Reading from a File
Creating an Adjacency List from an Edge List

The goal of this assignment is to write the **R** function `edge2adj.r` that constructs an adjacency list for a graph given the list of edges in the graph.

Input: *myfilename*, a text string that contains the name of the file containing the list of edges of a graph.

Output: *adjlist*, an **R** list of all the edges of a graph, in which the ith component of the list contains a vector of all the vertices adjacent to edge i.
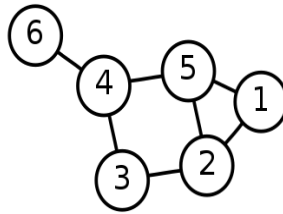
For example, here is a graph:

Figure 1: Graph with Six Vertices

The edge list associated with this graph is shown in Figure 2.

$$
\begin{array}{cc}
1 & 2 \\
1 & 5 \\
2 & 3 \\
2 & 5 \\
3 & 4 \\
4 & 5 \\
4 & 6 \\
\end{array}
$$

Figure 2: Edge List Associated with Figure 1

We want to turn this edge list into the associated adjacency list shown in Figure 3.

The first component contains the numbers 2 and 5, because Vertex 1 is adjacent to Vertices 2 and 5. The second component contains the numbers 1, 3, and 5 because Vertex 2 is adjacent to Vertices 1, 3, and 5. Etc.

There are several new **R** commands that you will need for this assignment.

1. **read.table**. Table-format files are best thought of as plain-text files with three key features that fully define how **R** should read the data.

```
1 | 2  5
2 | 1  3  5
3 | 2  4
4 | 3  5  6
5 | 1  2  4
6 | 4
```

Figure 3: Adjacency List Associated with Figure 1

(a) **Header**. If a *header* is present, it's always the fist line of the file. This optional feature is used to provide names for each column of data. When importing a file into **R**, you need to tell the software whether a header is present so that it knows whether to treat the first line as variable names or, alternatively, observed data values.

(b) **Delimiter**. The *delimiter* is the character that is used to separate the entries in each line. The delimiter cannot be used for anything else in the file. This tells **R** when a specific entry begins and ends.

(c) **Missing Values**. This is another unique character string used exclusively to denote a missing value. When reading the file, **R** will turn these entries into the form it recognizes: NA.

Here's the plain-text file MyFirstDataFile.txt.

```
name age.years gender entertaining age.months
Peter * M High 504
Lois 40 F * 480
Meg 17 F Low 204
Chris 14 M Med 168
Steve 1 M High *
Brian * M Med *
```

R will now read this in as a matrix.

```
> mydatafile <- read.table(file = "MyFirstDataFile.txt", header = TRUE,
                           sep = ' ', na.strings = "*",
                           stringsAsFactors = FALSE)
> mydatafile
   name age.years gender entertaining age.months
1 Peter        NA      M         High        504
2  Lois        40      F           NA        480
3   Meg        17      F          Low        204
4 Chris        14      M          Med        168
5 Steve         1      M         High         NA
6 Brian        NA      M          Med         NA
> mydatafile[1,2]
[1] "NA"
> mydatafile[2,3]
[1] "F"
> mydatafile[1,4]
[1] "High"
> mydatafile[4,2]
[1] "14"
> mydatafile[4,2] + 3
Error in mydatafile[4, 2] + 3 : non-numeric argument to binary operator
```

Note that numeric values are read as characters here.

For this assignment, there will be no header, the delimiter will be a space, and `na.strings` and `stringsAsFactors` do not have to be in the command.

Here are several examples.

```
> edge2adj("Edgelist01.txt")
[[1]]
[1] 2 3 4

[[2]]
[1] 1 3 7

[[3]]
[1] 1 2 4 6

[[4]]
[1] 1 3 5

[[5]]
[1] 4 6 9

[[6]]
[1] 3 5 7 8 9

[[7]]
[1] 2 6 8

[[8]]
[1]  6  7  9 10

[[9]]
[1]  5  6  8 10

[[10]]
[1] 8 9

> edge2adj("Edgelist02.txt")
[[1]]
[1] 2 7 9

[[2]]
[1]  1  5  7 10
```

```
[[3]]
[1] 5 7

[[4]]
[1] 5 6 9

[[5]]
[1]  2  3  4  6 10

[[6]]
[1] 4 5

[[7]]
[1] 1 2 3

[[8]]
[1]  9 10

[[9]]
[1] 1 4 8

[[10]]
[1] 2 5 8

> edge2adj("Edgelist03.txt")
[[1]]
[1] 2 3

[[2]]
[1] 1 3 4 5

[[3]]
[1] 1 2 4 5

[[4]]
[1] 2 3 5 6

[[5]]
[1] 2 3 4 6
```

```
[[6]]
[1]  4  5  8 11 12

[[7]]
[1] 8

[[8]]
[1]  6  7  9 10

[[9]]
[1]  8 10

[[10]]
[1] 8 9

[[11]]
[1] 6

[[12]]
[1] 6
```