In [ ]:
```
COMPUTER VISION (CE-632)
COURSE = DATA SCIENCE
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REG NO = 21-27-13
```

IMPORTING THE LIBRARIES

In [1]:
```
import cv2
import numpy as np
import matplotlib.pyplot as plt
```

Importing the image

In [16]:
```
image = cv2.imread("bird.jpg")
```

In [3]:
```
print(image.shape)
```

```
(322, 420, 3)
```

In [14]:
```
image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
```

Introducing the noise to an image

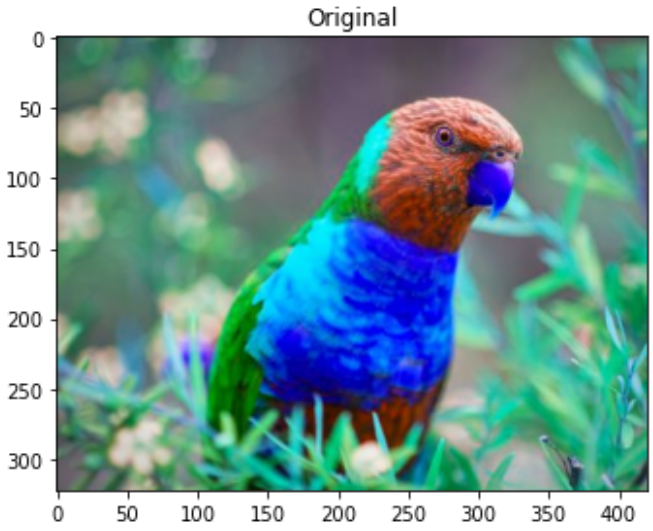
1. Salt and Pepper Noise

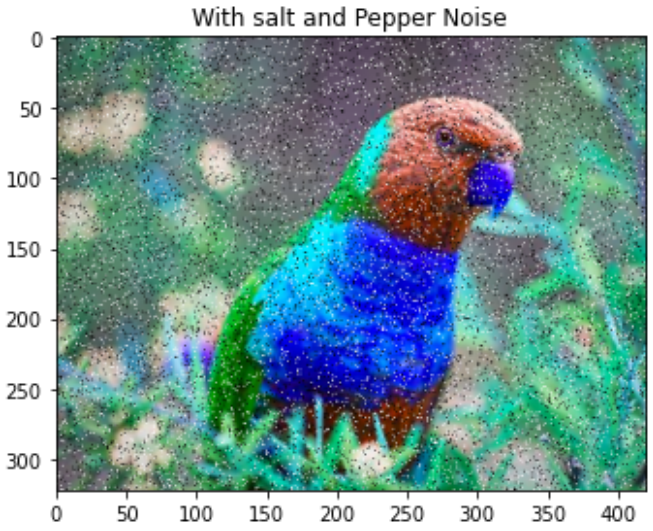
In [17]:
```
rows, column, channels = image.shape
p=0.1  #Lets say image has 10% noise (p is the probability)
import random

output_image = np.zeros(image.shape, np.uint8)
for i in range(rows):
    for j in range(column):
        r = random.random()
        if r< p/2:
            output_image[i][j] = [0,0,0]   #pepper (black) sprinkled
        elif r<p:
            output_image[i][j] = [255,255,255]   #salt (white) sprinkled
        else:
            output_image[i][j] = image[i][j]


from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Original")
ax[1].set_title("With salt and Pepper Noise")
ax[0].imshow(image)
ax[1].imshow(output_image)
```

