Network analysis in R: A tidy approach

NETWORK ANALYSIS IN THE TIDYVERSE

Massimo Franceschet

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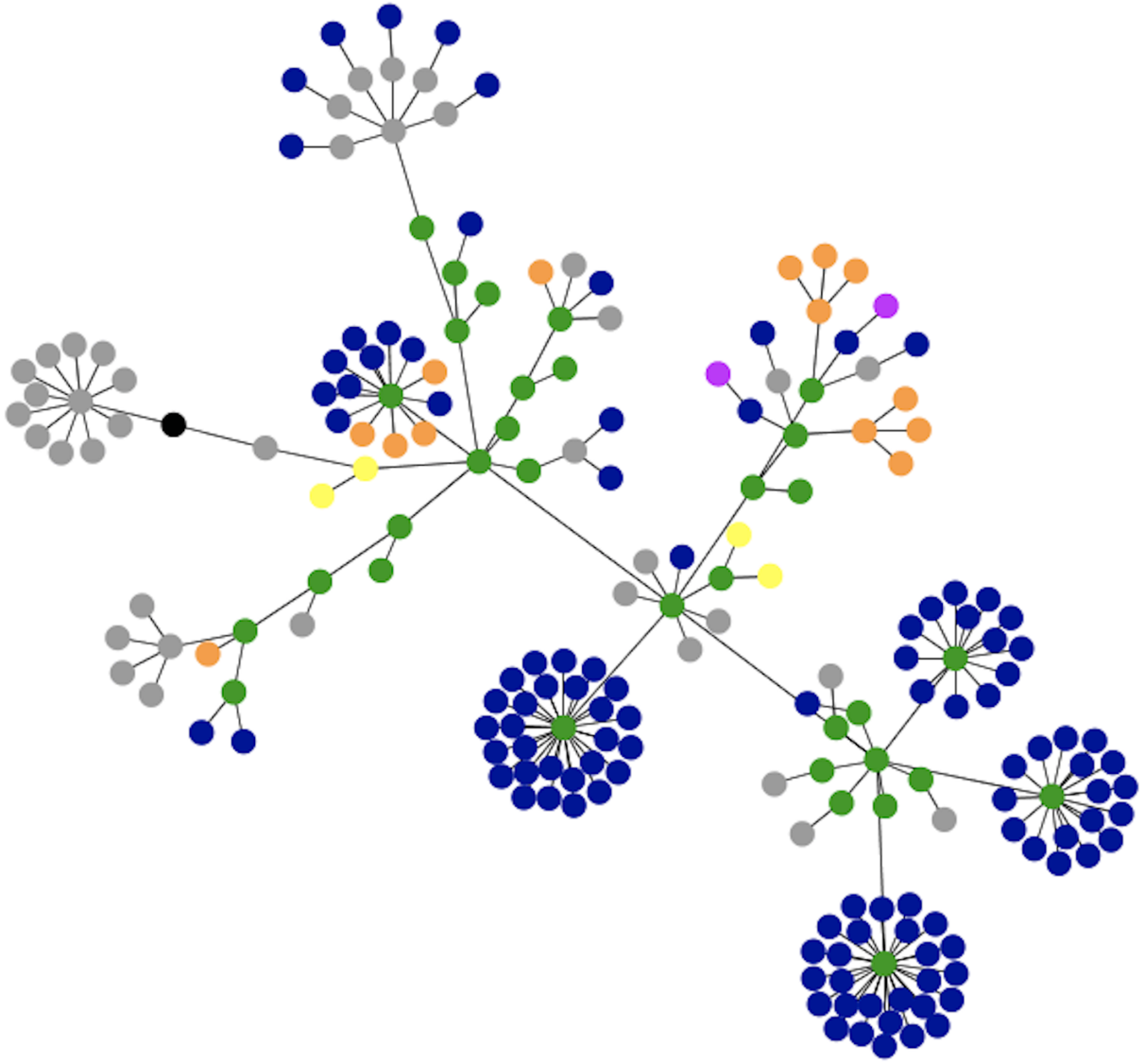
