Social Network Analysis

```
library(igraph)
CoSponsors=read.csv('cosponsors.csv', header=T)
Legislators=read.csv('legislators.csv', header=T)
CoSponsorGraph=graph_from_data_frame(CoSponsors,directed=F, vertices = Legislators)
CSG=simplify(CoSponsorGraph)
cliques(CSG, min=5, max=5)
clique.number(CSG)
largest_cliques(CSG)
assortativity(CSG, Legislators$Tenure, directed=F)
```

```
> cluster_walktrap(CSG)
IGRAPH clustering walktrap, groups: 4, mod: 0.031
+ groups:
  $`1`
   [1] "BF1" "BF2" "BG"  "BL"  "CC"  "CH"  "CM"  "DJ"
   [9] "EC"  "JB"  "JC1" "JC2" "JK"  "JR"  "KB"  "KG"
  [17] "LB"  "MC"  "MM1" "MM2" "PK"  "PO"  "PS"  "RB"
  [25] "RN"  "RW"  "SP1" "TP"  "WH"

  $`2`
  [1] "DE" "EJ" "LS" "MB"

  $`3`
  + ... omitted several groups/vertices
```

```
> clique.number(CSG)
[1] 30
> largest_cliques(CSG)
[[1]]
+ 30/35 vertices, named, from 017df28:
 [1] SP2 BF1 BF2 BG  BL  CC  CH  CM  DJ  EC  JB  JC1 JC2
[14] JK  JR  KB  KG  LB  MC  MM1 MM2 PK  PO  PS  RB  RN
[27] RW  SP1 TP  WH

> assortativity(CSG, Legislators$Tenure, directed=F)
[1] -0.01194782
> assortativity_degree(CSG, directed=F)
[1] 0.5835804
```

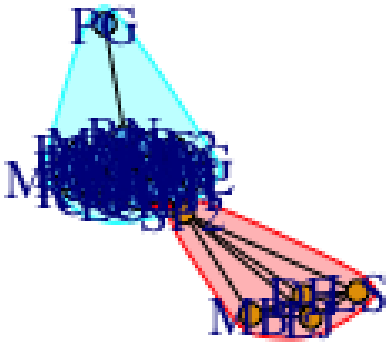
```
assortativity_degree(CSG, directed=F)
cluster_walktrap(CSG)
wc=cluster_walktrap(CSG)
wc[4]
```

```
> assortativity_degree(CSG, directed=F)
[1] 0.5835804
> cluster_walktrap(CSG)
IGRAPH clustering walktrap, groups: 4, mod: 0.031
+ groups:
  $`1`
   [1] "BF1" "BF2" "BG"  "BL"  "CC"  "CH"  "CM"  "DJ"
   [9] "EC"  "JB"  "JC1" "JC2" "JK"  "JR"  "KB"  "KG"
  [17] "LB"  "MC"  "MM1" "MM2" "PK"  "PO"  "PS"  "RB"
  [25] "RN"  "RW"  "SP1" "TP"  "WH"

  $`2`
  [1] "DE" "EJ" "LS" "MB"

  $`3`
  + ... omitted several groups/vertices
```

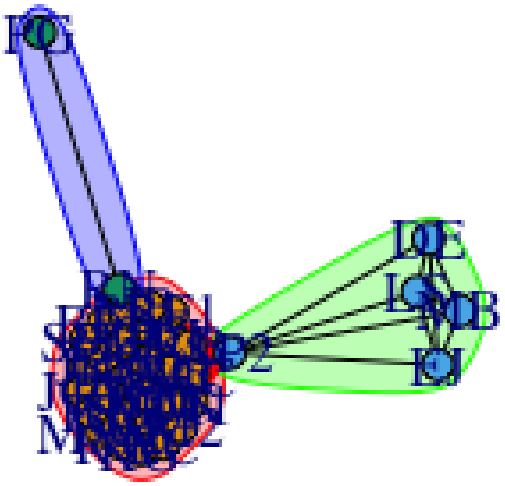
wc=cluster_walktrap(CSG, steps=200)
wc

```
> wc
IGRAPH clustering walktrap, groups: 2, mod: 0.039
+ groups:
  $`1`
  [1] "DE"  "EJ"  "LS"  "SP2" "MB"

  $`2`
   [1] "BF1" "BF2" "BG"  "BL"  "CC"  "CH"  "CM"  "DJ"
   [9] "EC"  "JB"  "JC1" "JC2" "JK"  "JR"  "KB"  "KG"
  [17] "LB"  "MC"  "MM1" "MM2" "PK"  "PO"  "PS"  "RB"
  [25] "RN"  "RW"  "SP1" "TP"  "WH"  "PG"
```

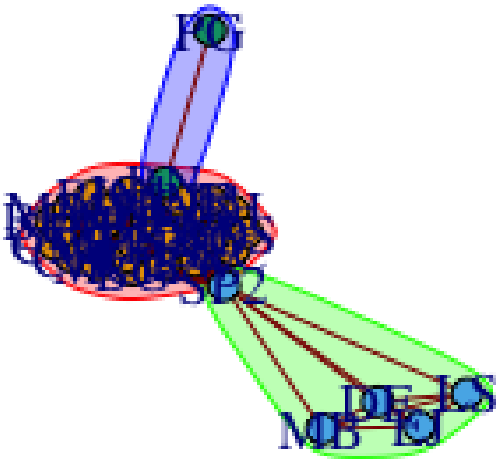
plot(wc, CSG)



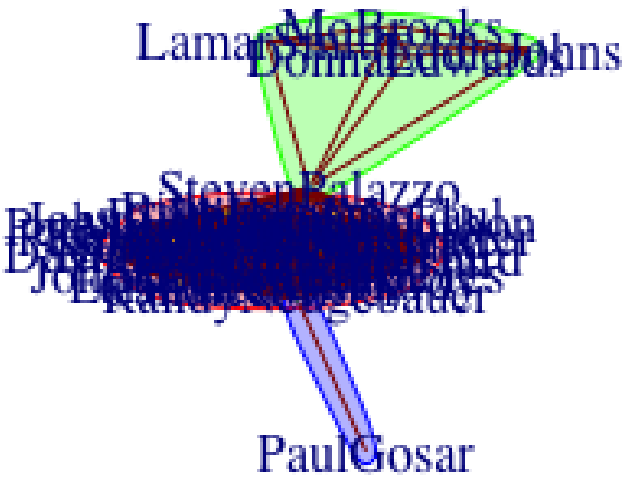
```
oc=cluster_optimal(CSG)
plot(oc, CSG, margin=-.275)
```



```
plot(oc, CSG, margin=-.275,edge.color='darkred')
```



```
plot(oc, CSG, margin=-.275,
    edge.color='darkred',vertex.label=V(CSG)$Legislator, vertex.size=evcent(CSG)$vector*5,
vertex.shape='sphere')
```




```
plot(oc, CSG, margin=-.275,
    edge.color='darkred',vertex.label=V(CSG)$Legislator, vertex.size=evcent(CSG)$vector*5,
vertex.shape='sphere',vertex.label.cex=.7,vertex.label.dist=.25)
```