

Resumen de las propiedades de las redes

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Propiedades generales

Membership

```
# Inicio temprano
```

```
summary(prop_graphs[[1]]$components$membership)
```

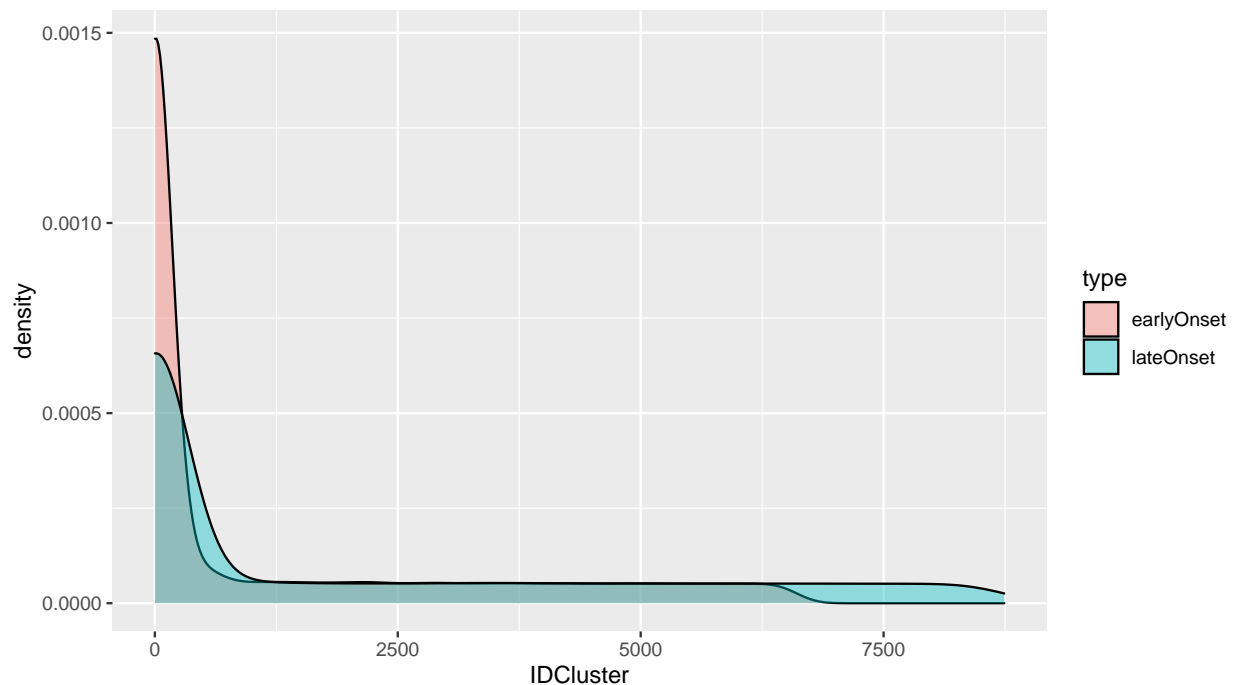
```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         1         1         1   1154   1829   6607
```

```
# Inicio tardio
```

```
summary(prop_graphs[[2]]$components$membership)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         1         1         1   1979   3893   8742
```

```
ggplot(data = data.frame(IDCluster = c(prop_graphs[[1]]$components$membership,
                                       prop_graphs[[2]]$components$membership),
                        type = rep(c("earlyOnset", "lateOnset"), each = 19542)),
       mapping = aes(x= IDCluster, fill = type)) + geom_density(alpha = 0.4)
```



```
#plot(density(prop_graphs[[1]]$components$membership), xlab = "ID del cluster")
#lines(density(prop_graphs[[2]]$components$membership))
```