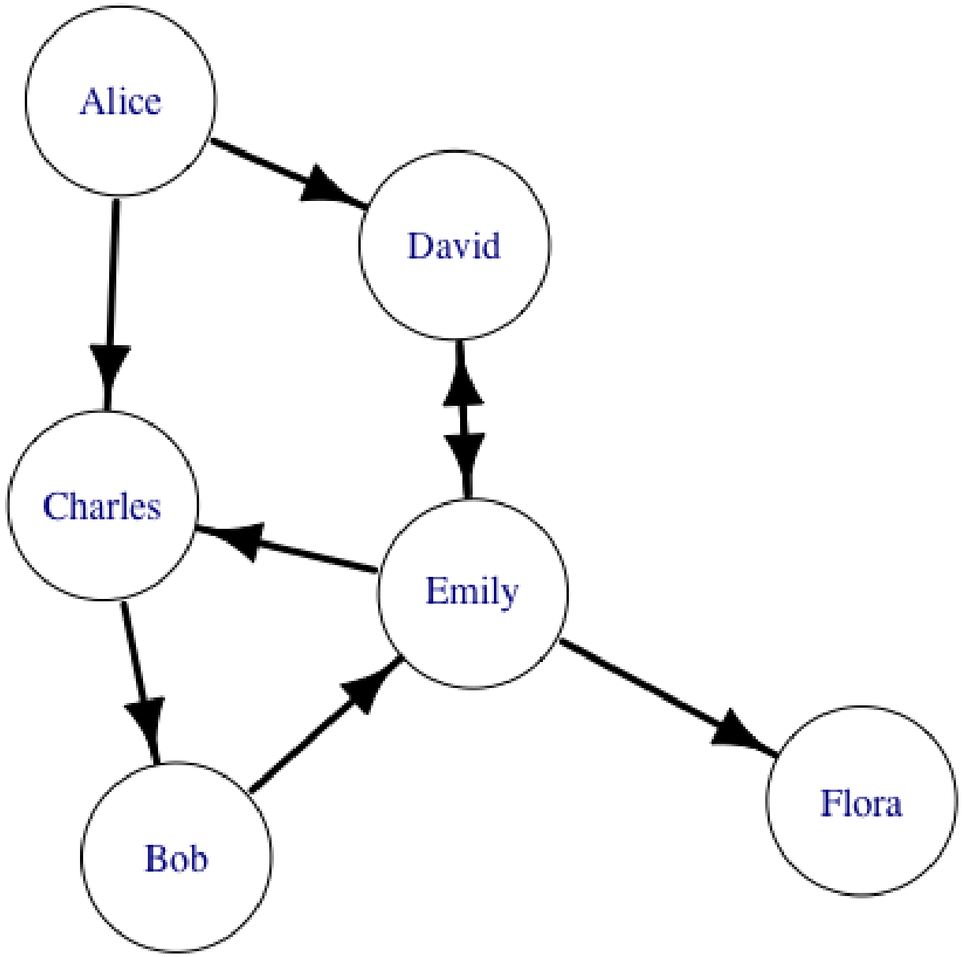
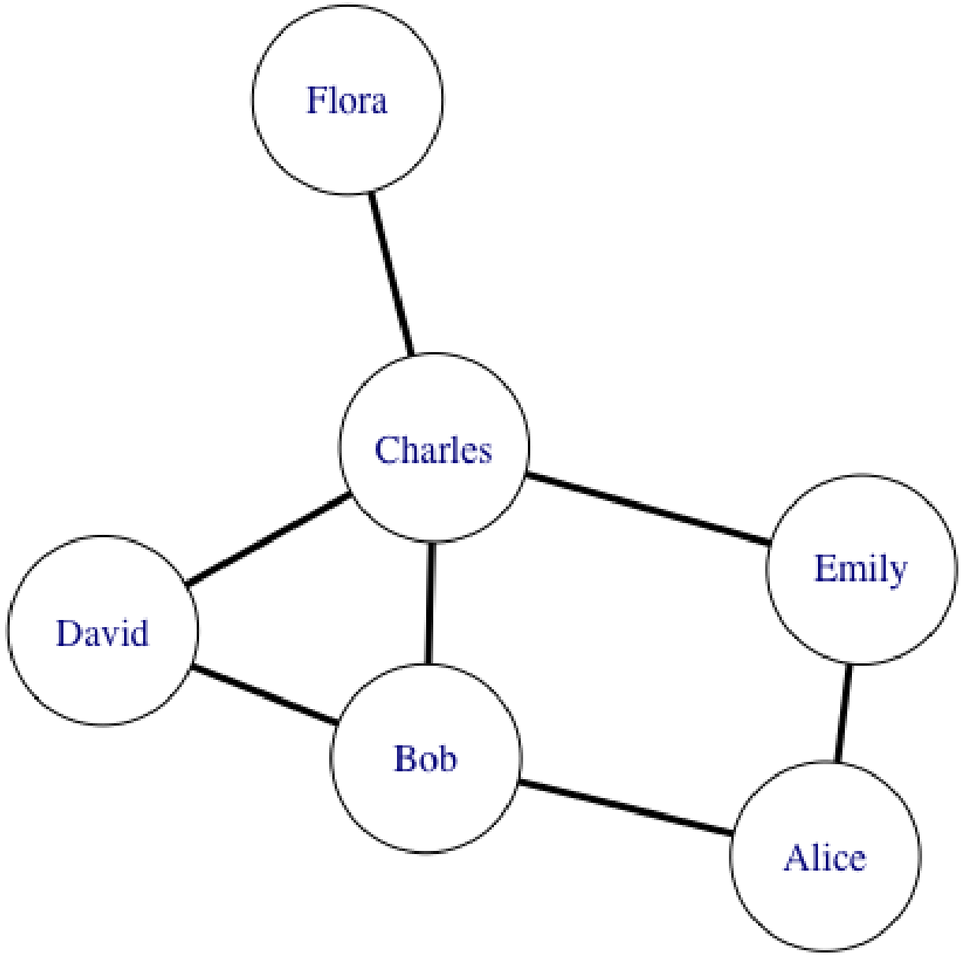
