Image Classification – Skin Lesions

*

Sai Sandeep Chittiboina
Applied Machine Learning
001203994

***Abstract*—In this report, I am going to train an artificial neural network model, which should be able to classify the images of dermatoscopic samples of "human against machine"(HAM) with 5372 images which are needed to be loaded and pre-processed then separate all of them in test and train data of the ratio of 70 percentage for the training data and 30 percentage for the testing data by using the sequential model which is capable of predicting the skin lesions by which category of lesions they belong to and predict whether it's a cancers skin lesion or not. To construct this ANN model it will be challenging to predict the skin lesions with more than 50 percentage accuracy, this will be very helpful in real-world applications as well here we are developing a semi-automated workflow for the health care, this is a report we are dealing with 7 different skin lesions which are Benign keratosis, Dermatofibroma, Melanoma, Vascular lesions, Basal cell carcinoma, Melanocytic nevi and Actinic keratoses. This will be very challenging for the machine to identify the difference between the little more contrasted skin with was surrounded.**

I. Introduction and Related Work

- Image classification is a most fundamental task of the computer vision where it can solve the real-time problems in healthcare, automobile, smartphones and many more.
- The classification of images is generally done into different types single-label classification and multi-label classification.
- The image classification needs data collection, building a model, training, test a model to check the accuracy and prediction.
- The training of the neural networks will always need a large number of images with good quality in resolution.
- The implementation of machine learning is the only methodology to train a machine in a supervisor or an unsupervised way.

II. Ethical Discussion

All people in the world have their own outlooks about the choice of what is right and wrong ethical approaches and social frameworks are the fundamentals of key moral principles in this researchers will be very strongly influenced by the ethical and legal regulations even though it doesn't carry the weight of the ethical things for the researchers but it will be genuinely obliged to confirm the legal regulations which are related to the field of the research.

III. Data-set preparation

In my data said I have 5372 images of dermatoscopy skin lesions samples with seven different lessons which are caused

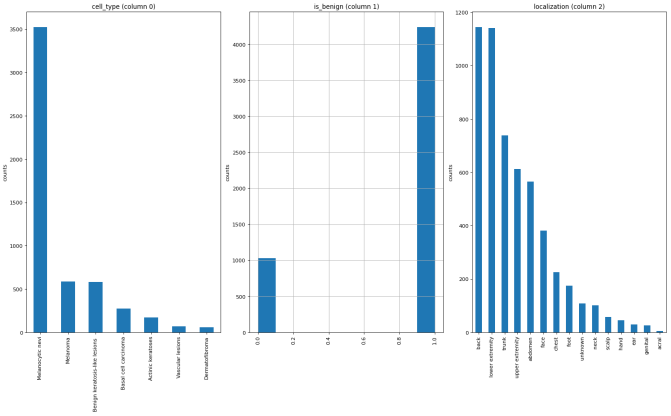

Fig. 1. visual of the data

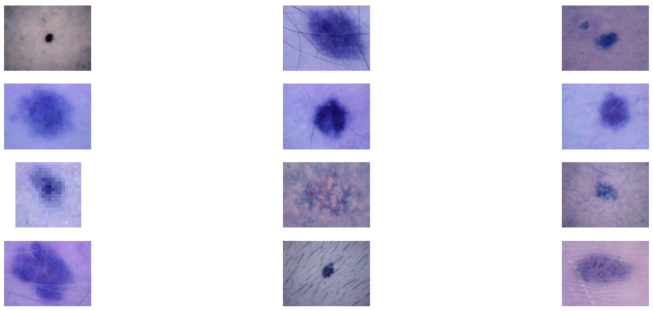

Fig. 2. Resize first 12 images in data set in grey scale

on various parts of the body to acquire more accuracy the cleaning of the data set is the most important. As the model cannot understand different images in different sizes we need to resize all the images into a same size in there I am resizing all in 100 pixels in length and 75 pixels in width. In a data of CSV file we are having four columns namely image-id, cell-type, is-benign, and localization.

