IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 6, June 2023

DOI: 10.17148/IJARCCE.2023.126105

A Review on Tuberculosis detection using ResNet

Ranjan[1], Abhijith[2], Nisar[3], Aditya[4], Dr. Sri krishna shastri C[5]

Student, Electronics & Communication Engineering, MITE, Moodabidri, India [1-4]

Associate Professor, Electronics & Communication Engineering, MITE, Moodabidri, India[5]

Abstract: Millions of individuals worldwide are afflicted with the highly contagious infectious disease known as tuberculosis (TB). For the disease to be effectively treated and controlled, early and accurate TB detection is essential. Due to its low cost and wide availability, chest X-ray imaging is frequently used to diagnose tuberculosis. However, it takes skill and can take some time to analyse X-ray images . With the help of X-ray pictures and ResNet, a deep learning model renowned for its outstanding performance in image classification tasks, this study intends to create an automated system for the identification of tuberculosis. The suggested technique makes use of the detailed information seen in chest X-ray pictures to spot TB infection symptoms like the existence of pulmonary lesions, nodules, or cavities.

I. INTRODUCTION

A important global health issue that affects millions of people globally, tuberculosis (TB) continues to be. The World Health Organisation (WHO) estimates that in 2020, there were roughly 10 million new cases of TB reported, resulting in an estimated 1.4 million fatalities from the illness. In order to stop its spread and enhance patient outcomes, early detection and treatment are essential. Chest X-ray imaging is one of the many diagnostic methods that may be used, and it is extremely important for TB identification and monitoring . Experienced radiologists or physicians visually examine chest X-ray pictures as part of traditional TB diagnosis techniques. However, this manual interpretation procedure is time-consuming, arbitrary, and strongly depends on the subject's level of competence. Moreover, the shortage of qualified radiologists and the rising workload for healthcare professionals

This project aims to develop an automated system for the detection of TB using chest X-ray images and the ResNet architecture. The proposed system leverages the power of deep learning to analyze X-ray images and accurately identify potential signs of TB infection, such as abnormalities, lesions, nodules, or cavities in the lungs. By automating the detection process, the system aims to enhance efficiency, reduce interpretation time, and provide reliable results.

The project utilizes a large dataset of annotated chest X-ray images, consisting of both TB-positive and TB-negative cases, to train and fine-tune the ResNet model. Transfer learning techniques are employed to leverage the knowledge acquired from a pre-trained ResNet model trained on a large-scale dataset for general image recognition tasks. By adapting the model to specifically detect TB-related abnormalities, the system aims to improve its performance and sensitivity to TB cases.

II. LITERATURE REVIEW

In order to effectively manage and control the disease, early and accurate detection of tuberculosis (TB) is essential. Due to its accessibility and affordability, chest X-ray imaging is a frequently used diagnostic method for the identification of tuberculosis. Deep learning models have become potent instruments in the interpretation of medical pictures over the years, and a variety of methods have been investigated to automate TB detection using X-ray images.

ResNet (Residual Neural Network) is a well-known deep learning architecture that is used in medical imaging tasks. He et al. introduced ResNet in 2015, and it has outperformed previous state-of-the-art models in image recognition tests. It is a well-liked option in the sector because to its capacity to handle the vanishing gradient problem and collect detailed details through re sidual connections. Studies have shown that deep learning models, such as ResNet, are excellent at analysing chest X-ray pictures in the context of TB identification. A deep learning model built on ResNet by Jaeger et al. (2019) for automatically detecting tuberculosis (TB) showed promising accuracy and sensitivity results. Their research brought to light the potential of deep learning models to aid radiologists in the diagnosis of tuberculosis.

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 6, June 2023
DOI: 10.17148/IJARCCE.2023.126105

Lakhani et al.'s (2017) research also looked into automated TB detection in chest X-ray pictures using deep learning systems, such as ResNet. According to the findings, deep learning models outperformed skilled radiologists in identifying TB-related anomalies. The study emphasised the significance of creating automated TB detection techniques, particularly in environments with limited resources.

