Dataset (kaggle) → (1GB)

20 CT scan of patients COVID-19
↳ Segmentation of Lung & infection made by experts.
Nifti format → Neuroimaging

Data Preprocessing → (Contrast Limited Adaptive Histogram Equalisation)

1) Contrast enhancement (CLAHE enhancer)
Why? we can traditional histogram equalization can also amplify noise & result in unnatural looking enhancement.
CLAHE limits the amplification by clipping the histogram at a certain threshold.
Steps → Divide into tiles
→ Compute Histogram, Equalisation, Clipping, Reassembly.

2) Cropping the CT scan
Step → 1) Binarised the image.
2) Biomedical imaging techniques erosion & dilation
3) Using k-means cluster, drew bound box
Binarisation → converting grayscale img to binary image.
Erosion → It is useful for removing small noise, isolation individual objects & disconnecting adjacent objects. It is effective in dealing with binary imag containing noise or unwanted thin connections.
(shrinks the boundary)
Dilation → It is helpful in improving the connectivity of segmented objects.
(expand the boundary)

3) Loading all data & converting them into tensor
Rotation, enhancement, reshapping, resize images → 2D63 for clasification

4) Saving data

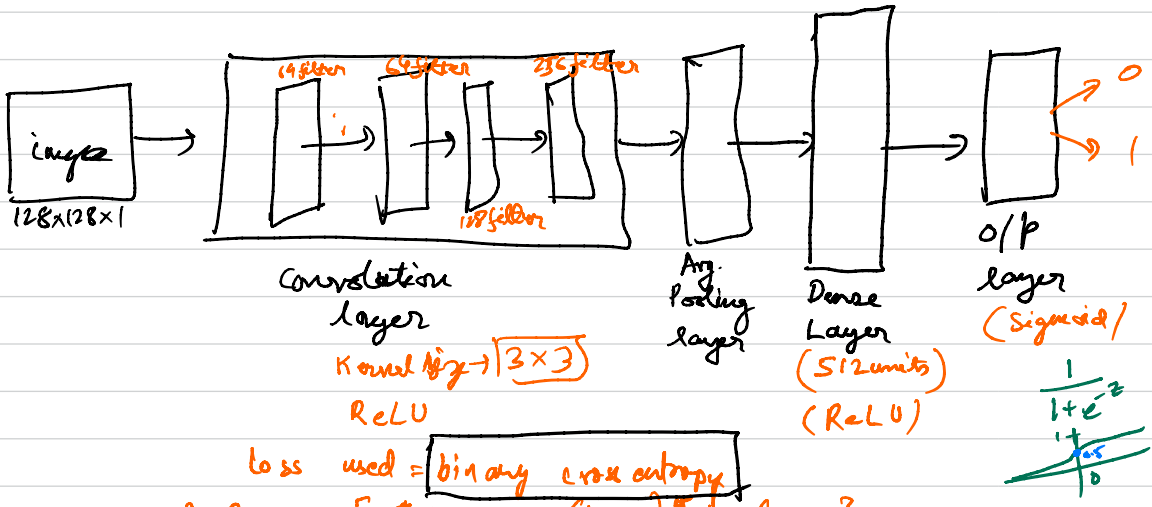
5) deleting blank masks.

image → 1564. For segmentation.

6) saving data

Classification → CNN model. 4 convolutional layer

Dense Layer 512 unit Ac – ReLu



loss used = binary cross entropy

$BCE = -[y * \log p + (1-y) * \log(1-p)]$

y = true value p = predicted

Adam optimizer.

→ Based on ROC curve, optimal threshold is calculated.

→ Calculate → Precision, Recall & F1-score.

$Pre = \frac{TP}{TP+FP}$

$Recall = \frac{TP}{TP+FN}$

$F1\ score = \frac{2 \times Pre \times Recall}{Pre + Recall}$

Pred \ True	+ve	-ve
+ve	TP	FP
-ve	FN	TN

$Acc = \frac{TP+TN}{TP+FP+TN+FN}$

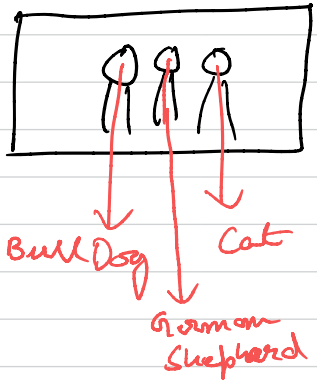
Segmentation → Converting an image into a collection of regions of pixels that are represented by a mask (or) a labeled image.

