



# IJIRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

e-ISSN: 2319-8753 | p-ISSN: 2320-6710



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 7, July 2021

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 7.569



9940 572 462



6381 907 438



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# Skin Cancer Detection System using Deep Learning

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**ABSTRACT:** This paper presents a skin cancer detection system using deep convolutional neural networks (CNNs) for early detection of skin cancer disease. This system overcomes the disadvantage of traditional way of detecting skin cancer, Biopsy method. It is done by removing skin cells and that sample goes to various laboratory testing. It is a painful and time consuming process especially during the time of COVID-19 where there's restriction of travelling around and scarcity of medical aid. The diagnosing methodology uses Image processing methods and Deep Learning methods. Due to the fact that CNNs achieve the best results for the larger datasets, which is not the case in the production environment, the main challenge is applying these methods on smaller datasets. Developing this skin cancer detection model is composed of several essential steps. It is developed using today's most advanced techniques such as CNNs and the use of deep learning techniques such as Model-Agnostic Meta-Learning(MAML++) and Transfer Learning for skin abnormality detection and CNN for detecting skin embeddings. The goal here is practical employment of these state-of-the-art deep learning approaches for the skin cancer detection tasks. The dermoscopy image of skin cancer is taken and it goes under various pre-processing techniques for noise removal and image enhancement. Then the image is directly given as input to the classifier. Convolution Neural Networks(CNNs) are used for classification. It classifies the given image into one of 7 categories on which the model was trained.

**KEYWORDS:** Convolution Neural Networks(CNNs),MAML++, Deep Learning, Image Processing.

## I. INTRODUCTION

Skin cancer is a deadly disease and a common form of cancer. Early detection increases the survival rate. Skin has three (3) basic layers. Skin cancer begins in the outermost layer, which is made up of first layer squamous cells, second layer basal cells, and innermost or third layer melanocytes cells. Squamous cells and basal cells are sometimes called non-melanoma cancers. Non-melanoma skin cancer always responds to treatment and rarely spreads to other skin tissues. Melanoma is more dangerous than most other types of skin cancer. If it is not detected at the beginning stage, it quickly invades nearby tissues and spreads to other parts of the body. Formal diagnosis method to skin cancer detection is Biopsy method.

Dermoscopy is a technique that is used to examine the structure of skin. An observation-based detection technique can be used to detect Melanoma using Dermoscopy images. The accuracy of the dermoscopy depends on the training of the dermatologist. The accuracy of Melanoma Detection can be 75%- 85% even though the experts in skin use dermoscopy as a method for diagnosis. The diagnosis that is performed by the system will help to increase the speed and accuracy of the diagnosis. Computers will be able to extract some information, like asymmetry, colour variation, texture features, these minute parameters may not be recognized by the human naked eyes.

Melanoma is responsible for the most deaths of all skin cancers, with nearly 9,000 people dying from it each year. It is also one of the most common types of cancers among U.S. adolescents and young adults. Annually, about \$3.3 billion of skin cancer treatment costs are attributable to melanoma.

## II. RELATED WORK

[1] Doctors can register themselves to the application by providing the required credentials such as Name, Email id, phone number, designation, hospital name, DOB etc. and can login using the registered username and password.

[2] Admin validates the details of the user for successful registration. Admin can also perform actions like add, delete and update details of the doctor and patient

[3] Doctor can add patient details such as Name, Email ID, Patient ID, DOB, patient's medical history, Skin cancer image of the patient that requires detection, etc.

[4] For creation of dataset, Dataset contains skin cancer images. Large numbers of images are required for neural networks to predict future unknown skin defects accurately. Images with different skin abnormalities are stored to make the model learn effectively about the skin abnormality feature of a particular patient. We have used 7 types of cancer here.

[5] Image pre-processing, the skin part in the image is extracted using Viola-Jones algorithm. Extracted skin part is resized to either 224×224 or 299×299 depending on the model.