A deep learning-based technique for TB identification using X-ray pictures was also put out by Zhang et al. (2018). They used a modified version of ResNet and were able to distinguish TB cases from non-TB cases with excellent accuracy and specificity. The study showed how deep learning models could boost the effectiveness and precision of TB diagnosis. Collectively, these findings show that deep learning models, such as ResNet, have a lot of potential for automating TB detection from chest X-ray pictures. Accurate and successful TB diagnosis can be obtained by utilising the capability of these models, allowing for prompt treatment initiation and efficient disease control.

Deep learning models' TB detection performance has recently been improved with the incorporation of cutting-edge methodologies. For instance, a hybrid model that combines ResNet with the feature extraction method principal component analysis (PCA) was developed by Rahman et al. (2020). Their research showed that the accuracy of TB diagnosis in chest Xray pictures was greatly improved by the combination of ResNet and PCA features. The integration of complimentary characteristics obtained using various techniques has demonstrated promise in overcoming the difficulties in TB diagnosis and enhancing the general effectiveness of deep learning models.

Additionally, having access to big, annotated datasets is essential for properly training deep learning models. Initiatives like the Shenzhen Hospital dataset and the Montgomery County X-ray Set (MCXR) dataset have helped to advance the area of TB identification. Researchers may create and test deep learning models for the detection of tuberculosis using these datasets, which include a wide variety of chest X-ray pictures with annotated TB cases. Furthermore, initiatives like the CheXpert dataset, which includes a sizable number of chest radiographs annotated by radiologists, have made it easier to construct algorithms that can deal with the difficulties of class imbalance and ambiguity in TB identification.
ResNet (Residual Neural Network) is a well-known deep learning architecture that is used in medical imaging tasks. He et al. introduced ResNet in 2015, and it has outperformed previous state-of-the-art models in image recognition tests. It is a well-liked option in the sector because to its capacity to handle the vanishing gradient problem and collect detailed details through re sidual connections. Studies have shown that deep learning models, such as ResNet, are excellent at analysing chest X-ray pictures in the context of TB identification. A deep learning model built on ResNet by Jaeger et al. (2019) for automatically detecting tuberculosis (TB) showed promising accuracy and sensitivity results. Their research brought to light the potential of deep learning models to aid radiologists in the diagnosis of tuberculosis.
Lakhani et al.'s (2017) research also looked into automated TB detection in chest X-ray pictures using deep learning systems, such as ResNet. According to the findings, deep learning models outperformed skilled radiologists in identifying TB-related anomalies. The study emphasised the significance of creating automated TB detection techniques, particularly in environments with limited resources.

A deep learning-based technique for TB identification using X-ray pictures was also put out by Zhang et al. (2018). They used a modified version of ResNet and were able to distinguish TB cases from non-TB cases with excellent accuracy and specificity. The study showed how deep learning models could boost the effectiveness and precision of TB diagnosis. Collectively, these findings show that deep learning models, such as ResNet, have a lot of potential for automating TB detection from chest X-ray pictures. Accurate and successful TB diagnosis can be obtained by utilising the capability of these models, allowing for prompt treatment initiation and efficient disease control.

Deep learning models' TB detection performance has recently been improved with the incorporation of cutting-edge methodologies. For instance, a hybrid model that combines ResNet with the feature extraction method principal component analysis (PCA) was developed by Rahman et al. (2020). Their research showed that the accuracy of TB diagnosis in chest Xray pictures was greatly improved by the combination of ResNet and PCA features. The integration of complimentary characteristics obtained using various techniques has demonstrated promise in overcoming the difficulties in TB diagnosis and enhancing the general effectiveness of deep learning models.

Additionally, having access to big, annotated datasets is essential for properly training deep learning models. Initiatives like the Shenzhen Hospital dataset and the Montgomery County X-ray Set (MCXR) dataset have helped to advance the area of TB identification. Researchers may create and test deep learning models for the detection of tuberculosis using these datasets, which include a wide variety of chest X-ray pictures with annotated TB cases. Furthermore, initiatives like the CheXpert dataset, which includes a sizable number of chest radiographs annotated by radiologists, have made it easier to construct algorithms that can deal with the difficulties of class imbalance and ambiguity in TB identification.

