Kungliga Tekniska Högskolan

Report

Homework 4 : Graph Spectra

Author :
Massimo Perini
Samuel Leonardo Gracio

Professor :

December 6, 2018

1 Short explanation of the program

Our program is coded in Python and Matlab. The first thing we did is the loading of the graph. Since the file is a text file, we create tuples of the values in order to represent the edges. Edges and vertexes are then loaded into networkx, since our program uses networkx in order to display and manipulate a graph. The Adjacency, diagonal and normalized laplacian matrixes are then built. With Scipy we extract the (sorted) eigenvalues and eigenvectors of the normalized laplacian matrix and we get the point in which the eigenvalues start dropping (k). We then get the k largest eigenvectors (associated with the largest eigenvalues) in order to generate the X matrix. We normalize X and we cluster the rows using KMeans (scikit-learn) library. The clustered graph is then displayed. The sparsety pattern and Fiedler Vector (eigenvector of the second smallest eigenvalue of L) is displayed too.

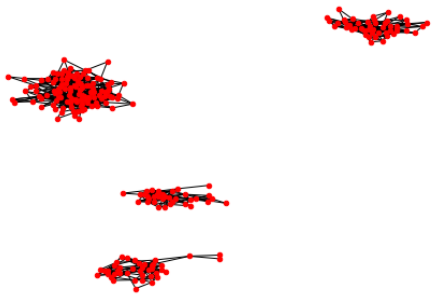

Figure 1: Graph 1

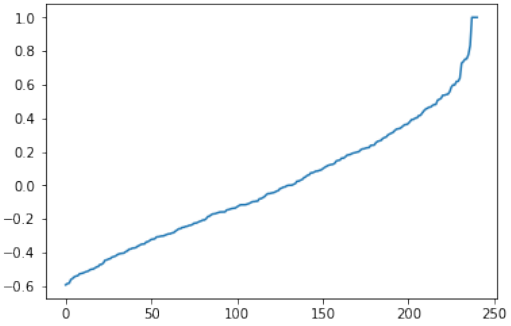

Figure 2: Sorted eigenvalues of normalized Laplacian of Graph 1

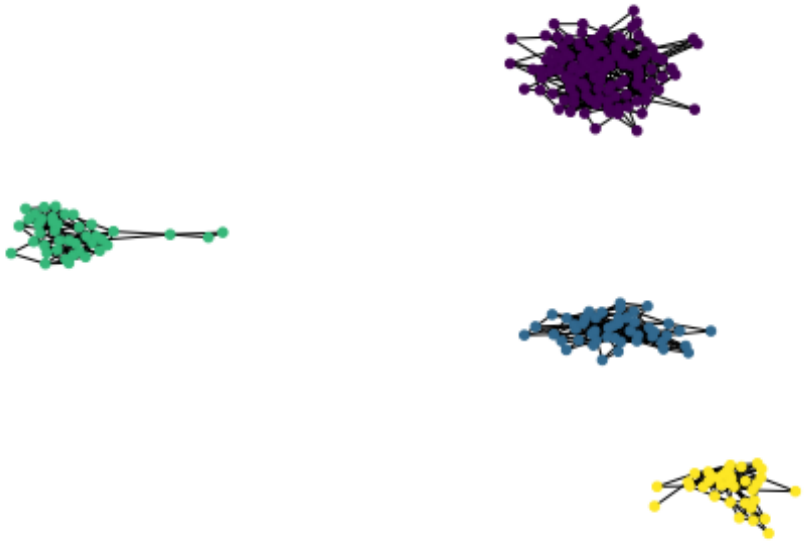

Figure 3: Clustered graph 1

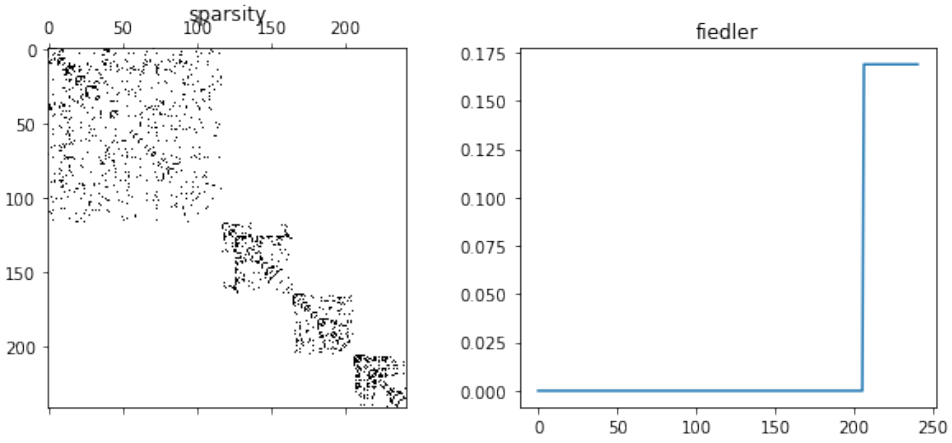

Figure 4: Fiedler Vector and sparsity pattern of graph 1

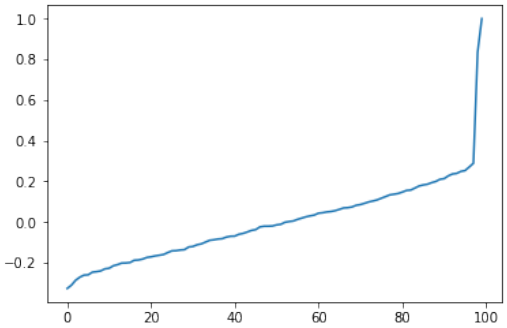

Figure 5: Sorted eigenvalues of normalized Laplacian of Graph 2

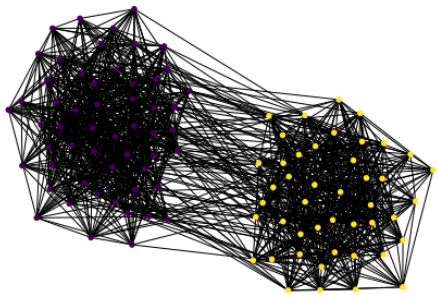

Figure 6: Clustered graph 2

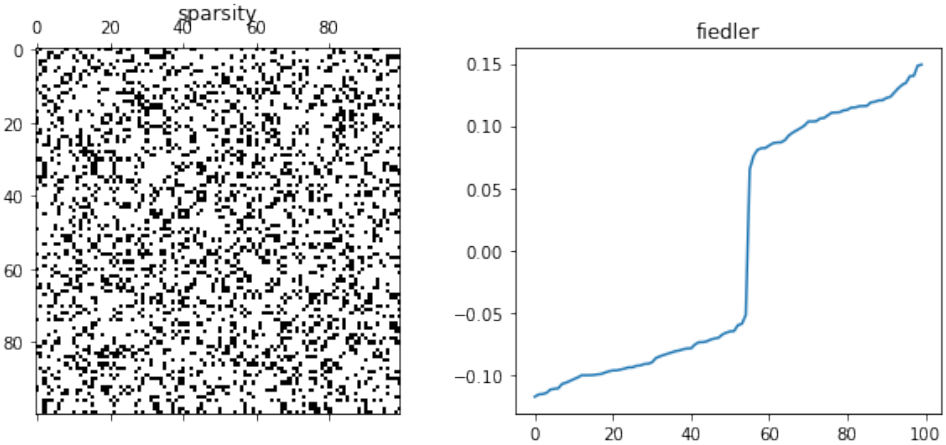

Figure 7: Fiedler Vector and sparsity pattern of graph 2