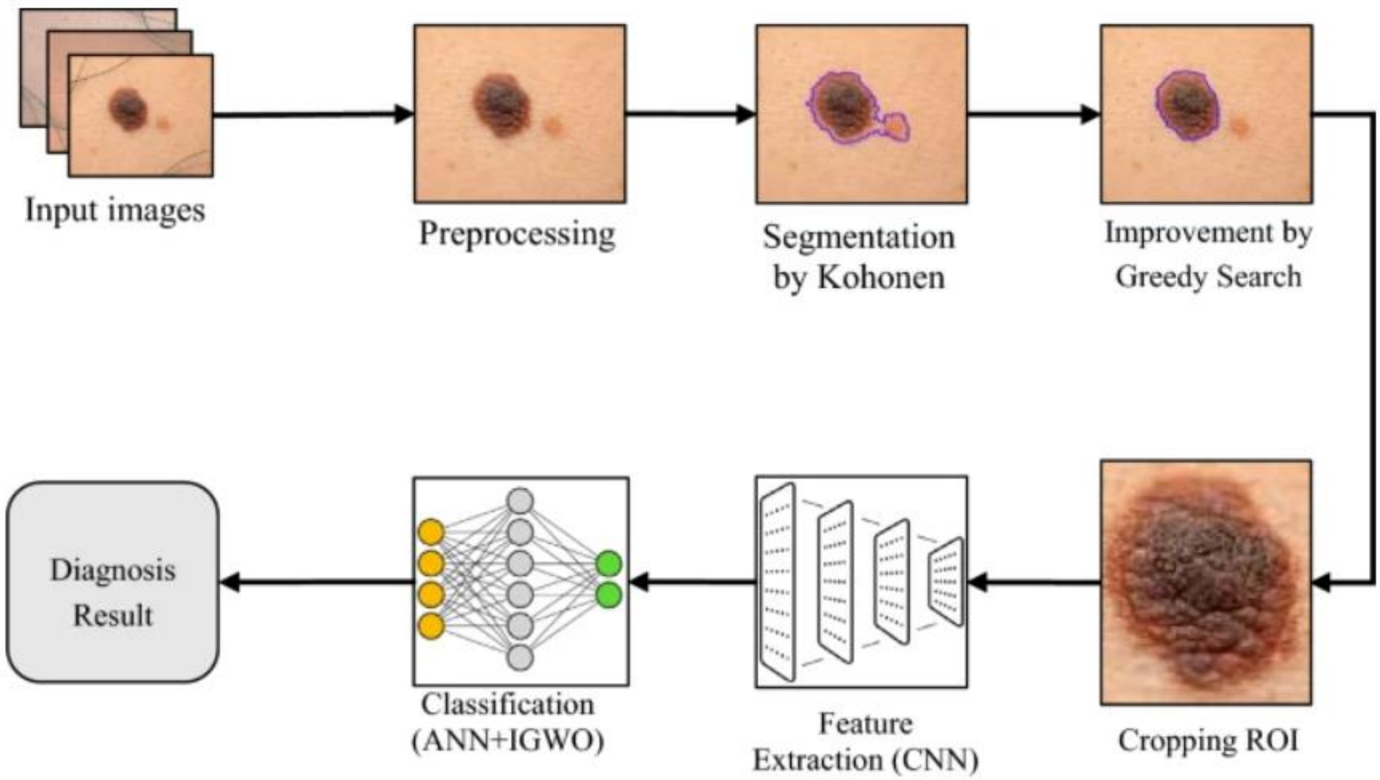

Fig 4.6 Feature extraction

4.7 Neural Networks

in the neural Networks we have used the Back Propagation Algorithm. The Back propagation is a supervised learning algorithm, for training the multi-layer perception's stile designing the neural networks we initialize the weights with some random values as we do not know what exactly the weight can be, so we first give some random weight if the model provides an error with large values, so, we need to need to change the values to somehow minimize the error value. To generalize this, we can just say. Calculate the error - How far is your model output from the actual output

• Minimum Error - Check whether the error is minimized or not.