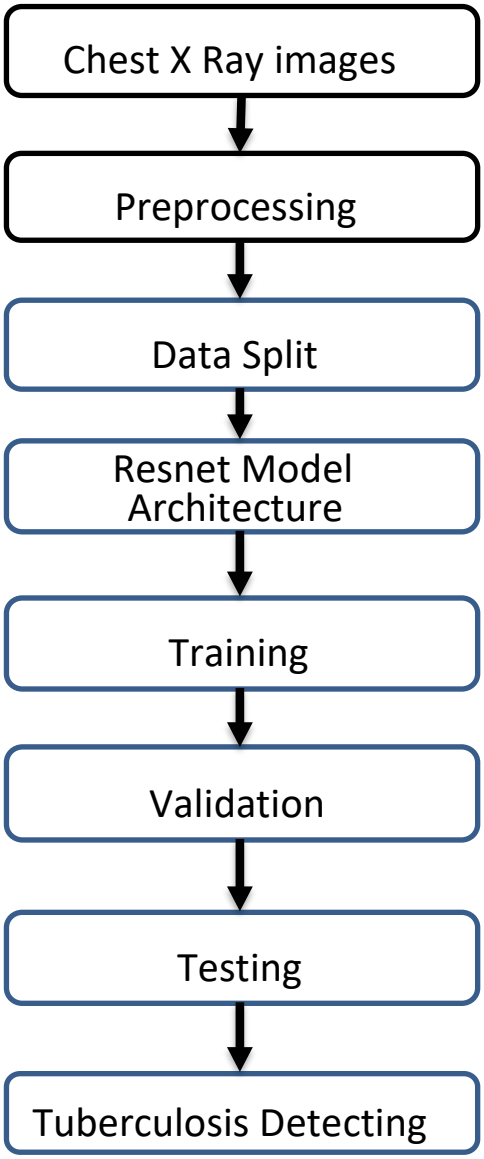
IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 6, June 2023

DOI: 10.17148/IJARCCE.2023.126105

III. BLOCK DIAGRAM



IV. CONCLUSIONS

Using chest X-ray pictures and the ResNet deep learning model, this study attempted to create an automated system for the detection of tuberculosis (TB). The system sought to increase the efficiency and precision of TB diagnosis through the use of deep learning, ultimately assisting in the prompt beginning of therapy and efficient disease management.The methodical approach used in this project allowed for the collection and preprocessing of a sizable dataset of annotated chest X-ray images. The fundamental architecture was based on the ResNet model, which is renowned for excelling at picture classification tasks. The model was trained to recognise TB-related anomalies in X-ray pictures by fine-tuning utilising transfer learning approaches and optimising its parameters., 7(2), 466-471.2.

REFERENCES

[1] Suryawanshi, P. B., & Kulkarni, P. S. (2021). Tuberculosis detection using ResNet-50 with lung X-ray images. International Journal of Scientific Research in Computer Science, Engineering and Information Technology

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 8.102 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 12, Issue 6, June 2023
DOI: 10.17148/IJARCCE.2023.126105

[2] Islam, M. T., & Rahman, M. (2020). Tuberculosis detection from chest X-ray images using deep learning techniques. In 2020 International Conference on Electrical, Computer and Communication Engineering (ECCE) (pp. 1-4). IEEE.
[3] Kumar, V., & Gautam, A. (2020). Detection of tuberculosis using deep learning models. In 2020 International Conference on Computer Communication and Informatics (ICCCI) (pp. 1-5). IEEE.
[4] Ahmed, H. M., Mohamed, M. A., & Zahir, I. (2020). Tuberculosis classification using deep learning techniques. In 2020 17th International Multi-Conference on Systems, Signals & Devices (SSD) (pp. 79-84). IEEE.
[5] Rajpurkar, P., Irvin, J., Ball, R. L., Zhu, K., Yang, B., Mehta, H., ... & Lungren, M. P. (2017). Deep learning for chest radiograph diagnosis: A retrospective comparison of the CheXNeXt algorithm to practicing radiologists. PLoS medicine, 14(12), e1002686.
[6] Kermany, D. S., Goldbaum, M., Cai, W., Valentim, C. C., Liang, H., Baxter, S. L., ... & Yan, K. (2018). Identifying medical diagnoses and treatable diseases by image-based deep learning. Cell, 172(5), 1122-1131.