[6] For building CNN model to detect the type of skin cancer from the uploaded image Convolutional layer is used to extract the high-level features such as edges before feeding it to the neural network. Here in this a model pre-trained on the ImageNet dataset with n layers without its final fully connected layer is stacked as the feature extractor. It contains a variety of layers like convolutional layers, Pooling Layers, Bottleneck Layers, Batch Normalization layers, Inception Blocks, Dense Block, Skip Connections, Dropout and fully connected layers. The convolutional layers with filters of size m x m are used with some activation function. The filters are a small matrix, with its height and width smaller than the image to be convolved. Activation function after every convolutional layer is to increase the non-linearity in the output. Convolutional layer is followed by the pooling layer. Pooling layer is added to speed up computation and to make some of the detected features more robust. Max pooling is used in this model. From each patch of a feature map, the maximum value is selected to create a reduced map. Dropout is used to avoid the overfitting in the network. It reduces the odds of overfitting by dropping out neurons at random, during every epoch. The feature map produced by the earlier layer is either GAP (Global Average Pooling) or GMP (Global Max Pooling) or flattened to a vector using a flatten layer before feeding it to the dense layer. Then this vector is fed to a fully connected layer so that it captures the complex relationship between the high-level features. The first dense layer uses an activation function of ReLU with 128 neurons. But the final layer, the fully connected layer uses SoftMax activation function since the result required is a multiclass classification and SoftMax returns the logits (the probability value of the type of cancer is few to the lower layers), there are 7 neurons in this case as we are training it on 7 types of skin cancer. The loss function used in this model is categorical cross-entropy which is used for single label categorization. The optimizer used here is adam. The role of the optimizer is to update the weight parameters to minimize the loss function.

[4] For Training and Evaluating the CNN model, dataset is split into three parts: train, validation and test set having 70%, 15% and 15% of split ratio respectively. The model is trained with the images in the train set by considering the required number of epochs. Then the trained model is tested with validation set images. This trained model and the corresponding weights are stored in the disk for the future recognition task.

[5] Skin cancer detection and results: The test images need to go through all the image pre-processing steps. Abnormal skin areas in the test images are detected. Trained model will predict the output and return the category of the type of cancer with a probability value.

### III. METHODOLOGY

#### 3.1 Modules

This application consists of two modules, they are:

1)ADMIN: He/she can Add a new model, Train the model and Save it for future use. He/she also can Validate the user in order to maintain safe usage of application.

2) USER: A User has to register initially and wait for the admin to validate to login. After the Admin validates, the user can log in. The user can capture an image of the cancer and upload. In order to get a classified result, the image is sent for feature extraction. After the extraction and image iterated through the system the model gives us the prediction of the resultant image.

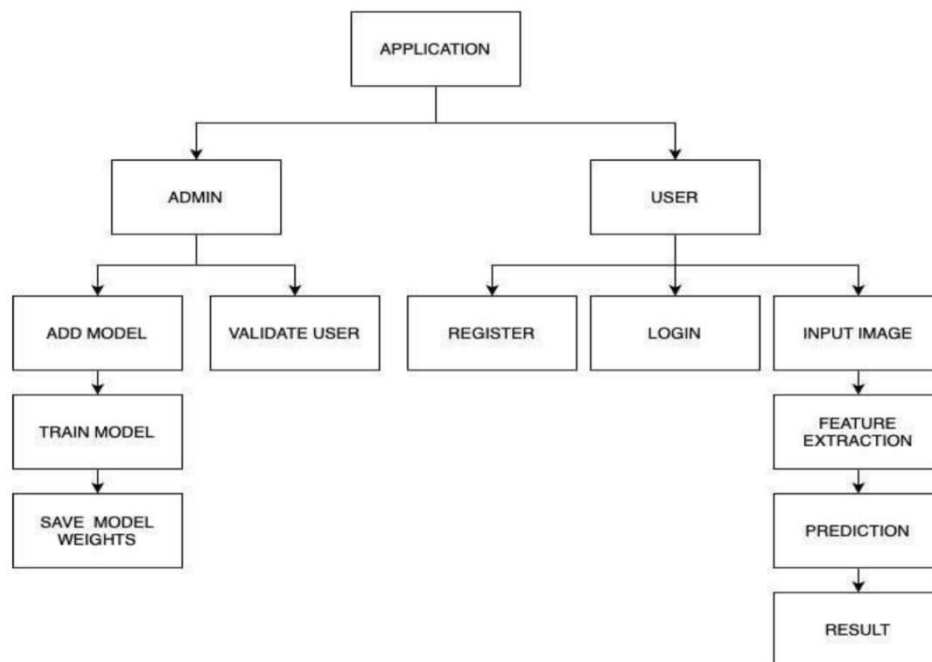


Figure1: Modular design

#### 3.2 Pre-Requisites

##### PYTHON

Python is a widely used high-level, general-purpose, interpreted, dynamic programming language. Its design philosophy emphasizes code readability and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages A Smart Methodology for Analysing Secure E-Banking and E-Commerce Websites such as Java and C++. The language provides constructs intended to enable clear programs on both small and large scales.

