In [129]:
```
# import the necessary libraries:
import numpy as np
from os import listdir
from PIL import Image

# get the current working directory:
os.getcwd()
# changing the current working directory:
pwd =os.chdir("/Users/karimaidrissi/Desktop/DSSA 5104 DL/photos")
print(os.getcwd())

```

```
/Users/karimaidrissi/Desktop/DSSA 5104 DL/photos
```

In [130]:
```
# load Image:
DC = Image.open("DC.png")
DC
```

Out[130]:

In [131]:
```
#convert to numpy array
DC_array= np.array(DC)
DC_array
```

Out[131]:
```
array([[[236, 244, 247],
        [236, 244, 247],
        [236, 244, 247],
        ...,
        [233, 240, 246],
        [233, 240, 246],
        [233, 240, 246]],

       [[236, 244, 247],
        [236, 244, 247],
        [236, 244, 247],
        ...,
        [233, 240, 246],
        [233, 240, 246],
        [233, 240, 246]],

       [[236, 244, 247],
        [236, 244, 247],
        [236, 244, 247],
        ...,
        [233, 240, 246],
        [233, 240, 246],
        [233, 240, 246]],

       ...,

       [[ 52,  61,  67],
        [ 53,  62,  67],
        [ 53,  62,  67],
        ...,
        [ 83,  97, 106],
        [ 89, 103, 112],
        [ 89, 103, 111]],

       [[ 50,  59,  64],
        [ 51,  60,  65],
        [ 50,  59,  64],
        ...,
        [ 74,  87,  95],
        [ 78,  89,  97],
        [ 85,  94, 103]],

       [[ 51,  59,  64],
        [ 51,  58,  64],
        [ 48,  56,  62],
        ...,
        [ 65,  76,  84],
        [ 71,  81,  87],
        [ 76,  85,  93]]], dtype=uint8)
```

In [132]:
```
#Get a list of all available images:
listing = listdir()
listing
```

Out[132]:
```
['.DS_Store',
 'photo8.png',
 'photo9.png',
 'photo17.png',
 'photo16.png',
 'photo14.png',
 'photo15.png',
 'photo11.png',
 'photo10.png',
 'photo12.png',
 'photo13.png',
 'photo22.png',
 'photo23.png',
 'photo21.png',
 'DC.png',
 'photo20.png',
 'photo24.png',
 'photo18.png',
 'photo19.png',
 'photo4.png',
 'photo5.png',
 'photo7.png',
 'photo6.png',
 'photo2.png',
 'photo3.png',
 'photo1.png']
```

looping through all images and calculate the Sum Square Residual:

In [133]:
```
# loop through all images that ends up with png format:
for file in listing: # for each file in listing
    if file.endswith(".png"): # if the file ends with png
        print(file)           # print the file
        current_image = Image.open(file) # open the current file
        image_array = np.array(current_image) # convert the curent file
        print( np.sum( (DC_array-image_array)**2)) # calculate the SSR

# by looking at the value of SSR, we can conclude that the lowest value
#is 0 because photo21.png and DC.png are identical.
```

```
photo8.png
1339805
photo9.png
1324267
photo17.png
1333834
photo16.png
1345037
photo14.png
1362517
photo15.png
1337309
photo11.png
1382550
photo10.png
1346530
photo12.png
1228811
photo13.png
1356070
photo22.png
1295654
photo23.png
1390261
photo21.png
0
DC.png
0
photo20.png
1303948
photo24.png
1370621
photo18.png
1304493
photo19.png
1382147
photo4.png
1296814
photo5.png
1172670
photo7.png
1346352
photo6.png
1329297
photo2.png
1374577
```

```
photo3.png
1330564
photo1.png
1274268
```

In [ ]:
```
1
```