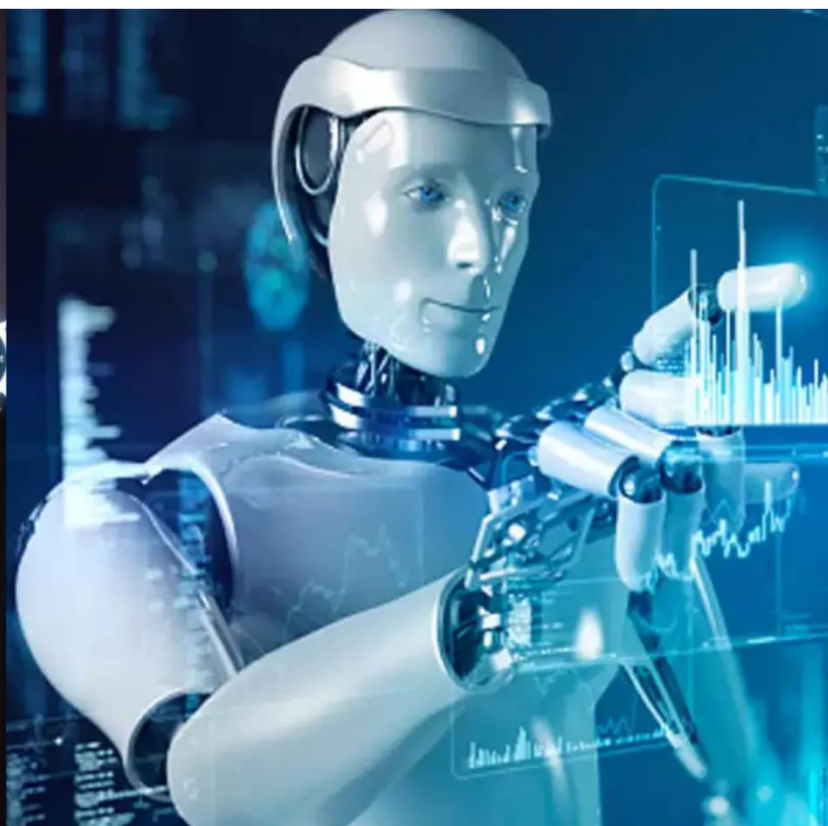




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COPD Classification of Chest CT Scans using CNN

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ABSTRACT: Chronic obstructive pulmonary disease (COPD) is a lung disorder that is not entirely reversible and is one of the leading causes of morbidity and mortality world early detection of diagnosis of COPD can enhance survival rates and reduce the chances of disease progression in patients a major concern to lung cancer which is progressive respiratory condition diagnosis is crucial for effective treatment this paper suggests employing pre-trained Convolutional Neural Network to automatically classify COPD from chest CT scan images models such as VGG16 and ResNet50 were optimized through transfer learning with a meticulously dataset of annotated CT scans we assessed the models based on precision, accuracy, recall and F1-score we can determine the type of lung cancer and classify the issue using the dataset classification of lung cancer leveraging knowledge transfer from a pre-trained COPD classification model to enhance diagnostic accuracy in other related pulmonary conditions.

KEYWORDS: COPD, chest CT scan, pre-trained model, deep learning, CNN, image classification.

I. INTRODUCTION

CT images become an essential tool for the detection and classification of COPD subtypes play an important role in early stage of lung cancer early detection improve patient outcome treatment through surgery it has high risk of individuals for lung cancer reducing mortality through invention CNN extract the critical features of images accurate detection and classification Resnet for feature extraction and classification have diagnostic precision These challenges include dataset class need large and annotated dataset to train the models this study proposes an automated CNN based for chest cancer detection using CT scan images it involves pre-processing such as noise reduction to improve model generation deep learning CNN architecture must train on public datasets to classify the chest cancer categories such as adenocarcinoma, large.cell.carcinoma, normal and squamous.cell.carcinoma model performance using metrics like accuracy,precision,F1-score and recall the successful framework enhance cancer detection speed and accuracy In this study we perpose CNN for classification of COPD we first train model for classification of COPD chest CT scans using features for COPD classification and model for chest cancer classification.

II. LITERATURE SURVEY

Ahmed et al.,[1]this paper classifies COPD using 3D resnet model and for classification pooling layer and fully connected layer and implemnet by keras model it use emphysema dataset for classification and it has 70% of classify the emphysema disease. Elmisery, A. M.[2] this paper studies machine learning and predict COPD early detection and classification with planning treatment of COPD apply supervised and unsupervised learning also use structure data and unstructured data models like SVM and random forest detect for CT scan accuracy has 85% use larger dataset. Thao Thi Ho et al., [3]suggest deep learning that uses 3D CNN CT scan classify COPD it is small airway disease used as multiple 3D inputs for the model has high accuracy 89.3% and high sensitivity 88.3% it use raw CT image data. Singla et al. [4] singla develop a deep learning on CT scan of 10,300 patients in COPD gene prediction they include three methodology models generative network, attention mechanism and discreptive network for predicting the model accuracy of 73%. Hasenstab et al. [5] suggest COPD CT severity to be classified and prediction of CT scan images of 9,000 participants has features like emphysema, airway thickness, air trapping and lung volume it will predict lung images accuracy as 68%. Zhang et al., Br J Radiol .[6] it suggests a deep learning CNN model features like emphysema and bronchial using model densenet-201 CNN output using logistic regression compare on metrics accuracy has 67%. Sun et al. [7] suggest severity stage of COPD using dataset as internal and external detect model staging and detection of CT scan COPD detection accuracy as 93% and accuracy of staging as 76%. Baraghoshi et al.[8]

suggest quantitative chest CT scan identify the COPD gene of smokers using the disease progression it has statistical models and emphysema measurement and population methods it shows progression metrics. Zhao et al.[9] suggest to improve the CT scan features separately it used 530 datasets classify in SVM model use four classes mild one, two and severe 3 and 4 accuracy has 63% and precision recall and f1-score as 70%.Chen et al. [10] suggest the chest CT scan images of COPD use clinical data as age, smoking in chest CT scan using deep learning models as imaging model, clinical model and fusion model data used as train and test for image data 84% and clinic data as 76%.

