Predicting Clinical Parameters of Lungs from Medical Data

Team

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Idea

We are looking at a problem of predicting features from medical images. Our dataset [1] consists of computed tomography (CT) images of lungs. The dataset provides us with the image masks for segmented lungs as shown in Fig. 1. It also has other important clinical parameters of the lungs as labels for each image, like lung area, lung volume fraction and lung percentile density (PD). Our aim is to build a Machine Learning model for segmenting the lungs area in the CT scan image and also predict the clinical parameters from the data such as - volume fraction, area, PD-05, PD-95 of lungs.
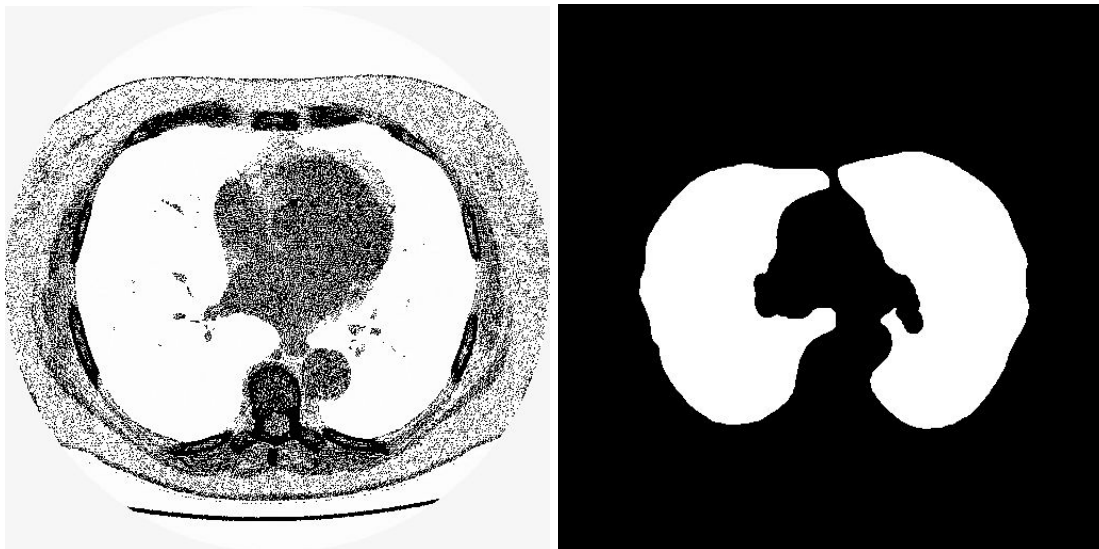

Fig. 1 - (Left) CT scan image, (Right) GT mask [1]

Lung Densitometry test on CT images of lungs is used to assess the attenuation level of the pulmonary tissues inside the lungs. The attenuation levels are expressed in Percentile Density (PD) 5th to 95th percentile Hounsfield units (HU) which reflects both the degree of inflation inside the lungs and the structural abnormalities [2][3]. PD-05 through PD-95 measures are often used in classifying the level of lung cancer. Case studies on smokers

suggest that often for smokers the PD value is higher as compared to that of non-smokers.

Our motivation for selecting this topic is primarily to explore several different ongoing research areas in Machine Learning, Computer Vision, and Biomedical Imaging fields. We hope such clinical parameters predicted by our model will be useful in analysing lung diseases like Emphysema, Lung Cancer, Chronic Obstructive Pulmonary Disease (COPD).

Project Milestones

1. Collecting dataset : We already have the dataset ready *[Completed]*
   a. https://www.kaggle.com/kmader/finding-lungs-in-ct-data
2. Learning algorithms and implementation *[03/15]*
   a. Segmentation : Bastin
   b. Predicting lung parameters : Apurbaa
3. Evaluation *[03/26]*
   a. Segmentation : Apurbaa
   b. Predicting lung parameters : Bastin
4. Report *[03/29]*
   a. Segmentation : Apurbaa
   b. Predicting lung parameters : Bastin
   c. Other parts : shared equally as needed in the final report

References

1. https://www.kaggle.com/kmader/finding-lungs-in-ct-data
2. https://erj.ersjournals.com/content/40/5/1142
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5341876/