Número de Clusters

```
kable(data.frame(earlyOnset = prop_graphs[[1]]$components$no,
                 lateOnset = prop_graphs[[2]]$components$no))
```

earlyOnset	lateOnset
6607	8742

Tamaño de los clusters

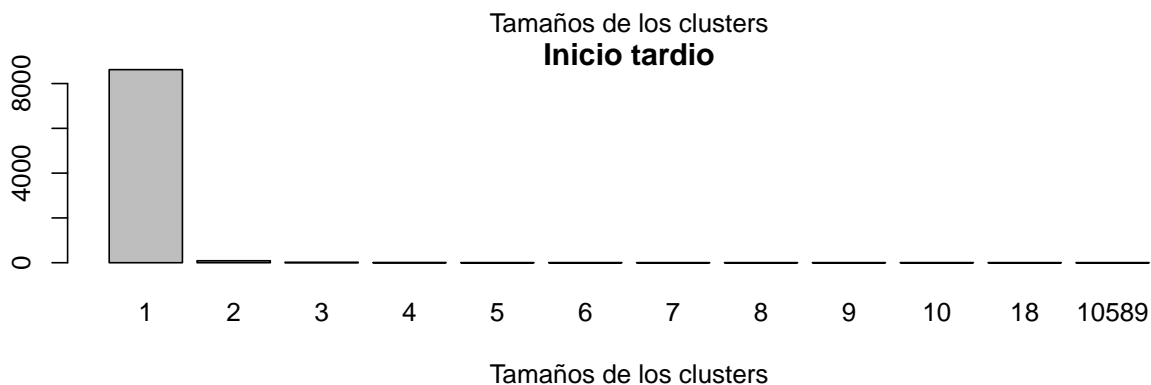
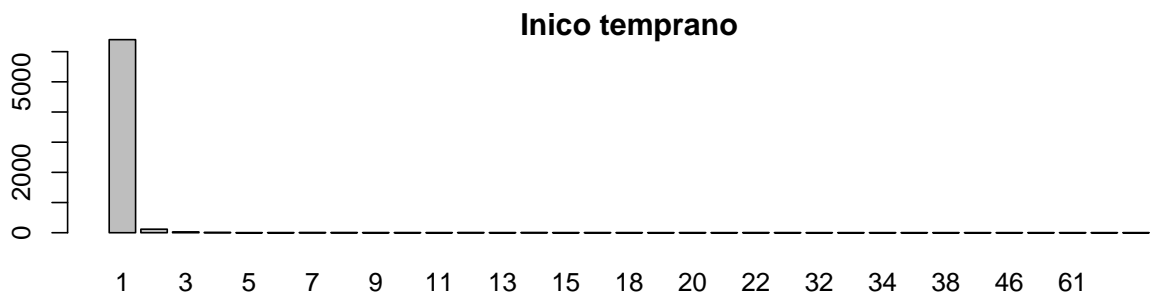
```
# Inicio temprano
summary(prop_graphs[[1]]$components$csz)
```

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
##      1.000     1.000     1.000     2.958     1.000 11738.000
```

```
# Inicio tardio
summary(prop_graphs[[2]]$components$csz)
```

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
##      1.000     1.000     1.000     2.235     1.000 10589.000
```

```
par(mfrow = c(2,1), mar = c(4, 3, 1, 1))
barplot(table(prop_graphs[[1]]$components$csz), xlab = "Tamaños de los clusters",
        main = "Inicio temprano")
barplot(table(prop_graphs[[2]]$components$csz), xlab = "Tamaños de los clusters",
        main = "Inicio tardio")
```



Rutas más cortas entre nodos

```
kable(data.frame(earlyOnset = prop_graphs[[1]]$average.path.length,  
                 lateOnset = prop_graphs[[2]]$average.path.length))
```

earlyOnset	lateOnset
4.109832	4.608719

Transitividad

```
kable(data.frame(earlyOnset = prop_graphs[[1]]$transitivity,  
                 lateOnset = prop_graphs[[2]]$transitivity))
```

earlyOnset	lateOnset
0.5314521	0.5385246

Diametro

```
kable(data.frame(earlyOnset = prop_graphs[[1]]$diameter,  
                 lateOnset = prop_graphs[[2]]$diameter))
```

