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Skin Cancer Classification using Tensorflow and Keras

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Abstract: *Skin cancer is an abnormal growth of skin cells. It generally develops in areas that are exposed to the sun, but it can also form in places that don't normally get sun exposure. Skin cancers aren't all identical, and they may not cause many symptoms. Still, unusual changes to your skin can be a warning sign for the different types of cancer. Being alert for changes to your skin may help you get a diagnosis earlier. Accurate and precise diagnosis of diseases has been a significant challenge and he recent advances in computer vision made possible by deep learning has paved the way for disease diagnosis for skin cancer. It described the innovative solution that provides efficient disease detection and deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various skin cancer diseases. A variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available skin cancer disease given image dataset. So, it observed that neural networks can capture the colors and textures of lesions specific to respective diseases upon diagnosis, which resembles human decision-making. And this model to deploy Django web framework.*

Keywords: Disease Detection, deep learning, Tensorflow.

I. INTRODUCTION

1.1 Artificial Intelligence

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

Artificial intelligence (AI) is intelligence demonstrated by machines, as opposed to the natural intelligence displayed by humans or animals. Leading AI textbooks define the field as the study of "intelligent agents" any system that perceives its environment and takes actions that maximize its chance of achieving its goals. Some popular accounts use the term "artificial intelligence" to describe machines that mimic "cognitive" functions that humans associate with the human mind, such as "learning" and "problem solving", however this definition is rejected by major AI researchers.

Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision. AI applications include advanced web search engines, recommendation systems (used by YouTube, Amazon and Netflix), Understanding human speech (such as Siri or Alexa), self-driving cars (e.g., Tesla), and competing at the highest level in strategic game systems (such as chess and Go), As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect. For instance, optical character recognition is frequently excluded from things considered to be AI, having become a routine technology.

AI programming focuses on three cognitive skills: learning, reasoning and self-correction.

- **Learning processes.** This aspect of AI programming focuses on acquiring data and creating rules for how to turn the data into actionable information. The rules, which are called algorithms, provide computing devices with step-by-step instructions for how to complete a specific task.
- **Reasoning processes.** This aspect of AI programming focuses on choosing the right algorithm to reach a desired outcome.
- **Self-correction processes.** This aspect of AI programming is designed to continually fine-tune algorithms and ensure they provide the most accurate results possible.

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Artificial neural networks and deep learning artificial intelligence technologies are quickly evolving, primarily because AI processes large amounts of data much faster and makes predictions more accurately than humanly possible.

1.2 Natural Language Processing (NLP)

Natural language processing (NLP) allows machines to read and understand human language. A sufficiently powerful natural language processing system would enable natural-language user interfaces and the acquisition of knowledge directly from human-written sources, such as newswire texts. Some straightforward applications of natural language processing include information retrieval, text mining, question answering and machine translation. Many current approaches use word co-occurrence frequencies to construct syntactic representations of text. "Keyword spotting" strategies for search are popular and scalable but dumb; a search query for "dog" might only match documents with the literal word "dog" and miss a document with the word "poodle". "Lexical affinity" strategies use the occurrence of words such as "accident" to assess the sentiment of a document. Modern statistical NLP approaches can combine all these strategies as well as others, and often achieve acceptable accuracy at the page or paragraph level. Beyond semantic NLP, the ultimate goal of "narrative" NLP is to embody a full understanding of commonsense reasoning. By 2019, transformer-based deep learning architectures could generate coherent text.

II. LITERATURE REVIEW

Title: Skin Cancer Detection And Classification Using Svm Classifier
Author: B. Arivuselvam, S. Tanisha**, Author:** S. Shalini, V.S. Subhalaksmi
Date: 2021

Human cancer is the most hazardous sicknesses existing which is principally brought about by hereditary flimsiness of numerous atomic changes. Among the numerous kinds of disease, skin cancer is quite possibly the most widely recognized sorts of malignancy. There are three kinds of skin malignant growth, to be specific, Basal Cell Carcinoma (BCC), Squamous Cell Carcinoma (SCC)and Melanoma, melanoma is the sort of skin cancer which is perilous. The skin cancer detection technology is extensively isolated into four fundamental parts beginning from gathering dermoscopic image data set, dermoscopic image database, image pre-processing which includes hair removal, noise removal, sharpening, resize, contrast stretching of the given skin image, segmentation in which gave for segmenting the zone of interest from the given image. Various methods can be utilized for segmentation. Some regularly utilized division calculations are k-means, thresholding histogram and so on, feature extraction from the portioned picture and grouping of the picture from the feature set separated from sectioned picture. Various classification algorithms are used for this, among which the utilization of machine learning and deep learning-based algorithm are used to improve results for classification. The most frequently utilized classification. algorithms are ‘support vector machine’, ‘feedforward artificial neural network’, ‘deep convolutional neural network’. This paper provides the two types of skin cancer - Basal Cell Carcinoma and Melanoma and equally threatening (skin) diseases such as Actinic keratosis, Cherry nevus, Dermatofibroma and Melanocytic nevus, and classify them into six different classes using the ‘support vector machine (SVM) classifier’.

