Manipulação de grafos no R

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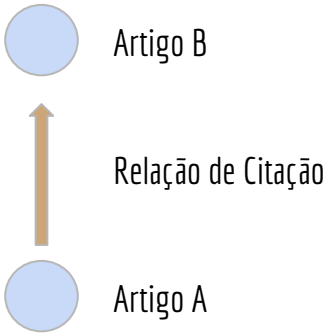
Sumário

Nesta apresentação serão tratados os pacotes:

- igraph, threejs, networkD3 e visNetwork (análise de grafos e visualização)
- neo4r (driver do banco de dados Neo4j)

Problema

Modelar os artigos científicos e as relações de citações entre eles



- Artigo A **cita** o Artigo B
- Artigo B é **citado** pelo Artigo A

Visualizar e interagir com a rede de citações

igraph

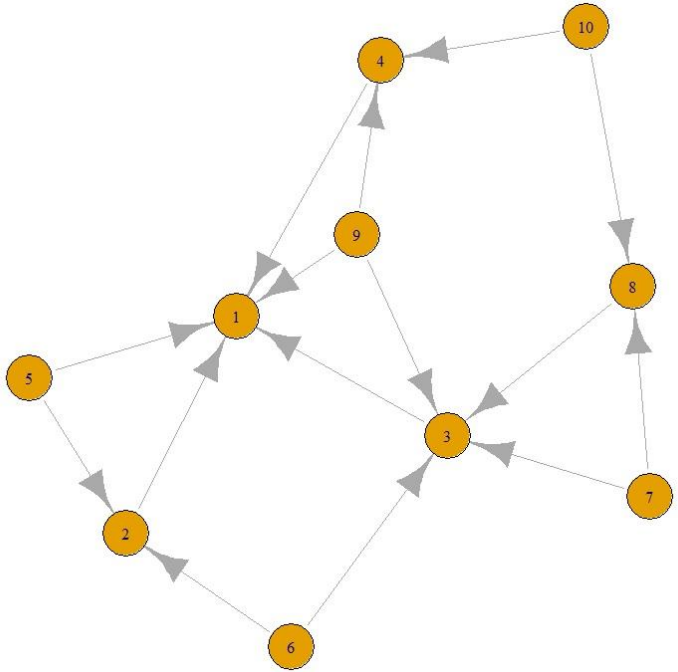
```
1 library(igraph)
2 net <- graph_from_data_frame(d=relationship, vertices=nodes, directed=T)
```

nodes

	id	title	year
1	1	Paper_A	2017
2	2	Paper_B	2018
3	3	Paper_C	2018
4	4	Paper_D	2018
5	5	Paper_E	2019
6	6	Paper_F	2019
7	7	Paper_G	2020
8	8	Paper_H	2020
9	9	Paper_I	2020
10	10	Paper_J	2021

relationship

	from	to
1	2	1
2	3	1
3	4	1
4	5	1
5	5	2
6	6	2
7	6	3
8	7	3
9	7	8
10	8	3
11	9	3
12	9	4
13	9	1
14	10	8
15	10	4