Update the parameters - If the error is huge then, update the parameters (weights and biases). After that again check the error. Repeat the process until the error becomes

minimum.

• Model is ready to make a prediction - Once the error becomes minimum, you can feed some inputs to your model and it will produce the output. The Backpropagation algorithm looks for the minimum value of the error function in weight space using a technique called the delta rule or gradient descent. We are trying to get the value of weight such that the error becomes minimum. Basically, we need to figure out whether we need to increase or decrease the weight value. Once we know that, we keep on updating the weight value in that direction until error becomes minimum. You might reach a point, where if you further update the weight, the error will increase. At that time, you need to stop, and that is your final weight value.

4.8 Convolution Neural Network

CNNs are neural networks with a specifies architecture that have been shown to be very powerful in areas such as image recognition and classification. CNNs have been demonstrated to identify faces, objects, and traffic signs better than humans and therefore can is found in robots and self-driving cars CNNs are neural networks with a specific architecture that have been shown to be very powerful in areas such as image recognition and classification. CNNs have been demonstrated to identify faces, objects, and traffic signs better than humans and therefore can be found in robots and self-driving cars CNNs are neural networks with a specific architecture that have been shown to be very powerful in areas such as image recognition and classification. CNNs have been demonstrated to identify faces, objects, and traffic signs better than humans and therefore can be found in robots and self-driving cars. CNNs are neural networks with a specific architecture that have been shown to be very powerful in areas such as image recognition and classification, CNNs have been demonstrated to identify faces, objects, and traffic signs better than humans and therefore can be found in robots and self-driving cars. CNNs are a supervised learning method and are therefore trained using data labeled with the respective classes. Essentially. CNNs Learn the relationship between the input objects and the class labels and comprise two components: the hidden layers in which the features are extracted and, at the end of the processing, the fully connected layers that are used for the actual classification task. Unlike regular neural networks, the hidden layers of a CNN have a specific architecture. In regular neural networks, each layer is formed by a set of neurons and one neuron of a layer is connected to each neuron of the preceding layer. The architecture of hidden layers in a CNN is slightly different. The neurons in a layer are not connected to all neurons of the preceding layer; rather, they are connected to only a small number of neurons. This restriction to local connections and additional pooling layers summarizing local neuron outputs into one value results in translation-invariant features. This results in a simpler training procedure and a lower model complexity.

