# Annex 6

## Authority arises from networks

The article's writer is supposed to be the authoritative source for readers, he/she is central for users that are reading the article. The verification of the author's centrality is a goal of the dissertation, the observation of the network created around the news is a mean for verifying the author's centrality. When the network's shape is a simple star the verification is easy, the author is in the middle of all users. When the shape becomes more complicated than a simple star, some other authorities could arise, they are users that captured the attention of other users and are able to shift the discussion around their views instead of the views presented by the article text. In order to verify this possible shift an algorithm developed by Kleinberg (1999) is applied to the network nodes, the algorithm's name is "Kleinberg Centrality". Given that a node represents a user, the tie represents a text, in the specific case of a network created around the news the tie is a comment. Kleinberg Centrality introduces the notion of "hub", in our context a hub is a node connected to other nodes, more nodes are connected to a hub more score is attributed to the hub. Authority is a node connected with hubs highly scored.
Only those networks with significant Kleinberg Centrality were chosen.
Note that just networks generated by Facebook commenting system returned significant results, networks generated by Twitter and newspapers' web pages did not generate significant results.

The next table lists the set of comments that generated networks with significant authorities

| date of article | media | Comments media | Comment n. | article n. | Jaccard value | Comments network shape | Comments network diameter |
|---|---|---|---|---|---|---|---|
| 30/01/19 | Independent | Facebook | 228 | 32 | 0.2 | Complex star with stars and lines | 4 |
| 07/02/19 | Daily Mail | Facebook | 159 | 53 | 0.25 | Complex star with stars and lines | 3 |
| 23/01/19 | Independent | Facebook | 229 | 30 | 0.27 | Complex star with stars and lines | 4 |
| 22/07/18 | Independent | Facebook | 155 | 29 | 0.28 | Complex star with stars and lines | 4 |
| 22/07/18 | Daily Express | Facebook | 160 | 110 | 0.33 | Complex star with stars and lines | 4 |

The R programming language code that generated the graphic representation of Kleinberg Centrality is the following

```
library(igraph)
ph <- vector('character');
for (indf in 1:rows_df) {
            ph <- c(ph,c(df[indf,7],df[indf,6]))
      }
gr <- graph(ph,directed = FALSE)
di <- diameter(gr)
as <- authority_score(gr, weights=NA)$vector
par(mfrow=c(1,2))
png(filename = paste0(dir_graph,'authority_',cm_num,'.png'),width = 1920,
height = 1920)
plot(gr, vertex.size=as*30, vertex.size = 6, vertex.label.cex = 1, edge.width =
2, main=paste('Authorities, set of comments n.', cm_num) )
dev.off()
```

The following pictures are the graphic representation of Kleinberg Centrality applied to networks listed in the above table.


