A (not so) gentle introduction to ecological networks

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Why should I care about networks?

- A good way to harness complexity
- A solid mathematical foundation
- Elegant algorithms
- That guy is going to talk about them for, like, two hours. . .

What is a network?

A mathematical approach

A *graph* is a **representation** of a **set of objects** where some pairs of objects are **connected** by **links**.

Or more formally, $G = (V, E)$, a *graph* G is an ordered pair of *vertices* V linked together by *edges* E.

Each element of E is a two-element subset of V.

The *order* of a graph is $|V|$, and its *size* is $|E|$.

What is a network?

An example

In an omnivory scenario, one top predator P consumes both an intermediate consumer C and a primary producer R. The intermediate consumer also consumes the producer.

This network is specified by

$$G = (\{P, C, R\}, \{\{P, C\}, \{P, R\}, \{C, R\}\})$$

Or for brevity

$$G = (\{P, C, R\}, \{PC, PR, CR\})$$

What is a network?

Edge direction

Edges can be *directed* (arcs, directed edges) or not. An edge between a vertex and itself (cannibalism) is a *self-loop*.

In an **undirected graph**, there are at most $|V|(|V|-1)/2$ edges if there are no *self-loops*.

In a **directed graph**, there are at most $|V|(|V|-1)$ edges if there are no *self-loops*.

Exercice: What is the maximal size of a graph of order n if there are self-loops?

Where is the ecology in all that?

graph	The whole community, *i.e.* the populations and their interactions
vertices	The composition of the community (species present)
edges	The interactions between the populations

Thank you very much!

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