Title: Computer aided Melanoma skin cancer detection using Image Processing
Author: Shivangi Jaina, Vandana jagtapb, Nitin Pise
Date: 2015

In recent days, skin cancer is seen as one of the most Hazardous form of the Cancers found in Humans. Skin cancer is found in various types such as Melanoma, Basal and Squamous cell Carcinoma among which Melanoma is the most unpredictable. The detection of Melanoma cancer in early stage can be helpful to cure it. Computer vision can play important role in Medical Image Diagnosis and it has been proved by many existing systems. In this paper, we present a computer aided method for the detection of Melanoma Skin Cancer using Image Processing tools. The input to the system is the skin lesion image and then by applying novel image processing techniques, it analyses it to conclude about the presence of skin cancer. The Lesion Image analysis tools checks for the various Melanoma parameters Like Asymmetry, Border, Color, Diameter,(ABCD) etc. by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Normal skin and Melanoma cancer lesion.

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Title: Skin Lesion Classification From Dermoscopic Images Using Deep Learning Techniques.
Author: Adria Romero Lopez, Xavier Giro-i-Nieto
Date:2015
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 patient's 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.

Title: Skin Lesion Classification: A CNN Way
Author: Prasad Thakar, Siddhivinayak A Kulkarnui
Date: 2020
Skin lesion growth of unwanted cells on the upper most layer of skin. These lesions may conation cancerous cells which may lead to health issues to the patient and in severe cases may lead to patient's demise. Dermatologists identify type of skin cancer by identifying it in image generated using dermatoscope and procedure known as Dermatoscopy. Previously there have been many studies which show classification of these dermatoscopic images using machine learning and deep learning solutions. Machine learning approaches use image processing techniques for identifying mole in given image and then for classification researchers have used techniques like SVM, random forest etc. With advances in field of deep learning there have been various methods proposed on classification of using CNN which achieves more precision and accuracy. In this paper we are proposing a CNN based approach for image classification with best overall accuracy of 78.08% and good multiclass AUC for all classes in HAM10000 dataset.

Title: Detection and Analysis of Skin Cancer from Skin Lesions
Author: Nidhal K. EL Abbadi and Zahraa Faisal
Date:19-11-2017
Skin cancers are the most common form of cancers in human, a physician faces many difficulties for accurate diagnose of lesion through its characteristics and in the naked eye. For that it is necessary to develop automatic methods in order to increase the accuracy of the diagnostic. In this paper, initially, skin images are filtered to remove unwanted particles, then a new method for automatic segmentation of lesion area is carried out based on Markov and Laplace filter to detect lesion edge, followed by convert image to YUV color space, U channel will be processed to remove thick hair and extract lesion area. Diagnosis of melanoma achieved by using ABCD rules with new method for determine asymmetry based on rotation of lesion and divide lesion to two parts horizontally and vertically then count the number of pixels mismatched between the two parts based on union and intersection between the two parts. New method to determine the number of colors based on suggestion of color regions for each color shade was suggested in this paper. The performance of the proposed method is tested on 220 different images. Accuracy for this method was encourage and reach up to 95.45%. The proposed method shows best accuracy when compared with other methods.

