MKSE312 Final Project

Susan Greenberg and Ayaka Nonaka

May 6, 2013

1 Introduction

In this report, we analyze the Facebook New Orleans dataset (`http://socialnetworks.mpi-sws.org/data-wosn2009.html`) using different community detection techniques: modularity maximization using KL algorithm, spectral bipartition, and the Louvain-Twitter algorithm.

We extracted 5 disjoint subgraphs of 2,500 nodes from the dataset to make the computation more feasible.

We were not able to compute the "flops" because it is obsolete in recent versions of MATLAB. This article explains more about why that is (near bottom of page): `http://www.mathworks.com/company/newsletters/news_notes/clevescorner/winter2000.cleve.html`

2 Modularity maximization using KL algorithm

Hopefully we can get some results here...

3 Spectral bipartition

Figures 1 - 5 show the results for spectral bipartition on the 5 subgraphs. The values for λ_2 for each subgraph respectively are: 0.8992, 0.5614, 0.9856, 0.9116, 0.9352. The λ_2 values tell us how easily the network can be split into two groups; the smaller the number, the easier to partition.

Subgraph 2 has the smallest λ_2 (0.5614), suggesting that it is the easiest to split, which seems to make sense since we can identify the two groups in the Figure 2.

On the other hand, subgraph 3 and 5 have the largest λ_2 (0.9856 and 0.9352 respectively), suggesting that they are the most difficult to split, which also seems to make sense because Figure 3 contains some nodes that

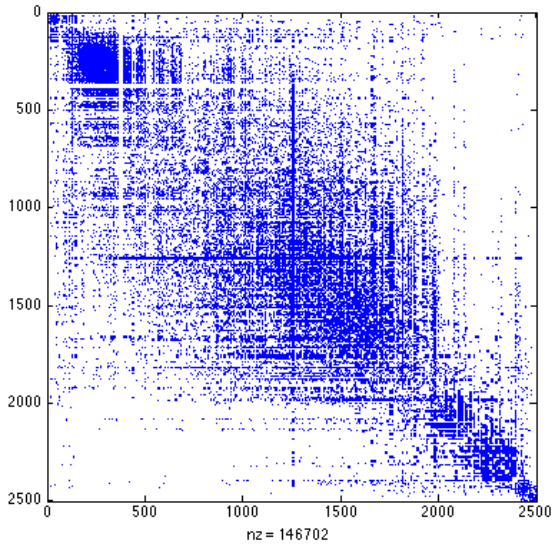

Figure 1: Spectral Bipartition for Subgraph 1

are highly connected (the long lines that extend throughout the entire plot), and Figure 5 shows a cloud of plots that don't seem to have much obvious grouping.

4 Louvain-Twitter algorithm

We used the Louvain algorithm MATLAB implementation by MIT Strategic Engineering (`http://strategic.mit.edu/downloads.php?page=matlab_networks`). We ran the algorithm on the 5 subgraphs. The results are as follows:

Subgraph	Number of Modules	Modularity
1	1134	0.0133
2	971	0.0287
3	1059	0.0179
4	1231	0.0057
5	1256	0.0204

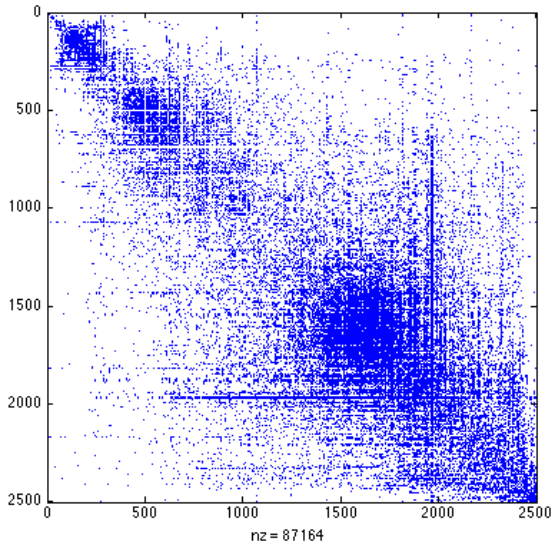

Figure 2: Spectral Bipartition for Subgraph 2

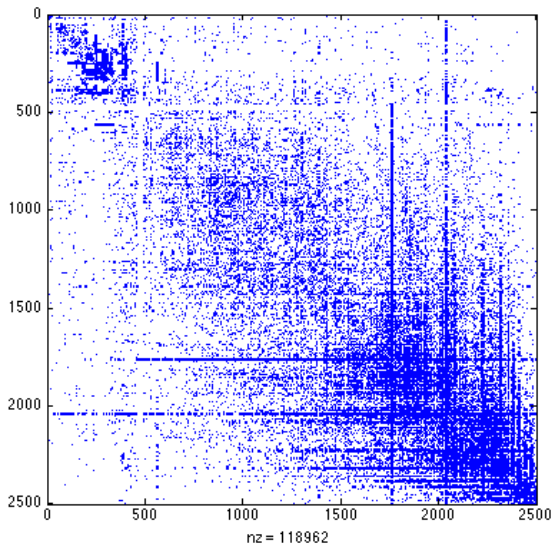

Figure 3: Spectral Bipartition for Subgraph 3

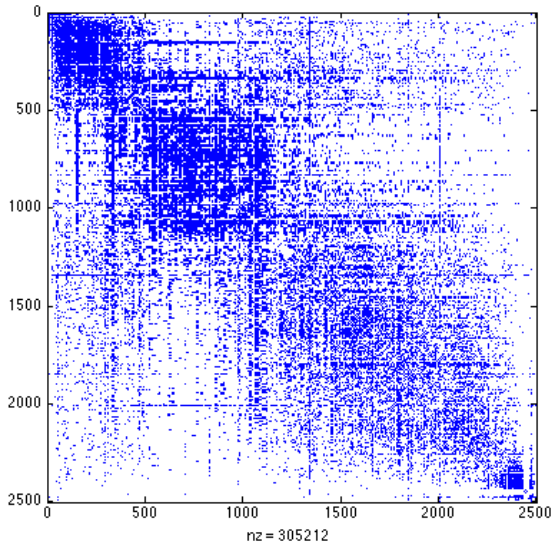

Figure 4: Spectral Bipartition for Subgraph 4

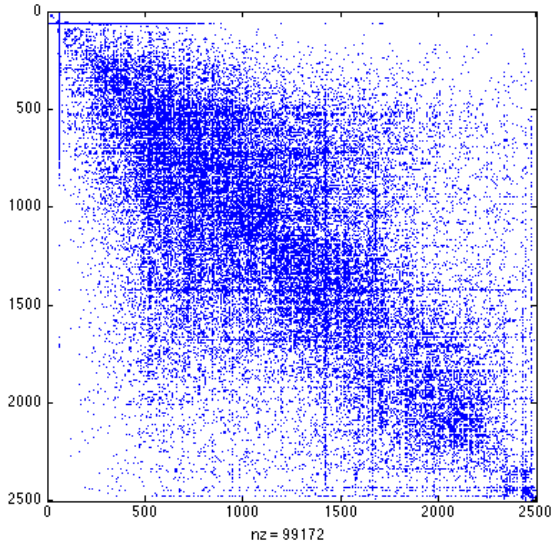

Figure 5: Spectral Bipartition for Subgraph 5