earlyOnset	lateOnset
22	30

Propiedades de los nodos

Degree

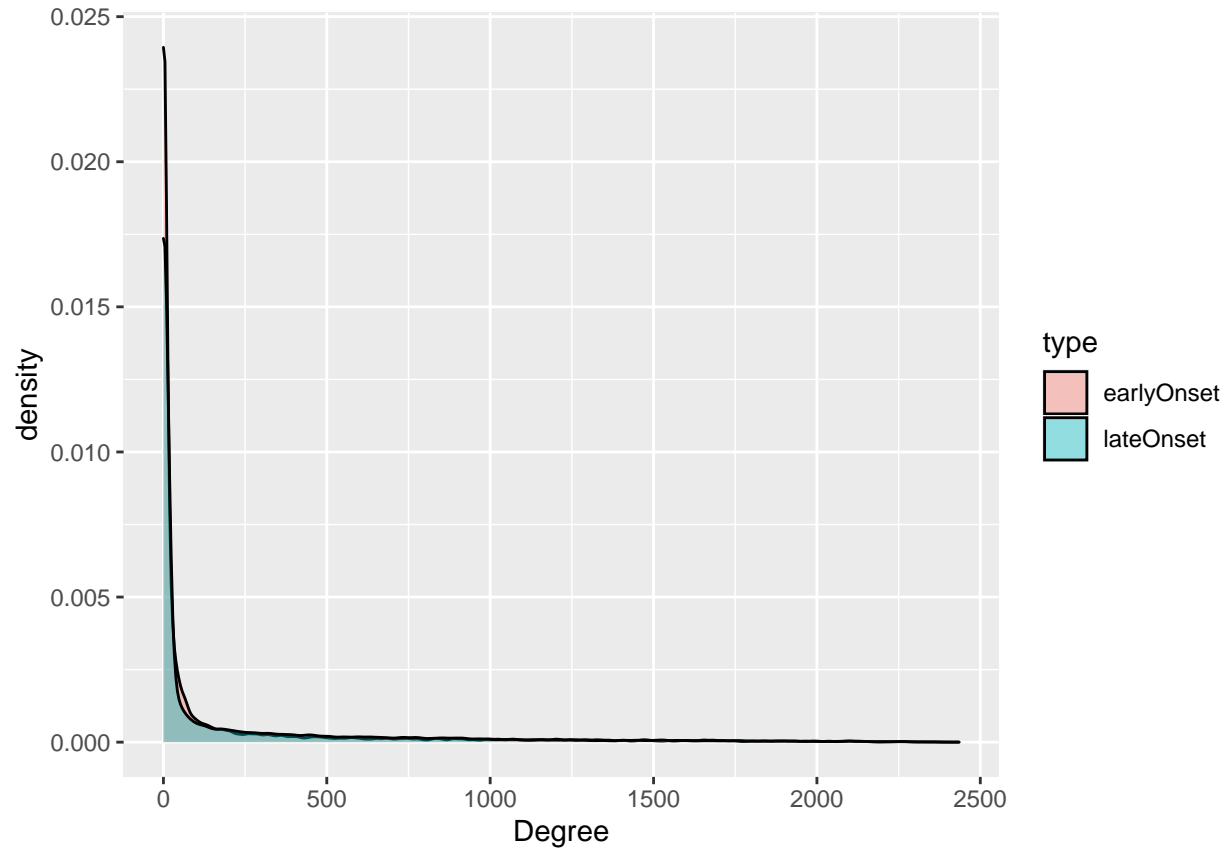
```
# Inicio temprano  
summary(prop_graphs[[1]]$nodes$degree)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   
##      0.0      0.0      7.0   179.7   93.0  2435.0
```

```
# Inicio tardío  
summary(prop_graphs[[2]]$nodes$degree)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   
##      0.0      0.0      2.0   195.4   148.8  2396.0
```

```
ggplot(data = data.frame(Degree = c(prop_graphs[[1]]$nodes$degree,  
                                   prop_graphs[[2]]$nodes$degree),  
                        type = rep(c("earlyOnset", "lateOnset"), each = 19542)),  
       mapping = aes(x= Degree, fill = type)) + geom_density(alpha = 0.4)
```



