데이터사이언스세미나I 7주차 과제

2020380613 강정민

1. Knoke의 2개 네트워크 각각에 R sna의 geodist 함수 대신 neighborhood 함수를 사용하여 나가는 방향의 r-근처와 들어오는 방향의 r-근처를 구하여라.

```
> library(sna)
> knoke.money <- as.matrix(read.table("C:\\Users\\pinkk\\OneDrive\\바탕 화면\\jung
min data\\22-1\\데이터사이언스세미나I\\데이터\\data7.1.txt",header=T))
> knoke.infor <- as.matrix(read.table("C:\\Users\\pinkk\\OneDrive\\바탕 화면\\jung
min data\\22-1\\데이터사이언스세미나I\\데이터\\data7.txt",header=T))
> #knoke.money의 r-neighbors
> rownames(knoke.money) <- colnames(knoke.money)
> knoke.money
     COUN COMM EDUC INDU MAYR WRO NEWS UWAY WELF WEST
COUN    0    0    1    0    1   0    0    1    1    1
COMM    0    0    1    0    0   0    0    0    0    0
EDUC    0    0    0    0    0   0    0    1    0    0
INDU    0    1    1    0    0   0    1    1    1    0
MAYR    0    1    1    0    0   0    0    1    1    0
WRO     0    0    0    0    0   0    0    0    0    0
NEWS    0    1    0    0    0   0    0    1    0    0
UWAY    0    0    0    0    0   0    0    0    1    1
WELF    0    0    1    0    0   0    0    1    0    0
WEST    0    0    0    0    0   0    0    0    0    0
> #knoke.money의 r-neighbors(neighborhood함수 사용)
> money.in1 <- apply(neighborhood(knoke.money,1,neighborhood.type="in"),1,sum)
> money.in2 <- apply(neighborhood(knoke.money,2,neighborhood.type="in"),1,sum)
> money.in3 <- apply(neighborhood(knoke.money,3,neighborhood.type="in"),1,sum)
> money.out1 <- apply(neighborhood(knoke.money,1,neighborhood.type="out"),1,sum)
> money.out2 <- apply(neighborhood(knoke.money,2,neighborhood.type="out"),1,sum)
> money.out3 <- apply(neighborhood(knoke.money,3,neighborhood.type="out"),1,sum)
> money.neighbor.in <- cbind(money.in1,money.in2,money.in3)
> rownames(money.neighbor.in) <- colnames(knoke.money)
> money.neighbor.in
     money.in1 money.in2 money.in3
COUN         0         0         0
COMM         3         1         0
EDUC         5         2         0
INDU         0         0         0
MAYR         1         0         0
WRO          0         0         0
NEWS         1         0         0
UWAY         6         1         0
WELF         4         2         1
WEST         2         5         1
> money.neighbor.out <- cbind(money.out1,money.out2,money.out3)
> rownames(money.neighbor.out) <- colnames(knoke.money)
> money.neighbor.out
     money.out1 money.out2 money.out3
COUN          5          1          0
COMM          1          1          2
EDUC          1          2          0
INDU          5          1          0
MAYR          4          1          0
WRO           0          0          0
NEWS          2          3          0
UWAY          2          1          0
WELF          2          1          0
WEST          0          0          0
> #knoke.money의 r-neighbors(geodist함수 사용)
> D <- geodist(knoke.money)$gdist
> degree(knoke.money,cmode="indegree")
 [1] 0 3 5 0 1 0 1 6 4 2
> (in.1 <- apply(D <=1,2,sum)-1)
 [1] 0 3 5 0 1 0 1 6 4 2
> (in.2 <- apply(D <=2,2,sum)-1)
 [1] 0 4 7 0 1 0 1 7 6 7
> (in.3 <- apply(D <=3,2,sum)-1)
 [1] 0 4 7 0 1 0 1 7 7 8
> neighbor.in <- cbind(in.1,in.2,in.3)
> rownames(neighbor.in) <- colnames(knoke.money)
> neighbor.in



     in.1 in.2 in.3
COUN    0    0    0
COMM    3    4    4
EDUC    5    7    7
INDU    0    0    0
MAYR    1    1    1
WRO     0    0    0
NEWS    1    1    1
UWAY    6    7    7
WELF    4    6    7
WEST    2    7    8
> degree(knoke.money,cmode="outdegree")
 [1] 5 1 1 5 4 0 2 2 2 0
> (out.1 <- apply(D <=1,1,sum)-1)
 [1] 5 1 1 5 4 0 2 2 2 0
> (out.2 <- apply(D <=2,1,sum)-1)
 [1] 6 2 3 6 5 0 5 3 3 0
> (out.3 <- apply(D <=3,1,sum)-1)
 [1] 6 4 3 6 5 0 5 3 3 0
> neighbor.out <- cbind(out.1,out.2,out.3)
> rownames(neighbor.out) <- colnames(knoke.money)
> neighbor.out
     out.1 out.2 out.3
COUN     5     6     6
COMM     1     2     4
EDUC     1     3     3
INDU     5     6     6
MAYR     4     5     5
WRO      0     0     0