III. METHODOLOGY

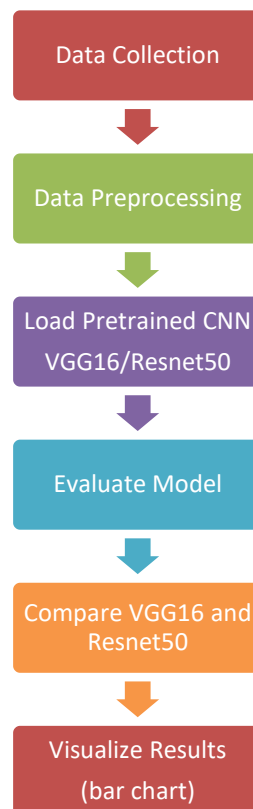


Figure1: COPD Detection

- Data Collection: this step contains collect the chest CT scan images to be required for training and testing models it contains labelled dataset include different classes like adenocarcinoma, large.cell.carcinoma, normal, squamous.cell.carcinoma images datasets contains sufficient and variety of data volume.
- Data pre-processing: this step collected images are prepare for model input pre-processing it includes resizing the input size image 224*224 pixels normalize the pixel values between 0 and 1 and apply data augmentation and split dataset into training and testing for evaluation.
- Load Pre-trained CNN (VGG16/Resnet50): the Pre-trained CNN contains VGG16 and Resnet50 are load on deep learning the model train on large datasets like medical images for classification to improve performance.
- Evaluate model: the models must train using the test dataset such as accuracy,precision,recall and F1 score are calculated each model identify different type of lung diseases condition.
- Compare VGG16 and Resnet50: this step compares performance of pre-trained models the testing phase analyse which model has better classification accuracy the comparison helps the most suitable model.
- Visualize Results: the results must be visualize on the graph like pie chart or bar chart it must compare the performance of the models having the accuracy of images which image has more performance it will display results.

IV. EXPERIMENTAL RESULTS

As can be seen from performance comparison graph VGG16 consistently outperforms Resnet50 in all major evaluation metrics achieving higher accuracy, F1-score, precision, recall these results demonstrate VGG16 strong and balanced classification capabilities effectively distinguish between positive and negative cases with minimal compromise between precision and recall Resnet50 on the other hand performs significantly worse especially in F1-score and precision which may be a sign of problems like sensitivity to class imbalance features from the dataset.

Metric	VGG16	Resnet50
Accuracy	0.84	0.51
F1-score	0.83	0.42
Precision	0.85	0.64
Recall	0.84	0.51

Table 4.1 result of the paper

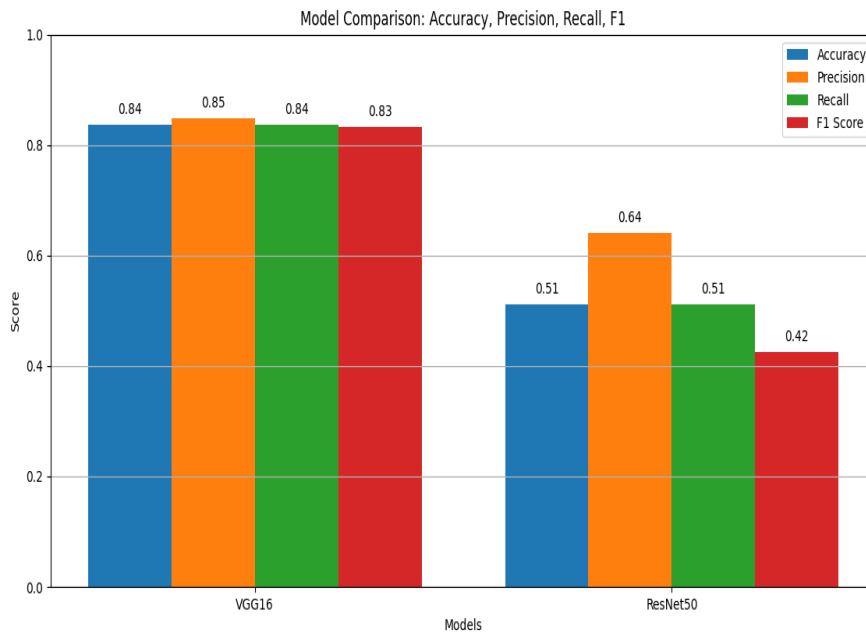


Figure 2: comparison graph of VGG16 and Resnet50

V. CONCLUSION

The CT scan images effectively demonstrated the capabilities of a deep learning based CNN utilizing VGG16 and ResNet50 for the automation of COPD and related lung diseases this was achieved through data augmentation and pre-processing models that extract valuable features from the dataset VGG16 has proven to be most reliable for this dataset while ResNet50 excelled the accuracy, F1-score, precision and recall and class wise predictions visualization technique has performance comparison chart indicate that CNN approach in clinical diagnosis future research could focus on integrating 3D analysis and training with larger and more diverse datasets.

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