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Majority Voting Algorithm for TB Detection: Machine Learning Approach

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Mycobacterium tuberculosis (Mtb) is an intracellular pathogen that has evolved defense mechanisms to evade the human immune response, allowing it to persist indefinitely in the host. The bacterium primarily targets the human lungs and produces the contagious disease tuberculosis (TB). Although the bacteria attack the lungs, TB can spread to other parts of the body such as the kidneys, bones, and brain. Tuberculosis can be fatal if not properly treated and it has already claimed the lives of many people throughout the world. Hence, early detection and treatment of the diseases are essential to improving the likelihood of a full recovery. Machine learning algorithms (ML) have shown great potential to provide more accurate diagnostic results while saving money and human lives. However, the technique can be accurate to a certain degree and improvements are required. In this work, a combination of machine learning algorithms (i.e., a convolutional neural network, a support vector machine and decision tree algorithms) use majority voting to classify chest X-ray images into infected and noninfected. The performance of the individual algorithms is optimized by hyperparameter techniques such as grid search; therefore, the voting system made of the three algorithms achieves an accuracy of 99% in classifying 800 (200 healthy and 600 TB-infected) chest X-ray images. The system classifies the TB-infected images by 98% and non-infected images by 100% providing high precision and recall. As such, the voting algorithm in this study can be applicable to point-of-care settings and has the potential to serve as a supplement to conventional illness detection techniques used in the medical industry.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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