## **Application of Deep Learning-based Methods in**

## **Tuberculosis Disease Classification**

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## Abstract

Tuberculosis (TB) is an infectious disease that causes the illness and death in millions of people for each year worldwide. Patients with cavitary TB are more contagious, and chest X-rays could help to diagnose cavities. This pilot study aims to conduct the performances of TB types classification on chest X-rays using deep learning methods. The dataset consisted of 270 chest X-rays totally, single image per patient, selected based on CT scan date. Three different seeds were setting to sample the chest X-rays and lung regions images into 50% for training, 25% for validation and 25% for testing. The chest X -rays and lung regions images extracted by an U-Net model separately were used to train the model in experiment 1 and 2. In experiment one, a CNN model was trained by chest X-rays. Also, in experiment two, an U-Net model was used to extract lung regions images to train a CNN model. The VGG-19 pre-trained models were used to classify chest X-rays and lung regions images to assist diagnosis of TB. The best area AUC values of the VGG-19 pretrained model training by the first and the second group of lung regions were 0.7045 and 0.6719 on the test sets, respectively. The best AUC values of the fine-tuning VGG-19 pre-trained model trained by the third group and the first group were 0.6413 and 0.6621 on the test sets, respectively. In the future, the capabilities of the model can be further verified by increasing the number of chest X-rays.

Keyword: Tuberculosis, CNN, AUC, chest X-ray, cavity