Out[17]:
```
<matplotlib.image.AxesImage at 0x2443d82b910>
```



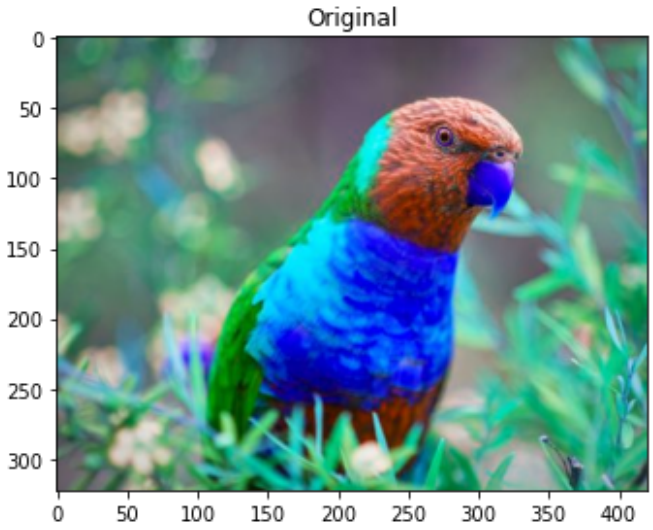


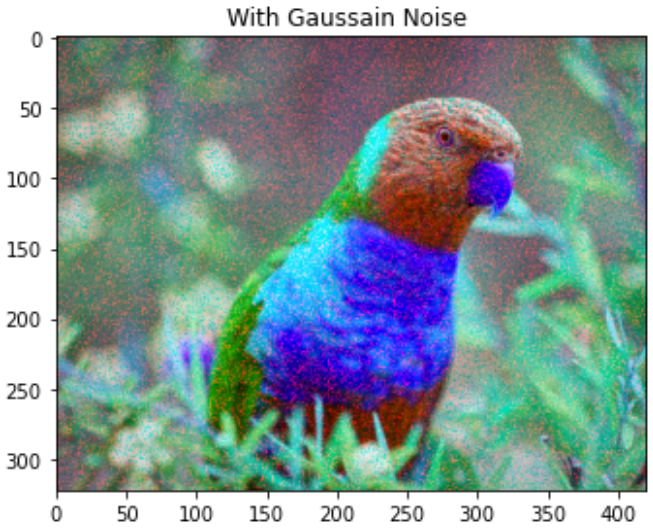
2. Gaussian Noise

In [19]:
```
rows, column, channels = image.shape
gaussian_noise = np.zeros(image.shape, np.uint8)
cv2.randn(gaussian_noise, 1, 200)  #mean value = 1 And std = 200
output_image2 = image + gaussian_noise
```

In [25]:
```
from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Original")
ax[1].set_title("With Gaussain Noise ")
ax[0].imshow(image)
ax[1].imshow(output_image2)
```

