

## Assignment 5 Report

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We are using unsupervised learning to reduce the number of color points in an image. This application is also called as *image segmentation* or *color quantization*. We are using K-means algorithm for the clustering of colors in images.

**Language:** R   **Tool:** R-studio

**Package:** We used default k-means function provided in R, which is

### K-Means Clustering

#### Description

Perform k-means clustering on a data matrix.

#### Usage

```
kmeans(x, centers, iter.max = 10, nstart = 1,  
       algorithm = c("Hartigan-Wong", "Lloyd", "Forgy",  
                     "MacQueen"), trace=FALSE)  
## S3 method for class 'kmeans'  
fitted(object, method = c("centers", "classes"), ...)
```

#### Running Instructions:

1. Change the input file & path on Line 5 if needed
2. Just run the ImageClustering.R file given
3. You will see original image and 3 outputs corresponding to that image in plots section.

### **Output explanation:**

**Note: Output Images are posted in ["/Part3/clusteredImages"](#)**

There are 4 type of outputs for every image (image1 to image 5)

#### **Output 1: Three color clusters**

we have used 3 colors as centers to cluster all other colors in image, so the final image is all colors clustered in 3 major colors.

"Kmeans" function provided by R is used to build a model. We used  
centers = 3, number of clusters  
trace = true, which given number of steps required for kmeans to  
converge in every iteration

#### **Output 2: Five color clusters**

we have used 5 colors as centers to cluster all other colors in image, so the final image is all colors clustered in 5 major colors.

"Kmeans" function provided by R is used to build a model. We used  
centers = 5, number of clusters  
trace = true, which given number of steps required for kmeans to  
converge in every iteration

#### **Output 3: Vonoroi regions**

Just as a little experimental variation in Kmeans Clustering, we also plotted Voronoi regions. To get the Voronoi regions, we cluster primarily in Cartesian space, rather than in color space. This produces, essentially, [Voronoi](#) regions shaded with a region-average color.

"Kmeans" function provided by R is used to build a model. We used

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centers = k, number of clusters,  
iter.max = 50, which is number of maximum iterations for kmeans to converge

#### Output 4: Cluster Centers plotted

In the output 3, Instead of plotting regions if we only plot the cluster centers we get output 4. This allows us to see the cluster centers with their colors.

“Kmeans” function provided by R is used to build a model. We used  
centers = k, number of clusters,  
iter.max = 50, which is number of maximum iterations for kmeans to converge

#### References:

- <https://www.r-bloggers.com/r-k-means-clustering-on-an-image/>
- <http://www.magesblog.com/2012/12/now-i-see-it-k-means-cluster-analysis.html>
- <https://cran.r-project.org/web/packages/jpeg/jpeg.pdf>
- <http://is-r.tumblr.com/post/36732821806/images-as-voronoi-tesselations>