```
1   from google.colab import drive
2   drive.mount('/content/drive')
3   import numpy as np
4   import scipy.io
5   import pandas as pd
6   from skimage import color
7   from skimage import io
8   import math
9   import matplotlib.pyplot as plt
```
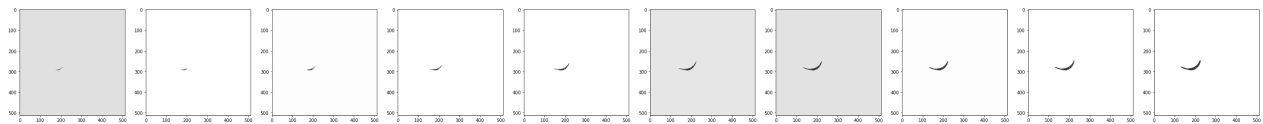
```
Mounted at /content/drive
```

```
1   ctScans = scipy.io.loadmat('/content/drive/My Drive/CCE-AIMIA/ctscan_hw1.mat')
2   ctMasks = scipy.io.loadmat('/content/drive/My Drive/CCE-AIMIA/infmsk_hw1.mat')
```

```
1   fig, axis = plt.subplots(1, 10, figsize=(50, 50))
2   for i in range(0,10):
3     #axis[i] = (ctScans['ctscan'][:,:,i])
4     axis[i].imshow((ctScans['ctscan'][:,:,i]),cmap="gray")
5     #plt.imshow(axs[i],cmap="gray",vmin=0, vmax=255, origin=(0,0))
```



```
1 fig, axis = plt.subplots(1, 5, figsize=(50, 50))
2 axis[0].imshow((ctScans['ctscan'][:,:,3531]), cmap ="gray")
3 axis[1].imshow((ctScans['ctscan'][:,:,3522]), cmap ="gray")
4 axis[2].imshow((ctScans['ctscan'][:,:,3513]), cmap ="gray")
5 axis[3].imshow((ctScans['ctscan'][:,:,3514]), cmap ="gray")
6 axis[4].imshow((ctScans['ctscan'][:,:,3515]), cmap ="gray")
```

<matplotlib image AxesImage at 0x7f0776f3eed0>

```
1 fig, axis = plt.subplots(1, 5, figsize=(50, 50))
2 axis[0].imshow(ctMasks['infmsk'][:,:,3531]) #,cmap ="gray")
3 axis[1].imshow(ctMasks['infmsk'][:,:,3522]) #,cmap ="gray")
4 axis[2].imshow(ctMasks['infmsk'][:,:,3513]) #,cmap ="gray")
5 axis[3].imshow(ctMasks['infmsk'][:,:,3514]) #,cmap ="gray")
6 axis[4].imshow(ctMasks['infmsk'][:,:,3515]) #,cmap ="gray")
```

<matplotlib.image.AxesImage at 0x7f0775552d10>
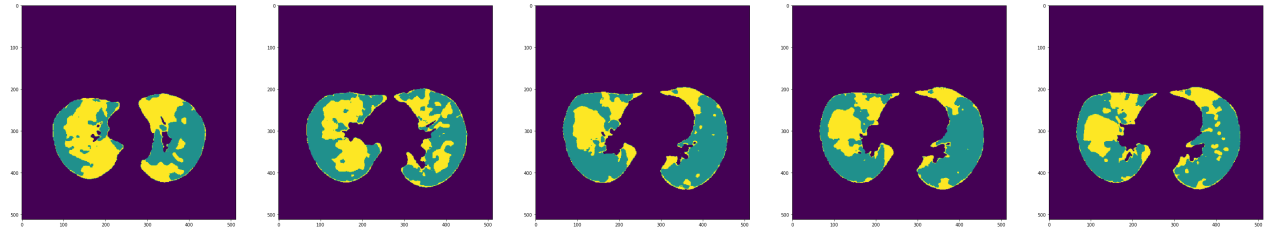

```
1 #Historgram Test
2 img1 = ctMasks['infmsk'][:,:,3513]
3 img2 = ctScans['ctscan'][:,:,3513]
4 #plt.hist(img.ravel(), bins=256, range=(0.0, 1.0), fc='k', ec='k') #calculating histogram
5 plt.hist(img1.ravel(),256,[0,5])
6 plt.show()
7 plt.hist(img2.ravel(),256,[0,255])
8 plt.show()
```

```
1 (ms,ns,cs)= (ctScans['ctscan']).shape
2 (mm,nm,cm)= (ctMasks['infmsk']).shape
3 print((ms,ns,cs))
4 print((mm,nm,cm))

   (512, 512, 3554)
   (512, 512, 3554)
```

```
1 ctscansarray = []
2 ctmasksarray = []
3 for i in range(cm):
4     ctscansarray.append((ctScans['ctscan'][:,:,i]))
5     ctmasksarray.append((ctMasks['infmsk'][:,:,i]))
```

```
1 ctmasksHealthy = []
2 ctmasksInfected = []
3 Percentage_infection = []
4 for i in range(len(ctmasksarray)):
5   ctmasksHealthy.append(np.sum((ctmasksarray[i])==2))
6   ctmasksInfected.append(np.sum((ctmasksarray[i])==1))
7   Percentage_infection.append((ctmasksInfected[i]/(ctmasksHealthy[i]+ctmasksInfected[i]))
```

```
1 SevereInfCT = []
2 MildInfCT = []
3 NormalCT = []
4 for i in range(len(Percentage_infection)):
5   if(Percentage_infection[i] >= 40):
6     SevereInfCT.append(Percentage_infection[i])
7   elif((Percentage_infection[i] > 0 ) and (Percentage_infection[i] < 40 )):
8     MildInfCT.append(Percentage_infection[i])
9   else:
10     NormalCT.append(Percentage_infection[i])
```

```
1 num1 = np.random.randint(0, len(SevereInfCT))
2 print(num1)
3 fig, axis = plt.subplots(1, 2, figsize=(50, 50))
4 axis[0].imshow((ctscansarray[num1]),cmap="gray")
5 axis[1].imshow((ctmasksarray[num1]))#,cmap="gray")
6 print(f'The Infection rate is {SevereInfCT[num1]} percent it is Severe infected CT Slice!!
7
```