Betweenness

```
# Inicio temprano
```

```
summary(prop_graphs[[1]]$nodes$betweenness)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         0         0       3  10964   8399 3386132
```

```
# Inicio tardio
```

```
summary(prop_graphs[[2]]$nodes$betweenness)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         0         0         0  10352   2088 6562407
```

Transitividad

```
# Inicio temprano
```

```
summary(prop_graphs[[1]]$nodes$transitivity)
```

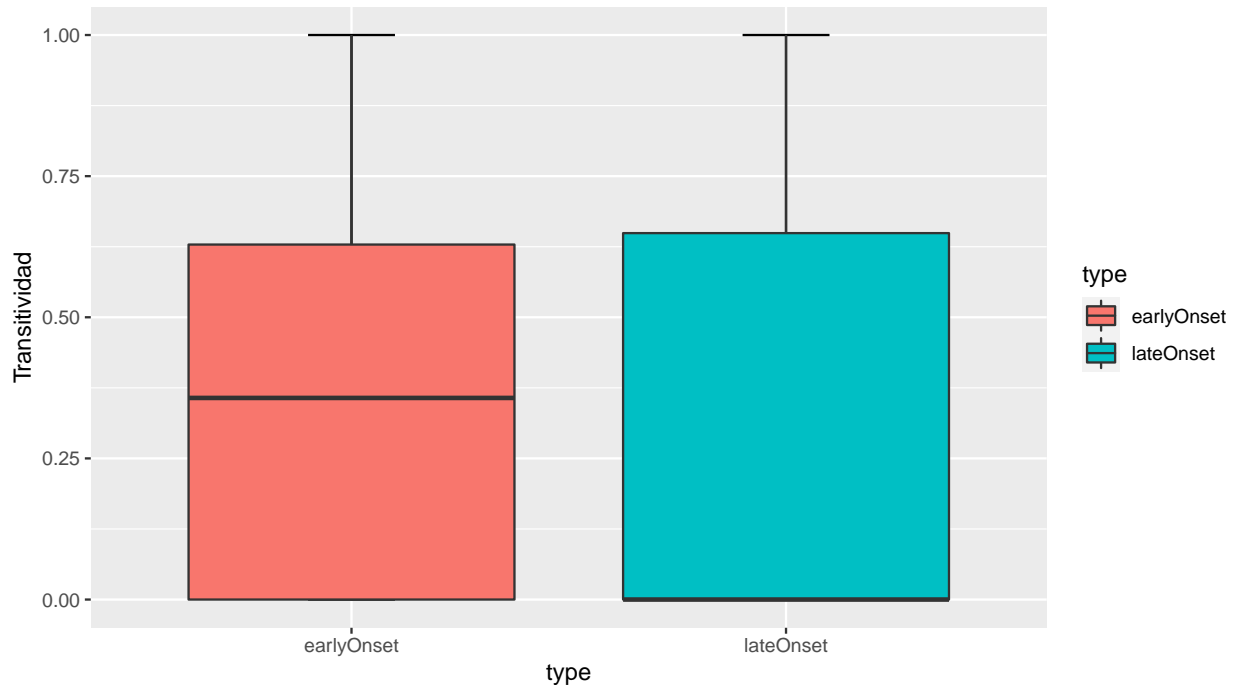
```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000 0.3571 0.3552 0.6288 1.0000
```

```
# Inicio tardio
```

```
summary(prop_graphs[[2]]$nodes$transitivity)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.0000 0.0000 0.0000 0.3258 0.6491 1.0000
```

```
ggplot(data = data.frame(transitivity = c(prop_graphs[[1]]$nodes$transitivity,
                                         prop_graphs[[2]]$nodes$transitivity),
                        type = rep(c("earlyOnset", "lateOnset"), each = 19542)),
      mapping = aes(x= type, y = transitivity, fill = type)) +
  scale_y_continuous(name = "Transitividad") +
  stat_boxplot(geom = "errorbar", width = 0.2) + geom_boxplot()
```



