Networks – Problem Set 2

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Exercise 1: Community Detection Algorithms

In this exercise we are going to examine the Karate Club network of Zachary in order to apply a community detection algorithm.

Part a): Computing Modularity

I implement the greedy agglomeration algorithm in order to detect the communities in the network. In `igraph` the function `cluster_fast_greedy` has the option of recording the modulartiy score after each merge as `modularity=TRUE`. I use the output to plot the required graph. Moreover, I plot the dendogram which indicates the community composition. It turns out that there are three communities detected. The two plots are given in Figures 1 and 2.

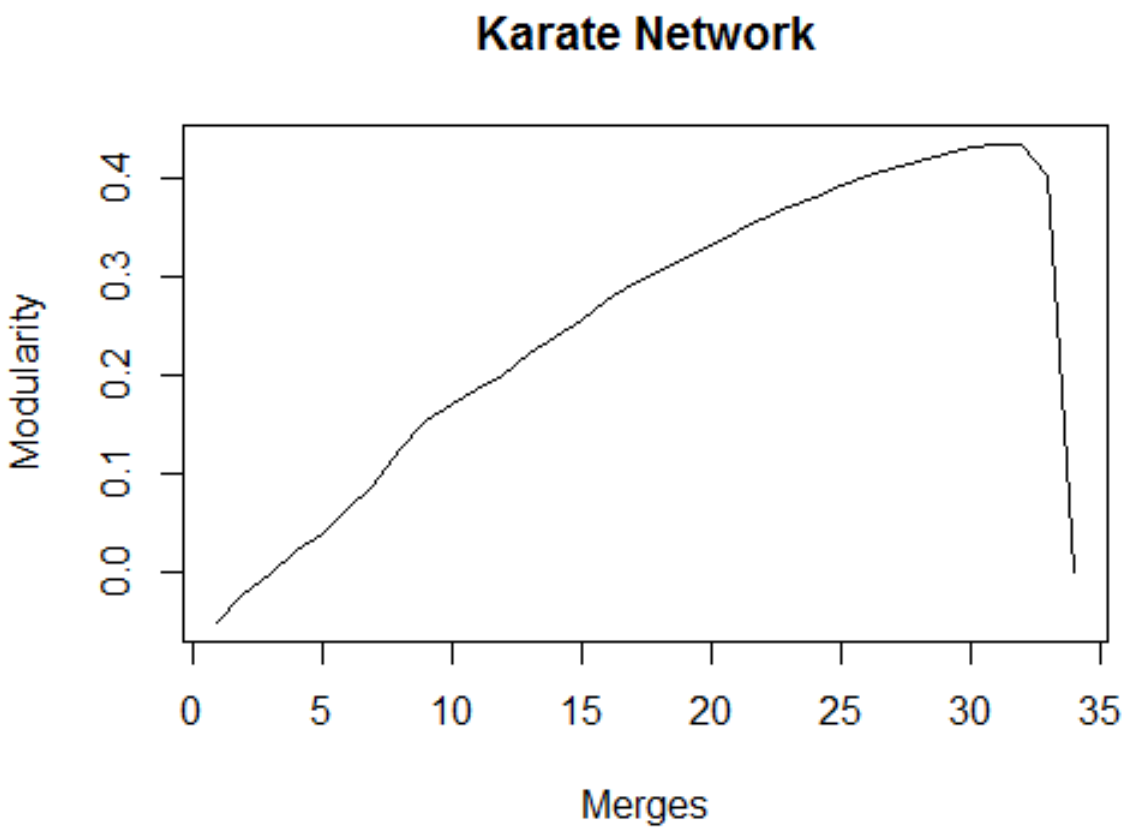

Figure 1: Modularity as a function of degrees

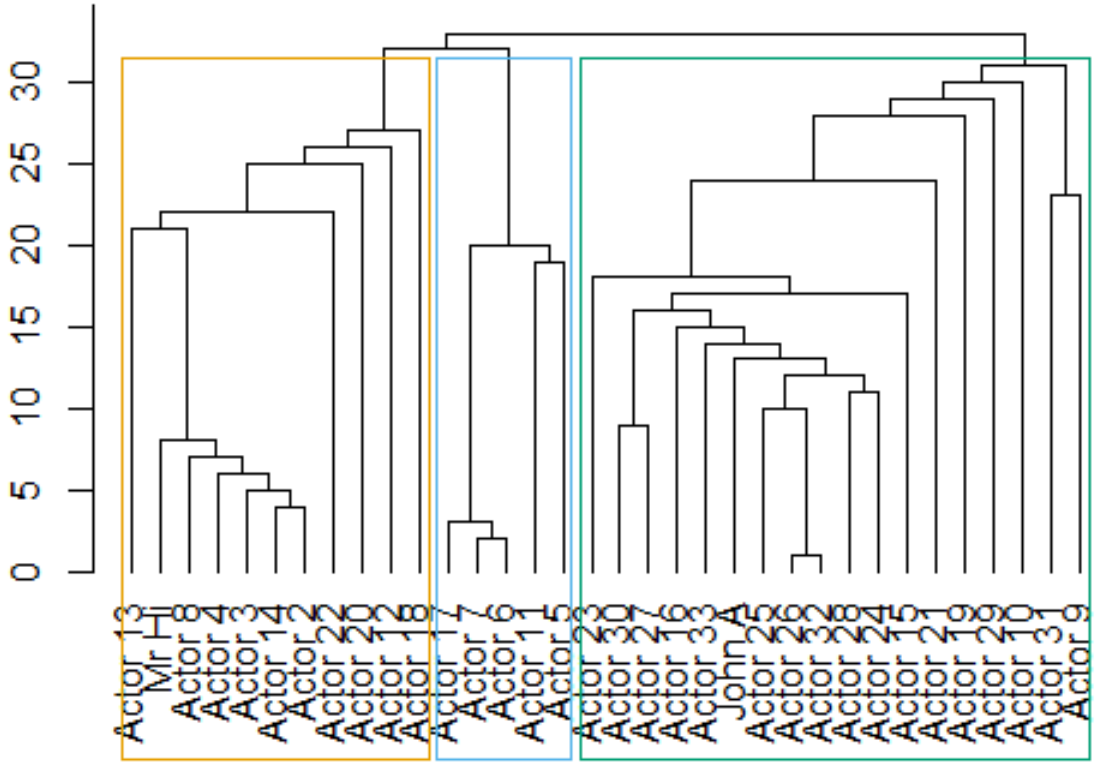

Figure 2: Dendogram for the Karate network

The algorithm suggests that the last couple of merges decrease modularity (connectiveness), so up to that point the communities are quite tight.

Part b): Plotting the Network

Here I plot the network using the `qgraph` package. The three communities are colored with distinct colors and the centering around Mr Hi and John A is clearly visible in Figure 3.

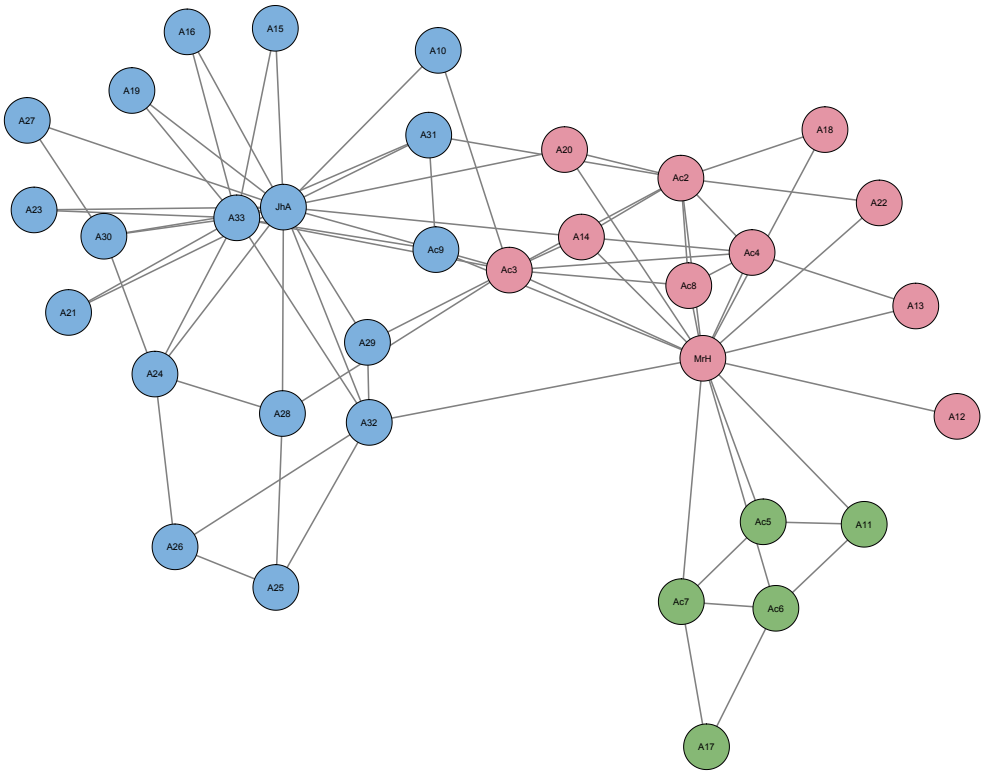

Figure 3: Network with communities in colors.