Semantic Segmentation

① For each pixel
↓
object category.

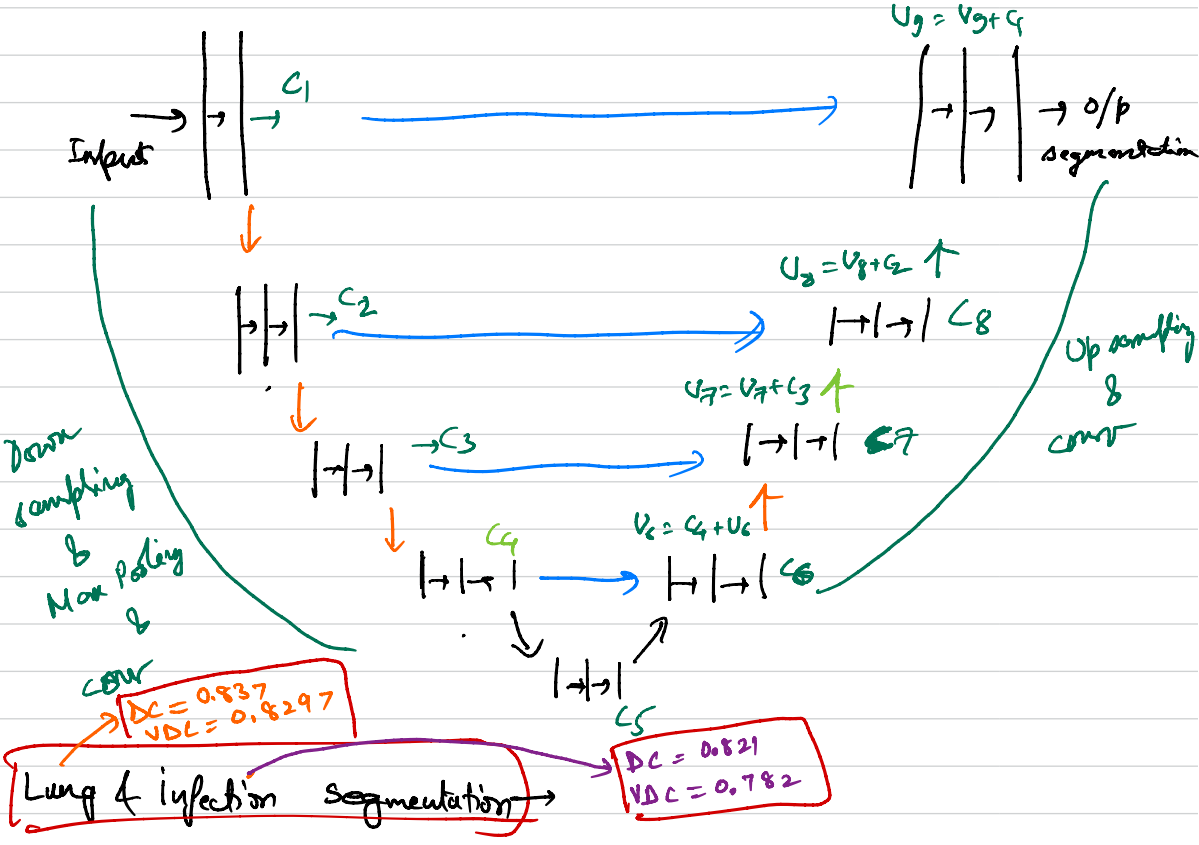
Instance Segmentation

① For each pixel
↓
differentiates for objects with the same labels.



Segmentation

Model used U-NET → semantic segmentation architecture.



Lung & infection Segmentation →

DC = 0.837
VDC = 0.8297

DC = 0.821
VDC = 0.782

Dice coefficient → efficiency of model

$$\frac{2 * \text{Intersection}}{\Sigma \text{individual}} = \frac{2 \times |X \cap Y|}{|X| + |Y|}$$

value + position testing data.

X → predicted
Y → truth

$$= \frac{2 \times TP}{2TP + FP + FN}$$

VDC → change in learning rate during training.

Validation Dice coefficient

↓ traing data.