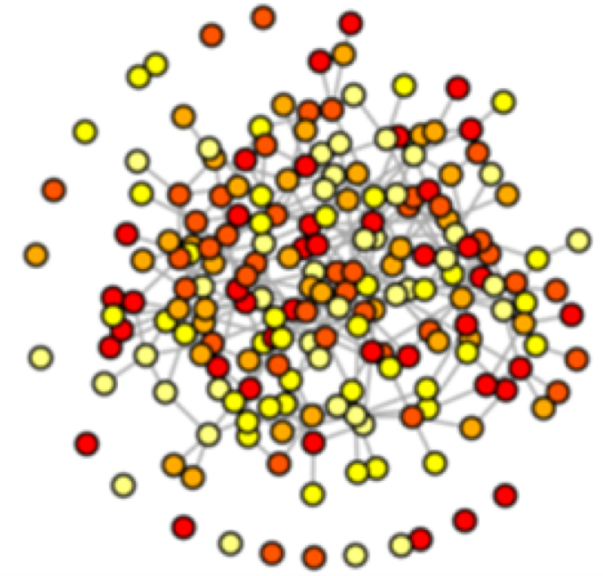


Networks in R



Kelsey Andersen, Robin Choudhury, & James Fulton

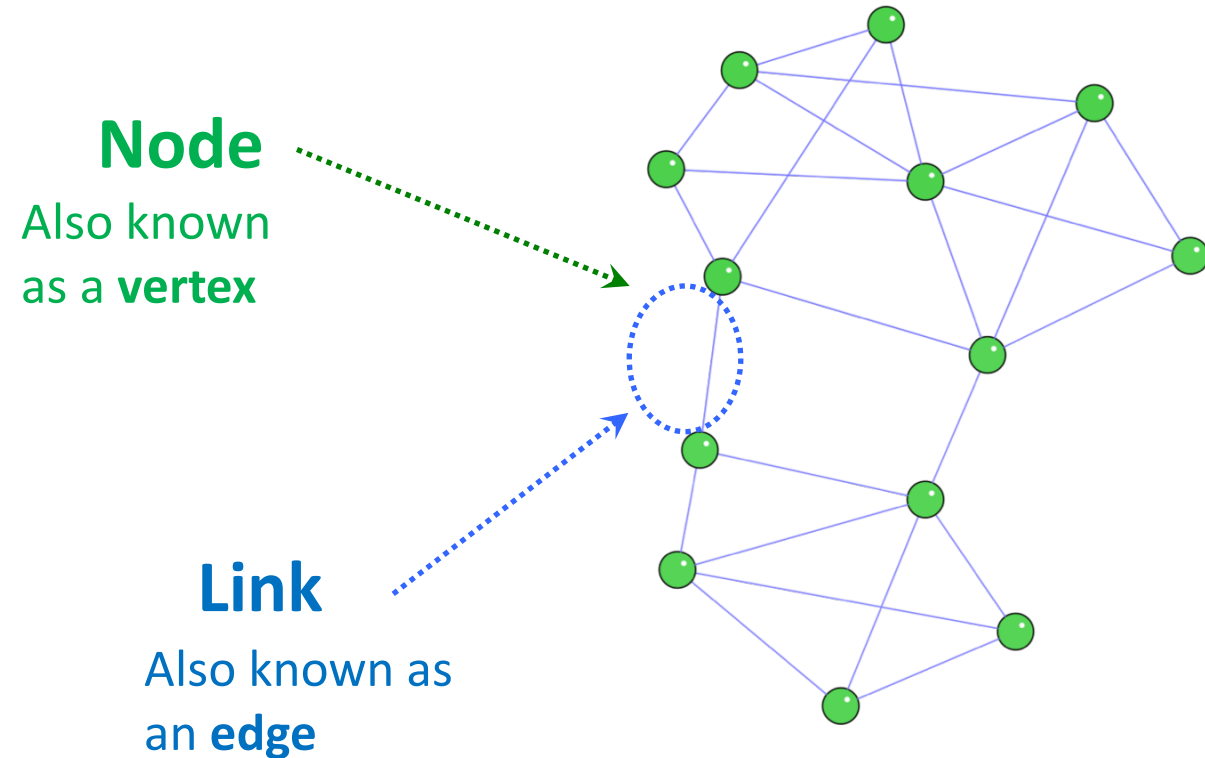
garrettlab.com

What is a network? Some key terms

- **Nodes**
- **Edges**

- **Dyads** – two nodes

- **Triads** – three nodes

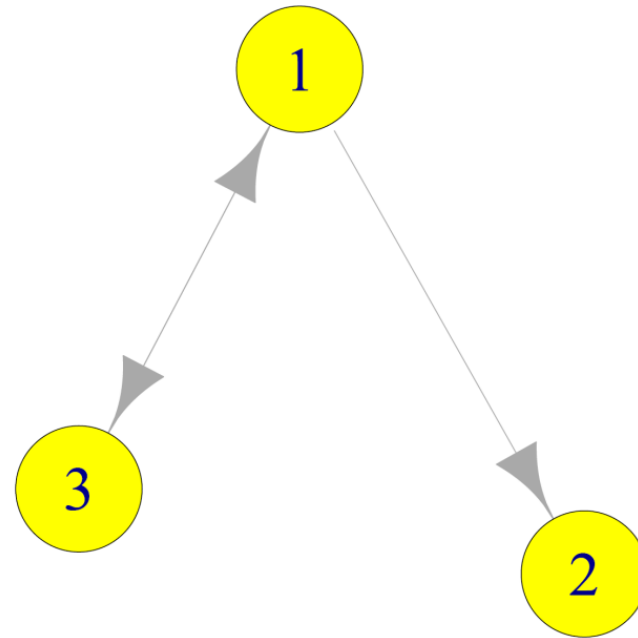


A network is basically an adjacency matrix

