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Skin Cancer Detection Using CNN Efficient Net Model

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ABSTRACT: Skin cancer is one of the life-threatening types of cancer, with an increasing death rate throughout the years. Detecting and predicting the type of skin cancer in its early stages provides better chances for treatment. In the recent years, Convolutional Neural Networks (CNNs) emerged as a significant solution that aids the diagnosis of skin cancer [1]. In this, Human Against Machine (HAM) 10000 dataset is used to demonstrate skin cancer classification strategy. EfficientB3 and a CNN proposed in this project are implemented, trained, and evaluated. This project presents the first systematic review of the state-of-the-art research on classifying skin lesions with CNNs using EfficientB3 Algorithm. The requisite of early detection of the type of skin cancer have been increased because of the rapid growth rate of skin cancer, its death rate and expensive treatment costs. Previously, the cancer cells are detected manually and it takes most of the time to get the reports and then treatment continues. This project proposed an artificial skin cancer detection system using machine learning method and image processing. The feature extraction techniques are used to extract the feature of the affected skin cells after the analysis of the dermoscopic image. A deep learning-based method convolutional neural network classifier is used for the detection of the extracted feature.

KEYWORDS: HAM10000 Dataset, Convolutional Neural Network, EfficientNet Algorithm, Global Average Pooling layer, Optimizers, Dropout Layer.

I. INTRODUCTION

Skin cancer is a state in which there is an unusual growth of melanocytic cells in the skin. Malignant melanoma is a type of skin cancer which is generally caused from the pigment-containing cells known as melanocytes. Melanoma can mostly be detected in non-Hispanic white males and females, and 75% of deaths emanate associated with this skin cancer. According to the world cancer organization the primary reason of melanoma is ultra-violet light exposure in those people who have low level of skin pigment.

The UV ray can be from different sources mainly exposure to UV rays of sun and nearly 25% of malignant can be from moles. Convolutional Neural Network algorithm is utilized to detect the type of skin cancer. This framework is based on extracting the important features of the images that leads to find out which type of cancer it is. Convolutional Neural Network (CNN) is a type of neural network which is used in image and signal processing. CNN is chosen because it results high accuracy in image processing. CNN has four standards of working. The primary layer is the input layer where skin doctor will give every one of the information they obtained. The input layer which has the information will be sent to the next layers which is then sent to the pooling layer. The pooling layer which performs max pool or min pool helps to pool the information structure. The pooling layer sends the pooling information for smoothing the information to straighten layer which changes the updated information to one dimensional vector.

At that point the information gets into the thick layer to get changed over to the class they want which is for the situation of 7 classes that are present in the data set which was used in this project i.e., HAM10000 those 7 classes are named as Melanocytic nevi, Melanoma, Benign keratosis-like lesions, Basal cell carcinoma, Actinic Keratoses, Vascular lesions, Dermatofibroma. This project represents automatic skin cancer detection approach based on convolutional neural network to classify the cancer images into either of the 7 classes that are mentioned above.

II. RELATED WORK

“Detection and Diagnosis of Skin Cancer Based On K-Means Cluster” is developed by Ahmed Shihab, Hussein, Salah Mariana Mocanu in 2021. The techniques used are K-Means Clustering, trial and error method for choosing k value. The advantages are: k-means clustering algorithm is the least difficult unsupervised learning method. Cluster value is given at random. The disadvantage is K-means assumes spherical shapes of clusters and doesn't work well when clusters are in different shapes such as elliptical clusters [2].

“Skin Cancer Classification Using Image Processing and Machine Learning” is developed by Arslan Javaid, Muhammad Sadiq, Faraz Akram in 2021. The techniques used are SVM, Quadratic Discriminant, Random Forest. The advantages are: Quadratic Discriminant performs well when there is non-linear data. The drawbacks are that SVM is not suitable for large data sets [3].

