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Performance Measures of Respiratory Disease Classification using Deep Learning

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Abstract: The paper is based on classification of respiratory illness like covid 19 and pneumonia by using deep learning. The symptoms of COVID-19 and pneumonia are similar. Due to this, it is often difficult to identify what is causing your condition without being tested for COVID-19 or other respiratory infections. To find out how COVID-19 and pneumonia differs from one another, this paper presents that a novel Convolutional Neural Network in Tensor Flow and Keras based Covid-19 pneumonia classification. The proposed system supported implements CNN using Pneumonia images to classify the Covid-19, normal, pneumonia. The knowledge from these studies can potentially help in diagnosis of the concerned disease. It is predicted that the success of the anticipated results will increase if the CNN method is supported by adding extra feature extraction methods for classifying covid-19 and pneumonia successfully thereby improving the efficacy and potential of using deep CNN to pictures.
Keywords: Deep Learning, Tensor, Keras, Covid19, Pneumonia, Django

I. INTRODUCTION

Deep learning is a type of machine learning which is based on artificial neural networks. It is on hype because earlier we failed to have that much processing power and plenty of information and the proper definition of deep learning is neurons. It is a particular quite machine learning that achieves power and by learning they represent the globe as a nested hierarchy of concepts, with each concept defined in respect to simple concepts. In brain approximately 100 billion neurons all at once this can be an image of a private neuron and every neuron is connected through thousands of their neighbours. It creates a synthetic structure called a man-made neural net where we have got nodes or neurons. It has some neurons for input value and a few for output value, there is also many neurons interconnected within the hidden layer and have to identify the particular problem so as to urge the proper solution and it should be understood, the feasibility of the Deep Learning should even be checked. It has to identify the relevant data which should correspond to the particular problem and will be prepared accordingly. Choose the Deep Learning Algorithm properly and it should be used while training the dataset, final testing should be done on the dataset. In medical deep learning algorithm is used to identify types of cancer, and imaging solutions that use deep learning to identify rare diseases or specific types of pathology. Deep learning has been a great role in providing medical professionals with insights that allow them to identify issues early on, thereby delivering better personalized and relevant patient care.

II. METHODOLOGY

A. Preprocessing and Training the model (CNN)

The dataset is preprocessed which can be Image reshaping, resizing and conversion to an array form. Test image can be also done by using this similar processing. A dataset consists of about 19 different plant species is obtained, from which any image can be used as a test image for the software.

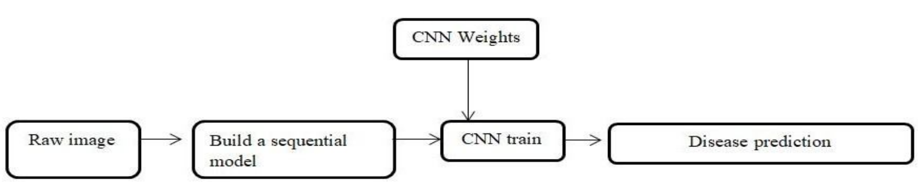

Fig. 1 Preprocessing and Training Model

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The train dataset is worked to train the model (CNN) so it can be able to identify the test image and also the disease. CNN has different type of layers that are Dense, Dropout, Activation, Flatten, Convolution2D, and MaxPooling2D. After the model is trained, the software can identify the disease if the plant species is contained within the dataset. After training and preprocessing, comparison of the test image and trained model is done to predict the disease.

B. CNN Model Steps

1) *Conv2D:* Layer to convert the image into multiple images activation is called as activation function.
2) *MaxPooling2D:* Used to max pool value from the size matrix and used for the next 2 layers.
3) *Flatten:* Used to flatten dimension of the image obtained after combining it.
4) *Dense:* Used to make fully connected model and hidden layer.
5) *Dropout:* Used to avoid over fitting on dataset and dense is output layer which contains only one neuron decide to which category that the image belongs.
6) *Image Data Generator:* It rescales the image and applies in some range, zooms the image and does horizontal flipping with the image. It also includes all possible orientation of the image.
7) *Training Process:* Target size specifies target size of image and fit_generator is used to fit data into the mode. Steps_per_epochs is about the number of times the model that will execute for the training data.
8) *Epochs:* It is the number of times model will be trained in forward and backward pass.
9) *Validation Process:* Validation data is used to feed the validation test data into the model.
10) *Validation Steps:* It is the number of validation test samples.

