myRadioloGIST: Early Detection of Lung Cancer from Hidden Gist Signals in CT Scans with Deep Neural Networks and Transfer Learning

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Each year, more people die of lung cancer than colon, breast, pancreas, and prostate cancers combined. Lung cancer survival rates decline from 75% in early stages to 5% when detected late. Yet, early screening for lung cancer is not common. Current detection techniques focus on locating cancerous nodules which appear once the disease has already advanced. There is an urgent need for early lung cancer detection to improve chances of survival. Studies have shown that expert radiologists are able to diagnose cancer instantly from a quick glance at a radiology scan even if the specific abnormality is not visible. The goal of this research is to design a system to proactively, rapidly, and accurately screen for lung cancer even if the cancerous nodules are not visible. A sophisticated deep learning model was developed that utilizes transfer learning techniques to identify lung cancer both with and without nodules (early stage). The convolutional neural network model was trained to identify and extract distinguishing features from lung CT scan images. These features were used to train a Support Vector Machine to automatically classify and detect lung cancer. “MyRadioloGIST” achieved a 90.4% recall rate for cancer nodule detection a significant improvement over previous methods with 78.9% recall rates without transfer learning. More significantly, 88.4% accuracy was achieved in diagnosing lung cancer in early stages when the nodules are not visible or have not appeared. MyRadioloGIST has the potential to transform cancer screening and save lives with early, accurate, and fast lung cancer detection.

Awards Won:
Serving Society Through Science: Second Award of $500
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