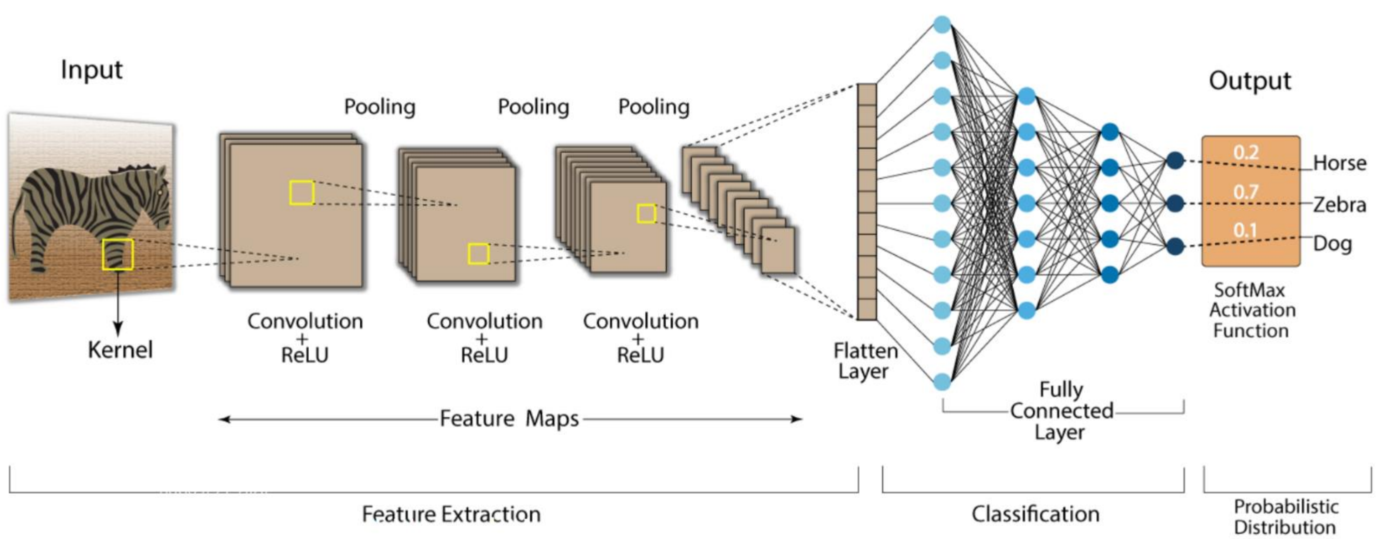

Fig 4.7 CNN

4.9 Lack of reproducibility

Lack of reproducibility in ML is a complex and growing issue exacerbated by a lack of code transparency and model testing methodologies. Research labs develop new models that can he quickly deployed in real-world applications. However, even if the models are developed to take into account the latest research advances, they may not work in real cases, Reproducibility can help different industries and professionals implement the same model and discover solutions to problems faster. Lack of reproducibility can affect safety, reliability, and the detection of bias.

CHAPTER 5
High Level Design of the Project

5.1 Block Diagram

The collaboration of these sensors within the system architecture enables real-time monitoring and detection of impurities or contaminants in the milk. The TDS, color, and temperature readings are collectively processed to generate comprehensive reports for each milk sample. This integrated approach enhances the accuracy and efficiency of milk quality assessments, providing a robust system that aligns with the industry's need for advanced and reliable milk purity detection mechanisms. The architecture is designed to be adaptable, allowing for future enhancements and integration with emerging technologies, ensuring the system's relevance and effectiveness in the dynamic landscape of dairy production and quality control.