C. CNN Algorithm

The architecture of a convolutional neural network consists of input layer, some convolutional layers, some fully-connected layers, and an output layer.

1) *Input Layer:* It has pre-determined and fixed dimensions that the image can be pre-processed before it which are often fed into the layer. Normalized gray scale images of size 48 X 48 pixels from the dataset are used for training, validation and testing. For testing laptop webcam images are used, within which face is detected and cropped by using OpenCV and can be normalized.
2) *Convolution and Pooling Layer:* The layer process is done by using batch processing and each batch has N number of images. CNN filter weights are updated on batches and each convolution layer takes the image batch input of 4 dimension N x Color-Channel x width x height. Feature map or filter for convolution is added as four dimensional such as number of feature maps in, number of feature maps out, filter width and filter height. In each convolution layer, the four dimensional convolutions are calculated between the image batches and have feature maps. After convolution only the parameter that changes is image width and height of the given image.

New image width = old image width – filter width + 1
New image height = old image height – filter height + 1

In each convolution layer down sampling subsampling is done for dimensionality reduction, this process is called as pooling. There are two categories of pooling which are max pooling and average pooling. Max pooling is completed after convolution, pool size of 2x2 is 12 taken as input, which splits the image into grid of blocks each of size 2x2 and takes maximum of 4 pixels. After pooling height and width of the images are affected. Two convolution layer and pooling layer are employed in the architecture of CNN. The convolution layer size of input image batch is Nx1x48x48. Here, size of image batch is N, number of color channel is 1 and both the image height and width is 48 pixel. The feature map of 1x20x5x5 results image batch is of size Nx20x44x44 then after convolution pooling is completed the pool size is 2x2, which ends up with image batch of size Nx20x22x22 and this is followed by second convolution layer with feature map of 20x20x5x5, results the image batch of size Nx20x18x18., followed by pooling layer with pool size of 2x2 and ends image batch of size Nx20x9x9.

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3) *Fully Connected Layer:* Layer is used by the way neurons transmit signals through the brain and it takes an outsized number of input features and then transforms the features through layers connected with the trainable weights. The two hidden layers of size 500 and 300 unit are utilized in fully-connected layer. The weight of fully connected layers is trained by forward propagation of training data and then backward propagation of its errors. Back propagation starts from evaluating the difference between prediction and true value, and calculates back the load adjustment that is needed for every layer before. It is ready to control the training speed and also the complexity of the architecture by tuning the hyper-parameter which is like learning rate and network density. Hyper-parameters include learning rate, momentum, regularization parameter, and decay. The output from the second pooling layer is in the size of Nx20x9x9 and input of first hidden layer of fully-connected layer is of size Nx500. So, the output of pooling layer is compressed to Nx1620 size and fed to first hidden layer. Output from first hidden layer is then fed into the second hidden layer. Second hidden layer is of the size Nx300 and the output is fed to output layer of size equal to number of face expression classes.
4) *Output Layer:* The **o**utput from the second hidden layer is connected to output layer which is having seven distinct classes and the output is obtained by using the probabilities for each of these seven classes. The class with the highest probability is known as predicted class.

D. AlexNet Algorithm

It has eight layers where there will be five convolutional layer and max pooling layer and rest of 5 layers will be fully connected layers. AlexNet is used to classify 1000 object category. The image input size will be as 227-227. The main usage of AlexNet is to quickly transfer learned features to a new task using smaller number of training images.

E. LeNet Algorithm

The LeNet algorithm is the first architecture of the convolutional neural networks. LeNet consists of seven layers in which there will be two convolutional layers, two pooling layers, two fully connected layers and rest one layer will be the output layer.

