Engr421 Fall21
HW8: Spectral Clustering
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1. I imported data
2. B (connectivity matrix) is created using connectivity_matrix function that takes a data set of size N and delta value. This function creates NxN matrix with diagonal values are 0 and have values 1 in ith row j column & ith column jth row if the distance between ith and jth data points in X are less then delta.
3. D (degree matrix) is created using degree_matrix function that takes connectivity matrix and creates a diagonal matrix with ith value equals to sum of the ith row of B value.
4. L_symmetric (normalized laplacian) is created using laplacian_symmetric function that takes connectivity and degree matrices and using the formula I calculated it.
    1. L_symmetric = I- D^(-1/2)BD^(-1/2)
5. To calculate R smallest eigenvectors, r_smallest_eigenvectors function is used. This function takes normalized Laplacian matrix and value R, calculates eigenvalues and eigenvectors using np's linalg's eig function. Using np's argsort on eigenvalues R+1 indexes of smallest eigenvalues are stored. Using the indexes R smallest (1^{st} to $R+1^{st}$) eigenvectors are stored in Z matrix.
6. Given K=5 and rows for initial centroids, k-means algorithm are run.
7. Using k-means results, centroids are updated regarding the data set and results are plotted.