Diagnosis of Skin Cancer Melanoma using Machine Learning

Submitted in partial fulfillment of the

requirements for the award of

Bachelor of Engineering degree in Computer Science and Engineering

By

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF COMPUTING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
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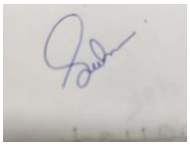
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Bala B (39110111) and Aswin S (39110098)** who carried out the Project Phase-1 entitled **"MELANOMA SKIN CANCER CLASSIFICATION USING TRANSFER LEARNING"** under my supervision from June 2022 to November 2022.



Internal Guide

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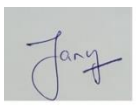
Submitted for Viva voce Examination held on 19.4.2023



InternalExaminer **ExternalExaminer**

DECLARATION

We, **Bala B (Reg No-39110111) and Aswin S (Reg No-39110098),** hereby declare that the Project Phase-1 Report entitled **"Diagnosis of Skin Cancer Melanoma using Machine Learning"** done by us under the guidance of **V. Subapriya,M.E.,Ph.D** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.

DATE: 19.4.2023
PLACE: Chennai

SIGNATURE OF THECANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management** of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. T.Sasikala M.E., Ph. D**, **Dean**, School of Computing, **Dr. L. Lakshmanan M.E., Ph.D.,** Head of the Department of Computer Science and Engineering for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **V.Subapriya, M.E.,Ph.D,**for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my phase-1 project work

I wish to express my thanks toall Teaching and Non-teaching staff members of the **Department of Computer Science and Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

Currently skin cancer is being detected by doctors by manually checking the pattern and area of affected area. Since this method is time consuming and is prone to human errors, research is being conducted to detect skin cancer automatically. Image Processing technique are extensively being used for the purpose. However due to limitation of Image Processing where in certain parameters have to be sent manually, this approach for automated detection turns out practically to be inefficient thus it would be apt to train the machine to identify the cancer areas without using complex algorithms, which is turn increases the accuracy and efficiency of the system/algorithms. Here, we can use the transfer learning algorithm to classify the skin cancer based on normal and abnormal(melanoma) patient of the data of the system.

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Human skin is the largest organ in our body which provides protection against heat, light, infections and injury. It also stores water, fat, and vitamin. The deadliest types in cancers are the Skin Cancer, since it would spread all over our body and if this not discovered and treated in the early stage. We have 3 types of skin cancers namely Basal cell carcinoma, Squamous cell carcinoma and Melanoma. But melanoma is deadliest among all skin cancers. The cases of melanoma skin cancer are increasing day by day. Early detection of Melanoma skin cancer must be cured in initial stage for the patient to get the chances of high recovery. They are seen on the skin as moles or marks. According to the skin structure it has two different layers namely epidermis which is considered to be the outer most layer and dermis is the inner layer. The lower part epidermis has Melanocytes. They contain pigmented cell that is found in epidermis that will produce melanin, this pigment will give colour to human skin. As the skin is thereby exposed to sun, they produce more and more pigment, hence Causes skin to be, darkened in colour which causes skin cancer melanoma. The risk factor of Melanoma is a fairy skin tone, sun burnings, and past genetic factors, prone to less immunity system and also exposure to ultra violet light rays excessively. If Melanoma is not detected in its early stages it might grow and also spread along the first layer of skin that is epidermis and at last, it comes in contact with Lymph vessel and the finally blood. The characteristics are shape, colour and size which are some important parameters for recognizing the skin cancer and they appear as moles with irregular border, shapes, change in colour, and diameter will be greater than 6mm. The various non-invasive techniques have been proposed in such a way to analyse detection cancer and separating it to be benign in nature or melanoma.