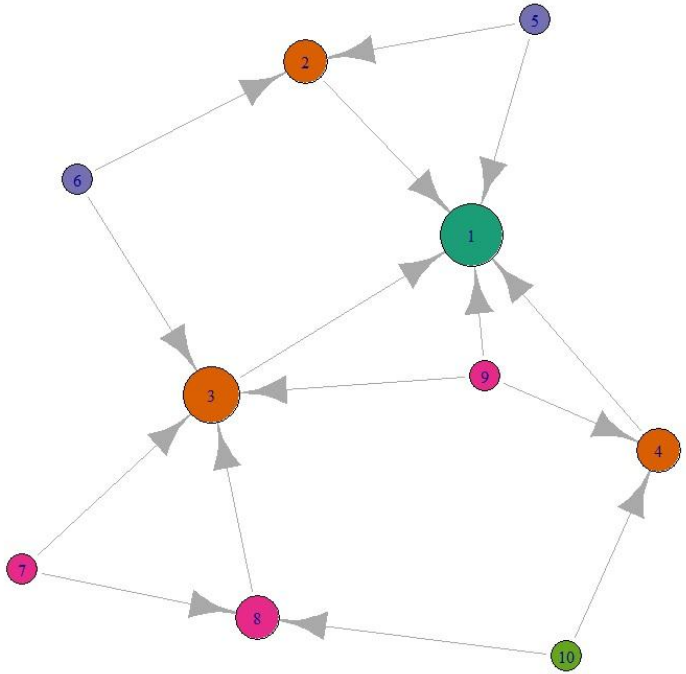
igraph

Tamanho e cor dos nós do grafo

```
degree_value <- degree(net, mode = "in")
nodes$value <- degree_value[match(nodes$id, names(degree_value))]  #Number of Citations

nodes<- nodes %>% mutate(color= colorBrewer[level], label = title )
V(network)$color <- colorBrewer[nodes$level]   #Node Color

nodes<- nodes %>% mutate(size = (value + 5) * 2 )
V(network)$size <- (V(network)$value + 5) * 2  #Node Size

network <- graph_from_data_frame(d=relationship, vertices=nodes, directed=T)
plot(network)
```

