# Leveraging Deep Learning for Critical X-ray Classification in the Era of Respiratory Diseases

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| **ABSTRACT**  This research addresses the challenge of categorising X-ray images into three categories: Covid, normal, and viral pneumonia. Effective classification in respiratory diseases is crucial for timely diagnosis and treatment planning, with direct implications for patient health [1-3].  Deep learning, particularly Convolutional Neural Networks (CNNs), is becoming an essential tool in medical image classification due to its unique capabilities in pattern recognition and feature extraction. This paper emphasises the significance of using deep learning techniques to automate and enhance the accuracy of X-ray image classification, thereby assisting healthcare professionals in making informed decisions [4, 5].  Transfer learning is an important aspect of this work, as it can utilise pre-existing knowledge from large datasets. This approach is particularly useful in the medical field, where labelled data is often limited and difficult to obtain. The discussion emphasises the advantages of transfer learning in optimising model performance and reducing the need for extensive labelled data.  The EfficientNetB0 model was chosen due to its superior efficiency in balancing model complexity and computational resources. The rationale behind this choice is explained by highlighting the model's robustness and generalisation capabilities in medical image classification tasks.  The paper concludes by presenting results that prove the effectiveness of the proposed methodology and underline its contribution to the field. The research presented here is unique in its comprehensive approach, which combines X-ray classification, deep learning, and transfer learning to create an efficient model. The evidence provided in this research demonstrates the model's strong performance, contributing to the advancement of medical image analysis and holding promise for real-world applications in the rapid and accurate diagnosis of respiratory diseases.  **References:**  [1] L. Brunese, F. Mercaldo, A. Reginelli, and A. Santone, "Explainable deep learning for pulmonary disease and coronavirus COVID-19 detection from X-rays," Computer Methods and Programs in Biomedicine, vol. 196, p. 105608, 2020.  [2] G. M. M. Alshmrani, Q. Ni, R. Jiang, H. Pervaiz, and N. M. Elshennawy, "A deep learning architecture for multi-class lung diseases classification using chest X-ray (CXR) images," Alexandria Engineering Journal, vol. 64, pp. 923-935, 2023.  [3] P. Vieira, O. Sousa, D. Magalhães, R. Rabêlo, and R. Silva, "Detecting pulmonary diseases using deep features in X-ray images," Pattern Recognition, vol. 119, p. 108081, 2021.  [4] I. M. Baltruschat, H. Nickisch, M. Grass, T. Knopp, and A. Saalbach, "Comparison of deep learning approaches for multi-label chest X-ray classification," Scientific reports, vol. 9, no. 1, p. 6381, 2019.  [5] A. U. Ibrahim, M. Ozsoz, S. Serte, F. Al-Turjman, and P. S. Yakoi, "Pneumonia classification using deep learning from chest X-ray images during COVID-19," Cognitive Computation, pp. 1-13, 2021. |

# Keywords: X-Ray Classification, Deep Learning, Transfer Learning, EfficientNetB0, Respiratory Diseases