A. Cleaning all the null values

By using the Dropna() function to the CSV file we are removing all the null values present in it, all this removal of extra data will lead us to get more accuracy while training and testing.

	image_id	cell_type	is_benign	localization
0	ISIC_0027419	Benign keratosis-like lesions	1.0	scalp
1	ISIC_0026769	Benign keratosis-like lesions	1.0	scalp
2	ISIC_0031633	Benign keratosis-like lesions	1.0	ear
3	ISIC_0029176	Benign keratosis-like lesions	1.0	face
4	ISIC_0029068	Benign keratosis-like lesions	1.0	face
...	...	...	...	...
5367	ISIC_0027265	Benign keratosis-like lesions	1.0	NaN
5368	ISIC_0025029	Melanocytic nevi	1.0	NaN
5369	ISIC_0029462	Melanocytic nevi	1.0	NaN
5370	ISIC_0030510	Melanocytic nevi	1.0	NaN
5371	ISIC_0033125	Melanoma	1.0	NaN

[5372 rows x 4 columns]

Fig. 3. Head of the csv file

B. Adding the images pixels to 5th row in csv data

By adding the 5 rows to the CSV file we can match image ids with the respective images in their cells so for doing that we are going to convert all the images in pixels in form of an array matrix and store them in the cell by running a for loop

	image_id	cell_type	is_benign	localization	path	image
0	ISIC_0027419	Benign keratosis-like lesions	1.0	scalp	../input/skin-images/ham_data_surnamesABCD/ham...	[[[190, 153, 194], [192, 154, 196], [191, 153,...
1	ISIC_0026769	Benign keratosis-like lesions	1.0	scalp	../input/skin-images/ham_data_surnamesABCD/ham...	[[[185, 127, 137], [189, 133, 147], [194, 136,...
2	ISIC_0031633	Benign keratosis-like lesions	1.0	ear	../input/skin-images/ham_data_surnamesABCD/ham...	[[[134, 90, 113], [147, 102, 125], [159, 115, ...
3	ISIC_0029176	Benign keratosis-like lesions	1.0	face	../input/skin-images/ham_data_surnamesABCD/ham...	[[[191, 146, 129], [192, 146, 133], [194, 145,...
4	ISIC_0029068	Benign keratosis-like lesions	1.0	face	../input/skin-images/ham_data_surnamesABCD/ham...	[[[149, 105, 85], [156, 114, 95], [163, 124, 1...

Fig. 4. Adding image pixels in 5th row

IV. Methods

For this image classification, I have used (CNN) Convolutional Neural Network or (ANN) Artificial Neural Network but by the time of executation the CNN is taking 4 days to train the data so as its going through convolutional layers and pooling layers to give the vision so when I am trying to run the CNN method its taking very long time, so I have used ANN model to train our data as it runs by connection between the nodes having the numerical values this is the main reason why I have converted all. The images in Pixels so that it can go through all the individual hidden layers by recognising more complex patterns in the network the artificial neural networks are generally implemented to classify tasks such as computer vision and speaks recognisation.

V. Experiments and Evaluation

ANN are built with the mission of processing the input information and transferring the data via different connections which are actively done by a transference function, which usually helps in the training process. These are built by successive layers with high-level features where each layer is associated with a set of mapping notes whereas the inputs of the processed layer are been selected by a sequential decision process and this morning structure will be like a bag DAG like architecture this will allow us to learn the transformations in the local Set this model algorithm is used in in reinforcement learning.

After fine-tuning the model running 50 layers of Epoch with the batch size of 10, I got an accuracy of 77.4 per cent with a validation accuracy of 76.4 per cent where the loss was 59 per cent and the validation loss was 70 per cent

```
input_shape = (75, 100, 3)
num_classes = 7

model = Sequential()
model.add(Conv2D(32, kernel_size=(3, 3),activation='relu',padding = 'Same',input_shape=input_shape))
model.add(Conv2D(32,kernel_size=(3, 3), activation='relu',padding = 'Same',))
model.add(MaxPool2D(pool_size = (2, 2)))
model.add(Dropout(0.25))

model.add(Conv2D(64, (3, 3), activation='relu',padding = 'Same'))
model.add(Conv2D(64, (3, 3), activation='relu',padding = 'Same'))
model.add(MaxPool2D(pool_size=(2, 2)))
model.add(Dropout(0.40))

model.add(Flatten())
model.add(Dense(128, activation='relu'))
model.add(Dropout(0.5))
model.add(Dense(num_classes, activation='softmax'))
model.summary()
```

Fig. 5. Sequential Model code which i have used to train and test the data

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 75, 100, 32)	896
conv2d_1 (Conv2D)	(None, 75, 100, 32)	9248
max_pooling2d (MaxPooling2D)	(None, 37, 50, 32)	0
dropout (Dropout)	(None, 37, 50, 32)	0
conv2d_2 (Conv2D)	(None, 37, 50, 64)	18496
conv2d_3 (Conv2D)	(None, 37, 50, 64)	36928
max_pooling2d_1 (MaxPooling2	(None, 18, 25, 64)	0
dropout_1 (Dropout)	(None, 18, 25, 64)	0
flatten (Flatten)	(None, 28800)	0
dense (Dense)	(None, 128)	3686528
dropout_2 (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 7)	903

