```python
In [ ]:  import cv2
         import numpy as np
         from matplotlib import pyplot as plt
         image_path = r"../dip_Images/"
         image = cv2.imread(image_path+r"Fig0359(a)(headCT_Vandy).tif",0)
         plt.imshow(image,cmap='gray')
```
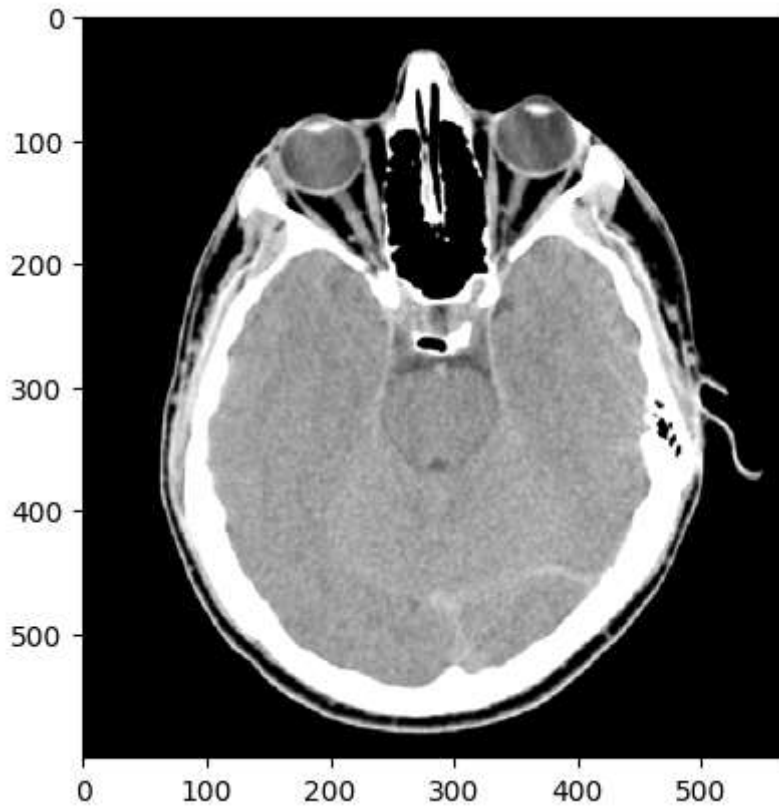
Out[ ]: <matplotlib.image.AxesImage at 0x272c7aa2180>


```python
In [ ]:  #Roberts operator
         kx = np.array([[ 1, 0],
                        [ 0,-1]])
         ky = np.array([[ 0, 1],
                        [-1, 0]])

         gx = cv2.filter2D(image,-1, kx)
         gy = cv2.filter2D(image,-1, ky)

         robert_grad_mag = (gx**2 + gy**2)**0.5
         plt.imshow(robert_grad_mag,cmap = 'gray')
```
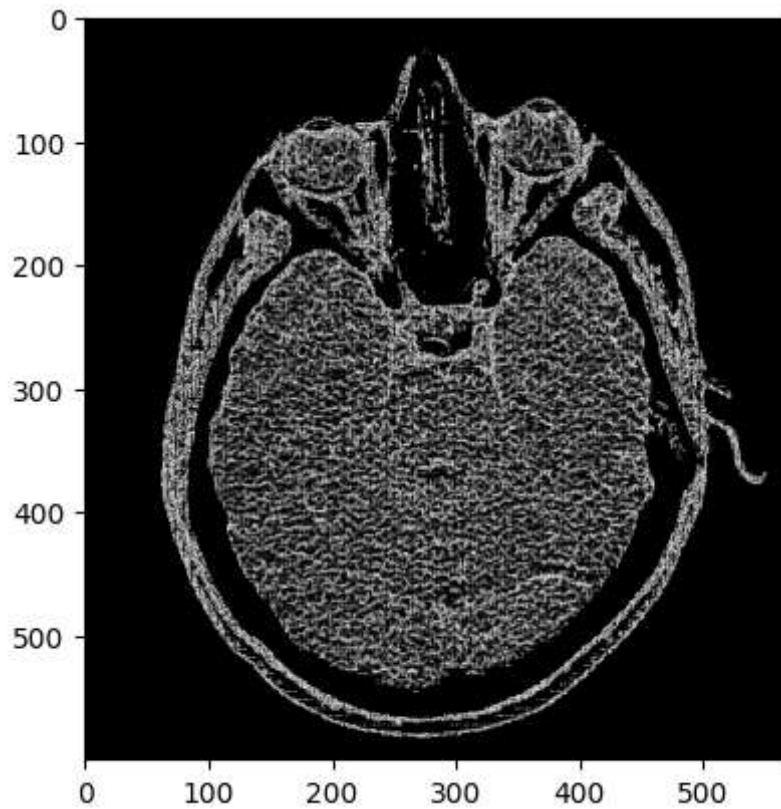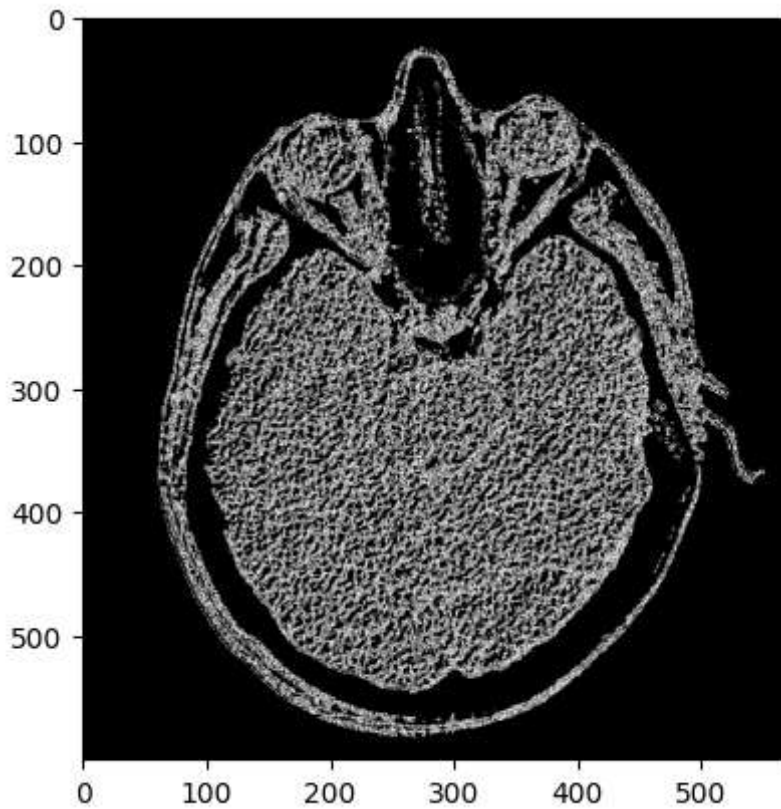
Out[ ]: <matplotlib.image.AxesImage at 0x19b2bc604a0>

```
In [ ]:  #prewitt
         kx = np.array([[-1,-1,-1],
                        [ 0, 0, 0],
                        [ 1, 1, 1]])

         ky = np.array([[-1, 0, 1],
                        [-1, 0, 1],
                        [-1, 0, 1]])

         gx = cv2.filter2D(image,-1, kx)
         gy = cv2.filter2D(image,-1, ky)

         prewitt_grad_mag = (gx**2 + gy**2)**0.5
         plt.imshow(prewitt_grad_mag,cmap = 'gray')