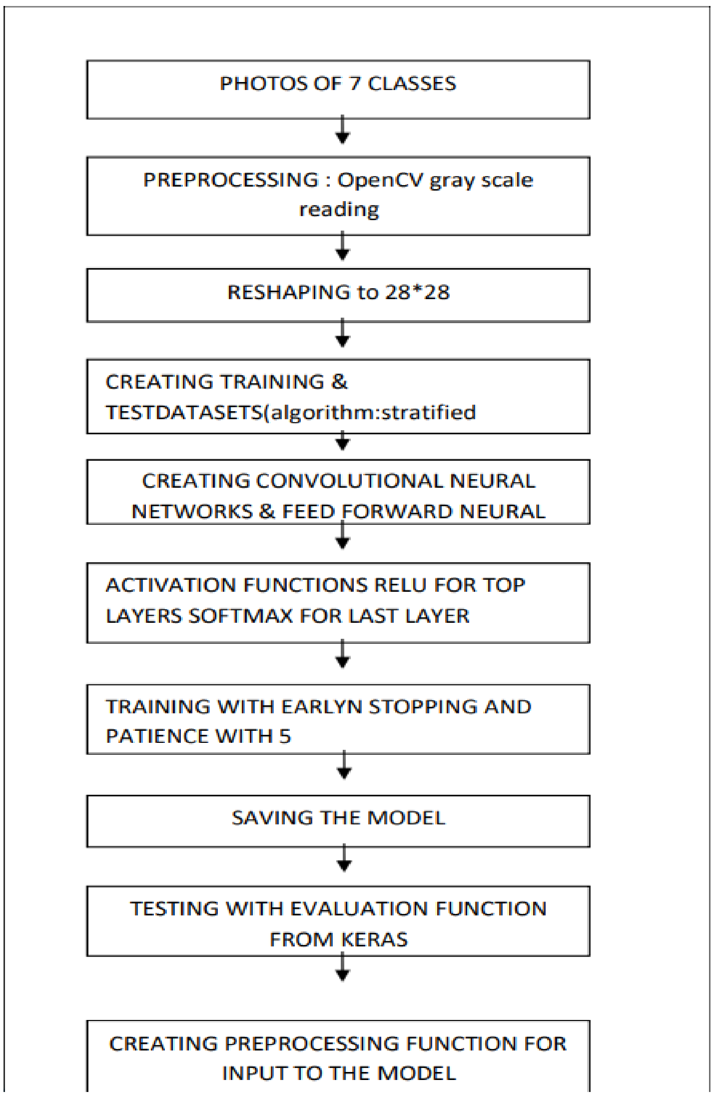

Fig 5.1 Block Diagram of Proposed System

5.2Architecture

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 detections done 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 step here comes is classification in which the website gives whether it is cancer or not.