“Machine Learning Algorithms based Skin Cancer Detection” is developed by Shuchi Juyal in 2020. This work presents a comparative analysis of 5 different machine learning algorithms random forest, Naive Bayes, logistic regression, kernel SVM and CNN. The use of five distinct machine learning classifiers could identify or detect kinds of skin cancer. The drawback is that detection of skin cancer can be explored with recent advances in AI and the benefits of diagnosis assisted with AI [4].

“Melanoma Skin Cancer Detection Using Image Processing and Machine Learning Techniques” is developed by MA. Ahmed Thaaajwer, UA. Piumi Ishanka in 2020. The techniques used are Grayscale and Gaussian filter for image preprocessing, uses GLCM features for feature extraction, SVM is used for classification. The use of GLCM features makes easy method than biopsy for both patients and doctors. The drawback is that it doesn't identify the type of cancer on dark skin image [5].

“Automatic Skin Cancer Detection in Dermoscopy Images based on Ensemble Lightweight Deep Learning Network” is developed by Lisheng Wei, Kun Ding, Huosheng hu in 2020. The techniques used are MobileNet, DenseNet, UNet which is used for feature extraction. The advantages of using these techniques are that it overcomes the limitation of the convolution kernel with a fixed receptive field. The drawback of this developed system is in U-Net style architectures learning may slow down in the middle layers of deeper models, so there is some risk of the network learning to ignore the layers where abstract features are represented [6].

“Detection of skin Cancer by using image processing” is developed by Yasir Salam Abdulghafoor, Muntaha R.Ibraheem in 2019. The techniques used are Image segmentation, Image enhancement, Noise reduction, Geometric transformation, Image registration on the input image. This system detects Eczema skin disease. The drawback is that many other types of Skin cancer can be detected with these techniques [7].

“Image Analysis Model for Skin Cancer Detection: Framework” is developed by Alaa Haddad, Shihab A. Hameed in 2018. The techniques used in developed system are applying enhancement on the captured image, segmentation of image, feature extraction, classification, and the expected severity or output. Benefits of using this developed system are it can be used as an effective, low-cost solution for skin cancer detection. The drawbacks are over segmentation when the image is noisy or has intensity variations, cannot distinguish the shading of the real images and time consuming [8].

“Digital dermatology: Skin Cancer detection model using image processing” is developed by Archana Ajith, Vrinda Goel, Priyanka Vazirani, M. Mani Raja. Implemented using three transforms: Discrete Cosine Transform, Discrete Wavelet Transform, Singular Value Decomposition. Using these transforms it provides feasible solution for skin cancer detection. The drawback is that the prototype must have a database that includes most skin cancer with pictures of all skin tones and types [9].

III. PROPOSED SYSTEM

Today's science has become advanced using Machine-Learning Algorithms. Here in the proposed system, HAM10000 dataset is used which gets trained using a convolutional neural network (CNN) which is a Machine-Learning Algorithm and after the training process it gives us the type of cancer by predicting the image that the user has given to the trained model.

Advantages

- Uses neural networks therefore faster than other traditional machine learning algorithms.
- It doesn't require high computational power.

IV. SYSTEM DESIGN

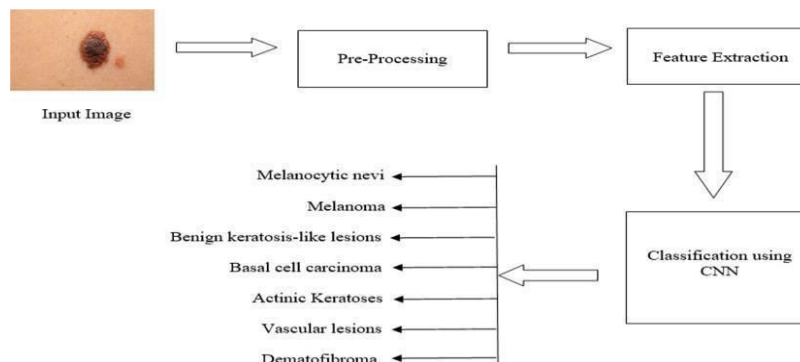


Figure 1: System Architecture for Skin Cancer Detection

Figure 1 signifies the methodology diagram it starts with the input image of skin cancer then continue with image pre-processing, feature extraction where it uses different layers present in CNN algorithm to extract the features from the input image layers like GlobalAveragePool, Maxpool, Dense, Dropout layers). And then after building and training the model the classification of 7 class labels takes place i.e., the model predicts the class/types of cancer [10].