ARTIFICIAL INTELLINGENCE:

Artificial intelligence (AI) is the ability of a computer program or a machine to think andlearn. It is also a field of study which tries to make computers "smart". As

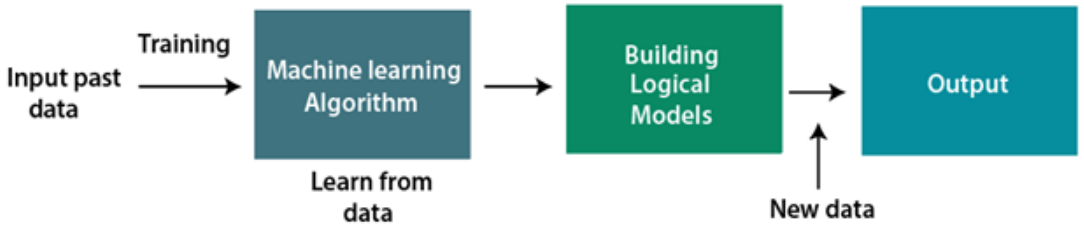
machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition. AI is an area of computer sciences that emphasizes the creation of intelligent machines that work and reacts like humans. Some of the activities computers with artificial intelligence are designed for include: Face recognition, Learning, Planning, Decision making etc., Artificial intelligence is the use of computer science programming to imitate human thought and action by analysing data and surroundings, solving or anticipating problems and learning or self-teaching to adapt to a variety of tasks.

MACHINE LEARNING

Machine learning is a growing technology which enables computers to learn automatically from past data. Machine learning uses various algorithms for **building mathematical models and making predictions using historical data or information**. Currently, it is being used for various tasks such as **image recognition**, **speech recognition**, **email filtering**, **Facebook auto-tagging**, **recommender system**, and many more. Machine Learning is said as a subset of **artificial intelligence** that is mainly concerned with the development of algorithms which allow a computer to learn from the data and past experiences on their own. The term machine learning was first introduced by **Arthur Samuel** in **1959**. We can define it in a summarized way as: “Machine learning enables a machine to automatically learn from data, improve performance from experiences, and predict things without being explicitly programmed”.

A Machine Learning system **learns from historical data, builds the prediction models, and whenever it receives new data, predicts the output for it**. The accuracy of predicted output depends upon the amount of data, as the huge amount of data helps to build a better model which predicts the output more accurately.

Suppose we have a complex problem, where we need to perform some predictions, so instead of writing a code for it, we just need to feed the data to generic algorithms, and with the help of these algorithms, machine builds the logic as per the data and predict the output. Machine learning has changed our way of thinking about the problem. The below block diagram explains the working of Machine Learning algorithm:



Features of Machine Learning:

- Machine learning uses data to detect various patterns in a given dataset.
- It can learn from past data and improve automatically.
- It is a data-driven technology.
- Machine learning is much similar to data mining as it also deals with the huge amount of the data.

Classification of Machine Learning

At a broad level, machine learning can be classified into four types:

1. Supervised learning
2. Unsupervised learning
3. Reinforcement learning
4. Semi-supervised Learning

1) Supervised Learning

Supervised learning is a type of machine learning method in which we provide sample labeled data to the machine learning system in order to train it, and on that basis, it predicts the output.

The system creates a model using labeled data to understand the datasets and learn about each data, once the training and processing are done then we test the model by providing a sample data to check whether it is predicting the exact output or not. The goal of supervised learning is to map input data with the output data. The supervised learning is based on supervision, and it is the same as when a student learns things in the supervision of the teacher. The example of supervised learning is **spam filtering**.

Supervised learning can be grouped further in two categories of algorithms:

- **Classification**
- **Regression**

Unsupervised Learning

Unsupervised learning is a learning method in which a machine learns without any supervision.The training is provided to the machine with the set of data that has not been labeled, classified, or categorized, and the algorithm needs to act on that data without any supervision. The goal of unsupervised learning is to restructure the input data into new features or a group of objects with similar patterns.

In unsupervised learning, we don't have a predetermined result. The machine tries to find useful insights from the huge amount of data.

It can be further classifieds into two categories of algorithms:

- **Clustering**
- **Association**

Reinforcement Learning

Reinforcement learning is a learning method that interacts with its environment by producing actions anddiscovers errors or rewards. Trial and error search and delayed reward are the most relevant characteristicsof reinforcement learning. This method allows machines and software agents to automatically determine theidealbehavior within a specific context in order to maximize its performance. Simple reward feedback isrequired for the agent to learn which action is best.

