

Rank Approximation for an Image using SVD

Importing an image

```
In[243]:= img = Import["/Users/siddharth/Downloads/image1.jpeg"]
```

Out[243]=



Case -1 : Rank 30 Approximation

```
In[244]:= rankapprox = 30;
```

```
In[245]:= (* Separating into RGB *)  
imgs = ColorSeparate[img]
```

Out[245]=



```
In[246]:= (* For Red color *)  
img1Data = ImageData[imgs[[1]]];
```

```
In[247]:= (* Rank of Original Matrix *)  
MatrixRank[img1Data]
```

Out[247]= 191

Checking Dimensions of Image

```
In[248]:= height = Dimensions[img1Data][[1]]
width = Dimensions[img1Data][[2]]
```

```
Out[248]= 263
```

```
Out[249]= 191
```

For red, green and blue :

```
img1data = ImageData[imgs[[1]];
{u1, s1, v1} = SingularValueDecomposition[img2data, rankapprox];
newImg2Data = u1.s1.(Transpose[v2]);
newImg2 = Image[newImg1Data];

img2data = ImageData[imgs[[2]];
{u2, s2, v2} = SingularValueDecomposition[img2data, rankapprox];
newImg2Data = u2.s2.(Transpose[v2]);
newImg2 = Image[newImg2Data];

img3data = ImageData[imgs[[3]];
{u3, s3, v3} = SingularValueDecomposition[img3data, rankapprox];
newImg3Data = u3.s3.(Transpose[v3]);
newImg3 = Image[newImg3Data];
```

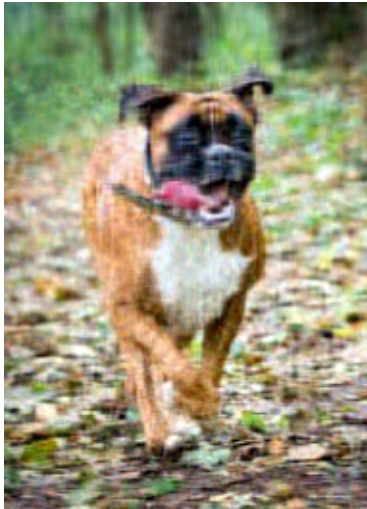
```
In[263]:= img
```



```
Out[263]=
```

```
In[264]:= newImg30 = ColorCombine[{newImg1, newImg2, newImg3}, "RGB"]
```

```
Out[264]=
```



Case - 2 : Rank 100 Approximation

```
In[265]:= rankapprox = 100;
```

```
In[266]:= img2data = ImageData[imgs[[1]];
{u2, s2, v2} = SingularValueDecomposition[img2data, rankapprox];
newImg2Data = u2.s2.(Transpose[v2]);
newImg2 = Image[newImg2Data];

img2data = ImageData[imgs[[2]];
{u2, s2, v2} = SingularValueDecomposition[img2data, rankapprox];
newImg2Data = u2.s2.(Transpose[v2]);
newImg2 = Image[newImg2Data];

img3data = ImageData[imgs[[3]];
{u3, s3, v3} = SingularValueDecomposition[img3data, rankapprox];
newImg3Data = u3.s3.(Transpose[v3]);
newImg3 = Image[newImg3Data];
```

In[278]:=

`img`

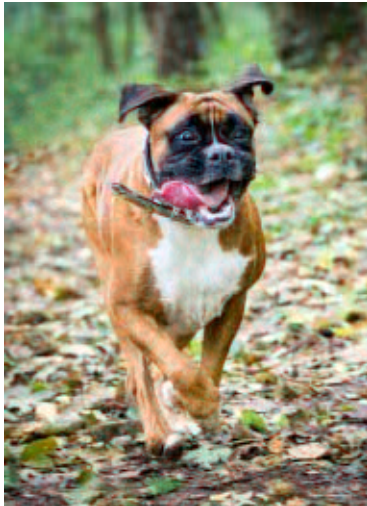
Out[278]=



In[280]:=

`newImg100 = ColorCombine[{newImg1, newImg2, newImg3}, "RGB"]`

Out[280]=

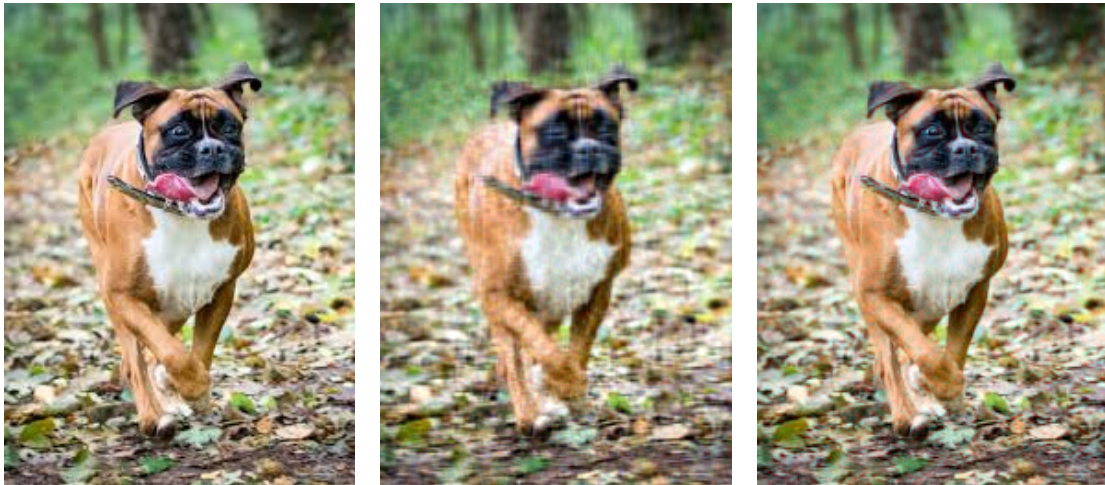


First image is the original image , second image is Rank 30 Approximation and third image is Rank 100 Approximation.

In[283]:=

```
GraphicsRow[{img,newImg30, newImg100}]
```

Out[283]=



I tried this experiment with Rank 30 Approximation and Rank 100 Approximation, Definitely Rank 100 Approximation gave better result. It gives an image closest to original image.