

Learning to Diagnose Edema from Chest Radiographs and Radiology Reports

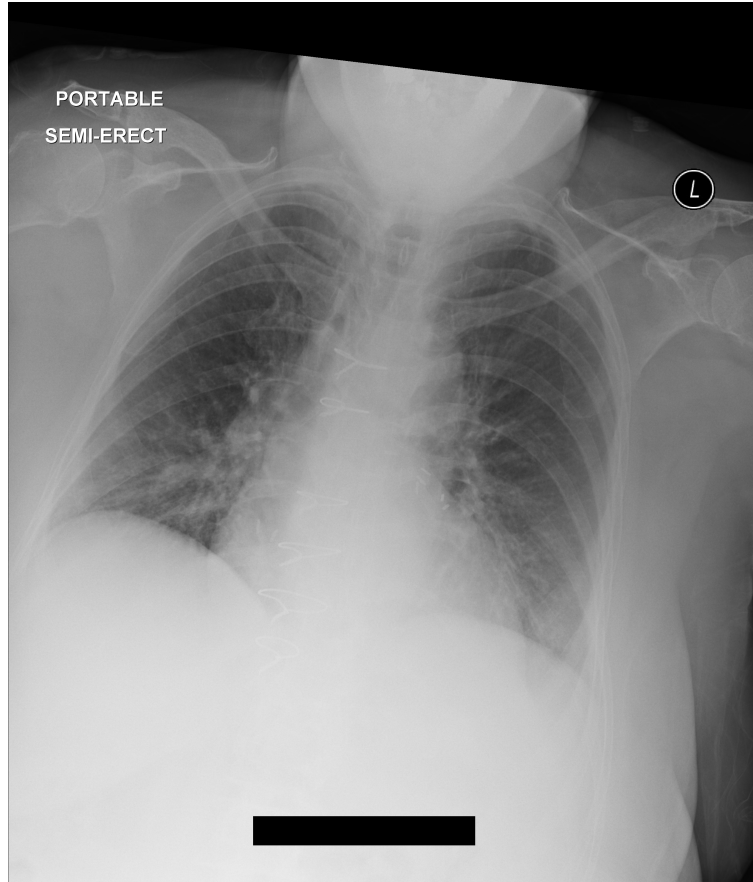
MIT 6.869 Final Project Proposal

Chest radiography is one of the most common imaging examinations for screening, diagnosis and treatment planning of many diseases. In particular, the treatment of heart failure patients, critically ill ventilated patients and renal failure patients is often based on the presence and the severity changes of pulmonary edema, which is commonly evaluated on chest radiographs. Experienced radiologists, however, only had a sensitivity of 77% with a kappa inter-rater agreement of 0.68 when detecting the presence of pulmonary edema [4]. Radiology reports capture the radiologists' impression of the edema diagnosis in a form of unstructured text.

We aim to develop a machine learning model that detects the presence of pulmonary edema from chest radiographs. Recently, a large-scale chest radiograph dataset has been released, which includes 370,000 x-ray images and their associated radiology reports [1]. One sample x-ray image and its radiology report are shown below 1. Other large chest radiograph datasets released by Stanford University and the National Institute of Healthcare (NIH) are also publicly available [3, 2]. In those datasets, only the images and selected pathology labels, which were extracted from the radiology reports, are released. We plan to train a machine learning model from the x-ray images and the pathology labels. Furthermore, we would like to investigate how to use the unstructured text data (radiology reports) to improve the detection of pulmonary edema from x-ray images.

References

- [1] <https://physionet.org/content/mimic-cxr/2.0.0/>
- [2] <https://stanfordmlgroup.github.io/competitions/chexpert/>
- [3] <https://www.kaggle.com/nih-chest-xrays/data>
- [4] Hammon, M., Dankerl, P., Voit-Höhne, H.L., Sandmair, M., Kammerer, F.J., Uder, M., Janka, R.: Improving diagnostic accuracy in assessing pulmonary edema on bedside chest radiographs using a standardized scoring approach. *BMC anesthesiology* **14**(1), 94 (2014)



FINAL REPORT

EXAMINATION: CHEST (PORTABLE AP)

INDICATION: ___ year old woman with chf exacerbation // ?new pneumonia

TECHNIQUE: CHEST (PORTABLE AP)

COMPARISON: ___

IMPRESSION:

Heart size and mediastinum are stable. There is interval development of more conspicuous upper zone re- distribution of the vasculature as well as perihilar opacities concerning for interval progression of interstitial pulmonary edema. No pleural effusion or pneumothorax is seen.

Figure 1: A sample chest x-ray image and its radiology report