Project 3- Skin Diagnosis Android Application

Research paper 1:

Author: Suneel Kumar, Ajit Singh

Title of the paper: Image Processing for recognition of skin Disease

URL to online version:
https://www.ijcaonline.org/archives/volume149/number3/25980-2016911373

URL: https://www.ijcaonline.org/archives/volume149/number3/kumar-2016-ijca-911373.pdf

Synopsis: In this research paper Suneel kumar and Ajit Singh has implemented image processing model for skin disease detection. For Image enhancement they are using Histogram equalization. The unique features of the enhance images were extracted using HSV histogram and SURF. Based on the features, the images were classified as infected skin and normal skin. For this classification K-Nearest Neighborhood(KNN) Classifier is used for recognition of specific skin disease.
This methodology has got good accuracy also. By varying the Image processing techniques and Classifiers, the precision can be improved for this system.
Use in our project: This paper helps me to extract unique features from the skin disease image with different methods.

HSV-histogram: In HSV color space for histogram generation each pixel contributes either its Hue or its Intensity. The number of constituents in the feature vector produced based on Hue is given by

$$Nh = Round\ 2pMULT\_FCTR + 1$$

SURF feature: The SURF algorithm has three main portions (a) interest point detection (b) local neighborhood description (c) matching.

Research paper 2:

Author: Jessica Velasco , Cherry Pascion , Jean Wilmar Alberio, Jonathan Apuang , John Stephen Cruz, Mark Angelo Gomez, Benjamin Jr. Molina , Lyndon Tuala , August Thio-ac , Romeo Jr. Jorda

Title of the paper: A Smartphone-Based Skin Disease Classification Using MobileNet CNN

URL:

http://www.warse.org/IJATCSE/static/pdf/file/ijatcse116952019.pdf

Synopsis: The MobileNet model was used by applying transfer learning on the 7 skin diseases to create a skin disease classification system on Android application. The researchers gathered a total of 3,406 images and it is considered as imbalanced dataset because of the unequal number of images on its classes. Using different sampling method and preprocessing of input data was explored to further improved the accuracy of the MobileNet.
In this research paper its aims to design a skin disease classification system application in an Android phone that will classify different skin diseases using the highest performance pretrained convolutional neural networks model in the said field of dataset.

Use in our project: This paper helps me to achieve how to use Android smartphone application in our project.
The development of an Android smartphone application that can identify skin diseases using deep learning through Convolutional Neural Network has three main process. These are capturing the skin lesion, deep learning analysis, and displaying the result.

Research Paper 3 :

Authors: Andre Esteva1*, Brett Kuprel1*, Roberto A. Novoa2,3, Justin Ko2, Susan M. Swetter2,4, Helen M. Blau5 & Sebastian Thrun6

Title of paper :
Dermatologist-level classification of skin cancer with deep neural networks

URL:
https://www.nature.com/articles/nature21056.epdf?author_access_token=8oxIcY
Wf5UNrNpHsUHd2StRgN0jAjWel9jnR3ZoTv0NXpMHRAJy8Qn10ys2O4tuPakXos4U
hQAFZ750CsBNMMsISFHIKinKDMKjShCpHIlYPYUHhNzkn6pSnOCt0Ftf6

Synopsis :
It is a computational method that creates a novel disease taxonomy, and a disease-partitioning algorithm that maps individual diseases into training classes. It is trained end-to-end directly from image labels and raw pixels, with a single network for both photographic and dermoscopic images. This system uses the CNN that matches the performance of dermatologists at three key diagnostic tasks: melanoma classification, melanoma classification using dermoscopy and carcinoma classification.
To take advantage of fine-grained information contained within the taxonomy structure, they developed an algorithm to partition diseases into fine-grained training classes. For training, Back propagation is used. During inference, the CNN outputs a probability distribution over these fine classes. To recover the

probabilities for coarser-level classes of interest, we sum the probabilities of their descendants.
Given an input image, the CNN outputs a probability distribution over the training nodes. Probabilities over the taxonomy follow: P(u) = sigma P(v) [V belongs to C(u)] u is any node, P(u) is the probability of u, and C(u) are the child nodes of u. Therefore, to recover the probability of any inference node we simply sum the probabilities of its descendant training nodes. Note that in the validation strategies all training classes are summed into inference classes.

Use in our project:
The Skin cancer detection is solved using the CNN . Disease partitioning algorithm is mage use for classifying the images into training classes.

Research Paper 4 :

Author: Jainesh Rathod, Vishal Waghmode, Aniruddh Sodha, Dr. Prasenjit Bhavathankar

Title of paper :
Diagnosis of skin diseases using Convolutional Neural Networks

URL :
https://ieeexplore.ieee.org/document/8474593

Synopsis :
The user gives input of the skin disease image, which then the system processes, does feature extraction using CNN algorithm and use softmax image classifier to diagnose diseases. If no disease is found, the system provides a negative result. Thus in this paper, a novel dermoscopy detection and classification method based on Convolutional Neural network (CNN) is proposed.
The architecture contains two major parts Image processing unit and classification unit. Image processing unit will enhance the image by removing noise and unwanted parts of the skin and then the image will be segmented into different segments to differentiate from normal skin after that features of the image will be extracted to find out whether skin is infected or not.
Classifies the images into one of the pre-defined diseases through classification Softmax classifier algorithm. Four main operations in the Convolutional Neural Networks are :

- Convolution: maintains the spatial interrelation of the pixels. This is done by attainment of image features using miniscule squares of the image.
- Non-linearity: s, it is an operation which is applied per pixel and supersedes all the non-positive values of each pixel in the feature map by zero.

It is basically a smooth approximation Equation : (1+ex (x) = lnf)

- Pooling or sub-sampling : helps in reducing the dimensions of each feature map but even while doing so retains the most consequential information of the map

After pooling is done, eventually our 3D feature map is converted to one dimensional feature vector

- Classification : features are then utilized for relegating the input image into different classes predicated on the training dataset.

Use in our project:
In the project, we are making use of the Image processing which will enhance the image by removing noise and unwanted parts of the skin and then the image will be segmented into different segments to differentiate from normal skin after that features of the image will be extracted to find out whether skin is infected or not.
Also, we use the input image in convoluted matrix form and apply non-linearity operation to obtain smooth approximation which is further used for applying final classification algorithm for skin cancer detection.

Research paper 5:

Author: Ranjan Jana, Debaleena Datta, Rituparna Saha

Title of the paper: Age Estimation from Face Image Using Wrinkle Features

URL:
https://www.sciencedirect.com/science/article/pii/S1877050915001908

Synopsis :
This paper provides methodology to estimate age by amazing wrinkle area of face images. Wrinkle geography areas are detected, and wrinkle features are extracted from face image. Depend on wrinkle features, each face image is clustered using fuzzy c-means clustering algorithm. Then, estimated age is calculated using their clustering membership value and average age of each cluster. In this method, Average age of each cluster is calculated using training face images. Average age of cluster j is calculated with $AVG_j = (\sum AGE_i) / N_j$. Where AGEi is the age of training face image i that belong to cluster j and Nj is the number of training face images those belongs to cluster j.

Age estimation of test face image is calculated using the following formula.
$EstimatedAGE_i = \sum (P_{ij} * AVG_j)$ where j = 1 to n. The obtained results are significant and remarkable.

Use in our project:
In Skin Diagnosis Application, this concept cover only 10% of work. While making user/patient profile will ask for face image and after capturing will give estimate age of human by this research algorithm.