igraph

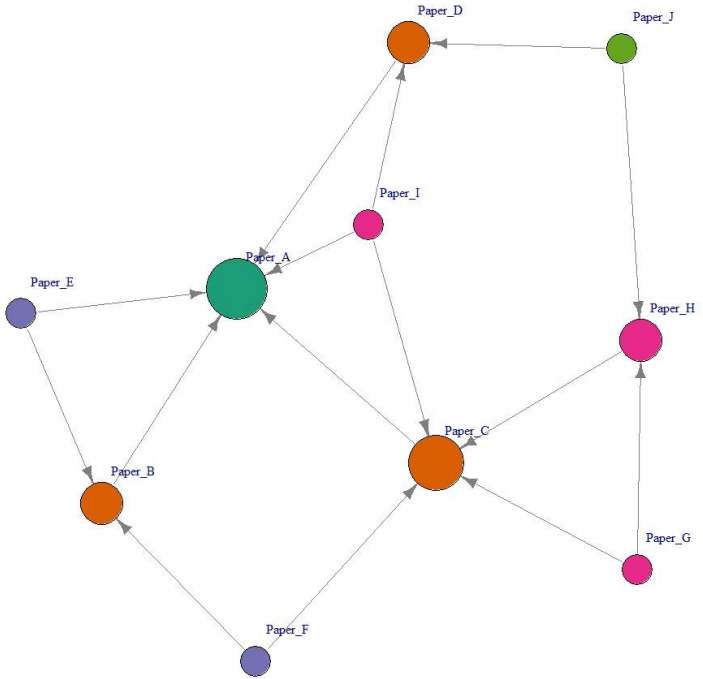
Tamanho e cor dos nós do grafo



igraph

Configurações relacionadas aos nós e arestas

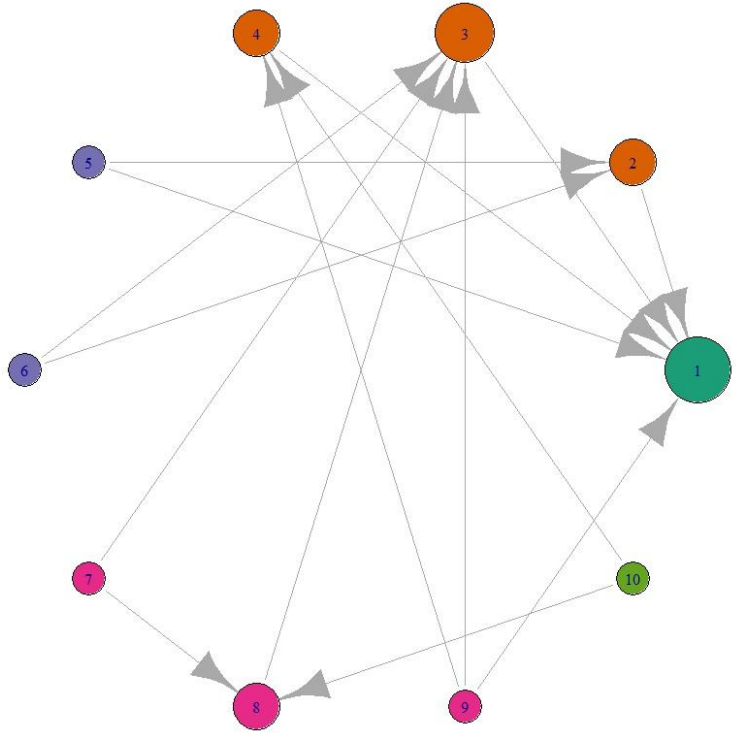
```
plot(network, edge.arrow.size=0.4,
     edge.color="gray50",
     vertex.label= V(network)$title,
     vertex.label.dist=2,
     margin=-0.1)
```



igraph

Configurações de layout

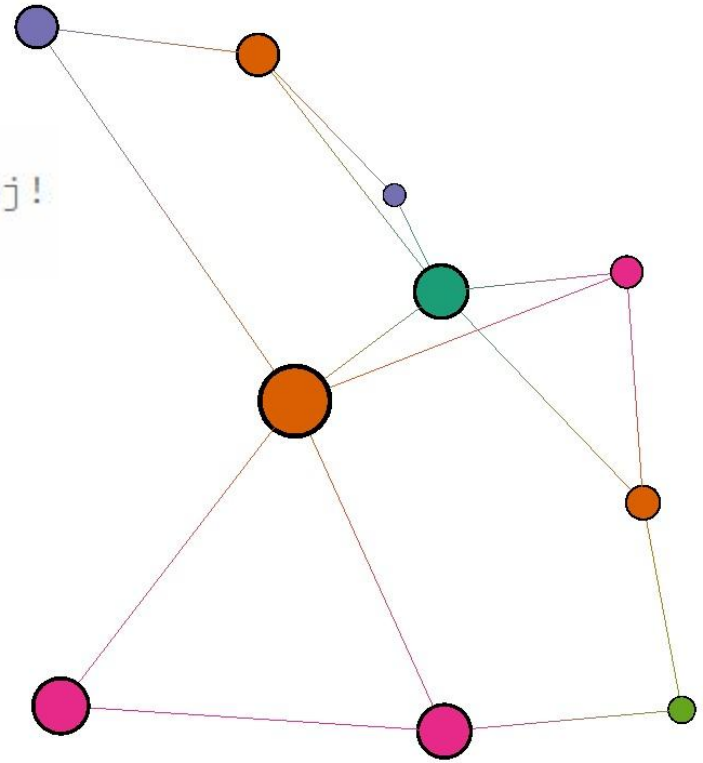
```
1 layout <- layout_in_circle(network)
2 plot(network, layout=layout)
```



threejs

Gráficos em 3D

```
1 library(threejs)
2 graph_js <- graphjs(network) #READ igraph Obj!
3 print(graph_js)
```

