Practice exercise 3
K-Means Image Segmentation Exercise

Problem: Segment a given image into K clusters using the K-means algorithm.

Dataset: You can use any image of your choice. For example, a natural image like a landscape or a portrait.

Task:

1. **Load the Image:**
    - Read the image using OpenCV or PIL.
    - Convert the image to a suitable color space (e.g., RGB, HSV, or LAB).
2. **Preprocess the Image:**
    - Resize the image to a smaller size for faster processing.
    - Flatten the image into a 2D array of pixels, where each pixel is represented as a feature vector (e.g., RGB values).
3. **Apply K-Means Clustering:**
    - Initialize K random centroids, each representing the mean color of a cluster.
    - Assign each pixel to the nearest centroid based on Euclidean distance.
    - Update the centroids as the mean of the pixels assigned to each cluster.
    - Repeat the assignment and update steps until convergence.
4. **Segment the Image:**
    - Replace each pixel with the color of its assigned cluster centroid.
    - Reshape the segmented image back to its original dimensions.
5. **Visualize the Results:**
    - Display the original and segmented images side-by-side.

https://medium.com/analytics-vidhya/image-segmentation-using-k-means-clustering-from-scratch-1545c896e38e