GHULAM ISHAQ KHAN INSTITUTE OF ENGINEERING SCIENCES AND TECHNOLOGY

Faculty of Computer Science and Engineering

Intelligent Medical Imaging And Point of Interest Detection

Group: Medical Graphing Study (MGS)

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Problem Statement

One of the best ways to treat lung cancer is to detect it early *(Crosby et al., 2022)*. However, due to a severe radiologist shortage in Pakistan, many people are unable to get essential diagnoses in time and either remain untreated or turn to expensive treatment in the private sector *(Bari, 2013)*.
Another issue worldwide is the amount of work radiologists are assigned, with many often working 60-hour work weeks *(Mollard, 2023)*. This not only reduces their performance by the end of their shifts, but they may miss details due to exhaustion.
Our aim is to not necessarily replace, but make it easier for radiologists to process more patients and provide care to them.

Motivation

Our project aims to make a significant positive impact through accurate and efficient AI assistance for radiologists, which can save numerous lives each year through earlier initiation of treatment.

Dataset Source

To achieve our goal, we require a dataset of utmost quality, accuracy, and detail. Moreover, we need one that was large enough to train our model to our standard. Luckily, we were able to locate the dataset from the Lung Image Database Consortium (LIDC) and Image Database Resource Initiative (IDRI), which contained a 133.16 GB dataset of images (Armato et al., 2015).

Proposed Methodology

We intend to use a convolutional neural network (CNN) to provide multiple enhancement filters and mark points of interest for the radiologist to review. This provides the radiologist with more assistance to work through patients faster and reduce the likelihood of missing key details in their report, while still ensuring their human expertise is utilised.

Expected Outcomes

We aim to create a Convolutional Neural Network (CNN) capable of detecting potential lung nodules (points of interest) in CT scans with very high sensitivity and high specificity, aiding in the early diagnosis of lung cancer. Further, we aim to provide a complete AI-powered tool that pre-processes medical images, applies relevant enhancement filters, and highlights suspicious regions.
To measure our performance we aim to achieve good benchmark performance on key metrics such as accuracy, precision, recall, and F1-score when validated against the ground truth data from the LIDC-IDRI dataset.

Tools and Libraries

Open-CV Python (Open Computer Vision Python)
Sci-Kit Learn
Numpy (Numerical Python), Pandas, and Scipy
PyTorch and Keras
PyDICOM (for processing DICOM format medical scans)
Pandas, Matplotlib, and Seaborn

References

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