Python supports multiprogramming paradigms, including object-oriented imperative and functional programming or procedural styles. It features a dynamic type system and automatic memory management and has a large and comprehensive standard library. Python interpreters are available for installation on many operating systems, allowing Python code execution on a wide variety of systems.



## TENSORFLOW

TensorFlow is a Python-friendly open source library for numerical computation that makes machine learning faster and easier. TensorFlow can train and run deep neural networks for handwritten digit classification, image recognition, word embeddings, recurrent neural networks, sequence-to-sequence models for machine translation, natural language processing, and PDE (partial differential equation) based simulations. Best of all, TensorFlow supports production prediction at scale, with the same models used for training. TensorFlow allows developers to create dataflow graphs—structures that describe how data moves through a graph or a series of processing nodes. Each node in the graph represents a mathematical operation, and each connection or edge between nodes is a multidimensional data array, or tensor.

TensorFlow provides all of this for the programmer by way of the Python language. Python is easy to learn and work with, and provides convenient ways to express how highlevel abstractions can be coupled together. Nodes and tensors in TensorFlow are Python objects, and TensorFlow applications are themselves Python applications. The actual math operations, however, are not performed in Python. The libraries of transformations that are available through TensorFlow are written as high-performance C++ binaries. Python just directs traffic between the pieces, and provides high-level programming abstractions to hook them together.

## HTML, CSS & JAVASCRIPT

**HTML** or HyperText Markup Language is the standard markup language for documents designed to be displayed in a web browser. Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

**CSS** is designed to enable the separation of presentation and content, including layouts, colours, and fonts. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file which reduces complexity and repetition in the structural content as well as enabling the .css file to be cached to improve the page load speed between the pages that share the file and its formatting.

**JavaScript**, often abbreviated as JS, is a programming language that conforms to the ECMAScript specification. JavaScript is high-level, often just in-time compiled. It has curly bracket syntax, dynamic typing, prototype-based object orientation, and first-class functions.

## POSTGRESQL

PostgreSQL is a powerful, open source object-relational database system that uses and extends the SQL language combined with many features that safely store and scale the most complicated data workloads. The origins of PostgreSQL date back to 1986 as part of the POSTGRES project at the University of California at Berkeley and has more than 30 years of active development on the core platform. PostgreSQL has earned a strong reputation for its proven architecture, reliability, data integrity, robust feature set, extensibility, and the dedication of the open source community behind the software to consistently deliver performant and innovative solutions. PostgreSQL runs on all major operating systems, has been ACID-compliant since 2001, and has powerful add-ons such as the popular PostGIS geospatial database extender.

## DJANGO

Django is a high-level Python web framework that enables rapid development of secure and maintainable websites. Built by experienced developers, Django takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel. It is free and open source, has a thriving and active community, great documentation, and many options for free and paid-for support. Django is versatile and can be (and has been) used to build almost any type of website from content management systems and wikis, through to social networks and news sites. It can work with any client-side framework, and can deliver content in almost any format (including HTML, RSS feeds, JSON, XML, etc). Django provides a secure way to manage user accounts and passwords, avoiding

common mistakes like putting session information in cookies where it is vulnerable (instead cookies just contain a key, and the actual data is stored in the database) or directly storing passwords rather than a password hash.

### 3.3 Proposed System

In this paper, in order to diagnose skin cancer speedily at the earliest stage the patient is provided and augmented assistance using deep learning. The essence of the approach is that a computer is trained to determine the problem by analysing the skin cancer images. This methodology uses digital image processing techniques and stacked CNNs in the form of a model are used for classification. This technique has inspired the early detection of skin cancers, and requires no oil to be applied to your skin to achieve clear sharp images of your moles. In this way, it's a quicker and cleaner approach. But, most importantly, due to its higher magnification, Skin Cancer Detection Using CNN models and MAML++ a newer method proposed to improve model learning can prevent the unnecessary excision of perfectly harmless moles and skin lesions. Classifiers will be trained to learn the features and finally used to classify. The novelty of the present methodology is that it should do the detection in very quick time hence aiding the technicians to perfect their diagnostic skills.