1. Convolutional Neural Network

Convolutional networks have been tremendously prosperous in practical applications. The denomination “convolutional neural network” denotes that the network employs a mathematical operation called convolution. Convolution is a specialized form of linear operation. Convolutional networks are certainly neural networks that use convolution in vicinity of preferred matrix multiplication in at least certainly one of their Convolutional neural networks or ConvNets is a neural network that uses a convolution technique to extract activation values from a quantity for some other volume layer. ConvNets in an easy feel is a chain of layers, wherein each layer of ConvNets, convert one activation extent to every other extent, with one-of-a-kind functions. There are three predominant sorts of layers that have three primary layers, specifically convolution layer (conv layer), pooling layer, and completely related layer.

Below figure indicates the architecture of CNN ultimate step at the forward pass enters the absolutely related layer or fully connected layer where the output is made in vector form and is processed with its weight value. After acquiring the output from the absolutely linked layer, the SoftMax values and error values can be calculated for the values inside the training dataset, to classify whether or not the output matches the model class or not. Convolutional neural networks functions on image volumes. Consequently, the input image can be said as the input volume. The volume consists of width, height, and dimensions of depth. The depth here is 3 colors, they are Red, Green, Blue (. On CNN, the input volume is initialized as $W \times H \times D$. When convolution, the filter calculates the dot product, at each value inside the input volume. The movement of the filter is to shift from the pinnacle to the lowest of the input volume, beginning from the top left then to the top right. Every movement from left to right is done as a whole lot as stride. Stride is how many steps it convolutes [12].