Out[25]: <matplotlib.image.AxesImage at 0x2443dc55f70>



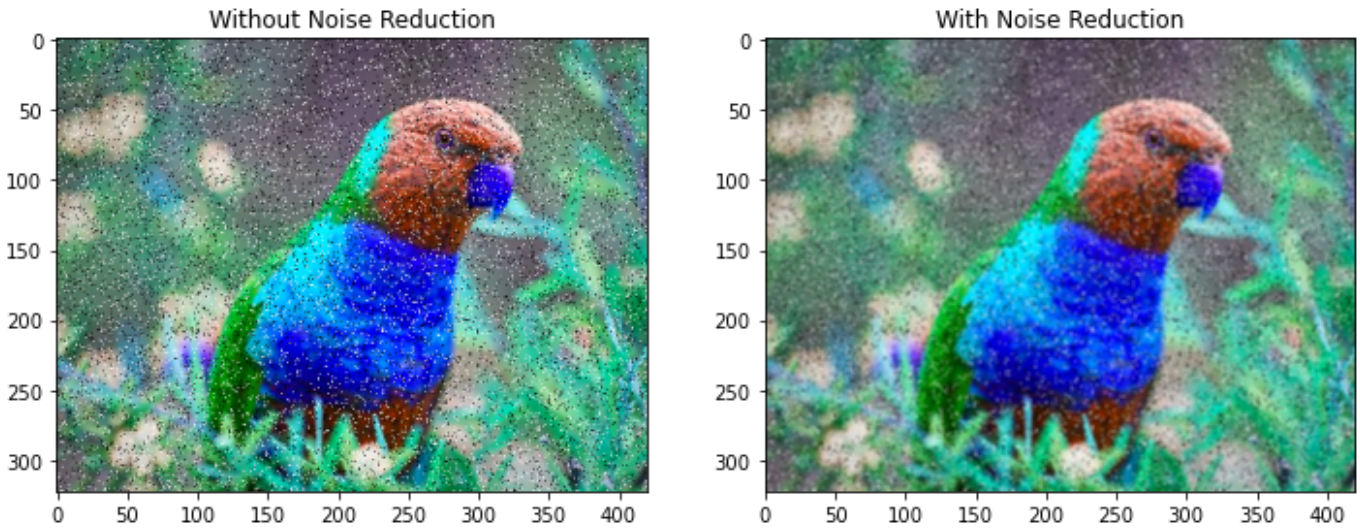


3D CONVOULUTION - IMAGE FILTERING

1. Averaging

In [23]:
```
blur = cv2.blur(output_image , (3,3))
from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Without Noise Reduction")
ax[1].set_title("With Noise Reduction")
ax[1].imshow(blur)
ax[0].imshow(output_image)
```

Out[23]: <matplotlib.image.AxesImage at 0x2443dba4880>

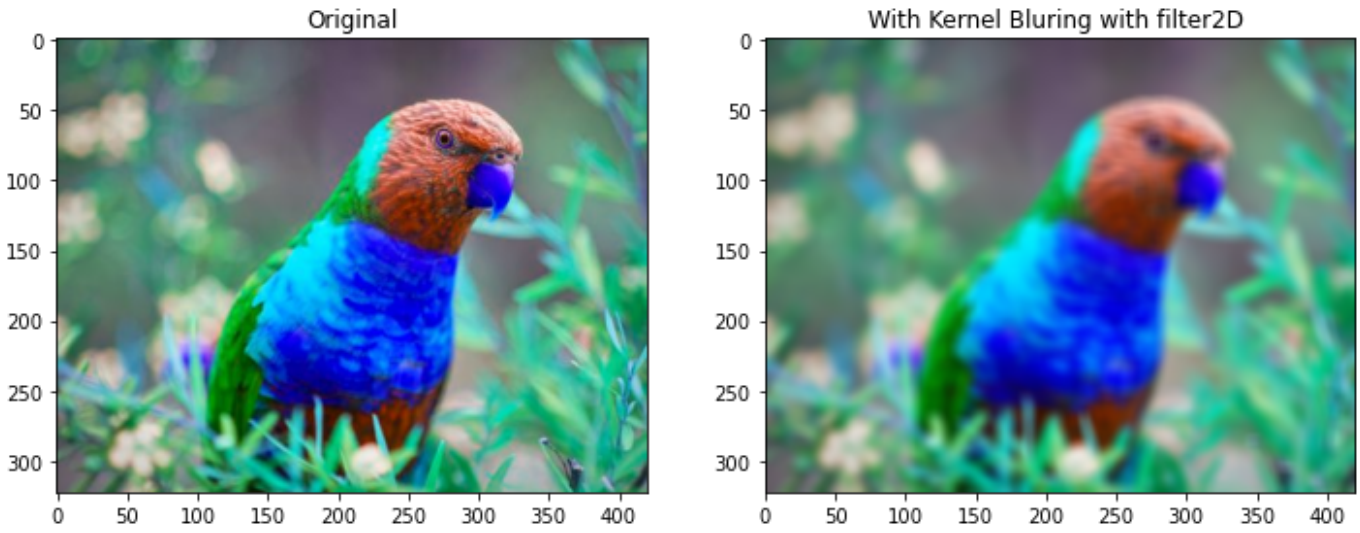


2. Kernel Bluring using Filter2D

In [33]:

```
kernel = np.ones((9,9),np.float32)/81.0
output_image_Kernel = cv2.filter2D(image, -1, kernel)
from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Original")
ax[1].set_title("With Kernel Bluring with filter2D ")
ax[0].imshow(image)
ax[1].imshow(output_image_Kernel)
```