*Illustration 1: Article n. 29, comments n. 155, diameter 4, Jaccard 0.28*

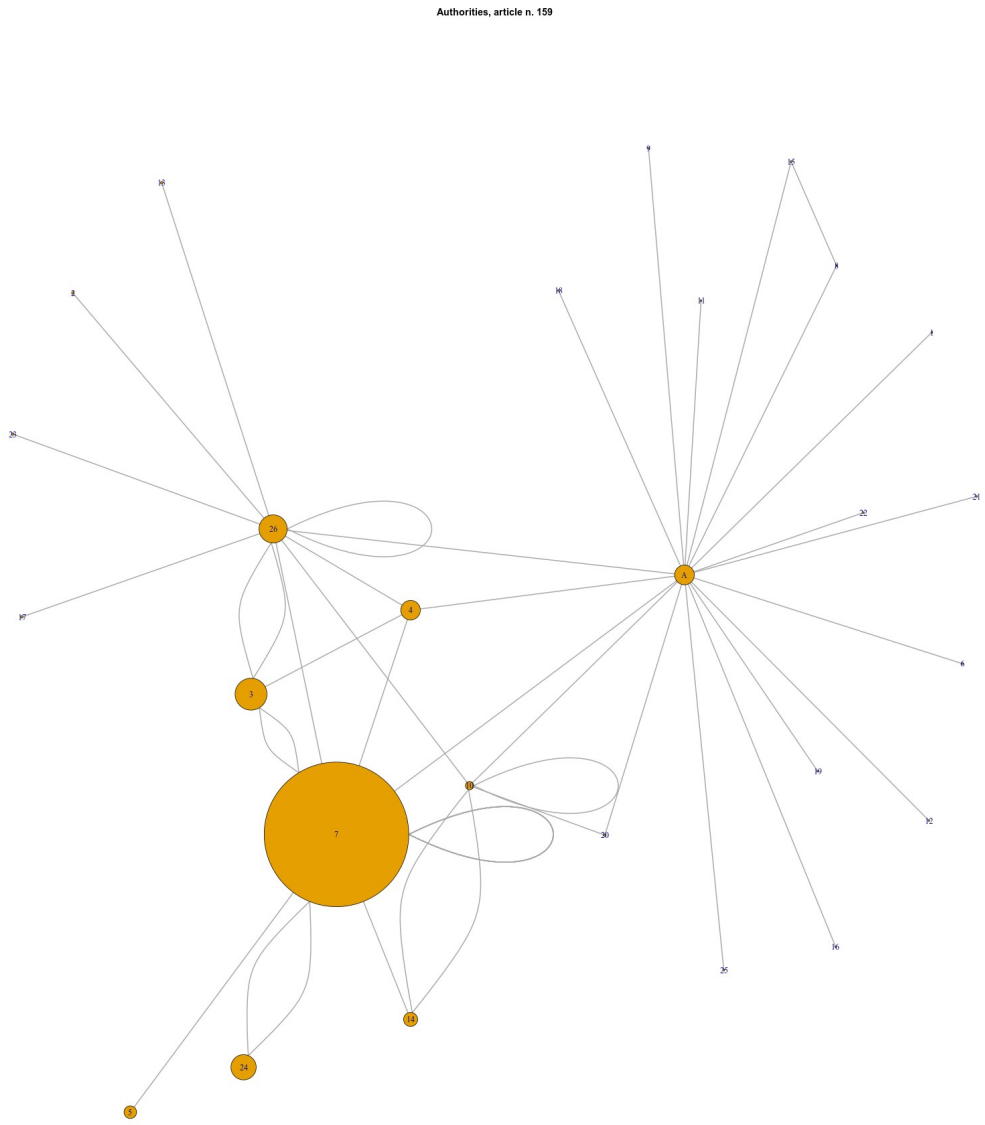


*Illustration 2: Article n. 53, comments n. 159, diameter 3, Jaccard 0.25*

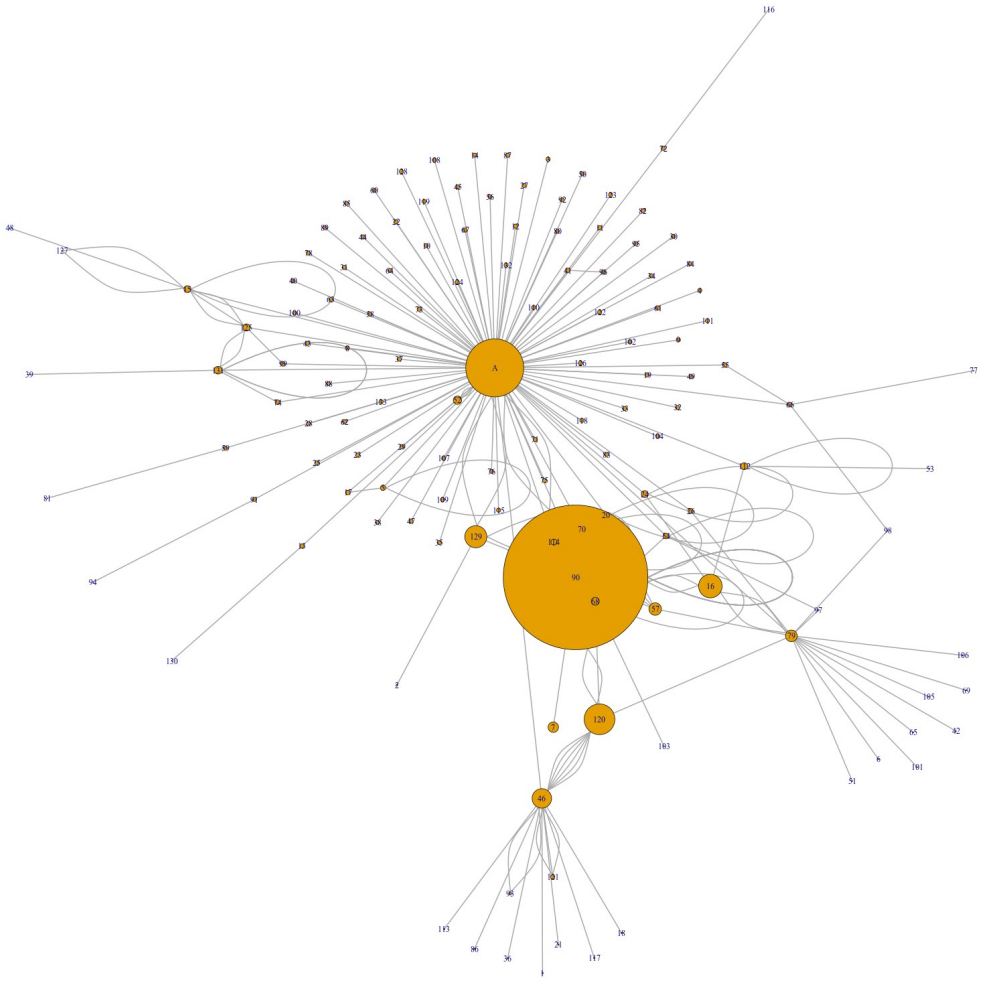


*Illustration 3: Article n. 110, comments n. 160, diameter 4, Jaccard 0.33*