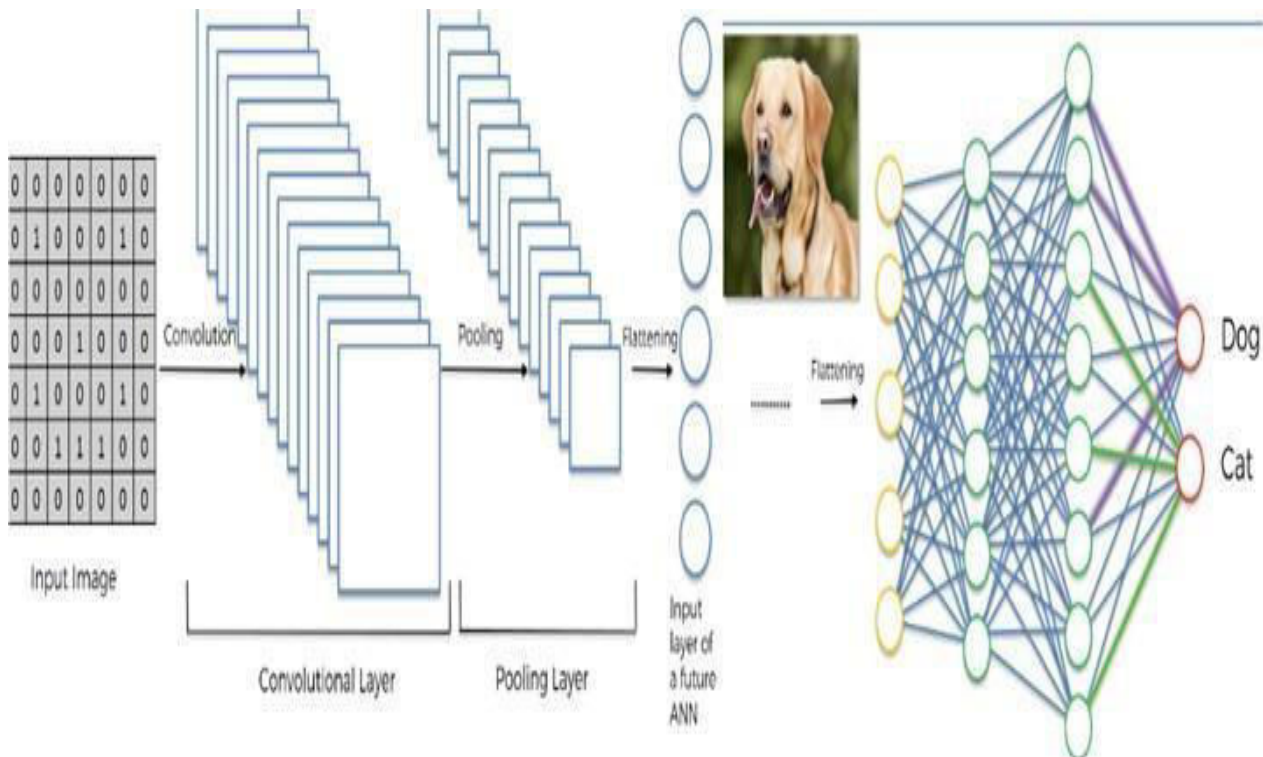


Figure 2: Architecture of Convolutional neural network

2. Optimizers

Optimizers are algorithms or techniques used to change the attributes of your neural network consisting of weights and learning rate as a way to lessen in order the losses. Different types of optimization algorithms or strategies are responsible for lowering the losses and to provide the maximum accurate results possible. The snapshots or images which are recursively trained using the convolutional layer are further optimized by using Adam's optimizer with the help of 2d masks images in the dataset taken [15].

3. EfficientNet Model Description

```
2 x = model.output
3 x = GlobalAveragePooling2D()(x)
4 x = Dropout(0.3)(x)
5 x = Dense(128, activation="relu")(x)
6 x = Dropout(0.3)(x)
7 x = Dense(64, activation="relu")(x)
8 predictions = Dense(7, activation="softmax")(x)
9 model = Model(inputs=model.input, outputs=predictions)
```

Figure 3: Different types of layers in the model

Figure 3 describes the layers that are present in the EfficientB3 model which is one of the Convolutional Neural Network (CNN) model i.e., being used in this project.

4. Global Average Pooling Layer

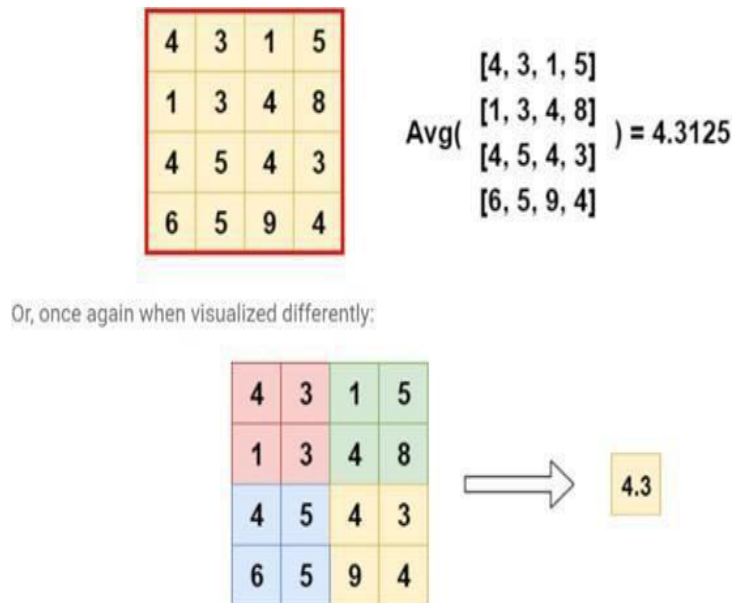


Figure 4: Global Average Pooling Layer

Figure 4 describes about Global Average Pooling layer they are often used to replace the densely- connected layers or full connected layers in a classifier. Rather, the model gives a convolutional layer that generates as many feature maps as the number of target classes, and it applies global average pooling to all the generated feature maps in order to convert into one value. As feature maps can be able to detect certain elements within the input data, the feature maps in the final layer adequately learn to recognize the existence of a particular class in this architecture. By feeding the values (as CNN is a Feed-forward network) that were generated by global average pooling is sent to SoftMax activation function, we obtain the multiclass probability distribution which is required [14].

