Lung Segmentation from X-Ray Image

Topics is Deep Learning

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Introduction

- Image Segmentation
- Medical Image segmentation
- Use of DNN

Problem Statement

- Automatic creation of binary mask of X-Ray Images of lungs using U-Net architecture to remove the need of manual masking for future segmentation of X-Ray lung images.

Dataset

- Montgomery County X-ray Set[1]
- Contain Original X-ray image, left mask, right mask and text file with info(not used)
- 138 posterior-anterior x-rays
- DICOM format converted to 512x512 PNG images

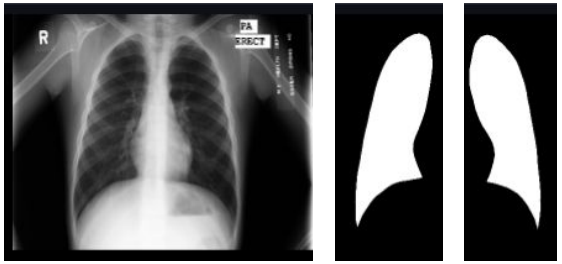
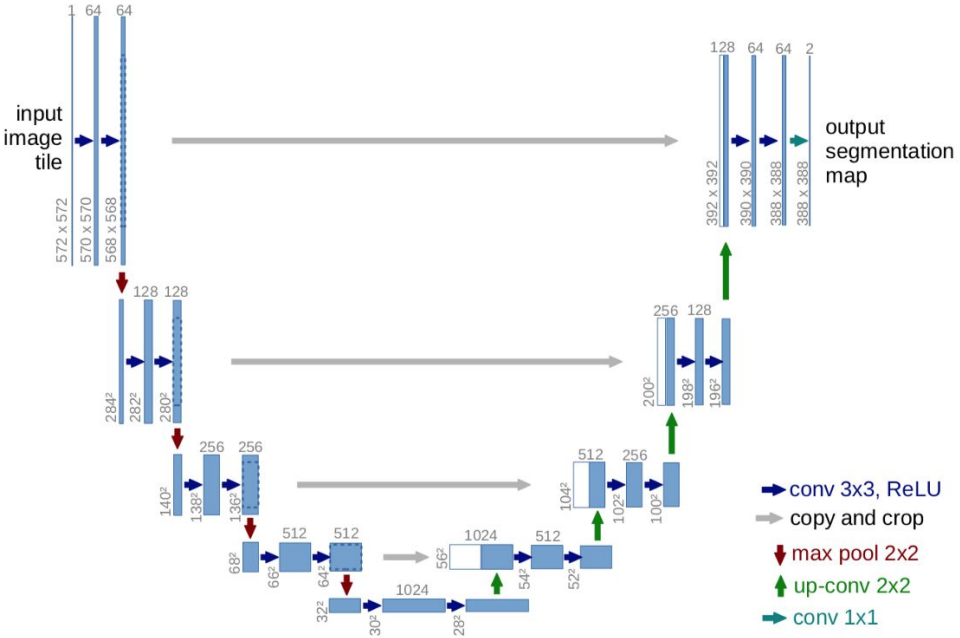


Figure 2. Sample Images from Dataset[3]

[1] https://ceb.nlm.nih.gov/repositories/tuberculosis-chest-x-ray-image-data-sets/