III. EXISTING SYTEM

The segmentation of pneumonia lesions from computer tomography scans of COVID-19 patients is important for perfect accurate diagnosis and accuracy result. The feature of deep learning has a potential to automate the task but requires a huge set of high end quality annotations which are difficult to gather the information. The main aim is to learn from noisy training labels that are easy to get a potential to conclude this problem to the current end. So, it is proposing a complete unique noise-robust framework to be from noisy labels for the new segmentation task. The importance for the diagnosis and treatment decisions of segmentation of COVID-19 pneumonia lesions from computer tomography scans is great challenge. At first, the infection lesions have a wide extend of complex appearances like Ground-Glass Opacity (GGO), reticulation, consolidation, etc.

In COVID-19 pneumonia lesion segmentation section, the pixel level annotation is highly noisy and clean annotations are highly difficult to gather the lesion. At first there were different annotators which may have different annotation that standard the cause inter-observer variability, and high intra-observer variability which can also existed. The variability is likely to cause a noise within the annotations which demonstrates the disagreement between two annotators. The second is to scale back the annotation efforts and some of the researchers use a human in the loop strategy where the annotator provides only refinements to the algorithm-generated labels for annotating. In such type of cases, the annotations are often hugely biased into the results of the algorithm and contain high noisy pixel-level labels.

In addition collection of less accurate annotations from non-experts is another justified solution to fight the limited availability of experts, but these annotations also are noisy at pixel level and will block the performance of the deep learning model. This may occur due to either of challenges for accurate annotation such as low contrast, ambiguous boundaries and appearances of the target, or which may cause by low-cost inaccurate annotations such as annotations given by non-experts, human inside the loop strategies and some of the algorithms generating pseudo labels. The only one advantage of the noise robust Dice loss function is that it does not depend upon a accurate and might be joined with different training strategies such as customary training process and making the self-assembling framework in the method.

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A. *Drawback*

1) It has not focused on AlexNet CNN in keras and Tensor Flow as classifier.
2) They are not using OpenCV computer vision technique
3) It is not focused on increasing the recognition rate and classification accuracy of feature image of chest X-ray.

IV. PROPOSED SYSTEM

The proposed recognition framework is supported by the structured two dimensional convolutional neural networks style of AlexNet and LeNet to classify whether it a Covid-19 or Pneumonia disease and thus by using the CNN it improves the accuracy of workflow of the result. The proposed method is to coach a Deep Learning algorithm which is capable of classifying Covid-19 and Pneumonia chest X-ray images, then to pre-process the data, visualize the image and then extract the feature to create AlexNet CNN using Covid-19 and pneumonia chest x-ray image dataset. The classification is based on three categories such as Covid-19, normal, pneumonia by using CNN model. It is suspected that the achievement of the gained results will increase, if the CNN method is supported by totalling extra feature extraction methods and classify the disease successfully whether it is covid-19 or pneumonia. The efficacy and potential of using deep CNN to pictures is also demonstrated.

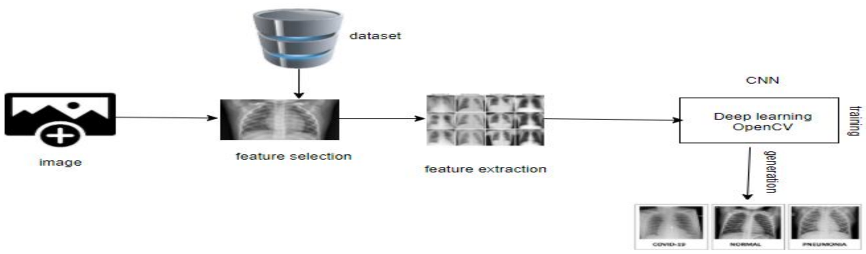

Fig. 2 Overall Architecture Diagram

A. *Algorithm Usage*

1) *CNN:* A convolutional neural network also called as ConvNet is a brand of deep neural network, commonly used to apply and analyse visual imagery. CNN algorithm is a multilayer that is a layer upon layer perceptron where the significant design is for recognition of two-dimensional image data. CNN imports the data from the dataset using keras preprocessing image data generator function which is used to create size, rescale, and range, zoom range and make horizontal flip.
2) *AlexNet and LeNet:* Deep learning algorithms used as a classifier. AlexNet contained eight layers and uses ReLU activation function and trains much faster. Output gives better accuracy and able to differentiate one images from other images

V. MODULES

A. *Training Manual CNN*

In training with manual CNN the dataset is imported by using keras preprocessing image data generator function which is used to create size, rescale, range, zoom range, horizontal flip and then the image dataset is imported from the folder with the help of data generator function which is used to set train, test, and validation, target size, batch size and class-mode by which it can train own created manual network by adding layers of CNN. Totally there are 2736 image dataset of chest x-ray, in which the data is spitted into 1288 for training and 1448 images for testing.

