

1 Introduction

This is the solution of HW3 of Network Data, which consists of 4 parts. First, for node g, manually validate its degree centrality (3), closeness centrality (0.6) and betweenness centrality (19.5). Then, for the network, manually identify all 2-cores and 3-cores. After that, we need to apply R-function modularity() to this network and report the calculation result. Final, we need to apply R-function cluster_walktrap() to this network and draw the result with R-function plot().

2

For node g,

I degree centrality:
 c.c.f.h) is directly connected with node g $\Rightarrow \text{degree}(g)=3$

II closeness centrality:

$$cc(g) = \frac{10-1}{2+2+1+2+2+1+1+2+2} = \frac{9}{15} = \frac{3}{5}$$

III betweenness centrality:

	6	g)	6(g)
a-f	2	1	$\frac{6}{2}$
a-h	1	1	1
a-i	1	1	1
a-j	1	1	1
b-f	2	1	$\frac{1}{2}$
b-h	1	1	1
b-i	1	1	1
b-j	1	1	1
c-f	2	1	$\frac{1}{2}$
c-h	1	1	1
c-i	1	1	1
c-j	1	1	1
d-h,i,j	13	1.3	3
e-h,i,j	1.3	1.3	3
f-h,i,j	13	1.3	3

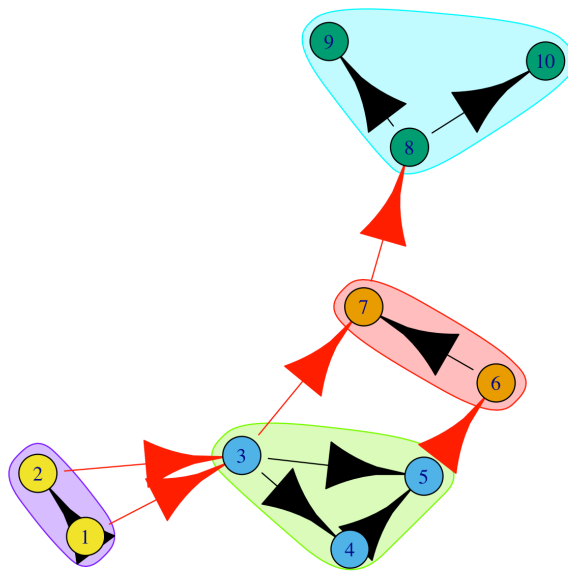
$$bc(g) = 3+3+3+3+7 + \frac{1}{2} \cdot 3 = 18 + \frac{3}{2} = 19\frac{1}{2}$$

2 I 2-cores:

II 3-cores:

3 After applying R-function modularity() to this network, the calculation result is 0.2951389.

4 After applying R-function cluster_walktrap() to this network, I draw the result with R-function plot() as below:



5 Appendix

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> library(network)
> library(igraph)
> library(intergraph)
> netmat <- rbind(
+   c('a','b'),c('a','c'),c('b','c'),
+   c('c','d'),c('c','e'),c('c','g'),
+   c('d','e'),c('e','f'),c('f','g'),
+   c('g','h'),c('h','i'),c('h','j')
+ )
> net = network(netmat, matrix.type = 'edgelist')
> netmat2 <- as.matrix(net,matrix.type = 'adjacency')
> net2 <- network(netmat2,matrix.type = 'adjacency')
> inet <- aslgraph(net2)
> cw <- cluster_walktrap(inet)
> modularity(cw)
> plot(cw,inet)

```