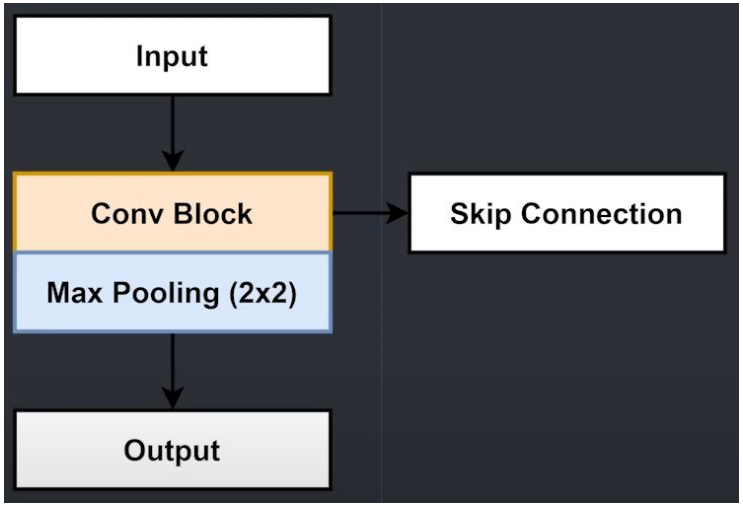
Approach Used



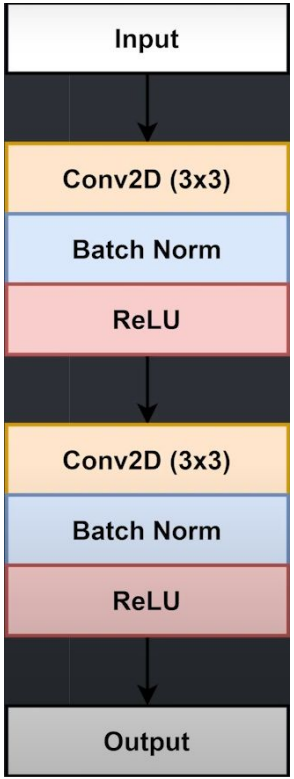
U-Net Architecture[2]

[2] https://towardsdatascience.com/unet-line-by-line-explanation-9b191c76baf5

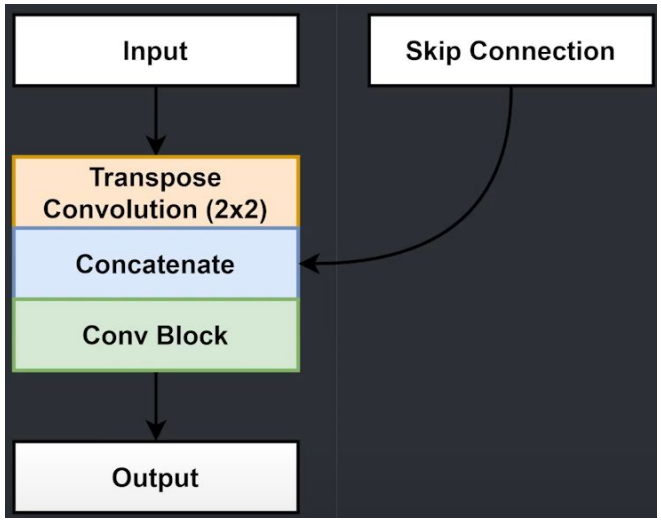
Building blocks for U-Net



Encoder



Bridge

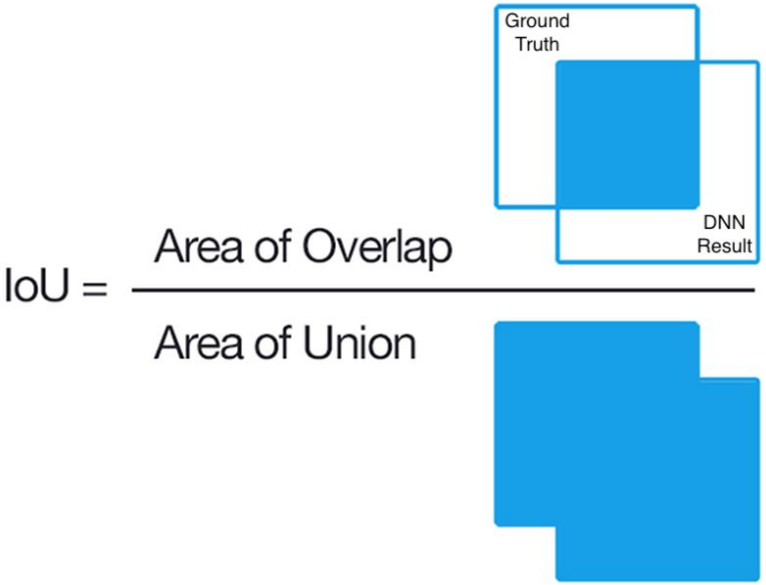


Decoder

Hyperparameters

- Batch Size = 2
- Learning Rate = 0.00005 (with ReduceLROnPlateau)
- Number of epochs = 20