Clustering Louvain

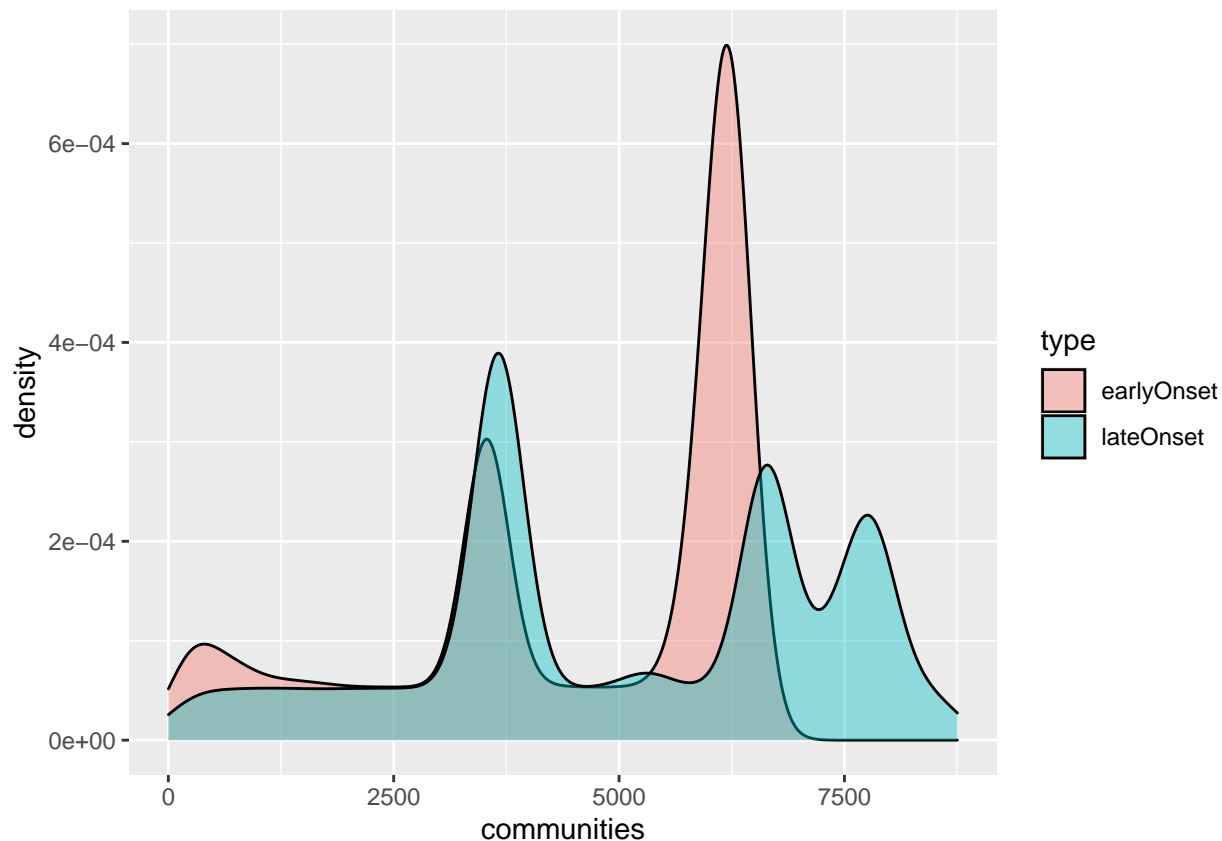
```
# Inicio temprano
summary(prop_graphs[[1]]$nodes$comm.louvain)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         1    3532    5612    4495    6182    6637
```

```
# Inicio tardio
summary(prop_graphs[[2]]$nodes$comm.louvain)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##         1    3627    5062    5044    6685    8753
```

```
ggplot(data = data.frame(communities = c(prop_graphs[[1]]$nodes$comm.louvain,
                                         prop_graphs[[2]]$nodes$comm.louvain),
                        type = rep(c("earlyOnset", "lateOnset"), each = 19542)),
      mapping = aes(x= communities, fill = type)) + geom_density(alpha = 0.4)
```