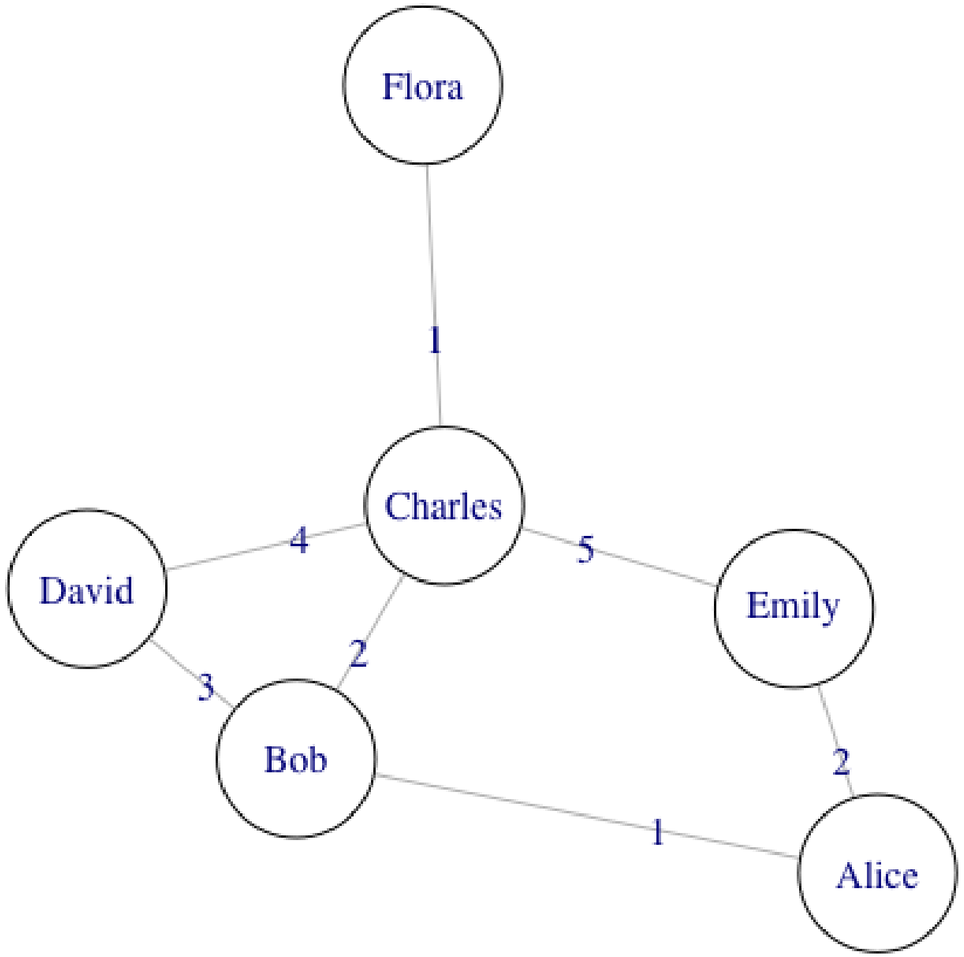
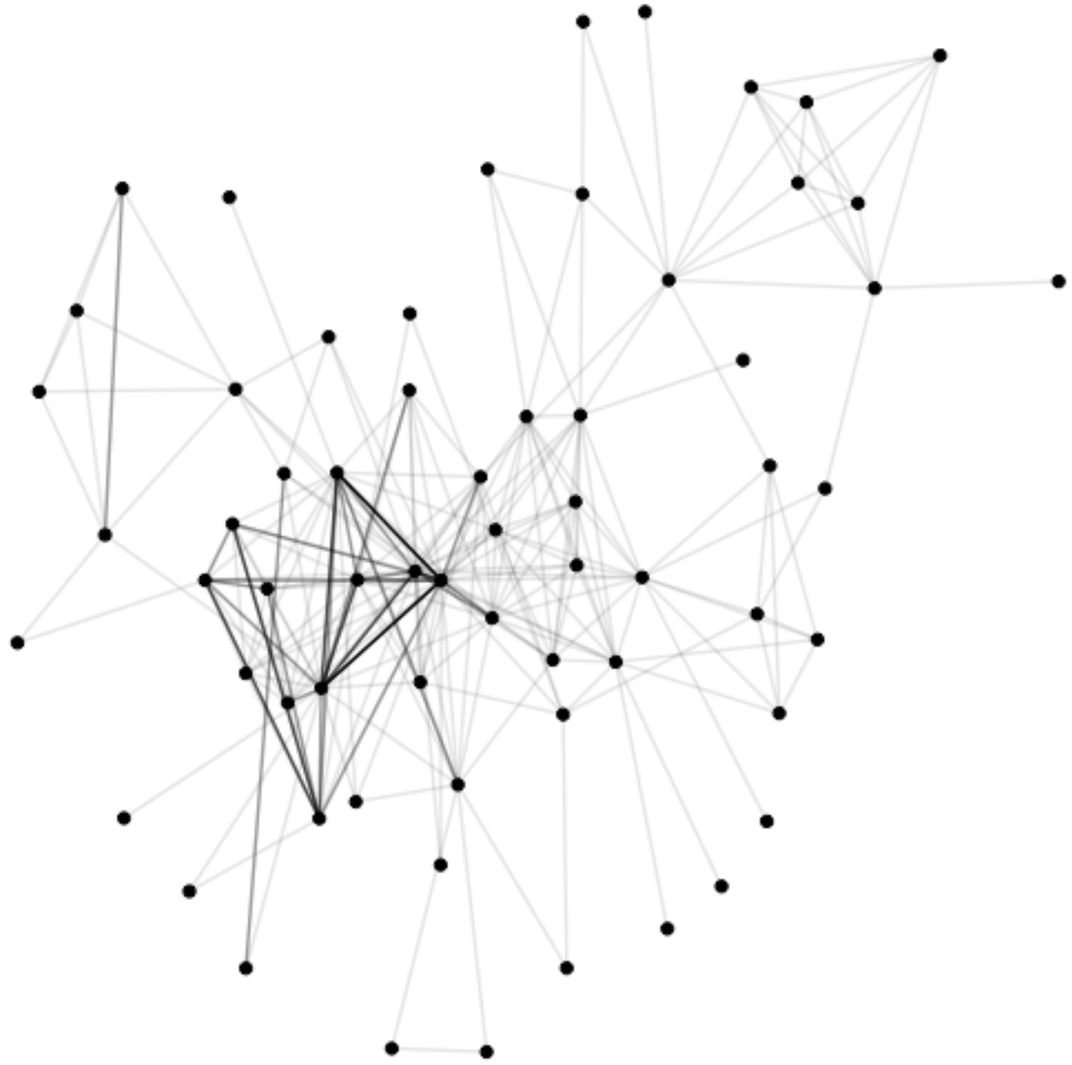
datacamp