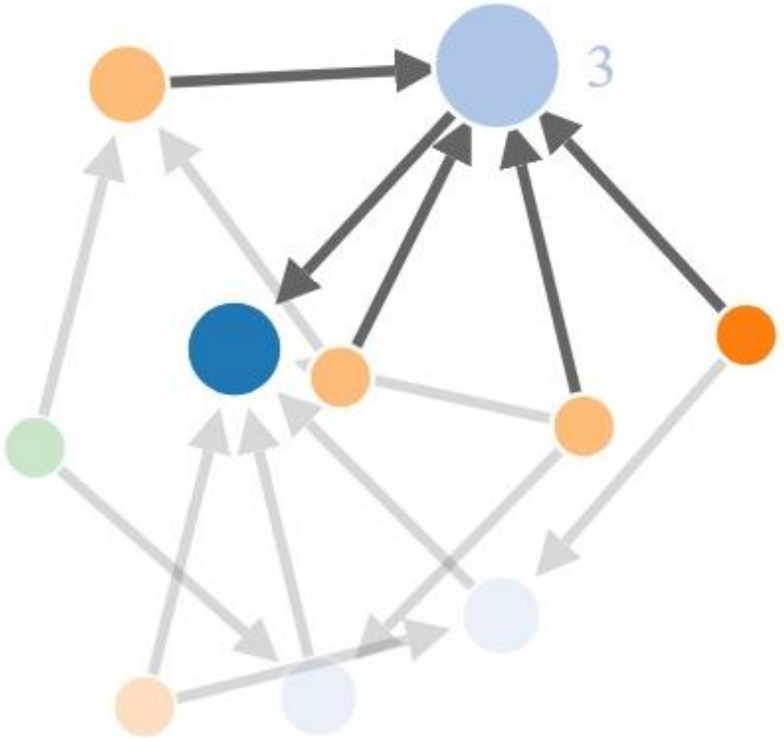


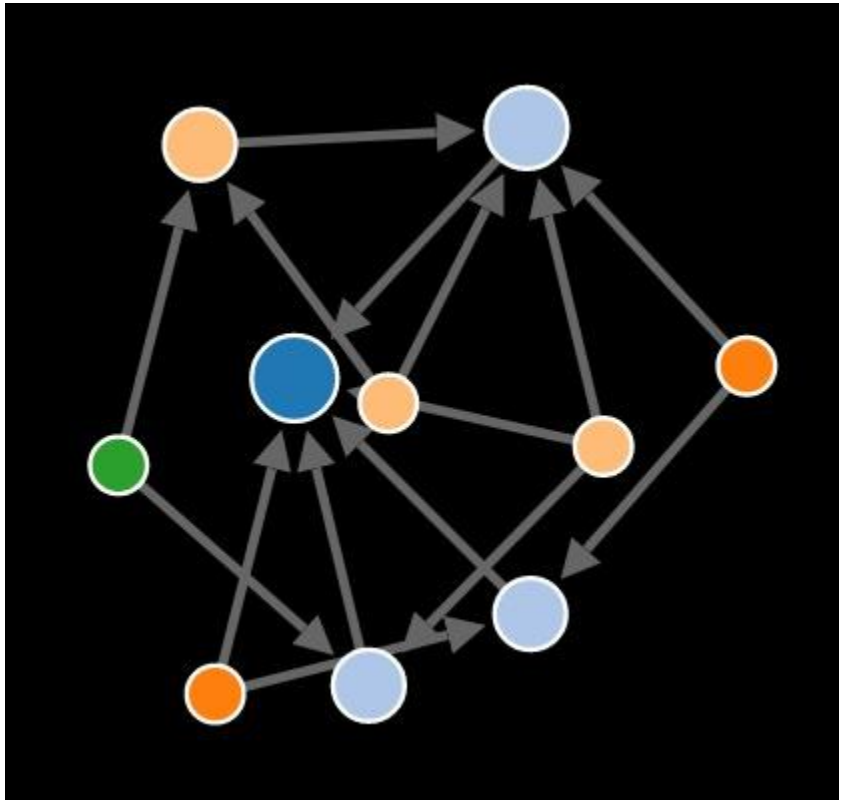
networkD3

Gráficos interativos

```
library(networkD3)

network <- graph_from_data_frame(d=relationship, vertices=nodes, directed=T)
GraphD3 <- igraph_to_networkD3(network, group = nodes$level,what = 'both')

GraphD3$nodes$size<- nodes$size
GraphD3$links$value<- 10

#Force Directed Network
fn<-forceNetwork(Links = GraphD3$links, Nodes = GraphD3$nodes, Source = 'source',
             Target = 'target', NodeID = 'name', Group = 'group',
             zoom = TRUE, linkDistance = 100,Nodesize = 'size',fontSize = 18,
             fontFamily = "serif",charge = -30,linkColour = "#666",
             opacity = 1, arrows = TRUE, bounded = FALSE, opacityNoHover = 0,
             clickAction = NULL,Value = "value")
```