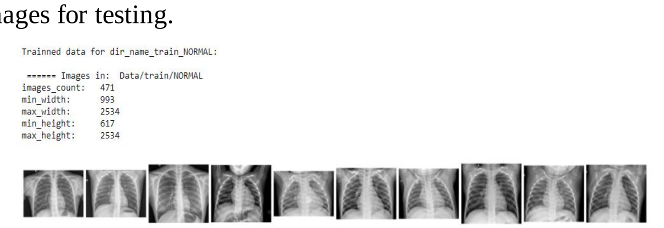

Fig. 4.1.1 Training Manual CNN (Normal)

In Fig4.1.1 the image dataset for the normal is imported from the folder with the help of data generator function and classified into min_width, max_width, images_count, min_height, max_height. Here the imported testing image dataset contains about 471 images.

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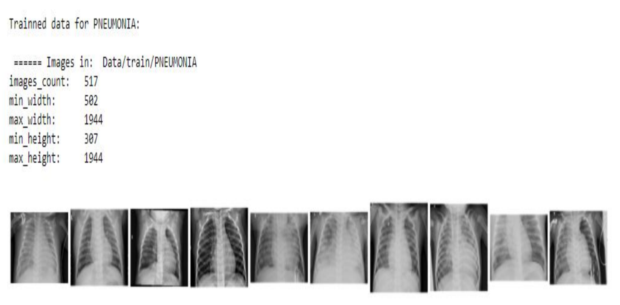

Fig. 4.1.2 Training Manual CNN (Pneumonia)

In Fig4.1.2 the image dataset for the pneumonia is imported from the folder with the help of data generator function and classified into min_width, max_width, images_count, min_height, max_height. Here the imported testing image dataset contains about 517 images.

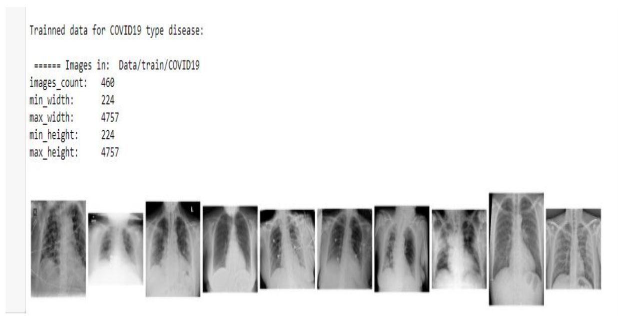

Fig. 4.1.3 Training Manual CNN (Covid19)

In Fig4.1.3 the image dataset for the covid-19 is imported from the folder with the help of data generator function and classified into min_width, max_width, images_count, min_height, max_height. Here the imported testing image dataset contains about 460 images.

B. Training dataset with AlexNet

In AlexNet the dataset which is used for training is mentioned as classifier and fit generator function is used to make training steps per epochs, total number of epochs, validation data and validation steps. Epoch is the number of times that the algorithms will work through the entire dataset. By using these data we can train our dataset successfully.