- An adjacency matrix is a square matrix that describes a network, where each element of the matrix indicates whether a link exists between two nodes (and potentially also includes information about the weight associated with that link)

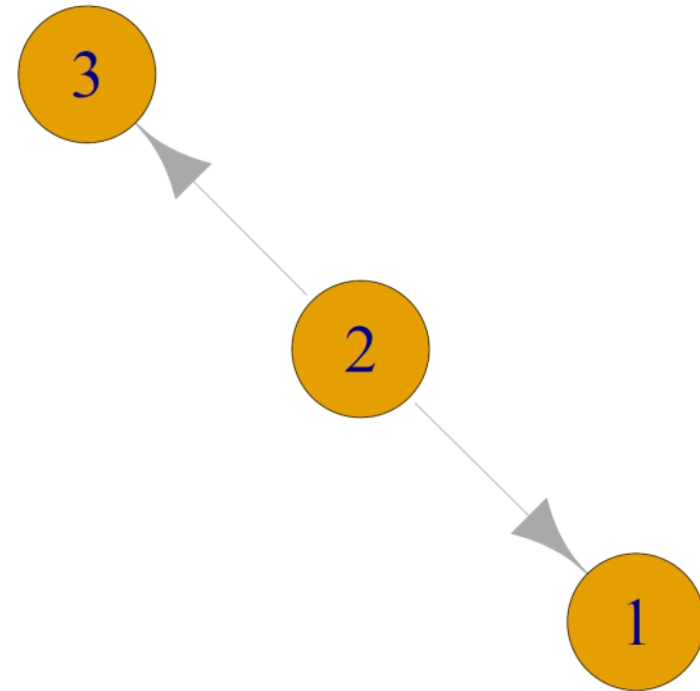
	To		
	N1	N2	N3
From			
Node1	0	1	1
Node2	0	0	0
Node3	1	0	0

=



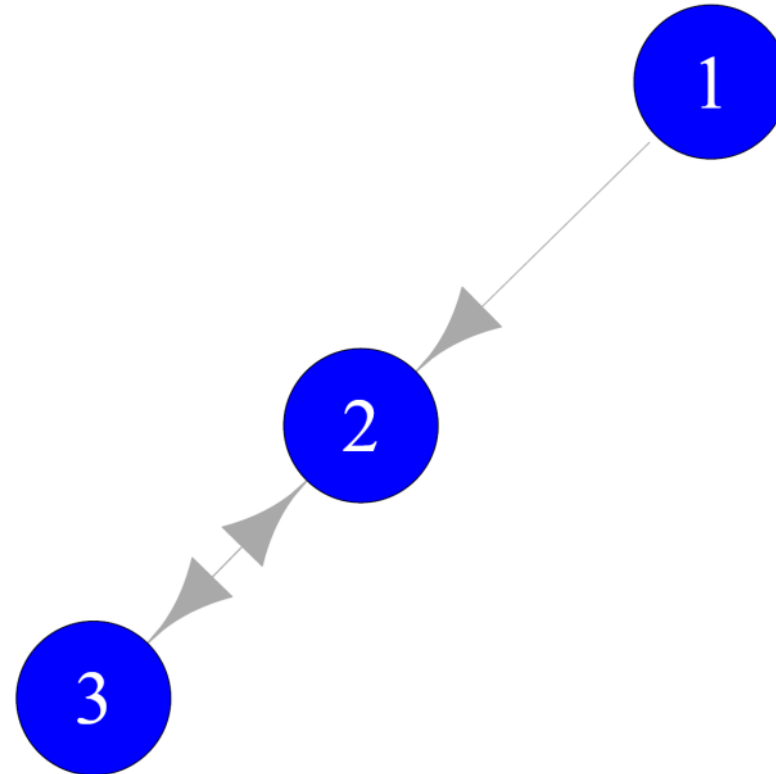
Can you draw what this network would look like?