NEWS     2     5     5
UWAY     2     3     3
WELF     2     3     3
WEST     0     0     0
>
> #knoke.infor의 r-neighbors(neighborhood함수 사용)
> rownames(knoke.infor) <- colnames(knoke.infor)
> knoke.infor
```

```
      COUN COMM EDUC INDU MAYR WRO NEWS UWAY WELF WEST
COUN     0    1    0    0    1   0    1    0    1    0
COMM     1    0    1    1    1   0    1    1    1    0
EDUC     0    1    0    1    1   1    1    0    0    1
INDU     1    1    0    0    1   0    1    0    0    0
MAYR     1    1    1    1    0   0    1    1    1    1
WRO      0    0    1    0    0   0    1    0    1    0
NEWS     0    1    0    1    1   0    0    0    0    0
UWAY     1    1    0    1    1   0    1    0    1    0
WELF     0    1    0    0    1   0    1    0    0    0
WEST     1    1    1    0    1   0    1    0    0    0
> infor.in1 <- apply(neighborhood(knoke.infor,1,neighborhood.type="in"),1,sum)
> infor.in2 <- apply(neighborhood(knoke.infor,2,neighborhood.type="in"),1,sum)
> infor.in3 <- apply(neighborhood(knoke.infor,3,neighborhood.type="in"),1,sum)
> infor.out1 <- apply(neighborhood(knoke.infor,1,neighborhood.type="out"),1,sum)
> infor.out2 <- apply(neighborhood(knoke.infor,2,neighborhood.type="out"),1,sum)
> infor.out3 <- apply(neighborhood(knoke.infor,3,neighborhood.type="out"),1,sum)
> infor.neighbor.in <- cbind(infor.in1,infor.in2,infor.in3)
> rownames(infor.neighbor.in) <- colnames(knoke.infor)
> infor.neighbor.in
     infor.in1 infor.in2 infor.in3
COUN         5         3         1
COMM         8         1         0
EDUC         4         5         0
INDU         5         4         0
MAYR         8         1         0
WRO          1         3         5
NEWS         9         0         0
UWAY         2         6         1
WELF         5         4         0
WEST         2         7         0
> infor.neighbor.out <- cbind(infor.out1,infor.out2,infor.out3)
> rownames(infor.neighbor.out) <- colnames(knoke.infor)
> infor.neighbor.out
     infor.out1 infor.out2 infor.out3
COUN          4          4          1
COMM          7          2          0
EDUC          6          3          0
INDU          4          4          1
MAYR          8          1          0
WRO           3          4          2
NEWS          3          5          1
UWAY          6          2          1
WELF          3          5          1
WEST          5          4          0
> #knoke.infor의 r-neighbors(geodist함수 사용)
> D <- geodist(knoke.infor)$gdist
> degree(knoke.infor,cmode="indegree")
 [1] 5 8 4 5 8 1 9 2 5 2
> (in.1_1 <- apply(D <=1,2,sum)-1)
 [1] 5 8 4 5 8 1 9 2 5 2
> (in.2_1 <- apply(D <=2,2,sum)-1)
 [1] 8 9 9 9 9 4 9 8 9 9
> (in.3_1 <- apply(D <=3,2,sum)-1)
 [1] 9 9 9 9 9 9 9 9 9 9
> neighbor.in_1 <- cbind(in.1_1,in.2_1,in.3_1)
> rownames(neighbor.in_1) <- colnames(knoke.infor)
> neighbor.in_1
     in.1_1 in.2_1 in.3_1
COUN      5      8      9
COMM      8      9      9
EDUC      4      9      9
INDU      5      9      9
MAYR      8      9      9
WRO       1      4      9
NEWS      9      9      9
UWAY      2      8      9
WELF      5      9      9
WEST      2      9      9
> degree(knoke.infor,cmode="outdegree")
 [1] 4 7 6 4 8 3 3 6 3 5
> (out.1_1 <- apply(D <=1,1,sum)-1)
 [1] 4 7 6 4 8 3 3 6 3 5
> (out.2_1 <- apply(D <=2,1,sum)-1)
 [1] 8 9 9 8 9 7 8 8 8 9
> (out.3_1 <- apply(D <=3,1,sum)-1)
 [1] 9 9 9 9 9 9 9 9 9 9
> neighbor.out_1 <- cbind(out.1_1,out.2_1,out.3_1)
> rownames(neighbor.out_1) <- colnames(knoke.infor)
> neighbor.out_1
     out.1_1 out.2_1 out.3_1
COUN       4       8       9
COMM       7       9       9
EDUC       6       9       9
INDU       4       8       9
MAYR       8       9       9
WRO        3       7       9
NEWS       3       8       9
UWAY       6       8       9
WELF       3       8       9
WEST       5       9       9
```

각각 knoke.moeny와 knoke.infor 데이터의 r-근처를 분석하기 위해 neighborhood 함수와 geodist 함수를 사용하였다. 각 함수별 출력된 결과는 동일하다.