Out[33]: <matplotlib.image.AxesImage at 0x2443f072790>

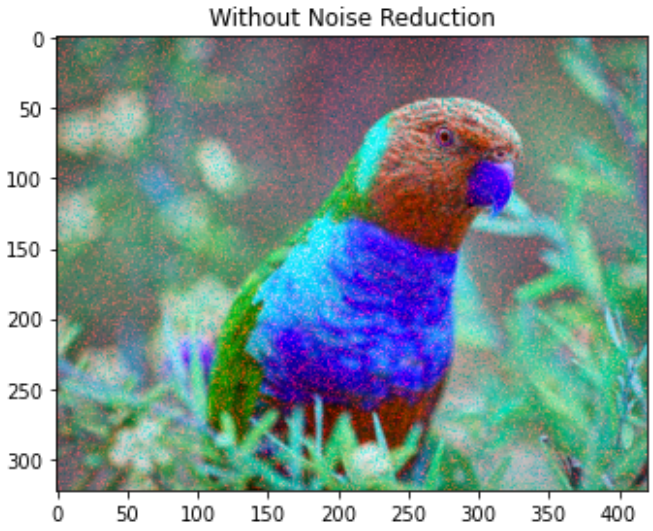


3. Gaussian Blur

In [27]:

```
#Removing gaussain noise with Gaussina blur
Gaussain_Blur = cv2.GaussianBlur(output_image2, (3,3),3)
from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Without Noise Reduction")
ax[1].set_title("With Noise Reduction By Gaussain Blur")
ax[0].imshow(output_image2)
ax[1].imshow(Gaussain_Blur)
```