145
The Infection rate is 63.052277847787074 percent it is Severe infected CT Slice!!!
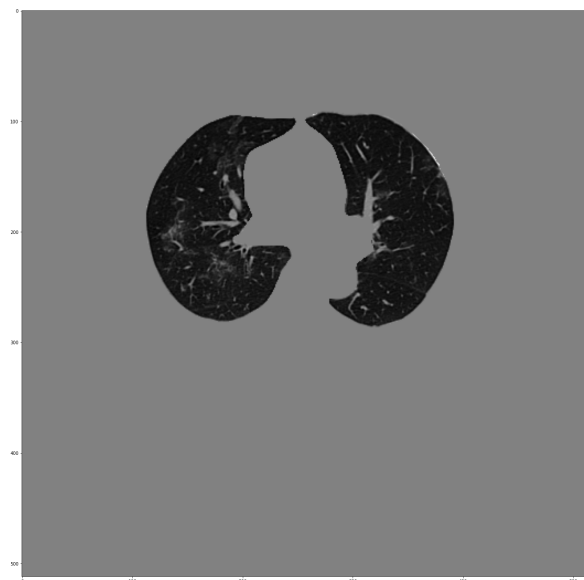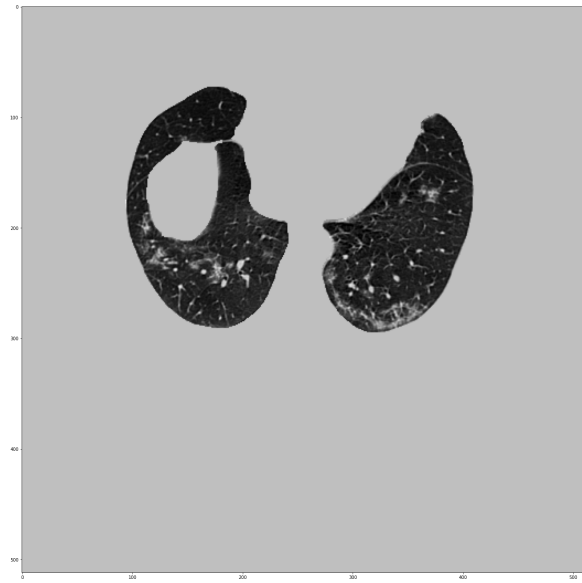


```
1 num2 = np.random.randint(0, len(MildInfCT))
2 print(num2)
3 fig, axis = plt.subplots(1, 2, figsize=(50, 50))
4 axis[0].imshow((ctscansarray[num2]),cmap="gray")
5 axis[1].imshow((ctmasksarray[num2]))#,cmap="gray")
6 print(f'The Infection rate is {MildInfCT[num2]} percent it is Mild infected CT slice!!')
```

```
59
The Infection rate is 15.145356543253513 percent it is Mild infected CT slice!!
```
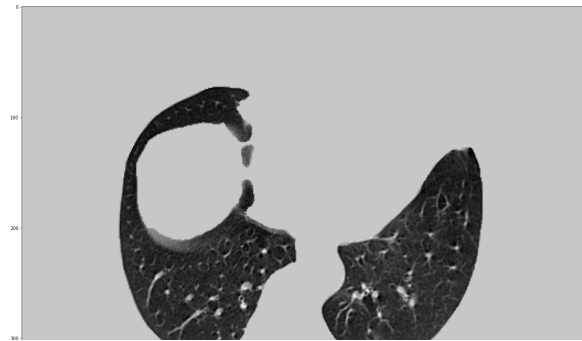


```
1 num3 = np.random.randint(0, len(NormalCT))
2 print(num3)
3 fig, axis = plt.subplots(1, 2, figsize=(50, 50))
4 axis[0].imshow((ctscansarray[num3]),cmap="gray")
5 axis[1].imshow((ctmasksarray[num3]))#,cmap="gray")
6 print(f'The Infection rate is {NormalCT[num3]} percent it is Normal CT Slice')
```