Semi-Supervised Learning

Semi-supervised learning fall somewhere in between supervised and unsupervised learning, since they use both labeled and unlabeled data for training – typically a small amount of labeled data and a large amount ofunlabeled data. The systems that use this method are able to considerably improve learning accuracy.Usually, semi-supervised learning is chosen when the

acquired labeled data requires skilled and relevant
resources in order to train it / learn from it. Otherwise, acquiring unlabeled data generally doesn't require

Objectives

Main objectives of training were to learn:

How to determine and measure program complexity,

- ✓ Python Programming
- ✓ ML Library Scikit, Numpy , Matplotlib, Pandas , Theano , TensorFlow
- ✓ Statistical Math for the Algorithms.
- ✓ Learning to solve statistics and mathematical concepts.
- ✓ Supervised and Unsupervised Learning
- ✓ Classification and Regression

ML Algorithms

Machine Learning Programming and Use Case

Advantages of Machine Learning

Every coin has two faces, each face has its own property and features. It's time to uncover the faces of ML.

A very powerful tool that holds the potential to revolutionize the way things work.

1. Easily identifies trends and patterns -

Machine Learning can review large volumes of data and discover specific trends and patterns that would not be apparent to humans. For instance, for an e-commerce website like Amazon, it serves to understand the browsing behaviors and purchase histories of its users to help cater to the right products, deals, and reminders relevant to them. It uses the results to reveal relevant advertisements to them.

2. No human intervention needed (automation) -

With ML, we don't need to babysit our project every step of the way. Since it means giving machines the ability to learn, it lets them make predictions and

also improve the algorithms on their own. A common example of this is anti-virus software. they learn to filter new threats as they are recognized. ML is also good at recognizing spam.

3. Continuous Improvement -

As ML algorithms gain experience, they keep improving in accuracy and efficiency. This lets them make better decisions. Say we need to make a weather forecast model. As the amount of data, we have keeps growing, our algorithms learn to make more accurate predictions faster.

4. Handling multi-dimensional and multi-variety data -Machine Learning algorithms are good at handling data that are multi-dimensional and multi-variety, and they can do this in dynamic or uncertain environments.

5. Wide Applications -

We could be an e-seller or a healthcare provider and make ML work for us. Where it does apply, it holds the capability to help deliver a much more personal experience to customers while also targeting the right customers.

Applications of Machine Learning

Applications of Machine Learning include:

Web Search Engine:

One of the reasons why search engines like google, bingetc work so well is because the system has learnt how to rank pages through a complex learning algorithm.

Photo tagging Applications:

Be it facebook or any other photo tagging application, the ability to tagfriends makes it even more happening. It is all possible because of a face recognition algorithm thatruns behind the application.

Spam Detector:

Our mail agent like Gmail or Hotmail does a lot of hard work for us in classifyingthe mails and moving the spam mails to spam folder. This is again achieved by a spam classifierrunning in the back end of mail application.

Database Mining for growth of automation:

Typical applications include Web-click data for betterUX, Medical records for better automation in healthcare, biological data and many more.

Applications that cannot be programmed:

There are some tasks that cannot be programmed as thecomputers we use are not modelled that way. Examples include Autonomous Driving, Recognitiontasks from unordered data (Face Recognition/ Handwriting Recognition), Natural languageProcessing, computer Vision etc.

Understanding Human Learning:

This is the closest we have understood and mimicked the human brain. It is the start of a new revolution, The real AI. Now, after a brief insight lets come to a moreformal definition of Machine Learning

DEEP LEARNING

Deep learning is a branch of machine learning which is completely based on artificial neural networks, as neural network is going to mimic the human brain so deep learning is also a kind of mimic of human brain. In deep learning, we don't need to explicitly program everything. The concept of deep learning is not new. It has been around for a couple of years now. It's on hype nowadays because earlier we did not have that much processing power and a lot of data. As in the last 20 years, the processing power increases exponentially, deep learning and machine learning came in the picture.

In human brain approximately 100 billion neurons all together this is a picture of an individual neuron and each neuron is connected through thousands of theirneighbours. The question here is how do we recreate these neurons in a computer. So, we create an artificial structure called an artificial neural net where we have nodes or neurons. We have some neurons for input value and some for-output value and in between, there may be lots of neurons interconnected in the hidden layer.