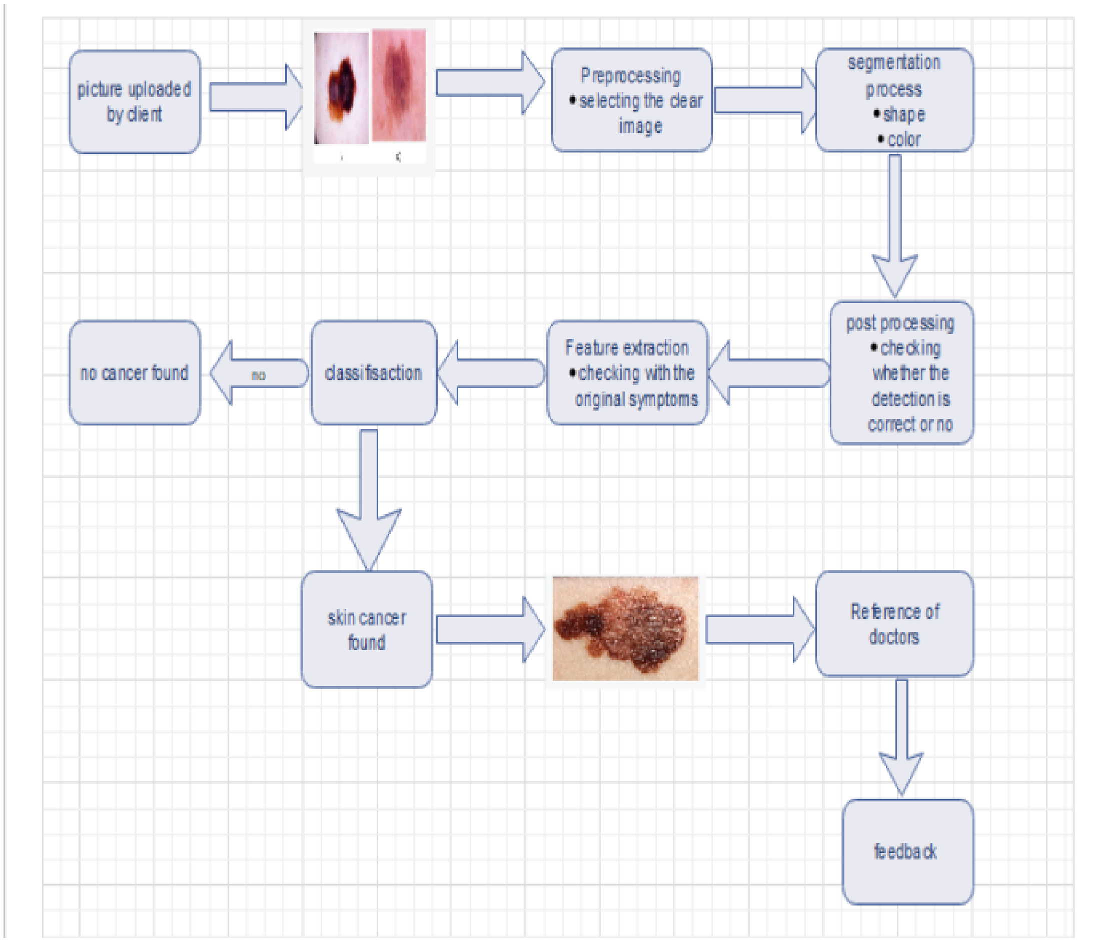

Fig 5.2 Methodology of skin cancer Detection System

CHAPTER 6
Feasibility Study

6.1 Introduction of Feasibility Study

Skin cancer represents a significant global health concern, with rising incidence rates and substantial societal and economic burdens. Early detection is pivotal for effective treatment and improved patient outcomes. In response to this challenge, the feasibility study aims to explore the viability and practicality of implementing an advanced skin cancer detection system. Leveraging cutting-edge technologies such as artificial intelligence and computer vision, this system seeks to revolutionize the diagnostic landscape by enhancing accuracy, accessibility, and efficiency. This introduction outlines the rationale behind the feasibility study, emphasizing the pressing need for innovative solutions to overcome the limitations of current diagnostic methods. The study will comprehensively assess technical capabilities, economic considerations, legal and ethical implications, operational integration, and scheduling aspects, providing a foundation for informed decision-making regarding the development and deployment of a skin cancer detection system. Through this exploration, we aspire to contribute to the advancement of healthcare technology, potentially revolutionizing the early diagnosis and management of skin cancer on a broader scale.

6.2 Economic Feasibility

The economic feasibility of implementing a skin cancer detection system is rooted in the potential long-term cost savings and healthcare benefits it offers. Initial development costs, including the investment in advanced technologies such as artificial intelligence and computer vision, must be weighed against the anticipated reduction in treatment expenses associated with early cancer detection. By facilitating timely interventions, the system can potentially minimize the financial burden on healthcare systems, decrease the costs associated with late-stage cancer treatments, and enhance overall resource efficiency. Moreover, economic feasibility extends to indirect benefits, such as improved patient outcomes leading to increased productivity and reduced societal healthcare costs. A thorough economic feasibility analysis should consider not only the upfront investments but also the sustainable economic advantages derived from the early detection and prevention of skin cancer, contributing to both individual well-being and the broader economic health of healthcare systems.

6.3 Technical Feasibility

The technical feasibility of a skin cancer detection system is promising, driven by advancements in computer vision, machine learning, and imaging technologies. High-resolution imaging devices, such as dermoscopes and digital cameras, offer the necessary input for accurate analysis. State-of-the-art machine learning algorithms, trained on diverse and extensive datasets, exhibit the capability to recognize subtle patterns indicative of skin cancer. The integration of these technologies allows for real-time image processing, enhancing the system's efficiency. Cloud computing resources further support the computational demands of complex algorithms, ensuring scalability. While challenges may arise in ensuring interoperability with existing healthcare infrastructure and addressing issues of data security and privacy, recent technological progress and the maturity of relevant frameworks suggest that the technical foundations for a reliable and effective skin cancer detection system are within reach.

6.4 Behavioral Feasibility

The behavioral feasibility of implementing a skin cancer detection system involves assessing the willingness of healthcare professionals, patients, and relevant stakeholders to adopt and integrate the technology into their routines. Understanding the behavioral aspects is crucial, considering the shift in practices required for medical professionals to incorporate AI-driven diagnostics into their decision-making processes. It also involves evaluating patients' acceptance of technology-assisted examinations and their willingness to actively participate in preventive measures. Education and awareness initiatives play a pivotal role in addressing potential resistance and fostering a positive reception. Moreover, ensuring the system aligns with established medical practices and patient expectations is essential for its successful integration into the healthcare ecosystem. Behavioral feasibility, therefore, encompasses the attitudes, perceptions, and adaptability of both healthcare providers and recipients, playing a pivotal role in the successful adoption and sustained use of a skin cancer detection system.