networkD3

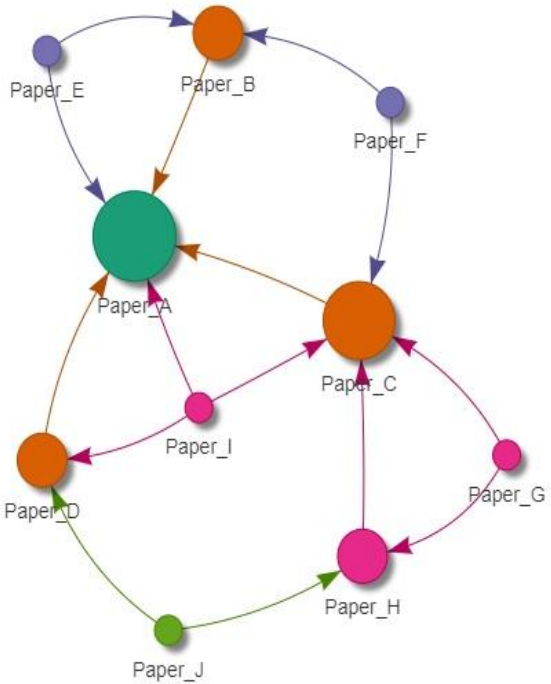




visNetwork

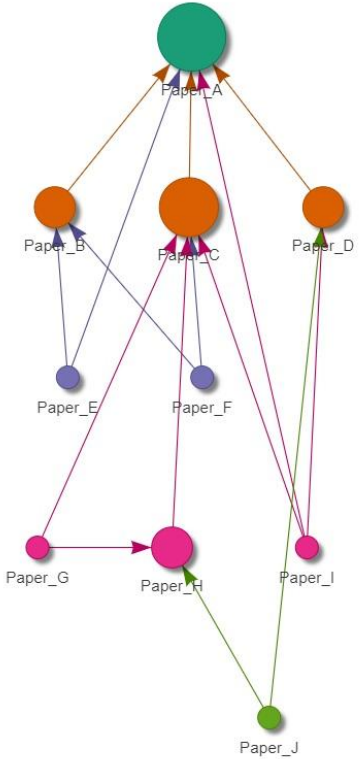
Configurações relacionadas aos nós e arestas

```
1  library(visNetwork)
2
3  visNetwork(nodes,relationship) %>%
4    visNodes(
5      shape = "dot",
6      shadow = list(enabled = TRUE, size = 5)) %>%
7    visEdges(arrows ="to")
```

