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Attention Mechanism: An Efficient Deep Learning Model For Pulmonary Disease Segmentation, Detection and Classification

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The human lung is seen as one of the vital organs of the human body; hence lung diseases are hazardous for humans. Lung diseases are some of the most common medical conditions in the world caused by Smoking, infections, and genes cause most lung diseases. Some lung diseases include Asthma, Pneumonia, Tuberculosis, Lung cancer, Acute respiratory distress syndrome etc. Artificial Intelligence (AI) and medical imaging have proven to be more effective, especially in the assessments of critical body parts such as the lungs, heart, brain etc.; thus, researchers focused on the development of AI-based methods to facilitate cheaper, faster and home-based Pulmonary detection to help mitigate the spread of the disease. On the other hand, there is a need for a quicker and more efficient design of AI tools to detect Pulmonary using limited medical imaging datasets. Radiological images such as computed tomography (CT) and chest radiography (X-ray) have proven promising in diagnosing lung disease. Research shows that CT is primarily used in analyzing Pulmonary. However, Chest X-rays are preferred over CT due to the radiation exposure and cost as they are less expensive, extensively available and have less radiation exposure. Various researchers have applied deep learning for the early detection of Pulmonary According to the prior studies, traditional methods suffer many issues like i.) Despite early expectations and promises and years of clinical usage, conventional methods have not achieved a level of performance that might improve realistic evaluation performance in the actual world. ii.) The prevalence of false-positive marks is a crucial drawback of traditional approaches. Unless the threshold for detecting abnormal regions is set at rates of more than one discovery per image, good sensitivity performance results. iii.) Nevertheless, identifying the forms and edges of lesions in ultrasound and microscopic images is challenging. Thus, feature extraction is still dependent on the radiologist's experience. Researchers' experiences with handcrafting features resulted in the emergence of modern techniques. Deep learning (DL), which is developed to mimic humans' intellect and decision-making, has shown tremendous performance for medical imaging tasks using different medical datasets. The convolutional neural network (CNN) is the primary known deep learning architecture for vision tasks (Image-Based data). To help the NN increase its performance, multiple images pre-processing and augmentation approaches are utilized for classification. Deep learning methods first extract the input image features. The extracted features also included irrelevant information's that subsequently impaired classification performance. Hence, choosing the essential characteristics is vital to achieving a higher classification precision rate. Therefore, selecting only the relevant features is a research topic currently being pursued. Several selection techniques such as PSO (Particle Swarm Optimization), GA (Genetic Algorithm) etc., are introduced in the literature and used in medical imaging. These feature extraction strategies only select the best subset of features rather than the entire feature space. The dominant benefit of feature selection approaches is that they enhance system accuracy while reducing processing time. Unfortunately, a few more key features are sometimes overlooked throughout the best feature selection process, influencing overall accuracy. Subsequently, Attention mechanisms were developed by computer vision researchers.

Biography

Chima is currently a Research Assistant and Ph.D. student at the School of Information and Software Engineering, University of Electronic Science and Technology of China. He is also a Teaching Assistant to Professor Liao Yong (Embedded Systems Design) and Professor Julia Di (Cultural Difference And Cross-Culture Communication). His research interest includes Medical Imaging, Object Detection and Classification, Attention Mechanism Framework. He received his BSc in Nigeria, Federal University of Technology Owerri (FUTO) and his MSc. in the University of Electronic Science and Technology of China, where he majored in Software Engineering (Artificial Intelligence). He has authored over 20 Conference and Journal papers. He has won numerous awards such as the Chengdu-Chongqing Economic Circle Innovation Competition for International Students, 2019 Second most Outstanding International Masters Student of University of Electronic Science and Technology of China, 2021 School of Information and Software Engineering Award for Excellent Performance and award of Excellent Academic Achievement, University of Electronic Science and Technology of China.

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