Out[27]: <matplotlib.image.AxesImage at 0x2443dda2d60>



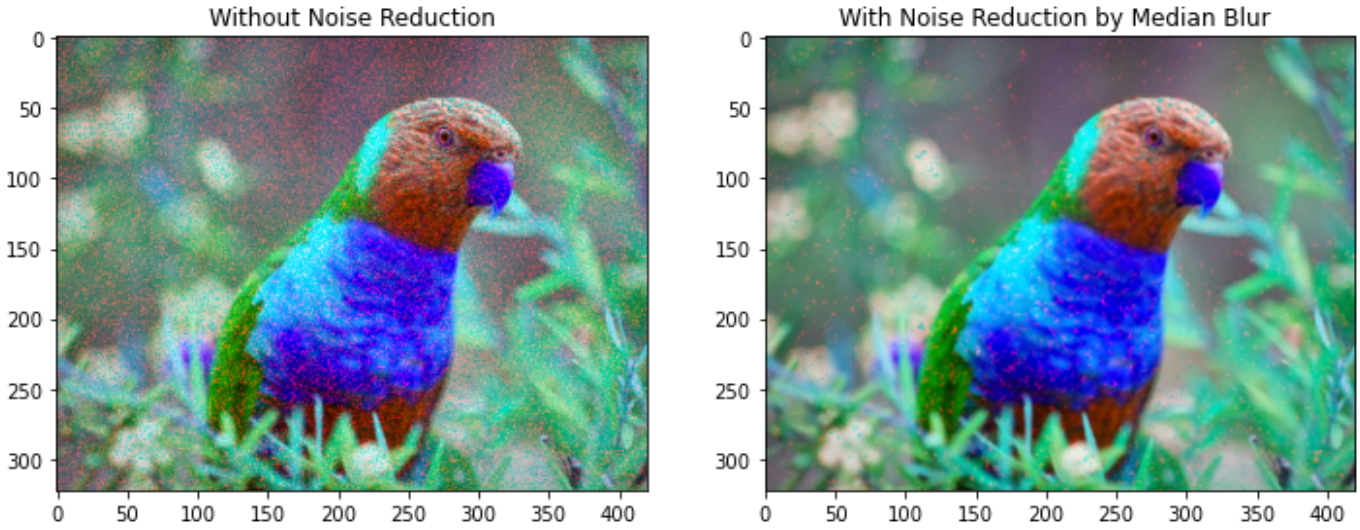
4. Median Blur

In [32]:

```
#This bluring effect is highly effective spqcially for salt and pepper noise in an image
Median_Blur = cv2.medianBlur(output_image2, 3)


from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Without Noise Reduction")
ax[1].set_title("With Noise Reduction by Median Blur ")
ax[0].imshow(output_image2)
ax[1].imshow(Median_Blur)
```

Out[32]: <matplotlib.image.AxesImage at 0x2443efb6700>

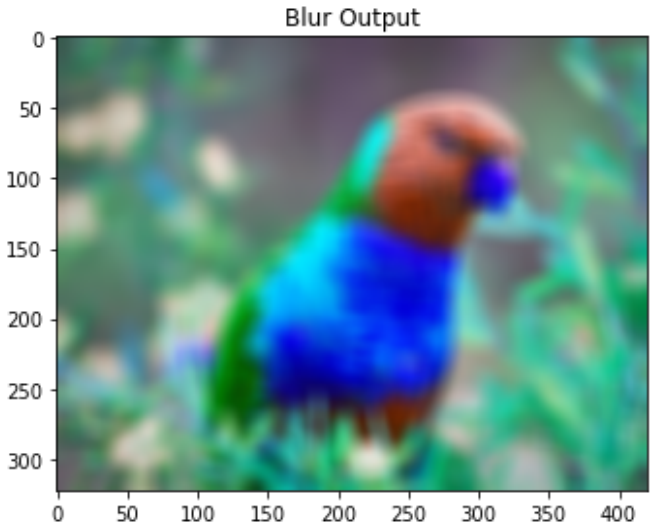


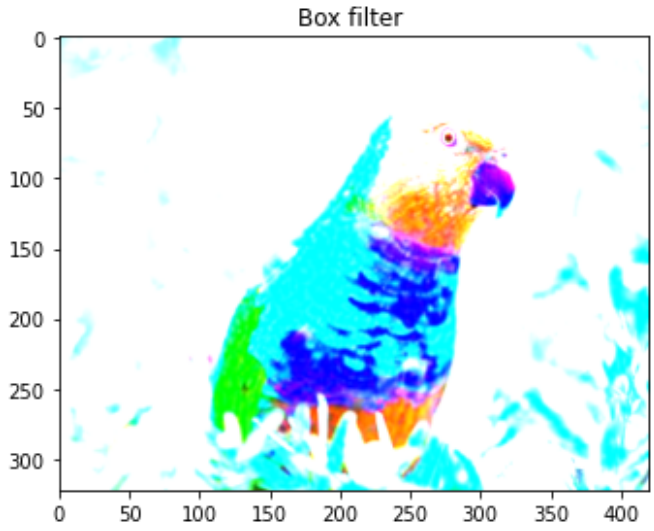
5. Box Filter and blur function bluring

In [38]:

```
output_blur = cv2.blur(image, (15,15))
output_box = cv2.boxFilter(image, -1, (2,2), normalize = False)
from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Blur Output")
ax[1].set_title("Box filter ")
ax[0].imshow(output_blur)
ax[1].imshow(output_box)
```

Out[38]: <matplotlib.image.AxesImage at 0x2443f2a61f0>





Bilateral Filtering (Reduction of Noise + Preserving of edges)

In [41]:

```
output_bil = cv2.bilateralFilter(image, 10,9,9)
from matplotlib.pyplot import subplots
fig,ax = subplots(1,2, figsize =(12,20))
ax[0].set_title("Original")
ax[1].set_title("Bilateral Filter ")
ax[0].imshow(image)
ax[1].imshow(output_bil)
```

Out[41]: <matplotlib.image.AxesImage at 0x2443dee1ca0>