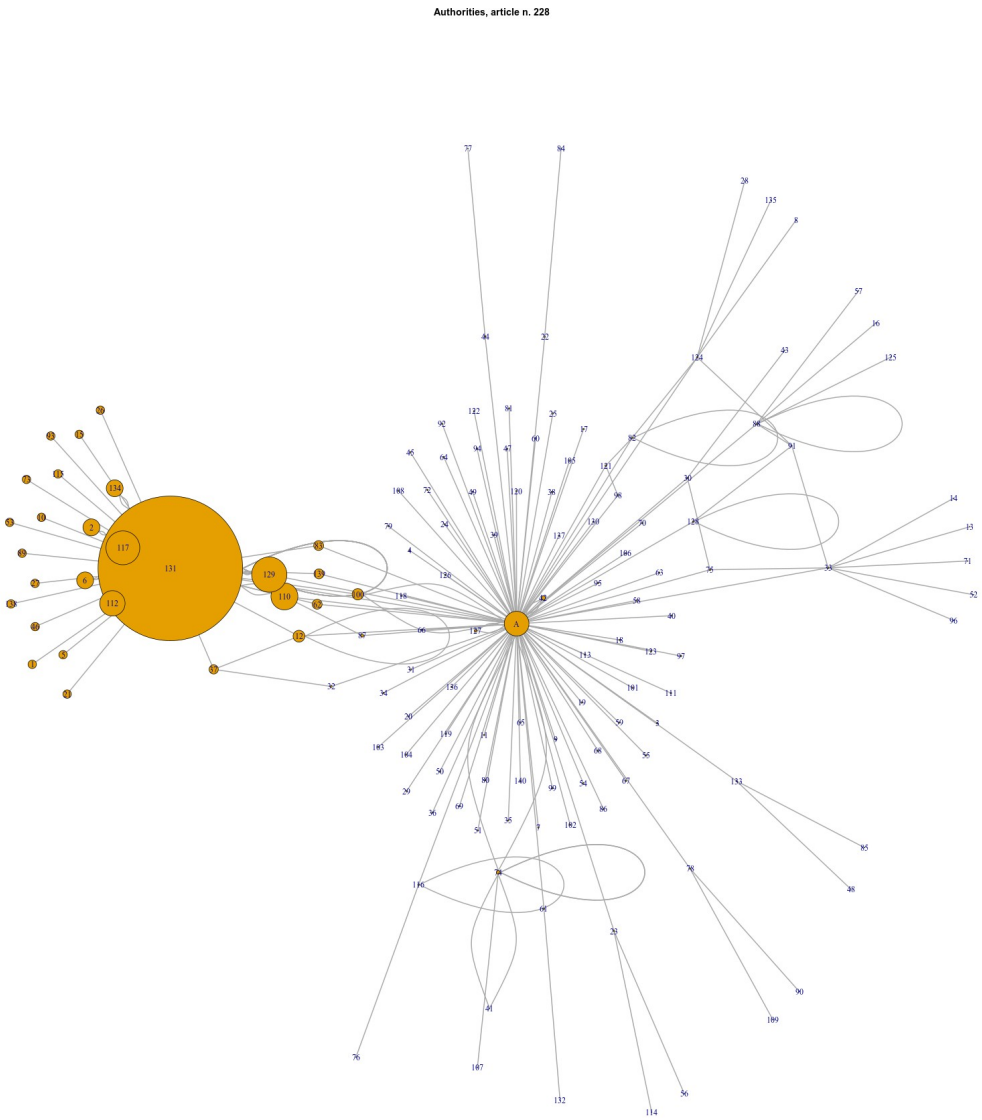


*Illustration 4: Article n. 32, comments n. 228, diameter 4, Jaccard 0.2*


*Illustration 5: Article n. 30, comments n. 229, diameter 4, Jaccard 0.27*

## References

Kleinberg, J. (1999). Authoritative Sources in a Hyperlinked Environment. J. ACM, 46, 604--632. doi: 10.1145/324133.324140