

# 데이터사이언스세미나I 6주차 과제

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1. 2절의 CEO-클럽 자료에서 26명 CEO와의 ‘평균’ 거리가 최소인 클럽을 찾아라.

```
> library(SNADData)
> library(sna)
> data(CEOCclubsAM)
> A <- as.matrix(CEOCclubsAM)
      club1 club2 club3 club4 club5 club6 club7 club8 club9 club10 club11
CEO1    0    0    1    1    1    0    0    0    1    0    0
CEO2    0    0    1    0    1    0    1    0    0    0    0
CEO3    0    0    1    0    0    0    0    0    0    0    0
CEO4    0    1    1    0    0    0    0    0    0    0    0
CEO5    0    0    1    0    0    0    0    0    0    0    0
CEO6    0    1    1    0    0    0    0    0    0    0    0
CEO7    0    0    1    1    0    0    0    0    0    1    1
CEO8    0    0    0    1    0    0    1    0    0    1    0
CEO9    1    0    0    1    0    0    0    1    0    1    0
CEO10   0    0    1    0    0    0    0    0    1    0    0
CEO11   0    1    1    0    0    0    0    0    1    0    0
CEO12   0    0    0    1    0    0    1    0    0    0    0
CEO13   0    0    1    1    1    0    0    0    0    1    0
CEO14   0    1    1    1    0    0    0    0    0    0    1
CEO15   0    1    1    0    0    1    0    0    0    0    0
CEO16   0    1    1    0    0    1    0    1    0    0    0
CEO17   0    1    1    0    1    0    0    0    0    0    1
CEO18   0    0    0    1    0    0    0    0    1    0    0
CEO19   1    0    1    1    0    0    1    0    1    0    0
CEO20   0    1    1    1    0    0    0    0    0    0    1
CEO21   0    0    1    1    0    0    0    1    0    0    0
CEO22   0    0    1    0    0    0    1    0    0    0    0
CEO23   0    1    1    0    0    1    0    0    0    0    0
CEO24   1    0    1    1    0    1    0    0    0    0    0
CEO25   0    1    1    0    0    0    0    0    0    0    0
CEO26   0    1    1    0    0    0    0    0    0    0    0

      club12 club13 club14 club15
CEO1    0    0    0    0
CEO2    0    0    0    0
CEO3    1    0    0    0
CEO4    0    0    0    1
CEO5    0    1    1    0
CEO6    0    0    1    0
CEO7    0    0    0    0
CEO8    0    0    0    0
CEO9    0    0    0    0
CEO10   0    0    0    0
CEO11   0    0    0    0
CEO12   0    0    0    0
CEO13   0    0    0    0
CEO14   1    1    0    1
CEO15   0    1    0    1
CEO16   0    0    1    0
CEO17   1    0    0    1
CEO18   1    1    0    1
CEO19   0    0    0    0
CEO20   0    0    0    1
CEO21   0    0    0    0
CEO22   0    0    0    1
CEO23   0    0    0    1
CEO24   0    0    0    1
CEO25   0    1    0    0
CEO26   1    0    0    0

> n <- nrow(A)
> m <- ncol(A)
> rownames(A) <- 1:n
> colnames(A) <- c("A", "B", "C", "D", "E", "F", "G", "H", "I", "J", "K", "L", "M", "N", "O")
> B <- rbind(cbind(matrix(0,n,n),A),cbind(t(A),matrix(0,m,m)))
> vertex.col <- c(rep("red",n),rep("blue",m))
> vertex.cex <- c(rep(1,n),rep(2,m))
> gplot(B, mode="kamadakawai", displayLabels=T, boxed.labels=F,
+       vertex.col=vertex.col, vertex.cex=vertex.cex,
+       label.col=vertex.col, label.cex=1.2, usearrows=F)
> #행 네트워크
> R <- A%*%t(A)
> diag(R) <- 0
> degree(R, cmode="indegree", ignore.eval=F)
[1] 37 26 25 39 27 33 37 16 18 26 36 14 39 61 46 39 48 32 42 53 35 32 42 45
[25] 35 35
> round(closeness(1/R, ignore.eval=F), 2)
[1] 1.41 1.14 1.09 1.49 1.14 1.28 1.52 1.02 1.09 1.09 1.44 0.92 1.45 2.04
[15] 1.70 1.42 1.76 1.49 1.59 1.87 1.36 1.24 1.59 1.70 1.41 1.42
> round(closeness(1/R, cmode="suminvundir", ignore.eval=F), 2)
[1] 1.57 1.20 1.17 1.77 1.26 1.49 1.67 1.12 1.21 1.17 1.59 1.00 1.63 2.47
[15] 2.07 1.69 2.11 1.66 1.78 2.19 1.48 1.39 1.92 1.90 1.62 1.62
> #열 네트워크
> C <- t(A)%*%A
> diag(C) <- 0
> degree(C, cmode="indegree", ignore.eval=F)
[1] 11 36 62 38 10 15 9 11 16 8 18 18 18 8 34
> round(closeness(1/C, ignore.eval=F), 2)
[1] 1.55 2.79 3.58 3.00 1.70 1.97 1.55 1.70 2.25 1.55 2.01 1.97 1.97 1.70
[15] 2.63
> round(closeness(1/C, cmode="suminvundir", ignore.eval=F), 2)
[1] 1.64 3.54 4.54 3.37 1.80 2.16 1.64 1.80 2.51 1.64 2.20 2.16 2.16 1.80
[15] 3.20
> #평균 요소
> R.degree <- degree(B, cmode="indegree")[1:n]
> R.closeness1 <- closeness(B)[1:n]
> R.closeness2 <- closeness(B, cmode="suminvundir")[1:n]
> R.betweenness <- betweenness(B)[1:n]
> R.degree
[1] 3 3 2 3 3 3 3 4 3 4 2 3 2 4 7 5 5 6 5 5 5 3 3 4 5 3 3
> #열의 요소
> C.degree <- degree(B, cmode="indegree")[(n+1):(n+m)]
> C.closeness1 <- closeness(B)[(n+1):(n+m)]
> C.closeness2 <- closeness(B, cmode="suminvundir")[(n+1):(n+m)]
> C.betweenness <- betweenness(B)[(n+1):(n+m)]
> C.degree
[1] 3 11 22 12 3 4 4 4 6 3 4 5 5 3 9
```

J 클럽이 ‘평균’ 거리가 최소이다.

2. 같은 자료에서 자신 외 25명 CEO와의 '평균' 거리가 최소인 CEO를 찾아라.

```
> round(betweenness(R),2)
[1] 7.69 5.21 0.30 0.30 0.30 0.00 7.69 0.26 0.86 0.30 0.30 0.26 7.69 7.69
[15] 0.30 2.18 0.30 6.18 7.69 7.69 7.69 2.49 0.30 7.69 0.30 0.30
> round(betweenness(C),2)
[1] 3.70 8.14 21.40 13.94 2.19 2.53 1.40 4.20 3.99 1.90 3.02 0.57
[13] 4.22 0.33 6.47
```

1번 CEO가 '평균' 거리 최소이다.