### 3.4 Architecture

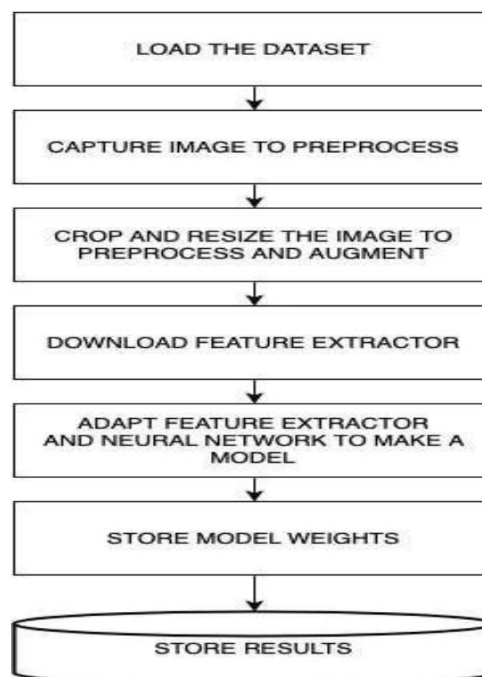


Figure2:Architectural Diagram

Architectural design is a graphical representation of a set of concepts that are part of architecture including the principles, elements and components.

#### IV. RESULT

The results of our final model are shown below:

|                     |      |
|---------------------|------|
| Training accuracy   | 0.95 |
| Training loss       | 0.47 |
| Validation accuracy | 0.92 |
| Validation loss     | 0.53 |
| Test accuracy       | 0.95 |
| Test loss           | 0.47 |