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 75, 75, 32)        896
_________________________________________________________________
max_pooling2d (MaxPooling2D) (None, 37, 37, 32)        0
_________________________________________________________________
conv2d_1 (Conv2D)            (None, 12, 12, 128)       36992
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 6, 6, 128)         0
_________________________________________________________________
flatten (Flatten)            (None, 4608)              0
_________________________________________________________________
dense (Dense)                (None, 256)               1179904
_________________________________________________________________
dense_1 (Dense)              (None, 3)                 771
=================================================================
Total params: 1,218,563
Trainable params: 1,218,563
Non-trainable params: 0
_________________________________________________________________
```

Fig. 4.2 Training dataset with AlexNet

In Fig4.2 AlexNet have eight layers in which there will be five convolutional layer and max pooling layer and rest of 5 layers will be fully connected layers. Here the model is sequential where the slack of layers which has one input as a tensor and other one output as tensor.

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C. Training dataset with LeNet

The LeNet is a deep learning convolutional neural network algorithm which takes the input image and assigns importance to various types of objects in the image which can be able to differentiate one image from the other image. LeNet consists of seven layers in which there will be two convolutional layers, two pooling layers, two fully connected layers and rest one layer will be the output layer.

D. Output and Deployment

In final module the trained deep learning model algorithm is changed into hierarchical data format file that is in the form of .h5 file which is then deployed in django framework for providing better user interface and accuracy of predicting the output.

VI. RESULT

The result that we are getting from our implemented algorithm provides better results than previous algorithm with reference to great accuracy and also the implemented algorithm provides stronger results when compared with other existing algorithm.

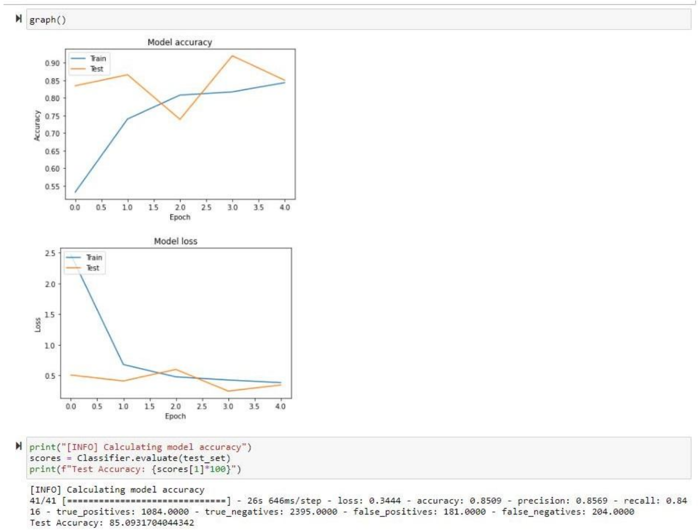