Alice
David
Charles
Emily
Bob
Flora


Flora
Charles
Emily
David
Bob
Alice


Flora
1
Charles
4
5
David
Emily
2
3
Bob
2
1
Alice



Building the network

```
# load packages for network exploration
library(readr)
library(igraph)
# read nodes and ties data into variables
nodes <- read_csv("nodes.csv")
ties <- read_csv("ties.csv")

# build a network from data frames
g <- graph_from_data_frame(d = ties,
                           directed = FALSE,
                           vertices = nodes)
```

Exploring the network

```
# explore the set of nodes and print the number of nodes
V(g)
vcount(g)

# explore the set of ties and print the number of ties
E(g)
ecount(g)
# add the name attribute "Madrid network" to the network and print it
g$name <- "Madrid network"
g$name
# add node attribute id and print the node `id` attribute
V(g)$id <- 1:vcount(g)

# print the tie `weight` attribute
E(g)$weight
```

Let's start the investigation!

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Visualizing networks

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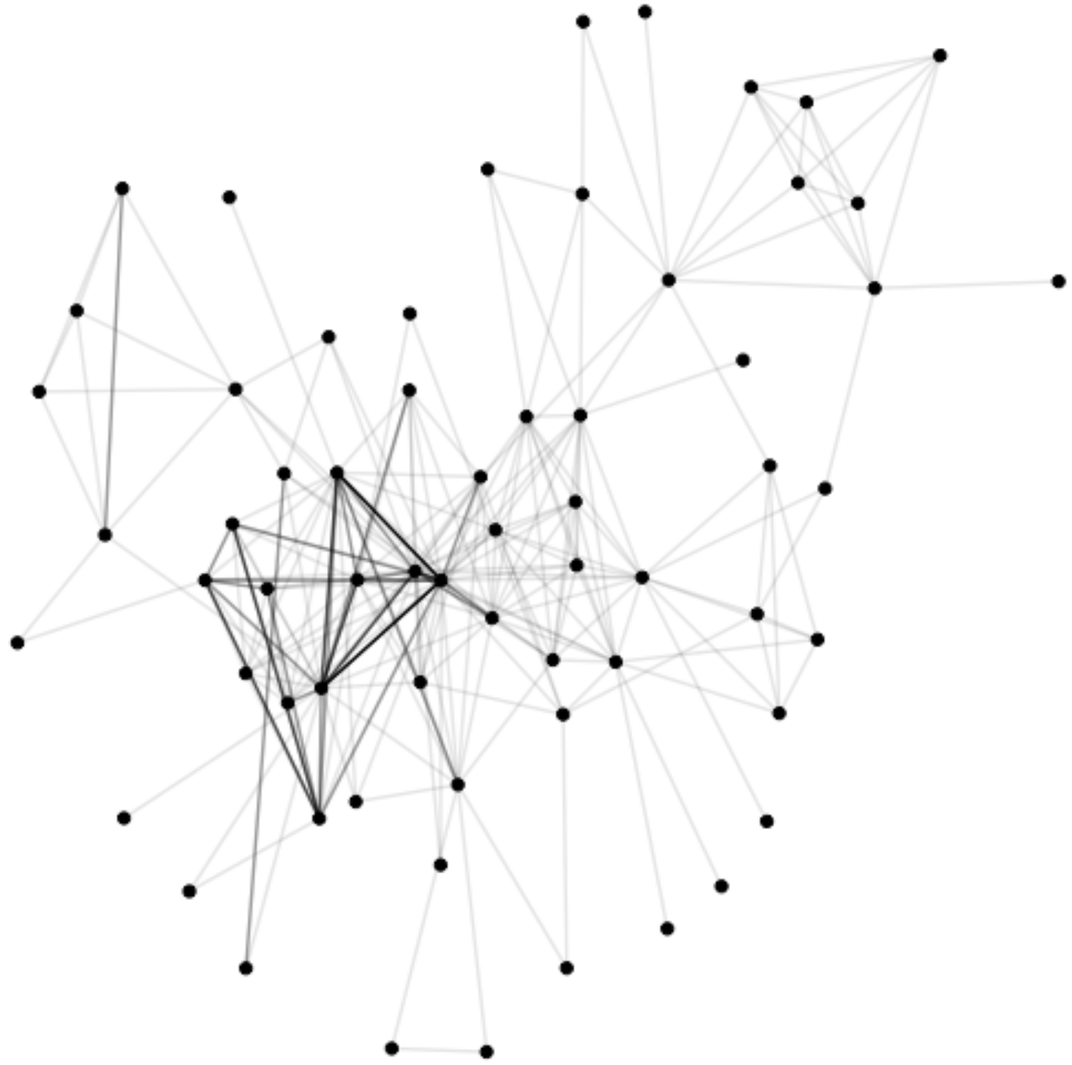
ggraph()

```
# load packages for data manipulation and visualization
library{igraph)
library(dplyr)
library(ggplot2)
library(ggraph)
```

```
# visualize the network
ggraph(g, layout = "with_kk") +
    geom_edge_link(aes(alpha = weight)) +
    geom_node_point()
```