Architectures:

1. **Deep Neural Network** – It is a neural network with a certain level of complexity (having multiple hidden layers in between input and output layers). They are capable of modeling and processing non-linear relationships.
2. **Deep Belief Network (DBN)** – It is a class of Deep Neural Network. It is multi-layer belief networks.

   Steps for performing DBN:

   a. Learn a layer of features from visible units using Contrastive Divergence algorithm.

   b. Treat activations of previously trained features as visible units and then learn features of features.

   c. Finally, the whole DBN is trained when the learning for the final hidden layer is achieved.
3. **Recurrent** (perform same task for every element of a sequence) Neural Network – Allows for parallel and sequential computation. Similar to the human brain (large feedback network of connected neurons). They are able to remember important things about the input they received and hence enables them to be more precise.

CONVOLUTIONAL NEURAL NETWORK (CNN):

When it comes to Machine Learning, Artificial Neural Networks perform really well. Artificial Neural Networks are used in various classification task like image, audio, words. Different types of Neural Networks are used for different purposes, for example for predicting the sequence of words we use Recurrent Neural Networks more precisely an LSTM, similarly for image classification we use Convolution Neural Network. In this blog, we are going to build basic building block for CNN.

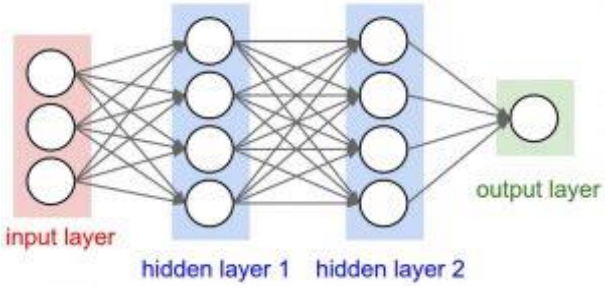
Before diving into the Convolution Neural Network, let us first revisit some concepts of Neural Network. In a regular Neural Network there are three types of layers:

1. Input Layers: It's the layer in which we give input to our model. The number of neurons in this layer is equal to total number of features in our data (number of pixels incase of an image).
2. Hidden Layer: The input from Input layer is then feed into the hidden layer. There can be many hidden layers depending upon our model and data size. Each hidden layers can have different numbers of neurons which are generally greater than the number of features. The output from each layer is computed by matrix multiplication of output of the previous layer with learnable weights of that layer and then by addition of learnable biases followed by activation function which makes the network nonlinear.
3. Output Layer: The output from the hidden layer is then fed into a logistic function like sigmoid or SoftMax which converts the output of each class into probability score of each class.

The data is then fed into the model and output from each layer is obtained this step is called feedforward, we then calculate the error using an error function, some common error functions are cross entropy, square loss error etc. After that, we backpropagate into the model by calculating the derivatives. This step is called Backpropagation which basically is used to minimize the loss.

Here's the basic python code for a neural network with random inputs and two hidden layers.

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



Now let's talk about a bit of mathematics which is involved in the whole convolution process.

- Convolution layers consist of a set of learnable filters (patch in the above image). Every filter has small width and height and the same depth as that of input volume (3 if the input layer is image input).
- For example, if we have to run convolution on an image with dimension 34x34x3. Possible size of filters can be axax3, where 'a' can be 3, 5, 7, etc but small as compared to image dimension.
- During forward pass, we slide each filter across the whole input volume step by step where each step is called stride (which can have value 2 or 3 or even 4 for high dimensional images) and compute the dot product between the weights of filters and patch from input volume.
- As we slide our filters we'll get a 2-D output for each filter and we'll stack them together and as a result, we'll get output volume having a depth equal to the number of filters. The network will learn all the filters.

Types of layers:

Let’s take an example by running a covnets on of image of dimension 32 x 32 x 3.