III. SYSTEM ARCHITECTURE

3.1 List of Modules

1. Manual Net
2. AlexNet
3. LeNet
4. Deploy

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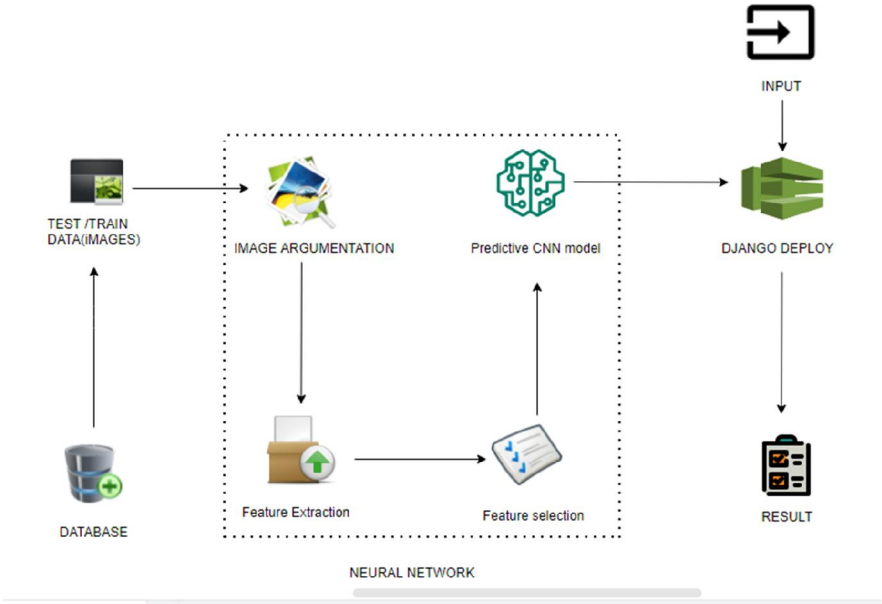

Fig: Architecture of AlexNet

Module Description

ALEXNET

AlexNet is the name of a convolutional neural network which has had a large impact on the field of machine learning, specifically in the application of deep learning to machine vision. AlexNet was the first convolutional network which used GPU to boost performance.

AlexNet architecture consists of 5 convolutional layers, 3 max-pooling layers, 2 normalization layers, 2 fully connected layers, and 1 softmax layer. Each convolutional layer consists of convolutional filters and a nonlinear activation function ReLU. The pooling layers are used to perform max pooling.

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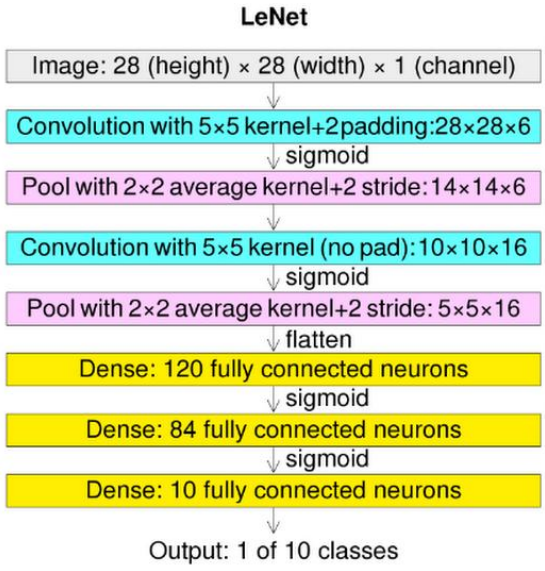
LENET:

LeNet was one among the earliest convolutional neural networks which promoted the event of deep learning. After innumerous years of analysis and plenty of compelling iterations, the end result was named LeNet.

Architecture of LeNet-5:

LeNet-5 CNN architecture is made up of 7 layers. The layer composition consists of 3 convolutional layers, 2 subsampling layers and 2 fully connected layers.



DEPLOY / RESULT:

Deploying the model in Django Framework and predicting output

In this module the trained deep learning model is converted into hierarchical data format file (.h5 file) which is then deployed in our django framework for providing better user interface and predicting the output whether the given OCT image is CNV / DME / DRUSEN / NORMAL.