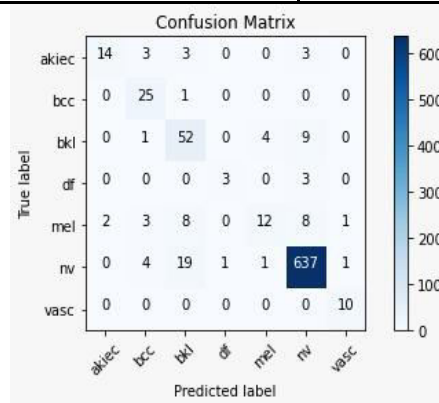


Figure3:Confusion Matrix of the final model

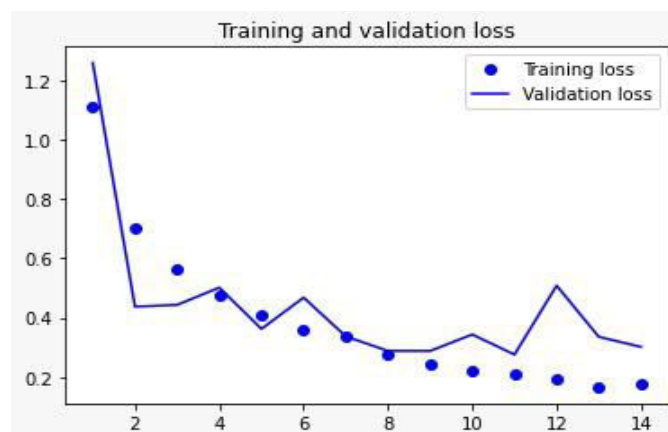


Figure4: Training and validation loss of the final model

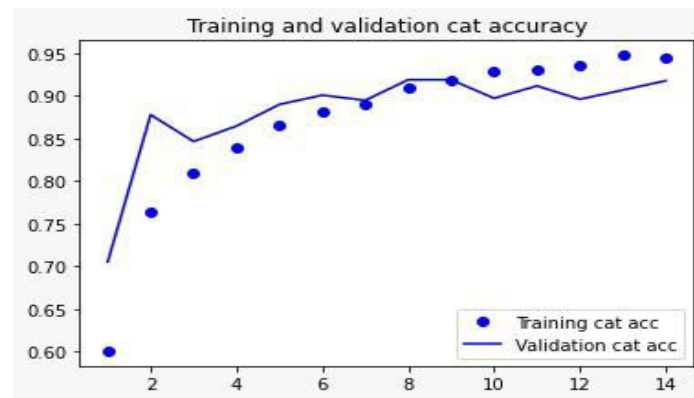


Figure5: Training and validation categorical accuracy of the final model

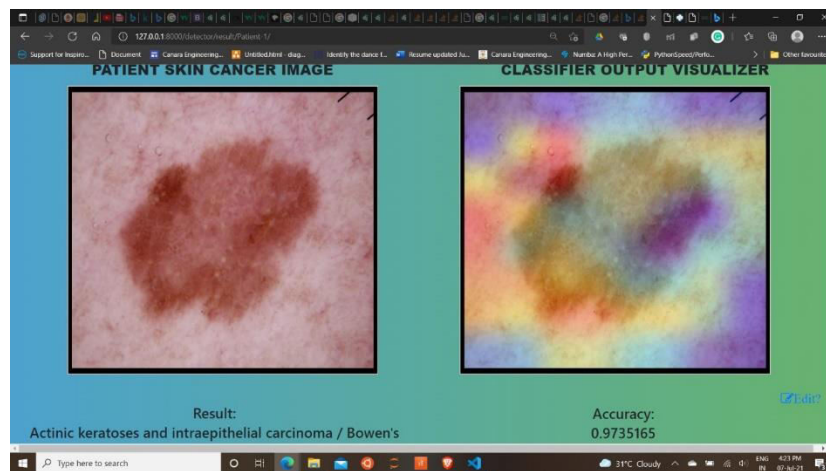
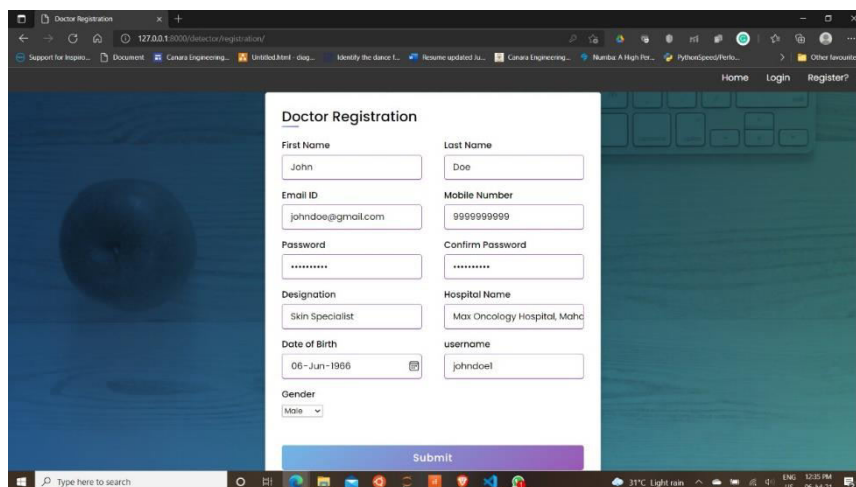