Out[ ]:  <matplotlib.image.AxesImage at 0x19b2baba420>
```

```
In [ ]:  #sobel
         kx = np.array([[-1,-2,-1],
                        [ 0, 0, 0],
                        [ 1, 2, 1]])

         ky = np.array([[-1, 0, 1],
                        [-2, 0, 2],
                        [-1, 0, 1]])

         gx = cv2.filter2D(image,-1, kx)
         gy = cv2.filter2D(image,-1, ky)

         sobel_grad_mag = (gx**2 + gy**2)**0.5
         plt.imshow(sobel_grad_mag,cmap = 'gray')

Out[ ]:  <matplotlib.image.AxesImage at 0x19b2bb1c980>
```
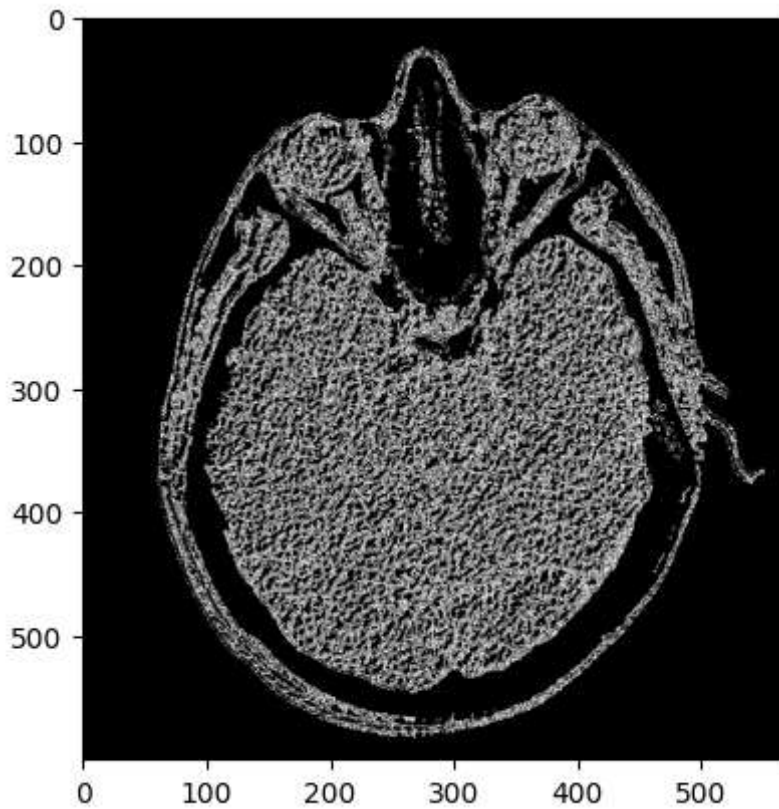
```
In [ ]:  plt.subplot(2, 2, 1)
         plt.imshow(image, cmap='gray')
         plt.title('Original')
         plt.axis('off')

         plt.subplot(2, 2, 2)
         plt.imshow(robert_grad_mag, cmap='gray')
         plt.title('robert_grad_mag')
         plt.axis('off')

         plt.subplot(2, 2, 3)
         plt.imshow(prewitt_grad_mag, cmap='gray')
         plt.title('prewitt_grad_mag')
         plt.axis('off')

         plt.subplot(2, 2, 4)
         plt.imshow(sobel_grad_mag, cmap='gray')
         plt.title('sobel_grad_mag')
         plt.axis('off')

         plt.show()
```

Original

robert_grad_mag

prewitt_grad_mag

sobel_grad_mag

In [ ]: