Automated Detection of Pulmonary Tuberculosis from Low-Resolution Chest X-rays in 8096 Adults Living with HIV or Diabetes in Three West African Countries

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Abstract

Recently, deep learning algorithms have shown great potential to standardise and automate the interpretation of chest x-rays (CXR). Such decision support is especially valuable in resource-limited settings, where expertise is inequitably distributed and pulmonary diseases such as tuberculosis (TB) are endemic. However, these algorithms are trained on digitised radiology systems in higher-resource settings, and thus, remote environments with analogue CXR printouts are excluded. Such images are often digitised secondarily via a photograph taken on a mobile device. This project aims to investigate the suitability of such imperfectly digitised CXR (IDCXR) on publicly available TB detection models. Specifically, the performance of such models in high risk population subsets such as persons living with HIV and diabetes. We test several models and find that a comprehensive pre-processing pipeline can render the IDCXR suitable for detecting TB, producing an F1 score of 0.97 and AUROC of 0.94 with similar performance in HIV and diabetic subpopulations.

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