Let's practice!

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Centrality measures

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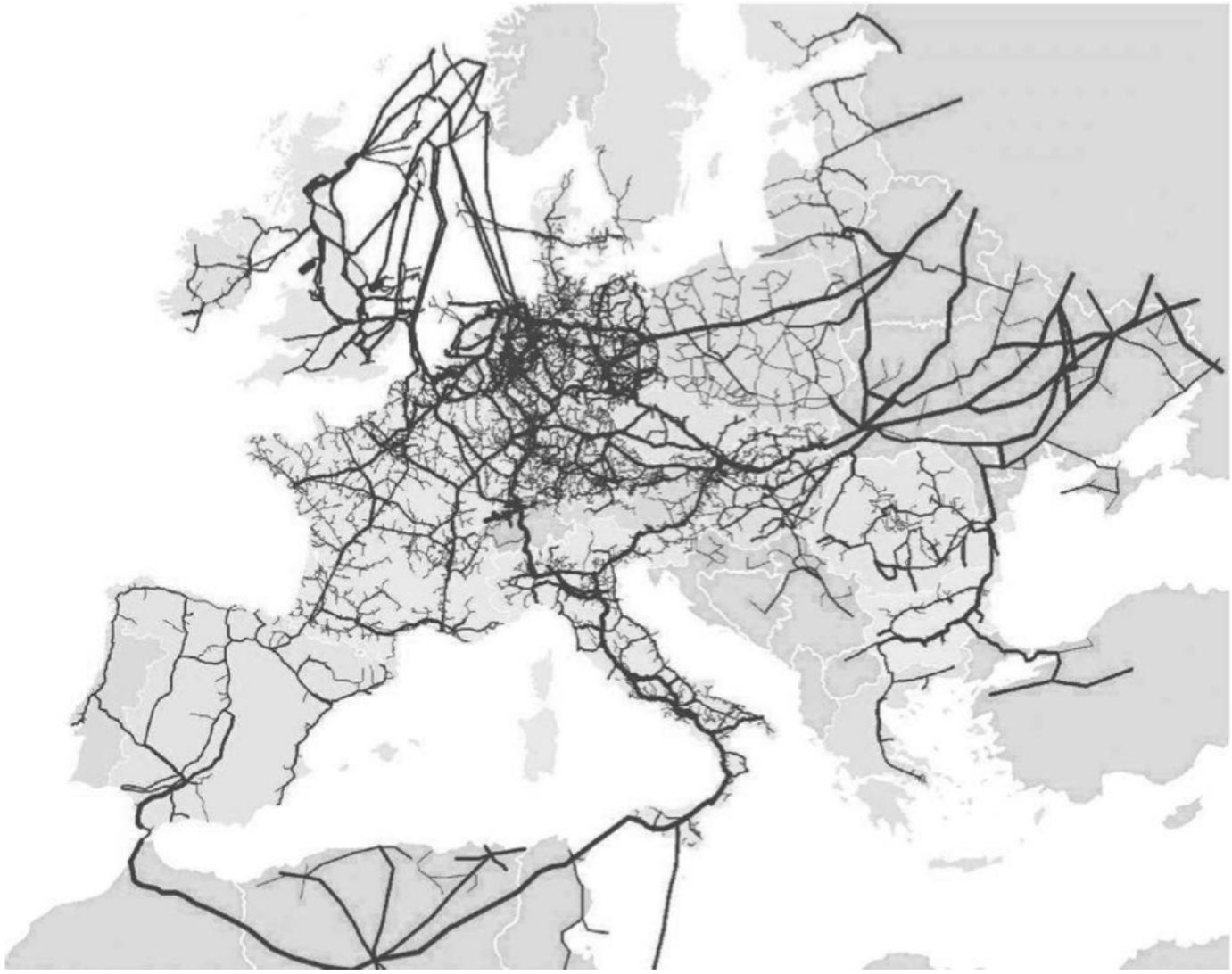
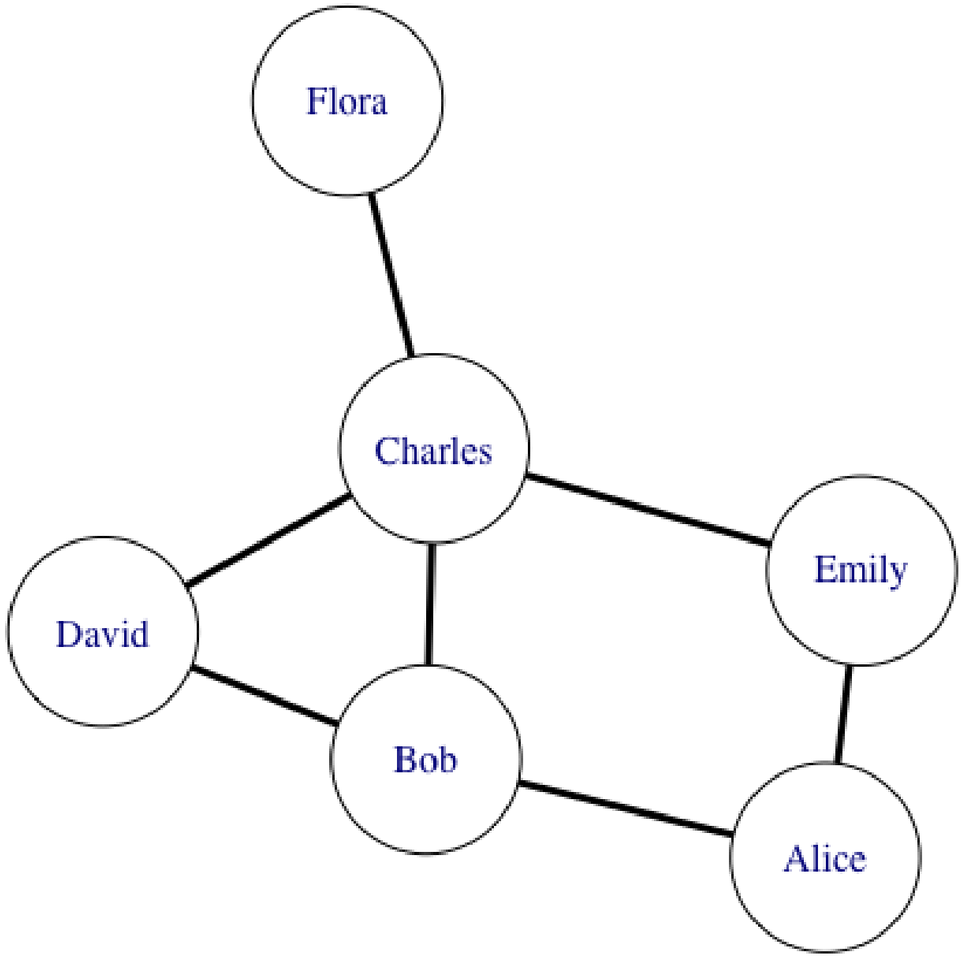


