Image Classification – Skin Lesions

Wajahat Ali Mughal
Applied Machine Learning
ID: 001191074

***Abstract*—Skin lesions is a type of disease in which a specific part of the skin got change with the rest of the skin. There are a couple of reasons that could be behind this change, one of them is cancer, which is a deadly disease. So, we are here to design a system that would be able to tell the type of disease with just a picture using Machine Learning.**

I. Introduction

Nowadays, there is a huge jump in the skin care disease, especially cancer and allergies and so on. That could be a deadly disease, but the thing is people don't realize they have such kind of disease due to the lack of awareness, which leads them to the end of their lives. We are here to raise an awareness between the peoples for this disease by developing a system that will be able to tell the people about their skin disease. The most important aspect in this process is to identify the type of disease that helps the people to identify it and start taking medicine according to it by consulting the doctors. There are different types of cancers, we focus on 7 categories to train our system.

- Actinic keratoses:
- Benign keratosis-like lesions.
- Basal cell carcinoma).
- Dermatofibroma.
- Melanocytic nevi.
- Melanoma.
- Vascular lesions.

I have used Neural Network to train my model. The strategies I used for training are ANN and CNN neural models.

II. Dataset

Dataset has provided by the professor. which has different columns, cell_type column represents names of different categories of diseases. Localization tells on which part of the body the disease appears, and image_id is representing the name of the images taken for the diseases and stored accordingly into provided folder.

TABLE I

image_id	cell_type	is_benign	localization
ISIC_0027419	Benign keratosis-like lesions	1.0	scalp
ISIC_0026769	Benign keratosis-like lesions	1.0	scalp
ISIC_0031633	Benign keratosis-like lesions	1.0	ear
ISIC_0029176	Melanocytic nevi	1.0	face
ISIC_0029068	Benign keratosis-like lesions	1.0	face
...	...	...	...
ISIC_0032052	Melanoma	1.0	NaN
ISIC_0031933	Benign keratosis-like lesions	1.0	NaN

[5376 rows x 4 columns]

III. Pre-processing

Preprocessing, referred to manipulation of data before processing and applying machine learning on it. Pre-processing contains several steps which are there to clean data from unwanted value. In the first step, we view the data if it contains any null values and try to remove it or replace it with the mean value of the column. The sum of number of null value found are given below.

TABLE II

df.isnull().sum()	
image$_id$	0
cell_type	100
is_benign	100
localization	18
dtype: int64	

I cleaned the dataframe using the dropna method for further processing, all the rows containing null values got dropped. The columns name cell_type and is_benign contains 100 null rows and localization contains 18 null rows.

After cleaning the data, as we can see in the Table 1 the image_id contains only names of the images, so for smooth processing and convenience we will add a new column path into the dataframe so that we will be able to locate the image easily. To do that we define the path of the folder containing the images of the dataset and combine it with the image_id and concatenating it with .jpg at the end so that we get a proper path with image name and proper extension of the image.

IV. Image Classification

Human brains are the seasoned veteran at deciding articles rapidly. Whenever you enter a supermarket, you can isolate bananas from different products like shoes. My 3 year old niece knew how to separate felines and canines. However to show those groupings with PC is extremely hard. Previously, image classification utilized raw pixels to classify the pictures. In our scenario we can clasify disease by variety histogram and edge discovery which permits you to classify diseases by variety and is benign. This strategy has been effective.

V. Image Processing

Next step after cleaning the data, I modified the images and reducing the size to 125x100 so that the system will be able to easily process the images. The system was taking longer to process the images due to large dimensions that is why I reduced the size.

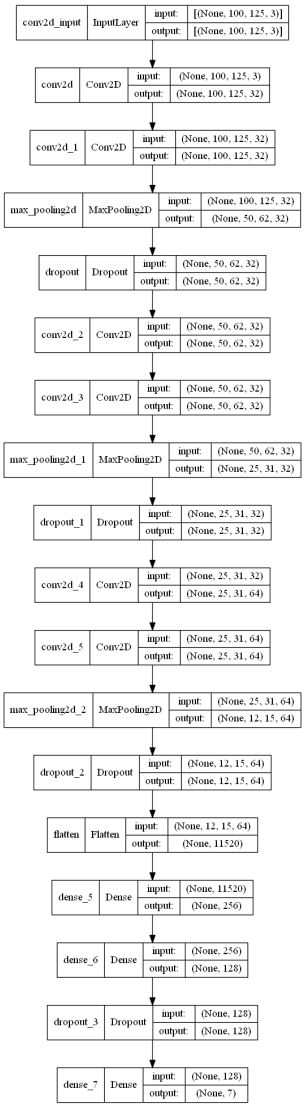
The images are divided under seven categories, the sample image for random 5 images of 7 categories .