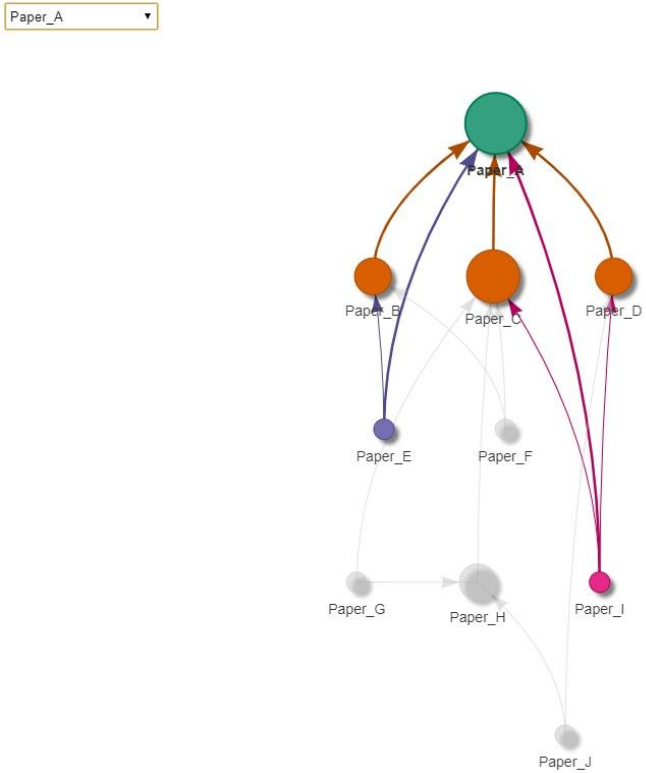


visNetwork

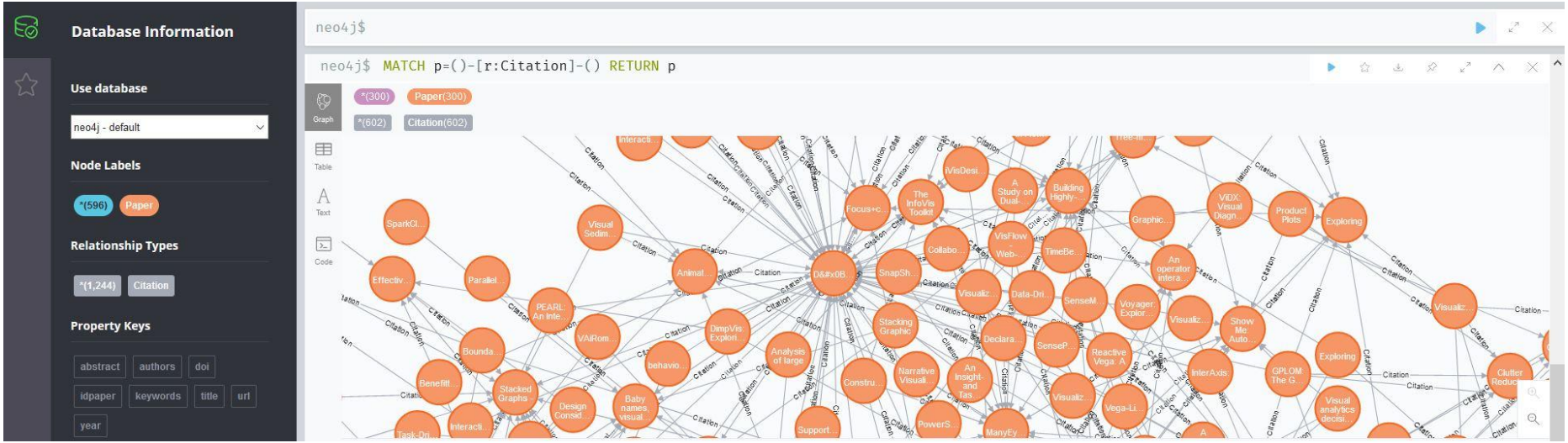
```
visHierarchicalLayout()
```




```
visOptions(nodesIdSelection = TRUE)
```