Figure6: Result and Accuracy



Doctor Registration

First Name: John

Last Name: Doe

Email ID: johndoe@gmail.com

Mobile Number: 9999999999

Password: \*\*\*\*\*

Confirm Password: \*\*\*\*\*

Designation: Skin Specialist

Hospital Name: Max Oncology Hospital, Moha

Date of Birth: 06-Jun-1986

Username: johndoe1

Gender: Male

Submit

Figure7: Doctor Registration page

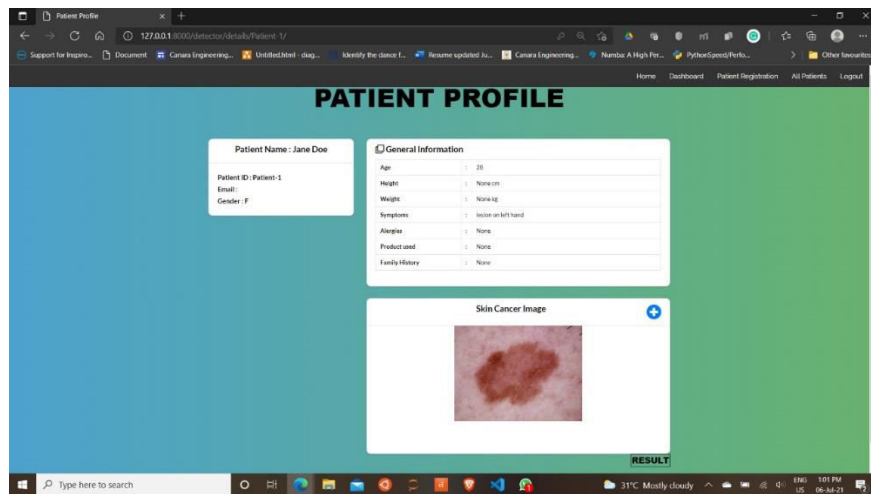


Figure8: Patient detail profile

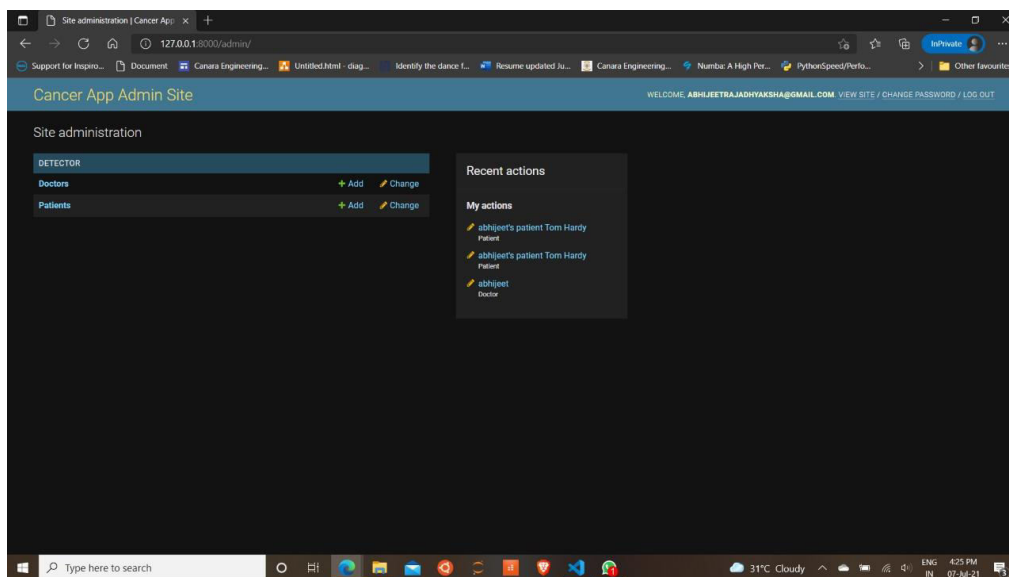


Figure9: Admin page

## V. CONCLUSION

We have successfully built a skin cancer detection system that can be used by doctors to detect and classify 7 types of skin cancers. It works well on all 7 types of skin cancers the model was trained on with high accuracy. We have also used various algorithms to resolve the problems in deep learning like model forgetting including visualization. We have seen how data balancing and fine-tuning the model after using transfer learning can help improve model accuracy. We have seen how the visualization of the model activations can improve and help both users and developers understand what the model saw to make its prediction using the Grad-CAM algorithm. We have also successfully implemented this solution in the form of a web app made using the Django web framework, that the users can use to access the website. The doctors can add patients and upload the pictures of the cancer photo online to get the prediction, he can also crop the image online. There is also an admin who can validate doctors by their credentials and allow them to access the website.



#### REFERENCES

- [1]J Abdul Jaleel, “Proposed Computer based skin cancer detection”, 2013.
- [2] M Chaithanya Krishna “This paper presents a computer aided method for the detection of Melanoma Skin Cancer using Image Processing tools”2016.
- [3] Revati Kadu “In this paper, a system is proposed which detects the skin diseases using Wavelet Techniques and Artificial Neural Network”,2018.
- [4]Inception-v4, “ Inception-ResNet and the Impact of Residual Connections on Learning (Szegedy et al.)” 2016.
- [5]R. R. Selvaraju, “Grad-CAM: Visual Explanations from Deep Networks via Gradient-Based Localization”, 2017.



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