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Explainable AI for Tuberculosis Detection using Deep Learning

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Abstract: *Explainable Artificial Intelligence (XAI) has emerged as a critical aspect of machine learning models, particularly in domains where transparency and interpretability are paramount. In this study, we present an enhanced deep learning framework leveraging XAI techniques for improved model interpretability and decision understanding. Our methodology encompasses preprocessing steps such as image conversion to numpy arrays, visualization of grey scale histograms, data augmentation, and image enhancement through contrast stretching and histogram equalization. Additionally, we integrate Explainable AI methods including LIME, SHAP, RISE, MFPP, and LRP to provide insights into the model's decision-making process. Through these techniques, we aim to elucidate the underlying factors influencing model predictions, thereby fostering trust and facilitating domain expert understanding. Experimental results demonstrate the efficacy of our approach in enhancing model interpretability while maintaining high predictive performance. This research contributes to the advancement of XAI methodologies, offering a transparent and interpretable framework applicable across various domains*

Keywords: Explainable Artificial Intelligence (XAI),Deep Learning, Convolutional Neural Networks (CNN), Image Processing, Tuberculosis Detection, Chest X-ray Images, Data Augmentation, Image Enhancement, Interpretability, LIME (Local Interpretable Model-agnostic Explanations), SHAP (SHapley Additive exPlanations), RISE (Randomized Input Sampling for Explanation), MFPP (Meaningful Perturbation-based Propagation), LRP (Layer-wise Relevance Propagation).