Fig. 5.1 Test Accuracy in Manual CNN

In Fig5.1 shows the test accuracy in Manual CNN and it also shows the graph for Model accuracy and Model loss that is the error of the model

Fig. 5.2 Test Accuracy in AlexNet

In Fig5.2 shows the test accuracy in AlexNet CNN and it also shows the graph for Model accuracy and Model loss that is the error of the model

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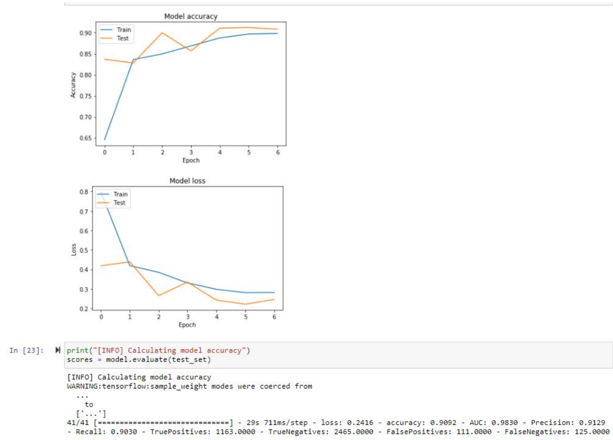

Fig. 5.3 Test Accuracy in LeNet

In Fig5.3 shows the test accuracy in Manual CNN and it also shows the graph for Model accuracy and Model loss that is the error of the model

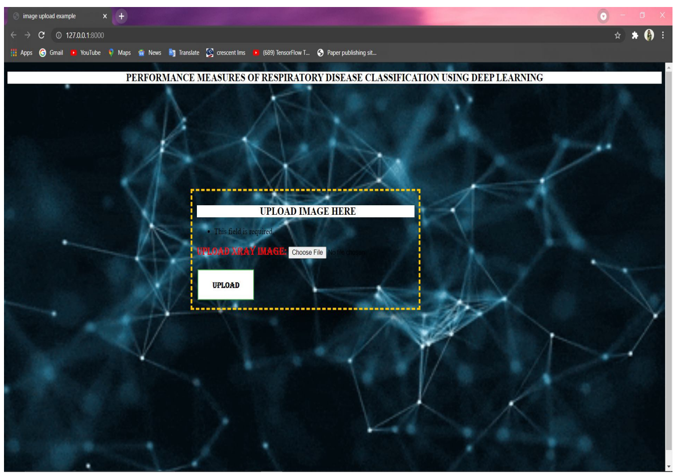

Fig. 5.4 Homepage

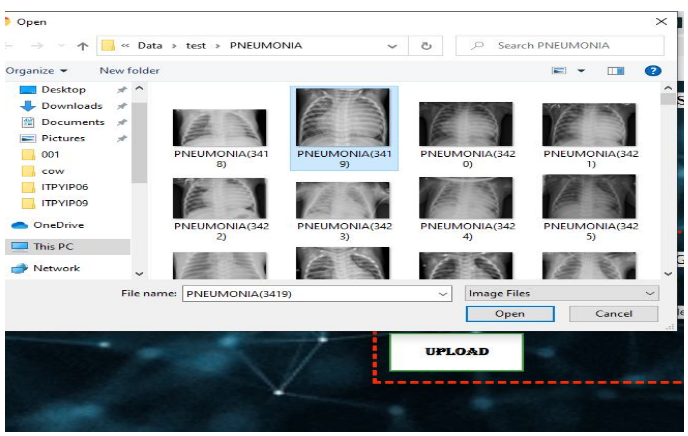

Fig. 5.5 Uploading X-ray Image

In Fig 5.4 shows the output for the homepage after the deployment in django and Fig 5.5 shows the uploading section of the chest x-ray image. We need to upload the chest xray image from the dataset that we have collected.

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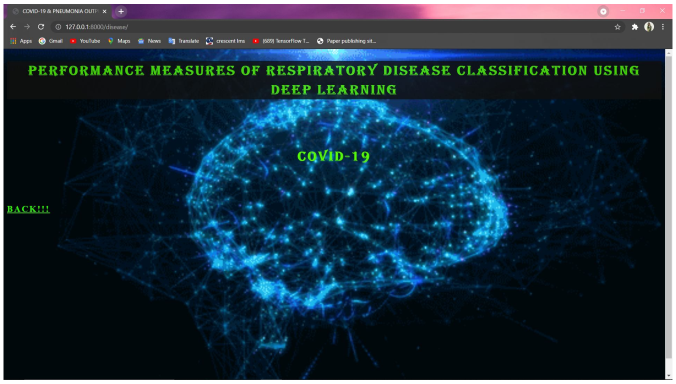

Fig. 5.6 predicting the output

In Fig 5.6 shows the final prediction of the output, the uploaded image is classified as covid-19. So, with the implemented algorithm we can able to classify the disease and make out better accurate results.

VII. CONCLUSION AND FUTURE ENHANCEMENT

The two respiratory diseases such as covid 19 and pneumonia has the same symptoms like high fever, cough, shortness of breathing, etc. So, we cannot able to predict the disease. To rectify this main cause of the problem we are in need to classify covid 19 and pneumonia disease by using deep learning technique. Without going to hospital and getting delay of time, with the help of chest x-ray images we can able to obtain the result whether the person is affected by corona or pneumonia disease. By using CNN, AlexNet and LeNet we have a clear idea of predicting the disease and results in a greater accuracy. Each of the mentioned algorithms has performed extremely well and the output is evaluated successfully. The future enhancement is to deploy real time this process by show the prediction results in web application or desktop application and to optimize the work to implement in Artificial Intelligence environment.

REFERENCES