Banco de dados Neo4j



neo4r

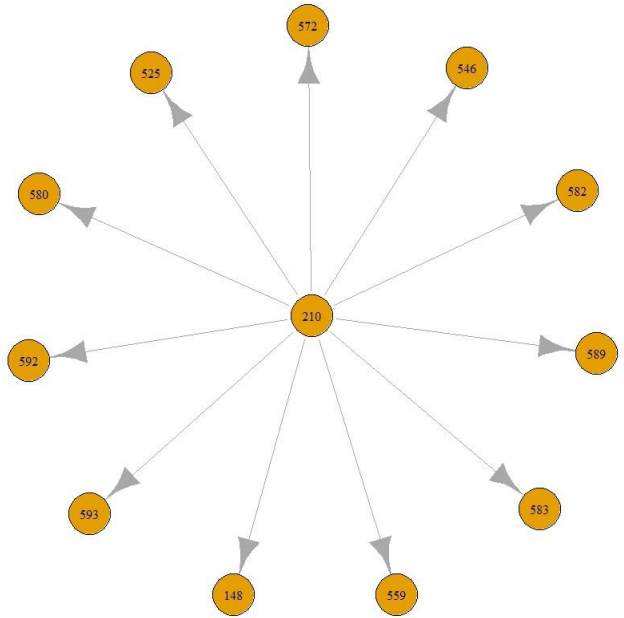
Configurações de conexão e consultas

```
1  library(neo4r)
2
3  library(dplyr)
4  library(purrr)
5
6  con <- neo4j_api$new(
7    url = "http://localhost:7474",
8    user = "neo4j",
9    password = "graphpass"
10 )
11
12 paper210_Out <- 'MATCH (a:Paper{idpaper:"210"}) -[r:Citation]-> (b:Paper) RETURN a,r,b' %>%
13                                 call_neo4j(con, type = "graph")
14
15 nodes<-paper210_Out$nodes
16 relationship<-paper210_Out$relationships
```

neo4j

Utilizando o pacote igraph

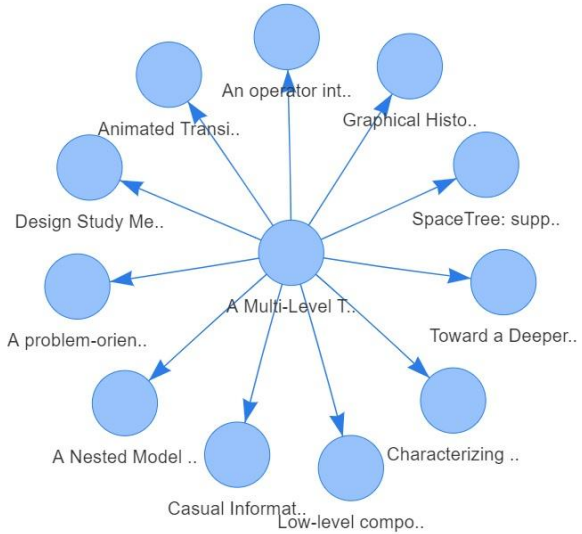
```
1 graph_object <- igraph::graph_from_data_frame(
2   d = paper210_Out$relationships,
3   directed = TRUE,
4   vertices = paper210_Out$nodes
5 )
6 plot(graph_object,
7      vertex.label= V(graph_object)$idpaper)
```



neo4j

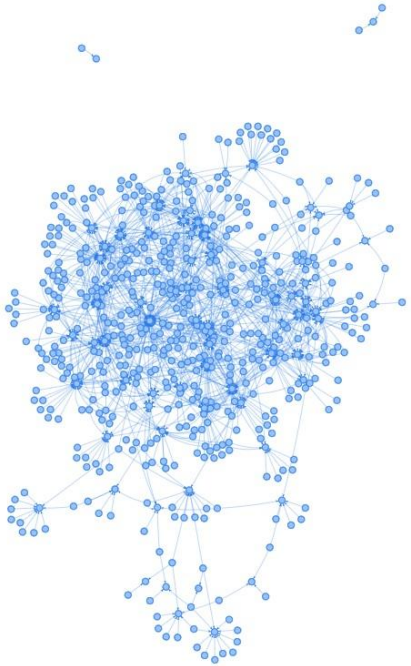
Utilizando o pacote visNetwork

```
1 visNetwork(paper210_Out$nodes,paper210_Out$relationships)%>%
2             visEdges(arrows = 'to', smooth =T)
```



neo4j

Visualização do grafo de citações utilizando o pacote visNetwork



Referências

- Colin Fay. Using R & Neo4j. 2019 https://neo4j-rstats.github.io/user-guide
- Katya Ognyanova. Static and dynamic network visualization. 2019
- B. Thieurmel. Introduction to visNetwork. 2019
- Allaire JJ. networkD3: D3 JavaScript Network Graphs from R. 2017
- igraph. The network analysis package. https://igraph.org/

Obrigado!