291
The Infection rate is 0.0 percent it is Normal CT Slice


```
1 len(NormalCT)
```

1441


```
1 #Stats
2 print(f'The total number of infection masks are equal to {len(Percentage_infection)}')
3 print(f'Severe infection was found in {len(SevereInfCT)} slices')
4 print(f'Mild infection was found in {len(MildInfCT)} slices')
5 print(f'There were {len(NormalCT)} normal slices')
```

The total number of infection masks are equal to 3554
Severe infection was found in 159 slices
Mild infection was found in 1954 slices
There were 1441 normal slices

```
1 s = (len(SevereInfCT)/len(Percentage_infection))*100
2 m = (len(MildInfCT)/len(Percentage_infection))*100
3 n = (len(NormalCT)/len(Percentage_infection))*100
4 print(f'The total Severe infection rate is {math.ceil(s)}%')
5 print(f'The total Mild infection rate is {math.ceil(m)}%')
6 print(f'The total Normal slices rate is {math.ceil(n)}%')
```

The total Severe infection rate is 5%
The total Mild infection rate is 55%
The total Normal slices rate is 41%

```
1 # Distribution of Categories
2 CTcategories = ['Normal-41%', 'Mild-Infection-55%', ' % Severe-Infection-5%']
3 data = [n, m, s]
4 # Creating plot
5 fig = plt.figure(figsize =(10, 7))
6 plt.pie(data, labels = CTcategories)
7 plt.show()
```

Normal-41%

% Severe-Infection-5%

Mild-Infection-55%
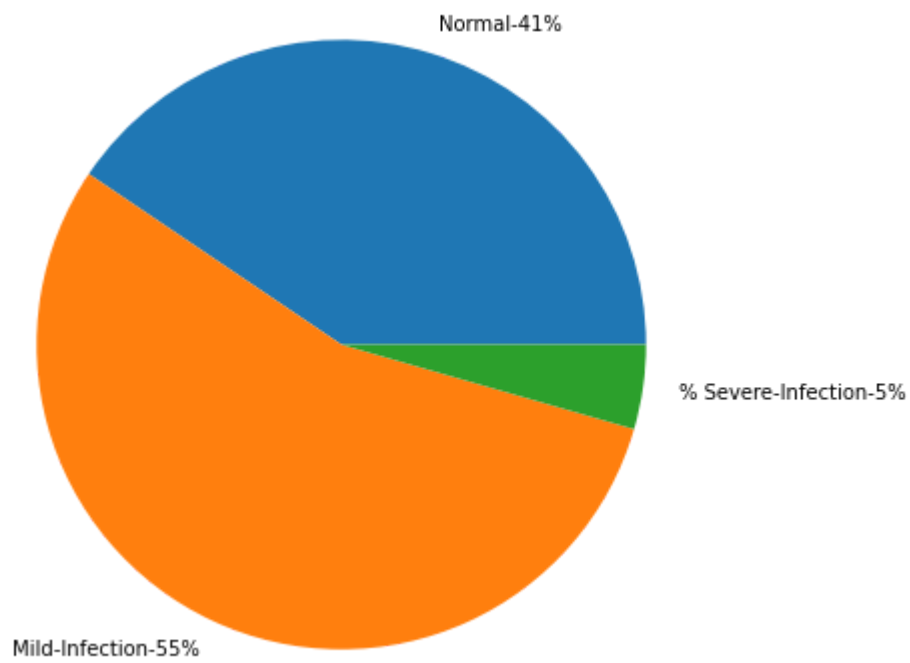
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