[1] Wang, G., Liu, X., Li, C., Xu, Z., Ruan, J., Zhu, H., ... & Zhang, S. (2020). A noise-robust framework for automatic segmentation of COVID-19 pneumonia lesions from CT images. IEEE Transactions on Medical Imaging, 39(8), 2653-2663.
[2] Ozturk, T., Talo, M., Yildirim, E. A., Baloglu, U. B., Yildirim, O., & Acharya, U. R. (2020). Automated detection of COVID-19 cases using deep neural networks with X-ray images. Computers in biology and medicine, 121, 103792.
[3] Gunasinghe, A. D., Aponso, A. C., & Thirimanna, H. (2019, March). Early prediction of lung diseases. In 2019 IEEE 5th International Conference for Convergence in Technology (I2CT) (pp. 1-4). IEEE.
[4] Anthimopoulos, M., Christodoulidis, S., Ebner, L., Christe, A., & Mougiakakou, S. (2016). Lung pattern classification for interstitial lung diseases using a deep convolutional neural network. IEEE transactions on medical imaging, 35(5), 1207-1216.
[5] Khobragade, S., Tiwari, A., Patil, C. Y., & Narke, V. (2016, July). Automatic detection of major lung diseases using Chest Radiographs and classification by feed-forward artificial neural network. In 2016 IEEE 1st International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES) (pp. 1-5). IEEE.
[6] Ibrahim, D. M., Elshennawy, N. M., & Sarhan, A. M. (2021). Deep-chest: Multi-classification deep learning model for diagnosing COVID-19, pneumonia, and lung cancer chest diseases. Computers in Biology and Medicine, 132, 104348.
[7] Bharati, S., Podder, P., & Mondal, M. R. H. (2020). Hybrid deep learning for detecting lung diseases from X-ray images. Informatics in Medicine Unlocked, 20, 100391.
[8] Apostolopoulos, I. D., Aznaouridis, S. I., & Tzani, M. A. (2020). Extracting possibly representative COVID-19 biomarkers from X-ray images with deep learning approach and image data related to pulmonary diseases. Journal of Medical and Biological Engineering, 40, 462-469.
[9] Aykanat, M., KILIÇ, Ö., Bahar, K. U. R. T., & SARYAL, S. B. B. (2020). Lung disease classification using machine learning algorithms. International Journal of Applied Mathematics Electronics and Computers, 8(4), 125-132.
[10] Tariq, Z., Shah, S. K., & Lee, Y. (2019, November). Lung disease classification using deep convolutional neural network. In 2019 IEEE international conference on bioinformatics and biomedicine (BIBM) (pp. 732-735). IEEE.