5. Dropout Layer

Dropout layer is a mask that voids/nullifies the contribution of some neurons in the network towards the next layer and leaves the other neurons unmodified. Applying a Dropout layer to the input neurons, results where it nullifies some of its features; it can also be applied in the hidden layer, in which case it nullifies the features of some hidden neurons. Dropout Layer are important in training the convolutional neural network (CNNs) because they prevent overfitting on the training data set.

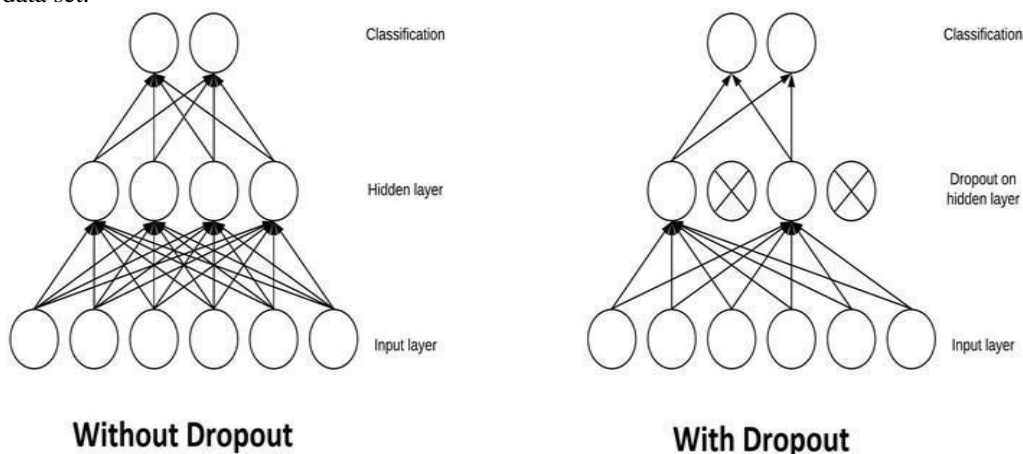


Figure 5: Dropout layer

Figure 5 show 10 pictures of a circle, in series, to a CNN during training. The CNN doesn't assume or learn that straight lines exist; as a consequence, it'll be pretty confused if later show it a picture of a square. This type of cases can be removed by adding the dropout layer to the training method to prevent overfitting [15].

