# 4. Exercise 2: Chest-Xray Segmentation

### Overview

In this assignment, you will explore segmentation of medical images, specifically, segmentation of pneumothorax in chest x-ray scans.

### What to hand in for this assignment:

Submit your notebook solutions (code) + written results/ images/ explanations/ descriptions in word/pdf.

### References

<https://medium.com/swlh/image-segmentation-using-deep-learning-a-survey-e37e0f0a1489>

+ list of references in moodle

### Steps :

Step 1: Utilize a Unet baseline solution on the Kaggle data -

<https://www.kaggle.com/c/siim-acr-pneumothorax-segmentation/overview>

This step must include a description of data exploration: data distribution, visualization, thorough evaluation, visualization of results, demonstration of good and bad results.

Step 2: Apply a modification or improvement to the available code on Kaggle. Modifications may include:

* Data preprocessing ( e.g. cropping lung ROI/ intensity normalization),
* Data augmentations
* Different Losses
* Different architectures (e.g. Xception , Efficient Net, …)
* Hyperparameter tuning (e.g. mini batche, learning rate, …)
* Pretraining on medical data instead of imagenet: (e.g. pre-trained weights from a past medical imaging competition on pneumonia identification: <https://www.kaggle.com/hmendonca/mask-rcnn-and-coco-transfer-learning-lb-0-155>)
* Ensemble models, mask-RCNN,
* Curriculum learning
* Utilization of additional Chest X-rays data such as:
  + [The MIMIC-CXR Database](https://archive.physionet.org/physiobank/database/mimiccxr/)
  + [CheXpert](https://stanfordmlgroup.github.io/competitions/chexpert/)
  + [Open-i service of the National Library of Medicine](https://openi.nlm.nih.gov/faq)

This Step must include the visualization and evaluation of the results and an analysis of the comparison of the baseline and extended results.

Extra Step 3: How good does this work for COVID data? (\*please make sure to add any additional data you use)

Good luck on Exercise 2!

**Exercise 2: Chest-Xray Segmentation**

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**Task list:**

* **4 nootebook**
  + **EDA**
    - **data preparing () – roi**
    - **slicing data relevant data base csv - or**
  + **traing predction** 
    - **baseline**
    - **training**
    - **evaluation**
    - **comparing** 
      1. **background:**
  1. **pneumothorax:**
* pneumothorax –
  1. **Code selection:**
* We exported code from Kaggle site base on competition of detecting pneumothorax in chest x-ray scans:
  + <https://www.kaggle.com/code/meaninglesslives/nested-unet-with-efficientnet-encoder>
  1. **Data Selection**:
* We exported data from Kaggle site which is divided to x-ray images & label mask

We divided the data into train, validation, and test:

* + Train – ??
  + Validation – ??
  + Test – ??

1. **Step 1:**
   1. **EDA** 
      1. Data
      2. Distribution
      3. Visualization
   2. **Baseline** (thorough evaluation, visualization of results, demonstration of good and bad results):
      1. architected design
      2. network
      3. metric – IOU
      4. loss function-
      5. Results

* Confusion matrix
* Accuracy
* Precision recall curve
* Detection images

1. **Step 2** - Apply a modification or improvement to the available code on Kaggle
   1. **Modification**
      1. architected design
      2. metric – IOU
      3. loss function-
      4. Results

* Confusion matrix
* Accuracy
* Precision recall curve
  + 1. Detection images
    2. **Compare results**