[11] Kieu, S. T. H., Bade, A., Hijazi, M. H. A., & Kolivand, H. (2020). A Survey of Deep Learning for Lung Disease Detection on Medical Images: State-of-the-Art, Taxonomy, Issues and Future Directions. Journal of Imaging, 6(12), 131.
[12] Zak, M., & Krzyżak, A. (2020, June). Classification of Lung Diseases Using Deep Learning Models. In International Conference on Computational Science (pp. 621-634). Springer, Cham.
[13] Bermejo-Peláez, D., Ash, S. Y., Washko, G. R., Estépar, R. S. J., & Ledesma-Carbayo, M. J. (2020). Classification of interstitial lung abnormality patterns with an ensemble of deep convolutional neural networks. Scientific reports, 10(1), 1-15.
[14] Yadav, S. S., & Jadhav, S. M. (2019). Deep convolutional neural network based medical image classification for disease diagnosis. Journal of Big Data, 6(1), 1-18.

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[15] Kikkisetti, S., Zhu, J., Shen, B., Li, H., & Duong, T. Q. (2020). Deep-learning convolutional neural networks with transfer learning accurately classify COVID-19 lung infection on portable chest radiographs. PeerJ, 8, e10309.

[16] Heo SJ, Kim Y, Yun S, Lim SS, Kim J, Nam CM, Park EC, Jung I, Yoon JH. 2019. *Deep learning algorithms with demographic information help to detect tuberculosis in chest radiographs in annual workers' health examination data.* International Journal of Environmental Research and Public Health 16:250

[17] Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, Spitters C, Ericson K, Wilkerson S, Tural A+15 more. 2020. *First case of 2019 novel coronavirus in the United States.* New England Journal of Medicine 382(10):929-936

[18] Hui DS, Azhar EI, Madani TA, Ntoumi F, Kock R, Dar O, Ippolito G, McHugh TD, Memish ZA, Drosten C+2 more. 2020. *The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health: the latest 2019 novel coronavirus outbreak in Wuhan, China.* International Journal of Infectious Diseases 91:264-266

[19] Hurt B, Kligerman S, Hsiao A. 2020. *Deep learning localization of pneumonia: 2019 coronavirus (COVID-19) outbreak.* Journal of Thoracic Imaging 35(3):W87-W89

[20] Krizhevsky A, Sutskever I, Hinton GE. 2012. *Imagenet classification with deep convolutional neural networks.* Advances in Neural Information Processing Systems 60(6):1097-1105

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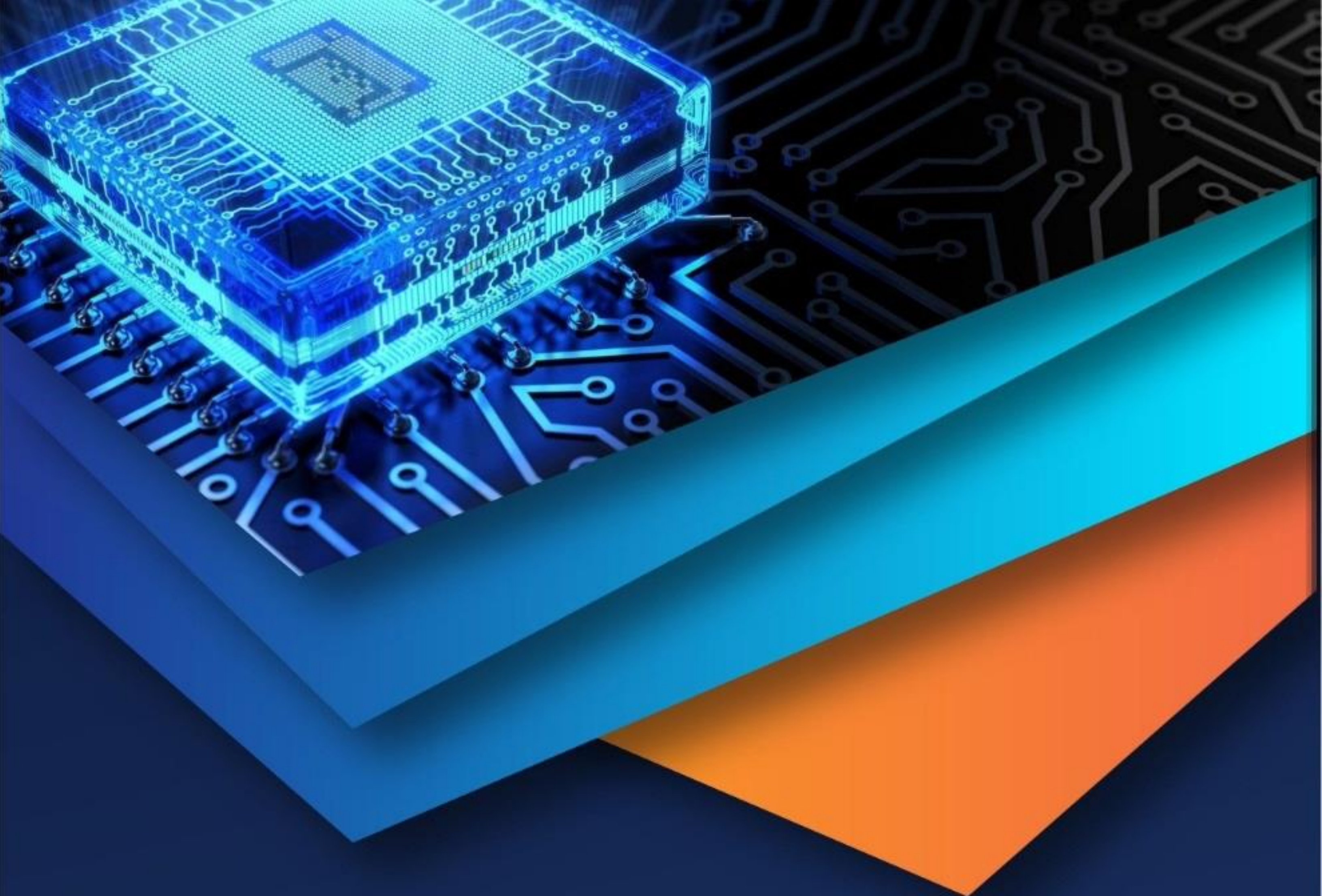

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