2. Knoke의 2개 네트워크 각각에서 노드 가치 node.value를 입선 수(indegree)로 정의하기로 한다. 노드별로 入線으로 연결된 노드들의 가치 합을 구하고 그것과 노드 가치 node.value 간 상관을 구하여라.

```
> library(sna)
> knoke.money <- as.matrix(read.table("C:\\Users\\pinkk\\OneDrive\\바탕 화면\\jung
min data\\22-1\\데이터사이언스세미나I\\데이터\\data7.1.txt",header=T))
> rownames(knoke.money) <- colnames(knoke.money)
> knoke.money
     COUN COMM EDUC INDU MAYR WRO NEWS UWAY WELF WEST
COUN    0    0    1    0    1   0    0    1    1    1
COMM    0    0    1    0    0   0    0    0    0    0
EDUC    0    0    0    0    0   0    0    1    0    0
INDU    0    1    1    0    0   0    1    1    1    0
MAYR    0    1    1    0    0   0    0    1    1    0
WRO     0    0    0    0    0   0    0    0    0    0
NEWS    0    1    0    0    0   0    0    1    0    0
UWAY    0    0    0    0    0   0    0    0    1    1
WELF    0    0    1    0    0   0    0    1    0    0
WEST    0    0    0    0    0   0    0    0    0    0
> knoke.infor <- as.matrix(read.table("C:\\Users\\pinkk\\OneDrive\\바탕 화면\\jung
min data\\22-1\\데이터사이언스세미나I\\데이터\\data7.txt",header=T))
> rownames(knoke.infor) <- colnames(knoke.infor)
> knoke.infor
     COUN COMM EDUC INDU MAYR WRO NEWS UWAY WELF WEST
COUN    0    1    0    0    1   0    1    0    1    0
COMM    1    0    1    1    1   0    1    1    1    0
EDUC    0    1    0    1    1   1    1    0    0    1
INDU    1    1    0    0    1   0    1    0    0    0
MAYR    1    1    1    1    0   0    1    1    1    1
WRO     0    0    1    0    0   0    1    0    1    0
NEWS    0    1    0    1    1   0    0    0    0    0
UWAY    1    1    0    1    1   0    1    0    1    0
WELF    0    1    0    0    1   0    1    0    0    0
WEST    1    1    1    0    1   0    1    0    0    0
>
> #node.value를 indegree로 정의
> node.value.money <- degree(knoke.money,cmode="indegree")
> node.value.infor <- degree(knoke.infor,cmode="indegree")
> node.value.money
 [1] 0 3 5 0 1 0 1 6 4 2
> node.value.infor
 [1] 5 8 4 5 8 1 9 2 5 2

> #노드별로 입선으로 연결된 노드들의 가치 합
> value.sum.money <- round(gapply(knoke.money,2,node.value.money,sum))
> value.sum.infor <- round(gapply(knoke.infor,2,node.value.infor,sum))
> value.sum.money
COUN COMM EDUC INDU MAYR  WRO NEWS UWAY WELF WEST
   0    2    8    0    0    0    0   11    7    6
> value.sum.infor
COUN COMM EDUC INDU MAYR  WRO NEWS UWAY WELF WEST
  25   40   19   31   40    4   40   16   24   12
>
> #노드별로 입선으로 연결된 노드들의 가치 합과 node.value 간 상관성
> node.value.money.mat <- as.matrix(node.value.money)
> value.sum.money.mat <- as.matrix(value.sum.money)
> node.value.money.mat
      [,1]
 [1,]    0
 [2,]    3
 [3,]    5
 [4,]    0
 [5,]    1
 [6,]    0
 [7,]    1
 [8,]    6
 [9,]    4
[10,]    2
> value.sum.money.mat
      [,1]
COUN    0
COMM    2
EDUC    8
INDU    0
MAYR    0
WRO     0
NEWS    0
UWAY   11
WELF    7
WEST    6
> round(gcor(node.value.money.mat,value.sum.money.mat),3)
[1] 0.954
> node.value.infor.mat <- as.matrix(node.value.infor)
> value.sum.infor.mat <- as.matrix(value.sum.infor)
> node.value.infor.mat
      [,1]
 [1,]    5
 [2,]    8
 [3,]    4
 [4,]    5
 [5,]    8
 [6,]    1
 [7,]    9
 [8,]    2
 [9,]    5
[10,]    2
> value.sum.infor.mat
      [,1]
COUN   25
COMM   40
EDUC   19
INDU   31
MAYR   40
WRO     4
NEWS   40
UWAY   16
WELF   24
WEST   12
> round(gcor(node.value.infor.mat,value.sum.infor.mat),3)
[1] 0.992
```