		To		
		N1	N2	N3
From	N1	0	0	0
	N2	1	0	1
	N3	0	0	0



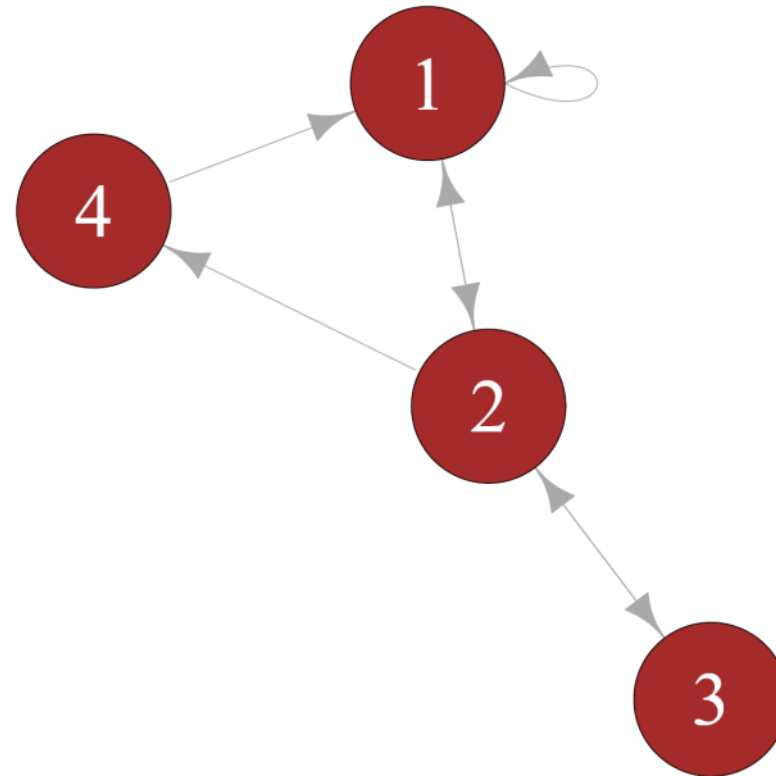
How about this adjacency matrix?

		To		
		N1	N2	N3
From	N1	0	1	0
	N2	0	0	1
	N3	0	1	0



Network example 3

	To			
	N1	N2	N3	N4
From				
N1	1	1	0	0
N2	1	0	1	1
N3	0	1	0	0
N4	1	0	0	0



Directed or undirected network?

	To		
	N1	N2	N3
From			
N1	0	1	0
N2	0	0	1
N3	0	1	0

	To		
	N1	N2	N3
From			
N1	0	1	0
N2	1	0	1
N3	0	1	0

Symmetric!

