Clustering with k-Means

Objective: Improve and evaluate the k-Means clustering implementation.

1. **Dataset Preparation:**
    - Generate a synthetic dataset using **make_blobs** from **sklearn.datasets** with 300 samples, 3 centers, and a cluster standard deviation of 1.5.
    - Visualize the generated dataset using matplotlib or seaborn.
2. **Algorithm Implementation:**
    - Modify the **random_centroids** function to ensure that the initial centroids are chosen more effectively. Hint: Consider using the **k-means++** initialization method.
    - Implement a function to visualize the clustering results, displaying data points colored according to their cluster assignments and marking centroids.
3. **Evaluation:**
    - Run the k-Means algorithm on the generated dataset with k=3 and max_iter=300.
    - Plot the SSE (Sum of Squared Errors) over iterations to observe the convergence.
    - Evaluate the effect of changing the **k** value on the clustering result and SSE. Test with k=2, 3, 4, and 5.