Node centrality

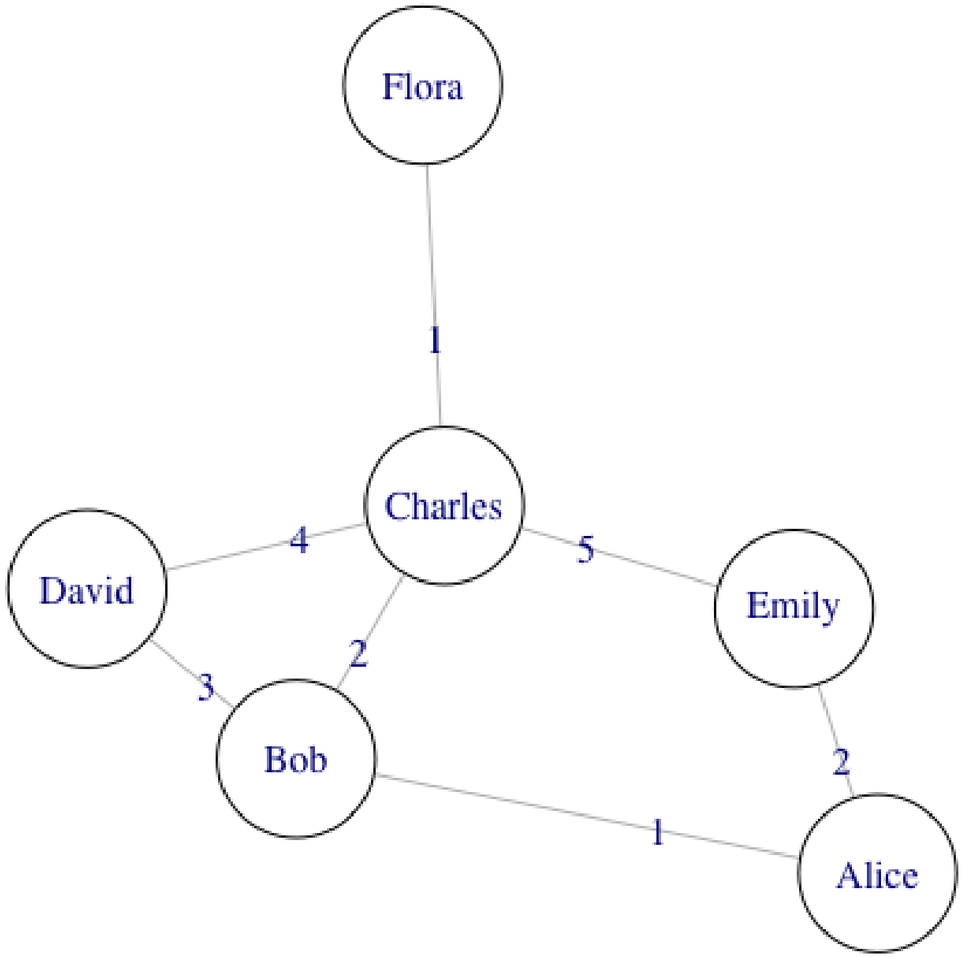
- Which are the most important nodes in a network?
  - Important web pages about a certain topic
  - Influential academic papers covering a given issue
  - Internet routers whose failure would greatly affect network connectivity


Flora
Charles
Emily
David
Bob
Alice

Computing degree

```
# compute node degrees
degree(g)
```

```
        Jamal Zougam       Mohamed Bekkali        Mohamed Chaoui
                  29                     2                    27
         Vinay Kholy         Suresh Kumar        Mohamed Chedadi
                  10                    10                     7
Imad Eddin Barakat   Abdelaziz Benyaich        Abu Abderrahame
                  22                     6                     4
     Omar Dhegayes          Amer Azizi     Abu Musad Alsakaoui
                   2                    18                    10
        Mohamed Atta      Ramzi Binalshibh        Mohamed Belfatmi
                  10                    10                    11
         Said Bahaji         Galeb Kalaje        Abderrahim Zbakh
                  11                    16                    15
```


Flora
1
Charles
4
5
David
Emily
2
3
Bob
2
1
Alice

Computing strength

```
# compute node strengths
strength(g)
```

```
      Jamal Zougam       Mohamed Bekkali        Mohamed Chaoui
                43                     2                    34
       Vinay Kholy          Suresh Kumar       Mohamed Chedadi
                10                    10                     7
Imad Eddin Barakat    Abdelaziz Benyaich       Abu Abderrahame
                35                     7                     4
     Omar Dhegayes           Amer Azizi   Abu Musad Alsakaoui
                 3                    27                    10
      Mohamed Atta       Ramzi Binalshibh      Mohamed Belfatmi
                12                    14                    19
       Said Bahaji          Galeb Kalaje      Abderrahim Zbakh
                17                    21                    15
```

Let's find the most central terrorists in the network!

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