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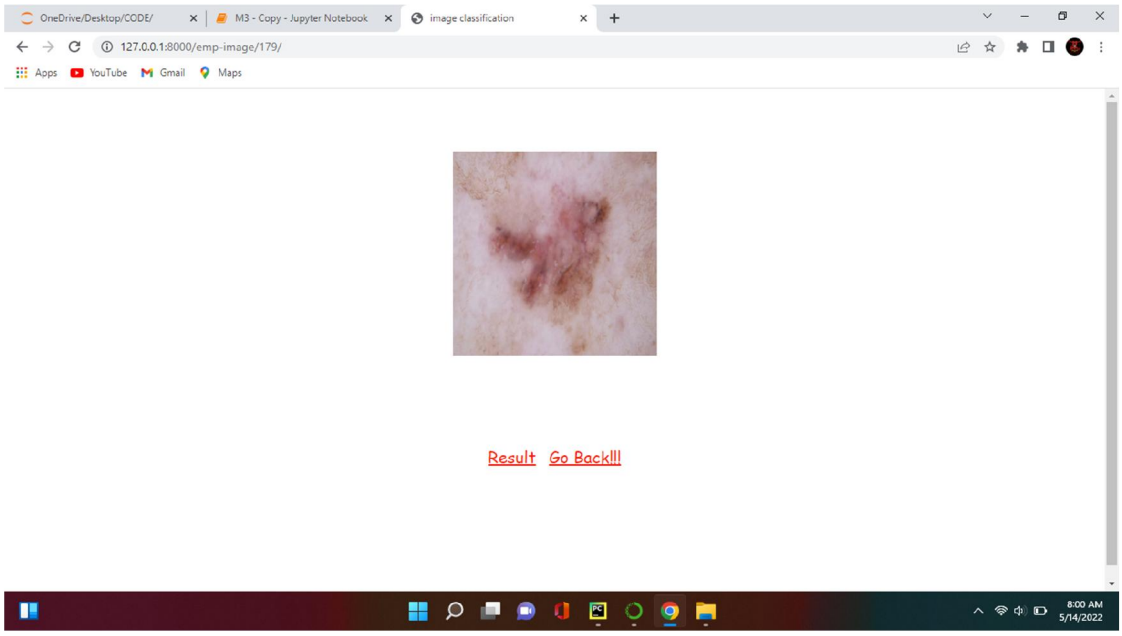

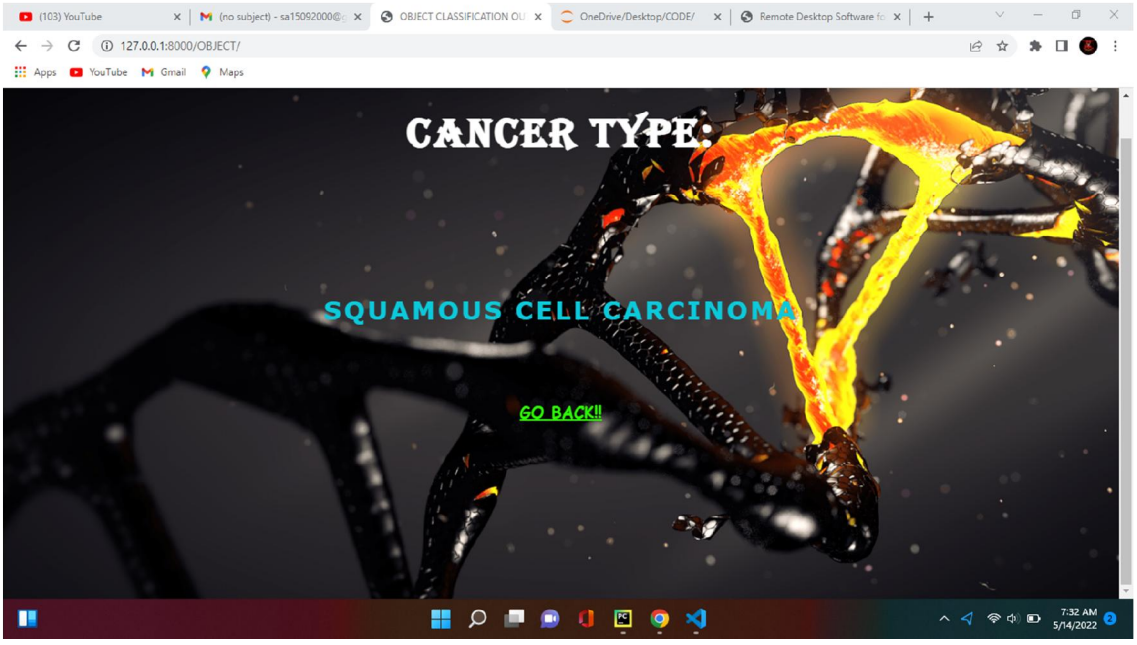

IV. CONCLUSION

A cancer is an abnormal growth of cells. By using Deep learning algorithm we can be sure that the application which is going to be used in the coming future will be helpful for betterment of human life. Where the disease can be known at early stage or beforehand what type of disease the patient is affected with and what needs to be done before it's too late for the person. Survival rate will be more if the Melanoma is detected in time. The accuracy of detecting disease is excellent. Since machine learning plays an important role of skin cancer detection it can be a helpful factor in the medical field.

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