V. RESULTS

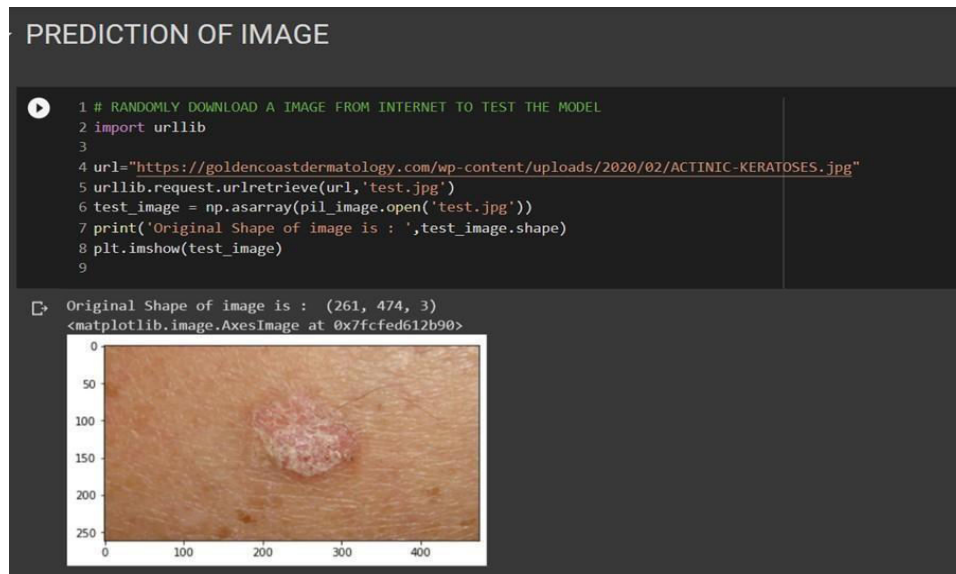


Figure 6: Sending the image to the trained model

Figure 6 demonstrates the process of sending the input image from the user to the trained model. In the figure urllib is used to import the skin cancer image by just passing the image address that is found in any website and then it prints the size of the image and imshow(test_image) is used to display the image.

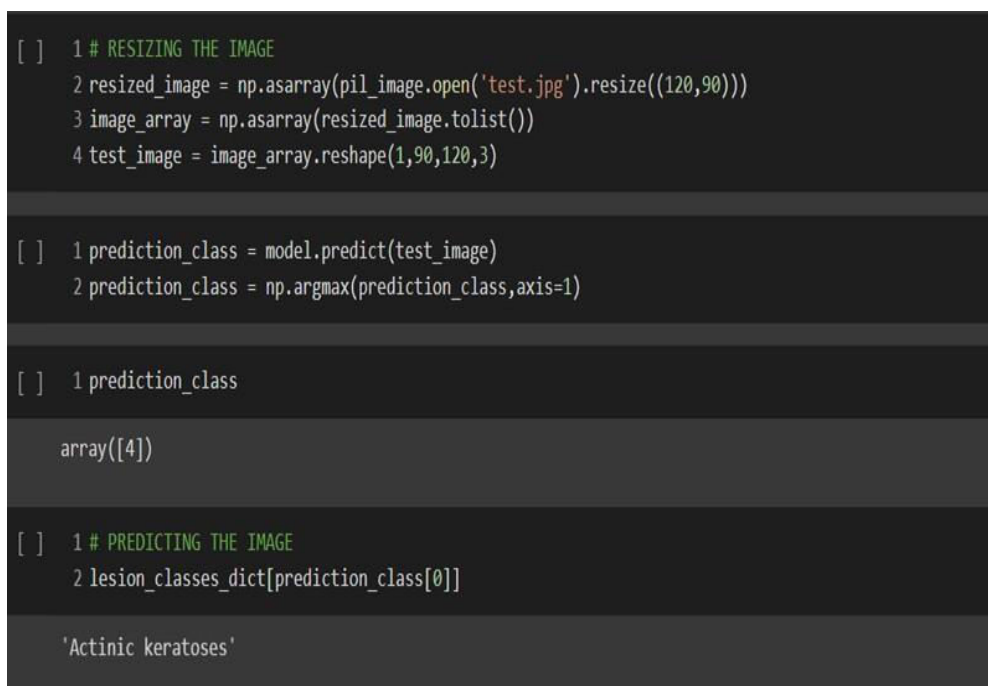


Figure 7: Predicting the Image

Figure 7 demonstrates the process of predicting the input image. After sending the input image that is shown in figure 4.2 the size of the image that is taken from the website is bit larger than the image that are used for the training process in order to predict accurately, resize the given input image using `resize()` function. Next in order to predict the given image `predict()` function is used and then it prints the class that the image belongs. Here in the case above the prediction was Actinic keratoses and input image also belongs to the same class.

VI. CONCLUSION

In this project, a Convolutional Neural Networks based approach have been proposed for Skin Cancer classification. A system is developed that can help patients and doctors to be able to detect or identify skin cancer classes i.e., Melanocytic nevi, Melanoma, Benign keratosis-like lesions, Basal cell carcinoma, Actinic Keratoses, Vascular lesions, Dermatofibroma. From the experimental and evaluation section, it can be said the model can be considered as a benchmark for skin cancer detection by assisting the dermatologist.

