**Assignment #1**

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Group D: 4023+ 730 = 4753 is Odd

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| **Image#1:** | **Image#2:** | **Image#5:** | **Image#8:** |
| Creating Image #1 was a forward process of filling a NumPy array with 4 different gray levels (one in each corner) | Creating Image #2 was a process of adding random noise (salt & pepper) setting random pixels to black and white | Creating Image #5 involved setting the upper half to a gray value darker than the lower half and the other 2 columns are set to light gray value | Creating Image #8 is adding salt & pepper noise to image #5 |

**Question #1:**

**Question#2:**

* Our implementation starts with a helper method to check if the K-Means segmentation converged or not. Meaning if the new centroids are the same as the old ones then the algorithm converged and the means stopping changing. However absolute convergence may not be reached or may exhaust our processor. So, we allowed a range of tolerance. This function takes 2 arrays and checks the similarity of their data.
* The following helper method classifies the pixel in hand to its nearest cluster. We calculate the Euclidean distance between the new pixel and the current centroids
* The third helper method assigns each pixel to the given centroids for the algorithm. Using the minimum distance method
* The next method is used to initialize the k-means clustering
* Once the K-means clustering is finished we generate the segmented image
* After that we flatten the segmented image & the original image into arrays so we can compute the confusion matrix, which will then be used to calculate the accuracy (TP+TN/ (TP+TN+FP+FN))
* This algorithm was used to segment the 4 images we created, and the aircraft image that corresponds to our group (colored & gray level)

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| Accuracy: 100.0 % | Accuracy:  100.0% | Accuracy:  100.0% | Accuracy:  100 % | Accuracy:  50.5% | Accuracy:  76.09% |

**Question#4: Accuracy 56.83%**