AI-ASSISTED PREDICTIVE MODEL FOR TUBERCULOSIS DISEASE

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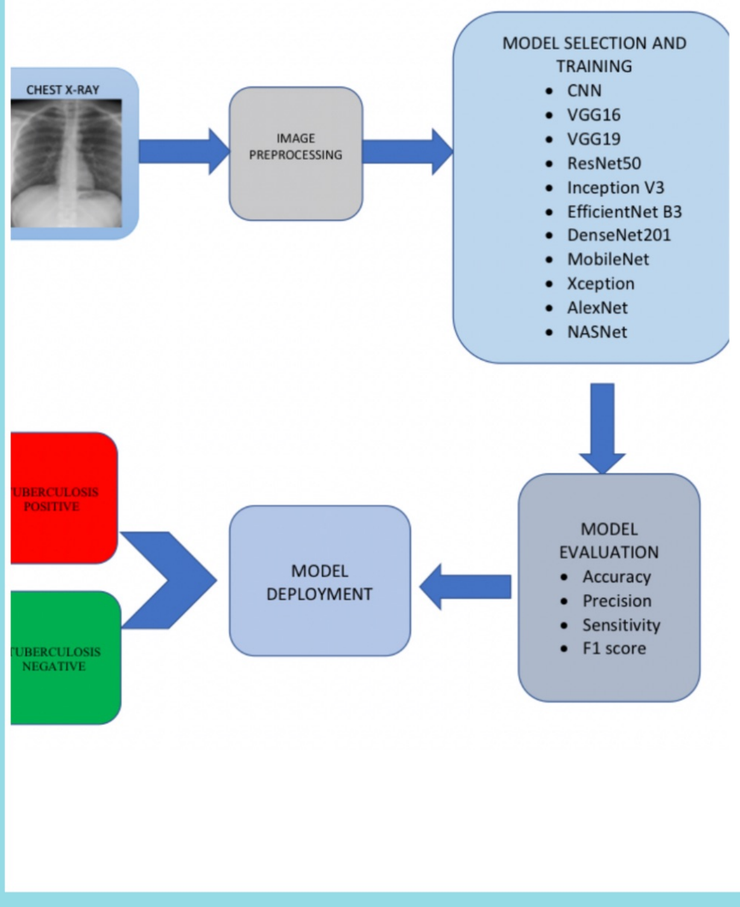
INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacteria named Mycobacterium tuberculosis [1]. It is of a major public health concern, causing millions of fatalities globally each year primarily in developing nations and among individuals with poor socioeconomic status[2].Effective disease management depends on early diagnosis and prompt treatment.

This study is aimed to build an Artificial intelligence (AI)- assisted model that can be used for the prediction of TB based on radiological data from patients suspected to have TB with the aid of machine learning algorithms. This research also examines the potential of AI-assisted models in detecting TB at a level that will overcome the radiologist limitations.

METHODOLOGY

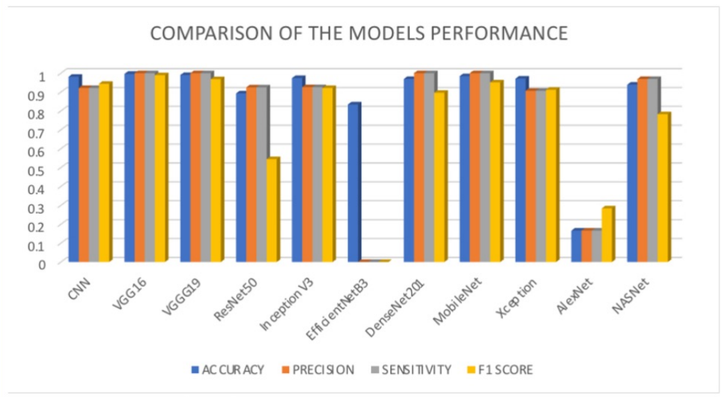


DATA PROCESSING

- The dataset used for training the model in this research was collected by [3] and made available on Kaggle. It contains 3500 Chest X-ray (CXRs) of Healthy people without TB and 700 CXRs of people infected with TB.
- The CXR images were preprocessed to enhance their quality and extract relevant features. The CXRs were resized to standardise the images for analysis then it was split into training and validation dataset.
- A Convolutional Neural Networks (CNNs), and other transfer learning models were use d to build the predictive model by selecting and training the reprocessed data.
- The model was then evaluated using the validation set to assess its performance and identify any area that needs improvement.

RESULTS

MODEL	ACCURACY	PRECISION	SENSITIVITY	F1 SCORE
CNN	0.981	0.921	0.921	0.944
VGG16	0.996	1	1	0.989
VGGG19	0.99	1	1	0.968
ResNet50	0.893	0.925	0.925	0.544
InceptionV3	0.974	0.926	0.926	0.921
EfficientNetB3	0.834	0	0	0
DenseNet201	0.969	1	1	0.896
MobileNet	0.984	1	1	0.951
Xception	0.971	0.907	0.907	0.912
AlexNet	0.166	0.166	0.166	0.284
NASNet	0.939	0.969	0.969	0.783



gure 2: Chart comparing the models performance

DISCUSSION

The successful application of AI-assisted predictive analysis using VGG16 in tuberculosis detection holds significant implications for medical diagnosis and treatment. The high accuracy, precision, sensitivity, and F1 Score achieved by VGG16 provide promising prospects for automating the screening and early detection of tuberculosis, which can aid in timely interventions and improved patient outcomes. While the use of pre-existing datasets has its limitations, this research underscores the potential of AI-assisted approaches in medical image analysis. Further research could focus on refining the model's performance, addressing the challenges of limited data availability, and exploring alternative approaches to enhance the accuracy and efficiency of tuberculosis detection using chest X-ray images.

CONCLUSION

In conclusion, this research on AI-assisted predictive analysis of tuberculosis using chest X-ray images demonstrates the effectiveness of VGG16 in accurately classifying tuberculosis cases. The findings contribute to the growing body of knowledge in the field of medical image analysis and pave the way for advancements in automated tuberculosis screening. Continued research in this area holds great promise for improving early detection and treatment outcomes in tuberculosis patients, ultimately contributing to the global efforts in combating this infectious disease.

REFERENCES

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