1. **Input Layer**: This layer holds the raw input of image with width 32, height 32 and depth 3.**Convolution Layer:** This layer computes the output volume by computing dot product between all filters and image patch. Suppose we use total 12 filters for this layer we’ll get output volume of dimension 32 x 32 x 12.
2. **Activation Function Layer**: This layer will apply element wise activation function to the output of convolution layer. Some common activation functions are RELU: max(0, x), Sigmoid: 1/(1+e^-x), Tanh, Leaky RELU, etc. The volume remains unchanged hence output volume will have dimension 32 x 32 x 12.
3. **Pool Layer**: This layer is periodically inserted in the covnets and its main function is to reduce the size of volume which makes the computation fast reduces memory and also prevents from overfitting. Two common types of pooling layers are max pooling and average pooling. If we use a max pool with 2 x 2 filters and stride 2, the resultant volume will be of dimension 16x16x12.
4. **Fully-Connected Layer:** This layer is regular neural network layer which takes input from the previous layer and computes the class scores and outputs the 1-D array of size equal to the number of classes.

Dense Layer:

Dense layer is the regular deeply connected neural network layer. It is most common and frequently used layer. Dense layer does the below operation on the input and return the output.

Dense layers add an interesting non-linearity property;thus, they can model any mathematical function. However, they are still limited in the sense that for the same input vector we get always the same output vector. They can't detect repetition in time, or produce different answers on the same input. Each neuron in a layer receives an input from all the neurons present in the previous layer—thus, they're densely connected. In other words, the dense layer is a fully connected layer, meaning all the neurons in a layer are connected to those in the next layer. Original implementation was using the Tanh function for the activation, it is now more frequent to use the ReLU, it is leading to faster training and lower probability of vanishing gradient. There are two convolutional layers based on 3x3 filters with average pooling

CHAPTER 2

LITERATURE SURVEY

This problem statement has been extensively studied over the past 5 years by researchers and automotive companies in a bid to create a solution, and all their solutions vary from analyzing various patterns of distractive habits to analyzing health vitals of the driver.

The work of Dr. K.S. Tiwari et al [1] introduced an eye-blink monitoring system and also provided a buzzer to alert the driver of his condition. Whereas the research paper of CeerthiBala et al [10] proposed a system to alert the traffic department when distraction isperceived.

Some studies were conducted using neuro cognitive information, especially, through EEG, and it has been used to show differences in brain dynamics when there occurs a change in alertness during driving. In Jap et all‘s research paper, we can understand their researches addressing drowsiness and fatigue detection using EEG, which showed that the ratio of slow to fast EEG waves were increased when the subject, in our case, the driver was distracted or influenced byfatigue.

Gharagozlou et al. suggested in his research paper that other different levels of fatigue and distraction can be estimated using band power features and EEG signal entropy features, showing a notable increase in alpha power corresponding to driverfatigue.

Rateb Jabbar et al [2] suggested that accuracy of detecting sleepiness increased byusing facial landmarks with a Convolution Neural Network (CNN). In J Hu and J Min‘s paper, entropy features were used to combine with Gradient Boosting Decision Tree Model. Deep learning models for fatigue classification were proposed, as in H. Zeng et all‘s work, through a Residual Convolution Neural Network (EEG-Conv-R), using data collected from 10 healthy subjects over 16channels.

Ravva Sai Sanketh, M Madhu Bala's research paper, the main aim of this model is to detect skin cancer for patients in earlier stages and treat them effectively so that we can reduce the mortality rate.

Dr.Abbas Hanon. Alasadi ,Baidaa M.Alsafy's research paper, The system consists of two phases: the first phase detects whether the pigmented skin lesion is malignant or benign; the second phase recognizes malignant melanoma skin cancer types. Both first and second phases have several stages. The experimental results are acceptable.

Nikita Raut, Aayush Shah's research paper, As per the literature the lesion characteristics such as shape, color, structure etc. are the important parameters for detection of skin cancer. In this paper we review the various soft computing and artificial intelligence techniques for early-stage melanoma skin cancer detection.

Munya Abdulmajid Arasi, El-Sayed A. El-Dahshan's research paper, The comparative study shows that the most common methods for features extraction are the Discreet Wavelet Transform (DWT) and the method which combines both texture and color features resulting in output of very high accuracy. The methods for the classification:í µí°¾-Nearest Neighbor, Artificial Neural Networks, and Support Vector Machines are very well in the range [%90-% 97, 5].

Adria Romero Lopez, Xavier Giro-i-Nieto's research paper, The proposed solution is built around the VGGNet convolutional neural network architecture and uses the transfer learning paradigm. Experimental results are encouraging: on the ISIC Archive dataset, the proposed method achieves a sensitivity value of 78.66%, which is significantly higher than the current state of the art on that dataset.