Total params: 3,752,999
Trainable params: 3,752,999
Non-trainable params: 0

Fig. 6. Model summary of sequential

```
Epoch 45/50
257/257 [==============================] - 42s 162ms/step - loss: 0.6203 - accuracy: 0.7779 - val_loss: 0.7376 - val_accuracy: 0.7618
Epoch 46/50
257/257 [==============================] - 42s 162ms/step - loss: 0.6020 - accuracy: 0.7666 - val_loss: 0.7231 - val_accuracy: 0.7545
Epoch 47/50
257/257 [==============================] - 42s 163ms/step - loss: 0.5875 - accuracy: 0.7853 - val_loss: 0.7468 - val_accuracy: 0.7509
Epoch 48/50
257/257 [==============================] - 42s 162ms/step - loss: 0.6380 - accuracy: 0.7564 - val_loss: 0.7157 - val_accuracy: 0.7482
Epoch 49/50
257/257 [==============================] - 42s 164ms/step - loss: 0.6012 - accuracy: 0.7779 - val_loss: 0.7360 - val_accuracy: 0.7527
Epoch 50/50
257/257 [==============================] - 41s 161ms/step - loss: 0.5952 - accuracy: 0.7744 - val_loss: 0.7009 - val_accuracy: 0.7645
```

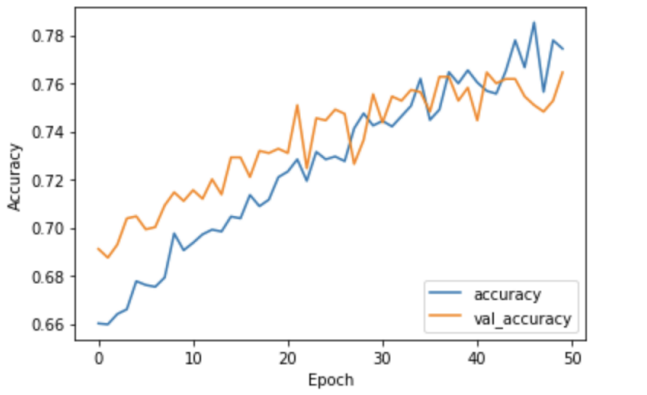

Fig. 7. Accuracy and validation accuracy per cent

TABLE I
AS THE FINAL RESULTS WERE.

	EPOCH48	EPOCH49	EPOCH50
loss	66.8	60.1	59.5
val-loss	71.5	73.6	70.0
acc	75.6	77.7	77.4
val-acc	74.8	75.2	76.4

VI. DISCUSSION AND FUTURE WORK

The image classification is one of the very important technologies in artificial intelligence this can be used in a number of real-time applications in this report we have generated a module using artificial neural networks and acquried 76 per cent accuracy in finding the skin disease within 5372 images. By building up the same model in other parts of healthcare industry such as identifying breast cancer and early stage of recognising Covid by using lung x-rays and generating the processed image of micro organisms and bacteria which were present in the body, this concept can be used in identifying and the criminals in CCTV footages by training the machine with their images previously so that it can identify them quickly, and there are many such applications like this of image classification.

A. Future projects

By implementing the same model with multiple classes of image in every category in a single application so that it can fit in her latest android and iOS mobiles so when a person is affected with a skin disease the user should have the access to take an image of his affected area so that this application will tell what are the steps and remedies and medicines which are need to be followed by him.

VII. CONCLUSIONS

In this paper i have used artificial neural networks to classify the skin lesion of seven types by using the same model we can develop many other modules and detect many more harmful diseases which are caused in our human bodies. In this way we can avoid a lot of diseases which are causing to human beans by increasing the rate of infection due to the lack of hospitals or doctors at their places.

REFERENCES

REFERENCES

[1] Radečić, D. (2021). TensorFlow for Computer Vision — How to Train Image Classifier with Artificial Neural Networks. [online] Medium. Available at: https://towardsdatascience.com/tensorflow-for-computer-vision-how-to-train-image-classifier-with-artificial-neural-networks-304bc82f3dd [Accessed 26 Apr. 2022].

[2] Sladojevic, S., Arsenovic, M., Anderla, A., Culibrk, D. and Stefanovic, D. (2016). Deep Neural Networks Based Recognition of Plant Diseases by Leaf Image Classification. Computational Intelligence and Neuroscience, [online] 2016, pp.1–11. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934169/ [Accessed 15 Jun. 2019].

[3] Tschandl, P., Rosendahl, C. and Kittler, H. (2018). The HAM10000 dataset, a large collection of multi-source dermatoscopic images of common pigmented skin lesions. Scientific Data, [online] 5(1). Available at: https://www.nature.com/articles/sdata2018161.