CHAPTER 7

Conclusion

The skin cancer incidences are intensifying over the past decades; the need of an hour is to move towards an efficient and robust automated skin cancer classification system, which can provide highly accurate and speedy predictions. In this study, we demonstrated the effectiveness of deep learning in automated dermoscopic multi-class skin cancer classification with the Mobile Net model trained on a total of 38,569 dermoscopy images from HAM10000 dataset. We matched the performance of expert dermatologists across seven diagnostic tasks with an overall accuracy of 83.1% for seven classes in the dataset, whereas top2 and top3 accuracy of 91.36% and 95.34%, respectively. Also, the weighted average of precision, the weighted average of recall, and the weighted average of Fl-score were found to be 89%, 83%, and 83%, respectively. We conclude that Mobile Net model can be used to develop an efficient real-time computer-aided system for automated medical diagnosis systems. As compared to previously proposed models the Mobile Net model has shown accurate and robust performance in addition to its faster and lightweight architecture. The future work may deal with the utilization of patient's personalized data such as genes, age, color in addition to the current study for skin cancer diagnosis. This additional feature can be advantageous to develop personalized computer-aided systems for the diagnosis of skin cancers.

CHAPTER 8
REFERENCES

Technical Paper References:

1. S.S. Manel, s.v. Shinde "different techniques for skin cancer detection using dermoscopy images", international journal of computer sciences and engineering vol.5(12), dec 2017, e-issn: 2347-2693.

2. poornima m s, dr. Shailaja k "detection of skin cancer using svm", international research Journal of engineering and technology (irjet) volume: 04 issue: 07 | july-2017.

3. muhammad imran razzak, saeeda naz and ahmad zaib "deep learning for medical image processing: overview, challenges and future" arxiv:1852.3865v2 [cs.cv] 20 july 2018

4. Koh HK, Geller AC, Miller DR, Grossbart TA, Lew RA. Prevention and early detection strategies for melanoma and skin cancer Current status. Arch. Dermatol. 1996;132(4):436-43. https://doi.org/10.1001/archderm. 1996.03890280098014

5. salome kazeminia, christoph baur, arjan kuijper, bram van Ginneken, nassir navab, shadi albarqouni, anirban mukhopadhyay "gans for medical image analysis", arxiv:1809.06222v2 [cs.cv] 21 dec 2018

6. Gaana, M and Gupta, Shweta and Ramaiah, Narayana Swamy, Diagnosis of Skin Cancer Melanoma using Machine Learning (March 22, 2019).

7. abrham debasu mengistu, dagnachew melesew alemayehu "computer vision for skin cancer diagnosis and recognition using rbf and som" international journal of image processing (ijip), volume (9) : issue (6) 2015.

8. Silver D et al. Mastering the Game of Go with Deep Neural Networks and Tree Search. Nature. 2016; 529:484-489. https://doi.org/10.1038/nature16961

9. yuexiang li and linlin shen "skin lesion analysis towards melanoma detection using deep learning network", arxiv: 1904.073653v2 [cs.cv] 20 aug 2018

10. veronika cheplygina, marleen de bruijne, josien p. W. Pluim, "notso-supervised: a survey of semi-supervised, multi-instance, and transfer Learning in medical image analysis" arxiv:1804.06353v2 [cs.cv] 14 sep 2018

11. salome kazeminia, christoph baur, arjan kuijper, bram van Ginneken, nassir navab, shadi albarqouni, anirban mukhopadhyay "gans for medical image analysis", arxiv:1809.06222v2 [cs.cv] 21 dec 2018

12. andreas maier, christopher syben, tobias lasser, christian riess "a gentle introduction to deep learning in medical image processing", arxiv:1810.05401v2 [cs.cv] 21 dec 2018 14. danilo barros mendes nilton correia da silva "skin lesions classification using convolutional Neural networks in clinical images", arxiv:1812.02316v1 [cs.cv] 6 dec
2018"

13. wasan kadhim saa'd" method for detection and diagnosis of the Area of skin disease based on color by Wavelet transform and a rtificial neural Network" al-qadisiya journal for engineering sciences vol. 2 no.4 year 2009

14. li-sheng wei, quan gan, and tao ji, "skin disease recognition method based on image color and Texture features" hindawi computational and mathematical methods in medicine volume 2018, article id 8145713, 10.