Wang et all., N. Hatami et all., and Z. Zhao et all.,'s methodologies used (recurrence plots and gramian angular fields), they have been successfully applied in computer vision algorithms combined with deep learning, these have been used in recent works in the EEG research domain, but still are relatively unexplored.

MkhuseliNgxande et al [6] reviewed machine learning algorithms such as Support

Vector Machines (SVMs), Convolutional Neural Networks (CNNs) and Hidden Markov models in this context. The work of Naveen SenniappanKaruppusamy et al [8] suggested an electroencephalography-based sleepiness detection system (ESDS) with accuracy of93.91%.

Yaocong Hu et al [8] proposed a new deep learning framework based onthe hybrid of 3D conditional generative adversial network and two-level attention bidirectional long short-term memory network. It was proposed for robust recognition aimed at extracting short-term spatial-temporal features designed as a 3D encoder-decoder gene generator with the condition of auxiliary information to generate high-quality fake image sequences and a 3D discriminator was devised to learn drowsinessrelated representation from spatial-temporal domain. In addition, for long-term spatial-temporal fusion, they investigated the use of two-level attention mechanism to guide the bidirectional long short-term memory to learn the saliency of shortterm memory information and long-term temporal information.

Mohamed HediBaccour et all‘s proposal consisted of an analysis of the potential eye-closure and head rotation signals of the driver to classify the driver‘s state using logistic regression models.

2.1 INFERENCES FROM LITREATURE SURVEY

literature Survey

[1] Title: Melanoma Disease Detection Using Convolutional Neural Networks

Author: Ravva Sai Sanketh, M Madhu Bala

Year: 2020

Description: There are different forms of cancers out of which skin cancer is the most common one, Usually, Every year the people infected by Skin Cancer will be more than the number of people infected by all other types of cancer combined. Mortality rates of skin cancer in the world have risen. According to the World Health Organization, the early finding of transformations of the skin significantly improve the chances of good medication and treatment so that the patient can

be saved. The Computer system integrated with the software developed from deep learning, namely convolutional neural networks (CNN), is **good at detecting skin cancer than experienced dermatologists, so now We had extended this Deep Learning Architecture to develop a model that categorizes the given infected skin image of patient as Malignant (Melanoma or Harmful) or Benign (Harmless) By using various libraries in Python. This model is trained and tested by using dataset taken from International Skin Imaging Collaboration(ISIC). The main aim of this model is to detect skin cancer for patients in earlier stages and treat them effectively so that we can reduce the mortality rate.**

[2] Title: Early Detection and Classification of Melanoma Skin Cancer

Author: Dr.Abbas Hanon. Alasadi ,Baidaa M.ALsafy

Year: 2015

Description: Melanoma is a form of cancer that begins in melanocytes (cells that make the pigment melanin). It can affect the skin only, or it may spread to the organs and bones. It is less common, but more serious and aggressive than other types of skin cancer. Melanoma can be of benign or malignant. Malignant melanoma is the dangerous condition, while benign is not. In order to reduce the death rate due to malignant melanoma skin cancer, it is necessary to diagnose it at an early stage. In this paper, a detection system has been designed for diagnosing melanoma in early stages by using digital image processing techniques. The system consists of two phases: the first phase detects whether the pigmented skin lesion is malignant or benign; the second phase recognizes malignant melanoma skin cancer types. Both first and second phases have several stages. The experimental results are acceptable.

[3] Title: A Study on Different Techniques for Skin Cancer Detection

Author: Nikita Raut, Aayush Shah

Year: 2018

Description: The number of cases of melanoma skin cancer has been increasing year by year. Skin cancer is one of the most dangerous types of cancers, because it's much more likely to spread to other parts of the body if not diagnosed and treated early. About three million people are diagnosed with the disease every year in the United States alone. Early detection of Melanoma skin cancer is very much necessary for the patient for it to be curable. Today's technological advancements can make possible the early detection of skin cancer. As per the literature the lesion characteristics such as shape, color, structure etc. are the important parameters for detection of skin cancer. In this paper we review the various soft computing and artificial intelligence techniques for early stage melanoma skin cancer detection.

