Detection of Malignant Lung Tumors From CT Scans Through Deep Learning-Based Artificial Intelligence Algorithms

Fu, Sophia (School: Carmel High School)

Lung cancer is the primary cause of cancer-related deaths worldwide. According to the American Cancer Society, misdiagnoses and lack of early detection are frequent, leading to tumor metastasis and a decrease in average 5 year patient lifespans by 7-10 times. In recent decades, groundbreaking research involving deep learning and artificial intelligence (AI) has demonstrated potential in disease detection and diagnostics, with several algorithms gaining FDA approval. In this project, I developed a novel deep learning-based AI algorithm to analyze and detect malignant lung tumors using the National Cancer Institute's Lung Nodule Analysis database. My comprehensive, three step methodology involved loading and combining CT data files, performing a semantic nodule segmentation, and identifying potential candidate nodules by cropping and grouping voxels of interest, which were subsequently combined with CT voxel data to train a pulmonary nodule classification algorithm that outputted malignant/benign probabilities. In optimizing my model's performance, I developed and explored various techniques to improve diagnostic accuracy, such as multi-view data augmentation and transfer learning. My final results showed that my model achieved a higher accuracy rate (AUC=0.91) in detecting malignant tumors. This approach could be applied to the diagnosis of other diseases, enabling early treatment , empowering doctors with informative and accurate results, and saving patient lives. This research highlights the potential of AI and machine learning when used in disease detection and diagnosis.