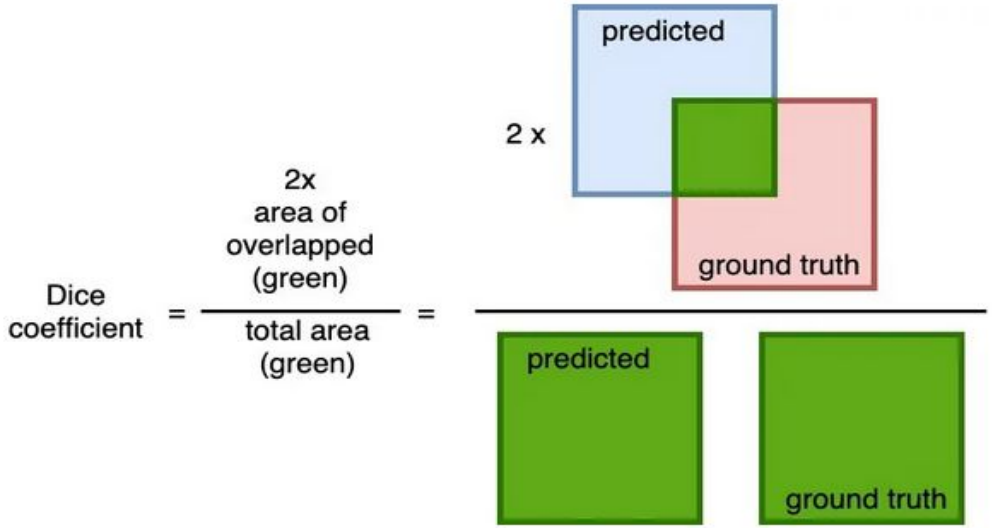
Metrics: IoU



Calculating IoU[3]

[3] https://medium.datadriveninvestor.com/deep-learning-in-medical-imaging-3c1008431aaf

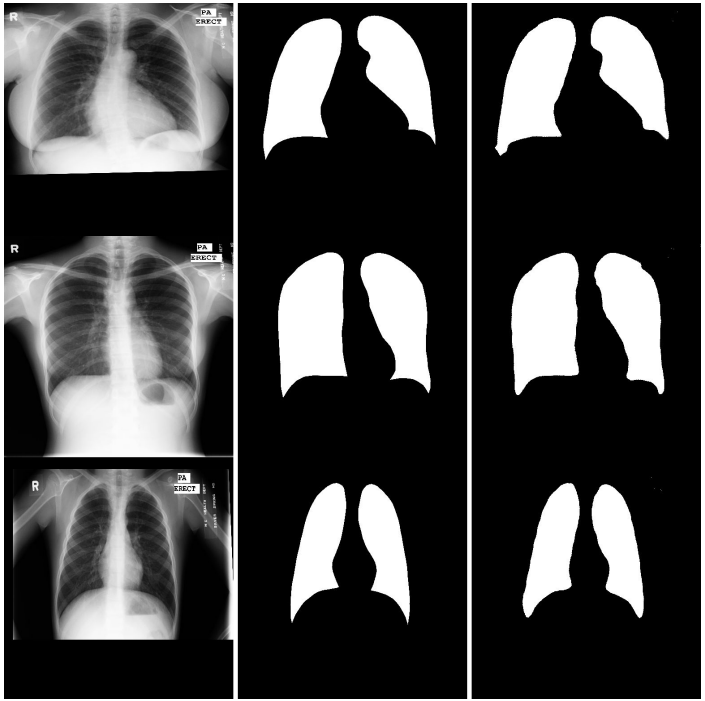
Metrics: Dice Coefficient



Calculating Dice Coefficient[3]

[3] https://medium.datadriveninvestor.com/deep-learning-in-medical-imaging-3c1008431aaf

Results



Original image, ground truth and predicted mask

Conclusion

- We can generate a decent mask with good dice coefficient for X-ray Lung images for the given Dataset using U-Net architecture model.

Thank You