[4] Title: Malignant Melanoma Detection Based on Machine Learning Techniques

Author: Munya Abdulmajid Arasi, El-Sayed A. El-Dahshan

Year: 2016

Description: Skin cancer is one of the most growing types and dangerous cancer in the world; the important of these cancers are malignant melanoma. The early diagnosis of malignant melanoma is a critical issue for dermatologists. In this paper, we present an overview of recent the state of the art in Computer-aided detection/diagnosis (CAD) systems in identifying and diagnosing malignant melanoma of dermoscopy images and describe its steps starting with image acquisition, preprocessing; and finishing with malignant melanoma classification of dermoscopic images. The comparative study shows that the most common methods for features extraction are the Discreet Wavelet Transform (DWT) and the method which combines both texture and color features resulting in output of very high accuracy. The methods for the classification:í µí°¾-Nearest Neighbor, Artificial Neural

Networks, and Support Vector Machines are very well in the range [%90-% 97, 5].

[5] Title: SKIN LESION CLASSIFICATION FROM DERMOSCOPIC IMAGES USING DEEP LEARNING TECHNIQUES

Author: Adria Romero Lopez, Xavier Giro-i-Nieto

Year: 2017

Description: The recent emergence of deep learning methods for medical image analysis has enabled the development of intelligent medical imaging-based diagnosis systems that can assist the human expert in making better decisions about a patients health. In this paper we focus on the problem of skin lesion classification, particularly early melanoma detection, and present a deep-learning based approach to solve the problem of classifying a dermoscopic image containing a skin lesion as malignant or benign. The proposed solution is built around the VGGNet convolutional neural network architecture and uses the transfer learning paradigm. Experimental results are encouraging: on the ISIC Archive dataset, the proposed method achieves a sensitivity value of 78.66%, which is significantly higher than the current state of the art on that dataset.

2,2 OPEN PROBLEMS IN EXISTING SYSTEM

1.Like other domains, researchers have successfully implemented the machine and Deep learning techniques to construct prediction models in the context of certain diseases such as Melanoma disease.

2. This approach was able to successfully discriminate between early-Melanoma subjects and controls with 96% sensitivity, 97% specificity and an AUC of 0.98.

3. In the existing method they use neural network but the accuracy is poor.

4. They used Artificial Neural Network based Classification Melanoma skin cancer.

CHAPTER 3

REQUIREMENT ANALYSIS

3.1 FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

Summary The feasibility of targeted screening for cutaneous malignant melanoma in the UK using a postal questionnaire and invitation to screening by a consultant dermatologist was investigated in a population based cross-sectional survey. A total of 1600 people aged 25–69 years, stratified by the social deprivation score of wards within one general practice, were randomly selected from a population of 8000.1227 (77%) returned the questionnaire and 896 (56%) attended the screening clinic. Uptake was lower for men ($P < 0.001$), those aged under 50 ($P < 0.001$), people from deprived areas ($P < 0.001$) and skin types III and IV (men only, $P < 0.001$). Twenty per cent of women and 10% of men felt nervous about attending the clinic, but only 4% were worried by the questionnaire. The level of agreement between the self- and dermatologist's assessments of risk factors was best for hair colour (Kappa = 0.67, sensitivity 73% and specificity 98%). People tended to under-report their level of risk. Over 95% knew about at least one major sign, but 54% reported incorrect signs of melanoma. Targeted screening for melanoma in the UK will be hampered by difficulties in accurately identifying the target population. Strategies to improve skin self-awareness rather than screening should be developed and evaluated.

3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

The risk factor of Melanoma is a fairy skin tone, sun burnings, and past genetic factors, prone to less immunity system and also exposure to ultra violet light rays excessively. If Melanoma is not detected in its early stages it might grow and also spread along the first layer of skin that is epidermis and at last, it comes in contact with Lymph vessel and the finally blood. Here, we can use the transfer learning algorithm to classify the skin cancer based on normal and melanoma cancer of abnormal patient of the system. We can use the five module to implement our project are datasets collection, data preprocessing, model implementation, classification and prediction of the system.