Propiedades de los edges

Inicio temprano

```
summary(prop_graphs[[1]]$edges$betweenness)
```

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.    Max.
##      1.0     14.6     29.1    161.2    70.1 2302276.6
```

Inicio tardio

```
summary(prop_graphs[[2]]$edges$betweenness)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       1      11     24     135    58 6533282
```

Exploración de algunos genes

Valores membership de los genes pertenecientes a clusters con el mayor tamaño

```
prop_graphs$earlyOnset$components$membership[prop_graphs$earlyOnset$components$csizesize == 11738]
```

```
## ENSG00000167578 ENSG00000231389 ENSG00000171302
##              1              1              4501
```

Valores membership de genes pertenecientes a clusters de un tamaño mayor a 50

```
prop_graphs$earlyOnset$components$membership[prop_graphs$earlyOnset$components$csizesize > 50 ]
```

```
## ENSG00000167578 ENSG00000153015 ENSG00000115685 ENSG00000231389 ENSG00000159592
##              1              1              1              1              1
```

```
## ENSG00000198373 ENSG00000171302 ENSG00000255337 ENSG00000254016
##           1           4501           4518           4569
```

Gen con el mayor degree

```
prop_graphs$earlyOnset$nodes[c(1, 2)] %>% filter(degree ==2435)
```

```
##           name degree
## ENSG00000085433 ENSG00000085433 2435
```

Genes con niveles altos de degree

```
prop_graphs$earlyOnset$nodes[c(1, 2)] %>% filter(degree >= 2300)
```

```
##           name degree
## ENSG00000159082 ENSG00000159082 2356
## ENSG00000091972 ENSG00000091972 2422
## ENSG00000129625 ENSG00000129625 2321
## ENSG00000111726 ENSG00000111726 2366
## ENSG00000129636 ENSG00000129636 2308
## ENSG00000155097 ENSG00000155097 2399
## ENSG0000014641 ENSG0000014641 2353
## ENSG00000133318 ENSG00000133318 2335
## ENSG00000085433 ENSG00000085433 2435
## ENSG00000170027 ENSG00000170027 2320
## ENSG00000089818 ENSG00000089818 2374
## ENSG00000070087 ENSG00000070087 2333
## ENSG00000131507 ENSG00000131507 2352
## ENSG00000104529 ENSG00000104529 2362
```

Redes

Early Onset

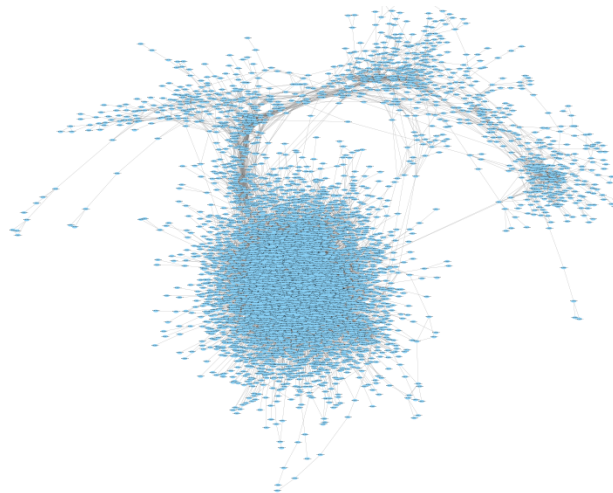


Figure 1: Red Inicio Temprano Alzheimer



Figure 2: Red Inicio Tardio Alzheimer