Examples of general questions to ask with networks

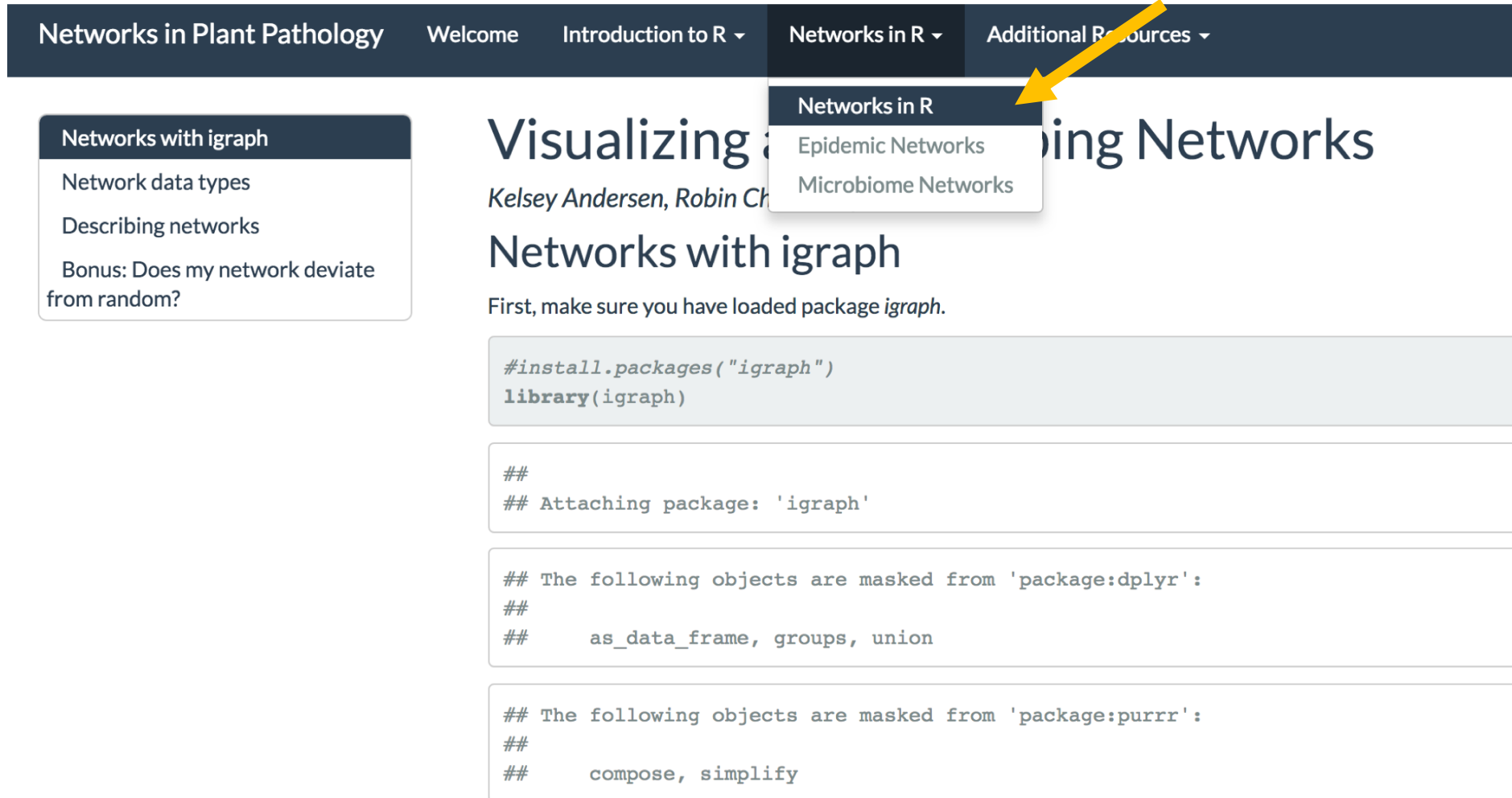
- What nodes and links have particularly important roles in the network?
- Are there clusters of nodes?
- How “complex” is the network?
- What would strengthen or weaken the network?

Today we will do most of our work in the igraph package in R

- igraph reference manual
 - <http://igraph.org/c/doc/igraph-introduction.html>
 - Definitely a reference – more detail than you might want to read through for a first try
- Katya Ognyanova has prepared some user friendly introductions
 - Network visualization: <http://kateto.net/network-visualization>
 - igraph in R: <http://kateto.net/networks-r-igraph>

Let's move to the markdown!

kelseyandersen.github.io/NetworksPlantPathology/



The screenshot shows a website header with a dark blue navigation bar. The main menu items are "Networks in Plant Pathology", "Welcome", "Introduction to R", "Networks in R", and "Additional Resources". The "Networks in R" menu is open, showing sub-items: "Networks in R", "Epidemic Networks", and "Microbiome Networks". A yellow arrow points to the "Networks in R" sub-item. On the left, a sidebar menu titled "Networks with igraph" lists "Network data types", "Describing networks", and "Bonus: Does my network deviate from random?". The main content area features a large heading "Visualizing and Analyzing Networks" and a sub-heading "Networks with igraph". Below the sub-heading is a code block containing R installation and library loading instructions for the igraph package.

Networks in Plant Pathology Welcome Introduction to R Networks in R Additional Resources

Networks with igraph

- Network data types
- Describing networks
- Bonus: Does my network deviate from random?

Visualizing and Analyzing Networks

Kelsey Andersen, Robin Ch

Networks with igraph

First, make sure you have loaded package *igraph*.

```
#install.packages("igraph")
library(igraph)

##
## Attaching package: 'igraph'

## The following objects are masked from 'package:dplyr':
##
##   as_data_frame, groups, union

## The following objects are masked from 'package:purrr':
##
##   compose, simplify
```