Fig 4.1: A Representation of a Driver Drowsiness System using Raspberry Pi

4,1 SELECTED METHODOLOGY OR PROCESS MODEL

4,2 ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM

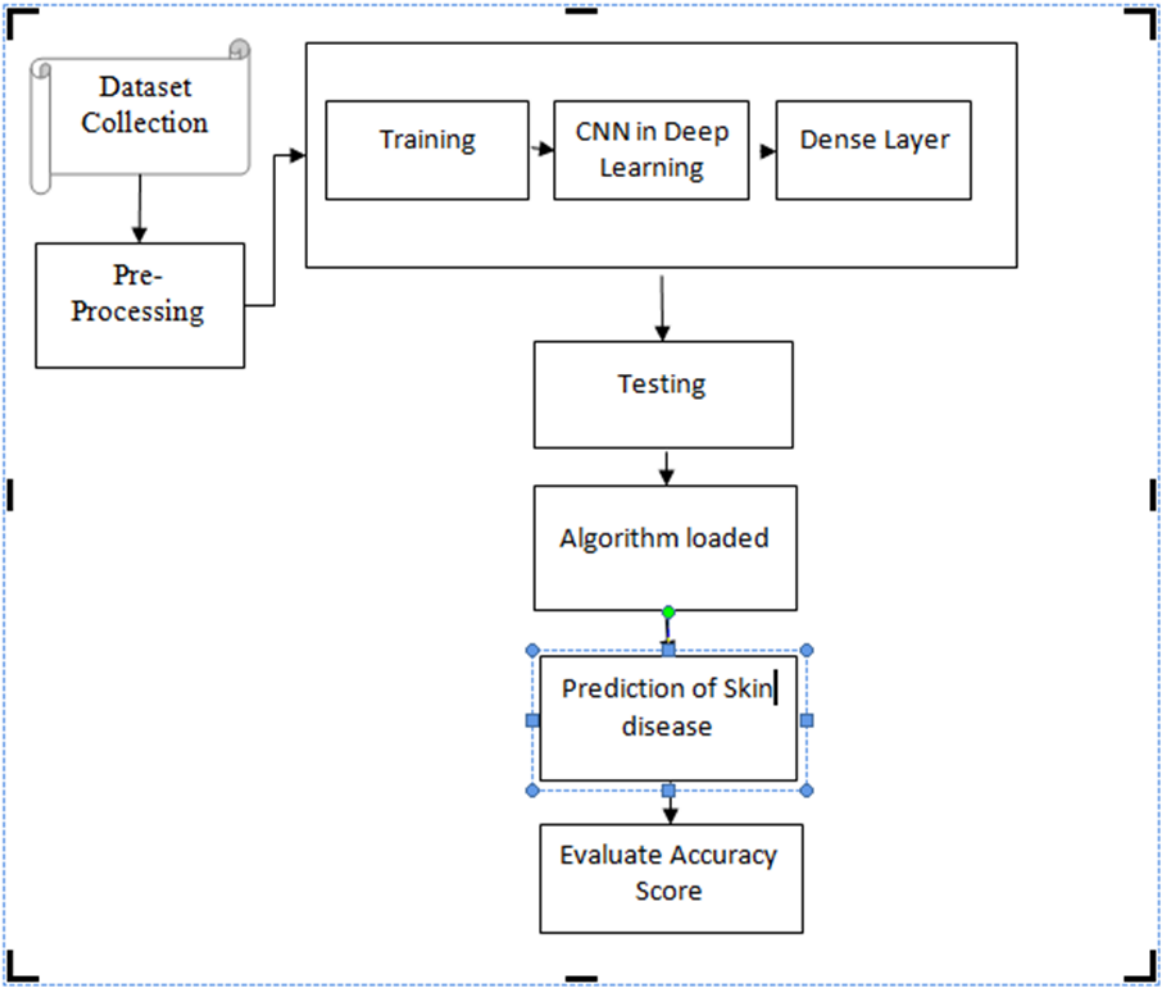


Fig 4.2: System Architecture for classification of melanoma skin cancer

4.3 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

4.4 PROJECT MANAGEMENT PLAN

4.5 FINANCIAL REPORT ON ESTIMATED COSTING

4.6 TRANSITION/ SOFTWARE TO OPERATIONS PLAN

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