REFERENCES

- [1]. Mahamudul Hasan, Samia Islam, Surajit Das Barman, Ahmed Wasif Reza, "Skin Cancer Detection Using Convolutional Neural Network", *Researchgate*.
- [2]. Ahmed Shihab, Hussein, Salah Mariana Mocanu, "Detection and Diagnosis of Skin Cancer Based On K-Means Cluster", 2021, doi: [10.1109/CSCS52396.2021.00031](https://doi.org/10.1109/CSCS52396.2021.00031), *Researchgate*.
- [3]. A. Javaid, M. Sadiq and F. Akram, "Skin Cancer Classification Using Image Processing and Machine Learning," *2021 International Bhurban Conference on Applied Sciences and Technologies (IBCAST)*, 2021, pp. 439-444, doi: [10.1109/IBCAST51254.2021.9393198](https://doi.org/10.1109/IBCAST51254.2021.9393198).
- [4]. Shuchi Juyal, "Machine Learning Algorithms based Skin Disease Detection", *Researchgate*.
- [5]. M. A. Thaajwer and U. P. Ishanka, "Melanoma Skin Cancer Detection Using Image Processing and Machine Learning Techniques," *2020 2nd International Conference on Advancements in Computing (ICAC)*, 2020, pp. 363-368, doi: [10.1109/ICAC51239.2020.9357309](https://doi.org/10.1109/ICAC51239.2020.9357309).
- [6]. L. Wei, K. Ding and H. Hu, "Automatic Skin Cancer Detection in Dermoscopy Images Based on Ensemble Lightweight Deep Learning Network," in *IEEE Access*, vol. 8, pp. 99633-99647, 2020, doi: [10.1109/ACCESS.2020.2997710](https://doi.org/10.1109/ACCESS.2020.2997710).
- [7]. Yasir Salam Abdulghafoor, Muntaha R. Ibraheem, "Detection of Skin Disease by using image processing", *Researchgate*.
- [8]. A. Haddad and S. A. Hameed, "Image Analysis Model For Skin Disease Detection: Framework," *2018 7th International Conference on Computer and Communication Engineering (ICCCE)*, 2018, pp. 1-4, doi: [10.1109/ICCCE.2018.8539270](https://doi.org/10.1109/ICCCE.2018.8539270).
- [9]. A. Ajith, V. Goel, P. Vazirani and M. M. Roja, "Digital dermatology: Skin Cancer detect model using image processing," *2017 International Conference on Intelligent Computing and Control Systems (ICICCS)*, 2017, pp. 168-173, doi: [10.1109/ICCONS.2017.8250703](https://doi.org/10.1109/ICCONS.2017.8250703).
- [10]. Mehwish Dildar, Shumaila Akram, Muhammad Irfan, Hikmat Ullah Khan, Muhammad Ramzan, "Skin Cancer Detection: A Review Using Deep Learning Techniques", *IJERPH*.
- [11]. S. Albawi, T. A. Mohammed and S. Al-Zawi, "Understanding of a convolutional neural network," *2017 International Conference on Engineering and Technology (ICET)*, 2017, pp. 1-6, doi: [10.1109/ICEngTechnol.2017.8308186](https://doi.org/10.1109/ICEngTechnol.2017.8308186).
- [12]. Y. Gao, W. Liu and F. Lombardi, "Design and Implementation of an Approximate Softmax Layer for Deep Neural Networks," *2020 IEEE International Symposium on SoftMax (ISCAS)*, 2020, pp. 1-5, Doi: [10.1109/ISCAS45731.2020.9180870](https://doi.org/10.1109/ISCAS45731.2020.9180870).
- [13]. <https://machinelearningmastery.com/adam-optimization-algorithm-for-deep-learning/>
- [14]. <https://www.machinecurve.com/index.php/2020/01/30/what-are-max-pooling-average-pooling-global-max-pooling-and-global-average-pooling/>
- [15]. A. Özgür and F. Nar, "Effect of Dropout layer on Classical Regression Problems," *2020 28th Signal Processing and Communications Applications Conference (SIU)*, 2020, pp. 1-4, Doi: [10.1109/SIU49456.2020.930205](https://doi.org/10.1109/SIU49456.2020.930205).



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