VI. ANN Neural Network

An ANN depends on an assortment of associated units or nodes called artificial neurons, which freely model the neurons in an organic mind. Every association, similar to the neurotransmitters in a natural mind, can send a sign to different neurons. A fake neuron gets a sign then processes it and can flag neurons associated with it. The ”signal” at an association is a genuine number, and the result of every neuron is figured by some non-direct capacity of the amount of its bits of feedbacks. The associations are called edges. Neurons and edges commonly have a weight that changes as learning continues. The weight increments or diminishes the strength of the sign at an association. Neurons might have a limit to such an extent that a sign is conveyed provided that the total message passes that boundary. Regularly, neurons are collected into layers. Various layers might perform various changes on their bits of feedbacks. Signals travel from the principal layer (the info layer), to the last layer (the result layer), perhaps subsequent to navigating the layers on different occasions.

CONVOLUTION NEURAL NETWORK (CNN)

Picture arrangement is one of the most fundamentally and generally involved field in PC vision. As of late, convolution neural network (CNN) has made incredible progress in the field of picture characterization because of the quick and exact element extraction capacity and end-to-end trained organization system (X. Lei, H. Pan and X. Huang,2019). The widened convolution calculation, which is broadly utilized for picture division, is applied in the picture order field in this paper. In numerous conventional picture arrangement calculations, convolution brain organization (CNN) assumes a significant part. Be that as it may, the old style CNN has the issue of consuming a lot figuring assets. To take care of this issue, first, this paper proposed an enlarged CNN model which is worked through supplanting the convolution parts of customary CNN by the expanded convolution pieces, and afterward, the widened CNN model is tried on the Mnist written by hand computerized acknowledgment informational collection. Second, to take care of the detail misfortune issue in the enlarged CNN model, the cross breed expanded CNN (HDC) is worked by stacking widened convolution portions with various expansion rates, and afterward the HDC model is tried on the wide-band remote detecting picture informational collection of earth’s landscape. The outcomes show that under a similar climate, contrasted and the conventional CNN model, the expanded CNN model decreases the preparation time by 12.99% and further develops the preparation precision by 2.86% moderately, contrasted and the widened CNN model, the HDC model lessens the preparation time by 2.02% and works on the preparation and testing exactness by 14.15% and 15.35% moderately. Accordingly, the enlarged CNN and HDC model proposed in this paper can altogether further develop the picture arrangement execution (X. Lei, H. Pan and X. Huang,2019).



CNN model consist of layers Convolutional, Pooling, Dropout, Flatten and Dens. After data passes through the input layer, it will repeatedly go through a couple of layers defined before until it gets the required output.

CNN vs Ann

ANN involves weights and an enactment function for the heft of its technique. The most ideal way to depict how ANN functions is that it artificially reproduces how our brain network functions. After it misunderstands something, it returns and ”meaningfully alters” the manner in which it thinks, as a human would. In ANN the ”layers” are the rows of the data points facilitated through neurons that all utilization a similar brain organization. ANN utilizes loads to learn. Loads help changed after every cycle through the neuron in ANN. ANN returns and changes the loads relying upon the precision determined by a ”cost work”.

Relatively, CNN does not have neuron or weight. CNN rather projects various layers on pictures and uses filtration to investigate picture inputs. These layers are the numerical layer, redressed direct unit layer, and completely associated layer. The reason for these layers is to figure out designs that the neural network would be able ”see”, process result of information, and give a n-layered vector yield.

That n-layered yield is utilized to notice particular highlights and associate them with the picture input gave. It can then give the characterization result to the client. Notwithstanding their disparities, the two strategies use proportions of the mistake to further develop learning and produce ages to investigate the viability of models created (Vidushi Meel,2022). After performing the CNN model on the code dataset we get 85

Conclusion

After performing both of the neural networks, I got accuracy 82 percent in ANN and 84 percent in CNN models. the tasks I performed gives suitable accuracy and will be beneficial for the predictions of the cancers diseases.

References

[1] X. Lei, H. Pan and X. Huang. 2019. ”A Dilated CNN Model for Image Classification”, Available at: https://ieeexplore.ieee.org/abstract/document/8756165.[Accessed: 26-April-2022]

[2] Vidushi Meel.2022. ”Similarities and Differences of ANN vs. CNN”. Available at:https://viso.ai/deep-learning/ann-and-cnn-analyzing-differences-and-similarities. [Accessed: 26/4/2022]

[3] M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.