

Competition Graphs and Food Webs

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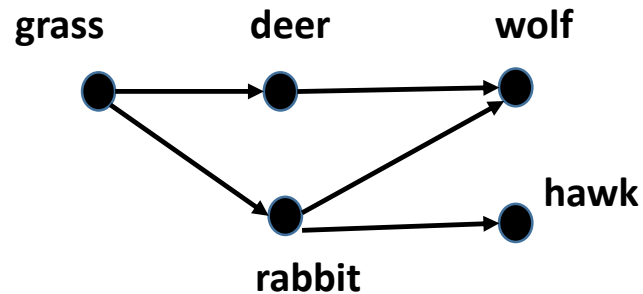
Overview

- Competition Graphs
- Interval Graphs
- Research Problem
- Direction of Research

Competition Graphs

- **Food Webs:** Vertices in a directed graph (digraph) are species in an ecosystem, **assume no cycles.**

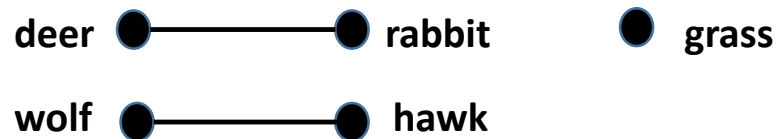
Example: Graph D



Note: Edges are directed from prey to predator, energy flow.

- **Competition Graph:** For a digraph $D = (V, E)$, its corresponding competition graph: G is an undirected graph with vertex set V and there is an edge between two vertices if and only if they share a common prey.

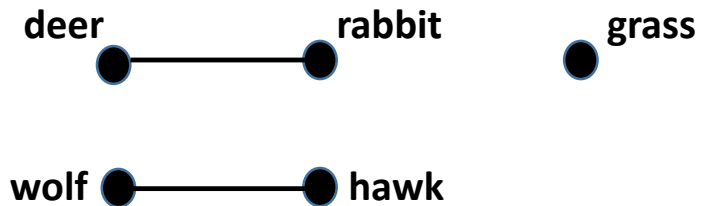
Example: Graph G



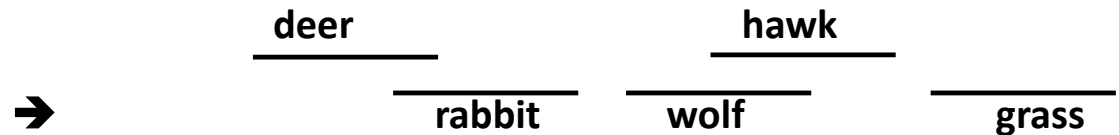
Interval Graphs

- Each vertex can be assigned an interval on the real line.
- There is an edge between two vertices if and only if their corresponding intervals overlap.

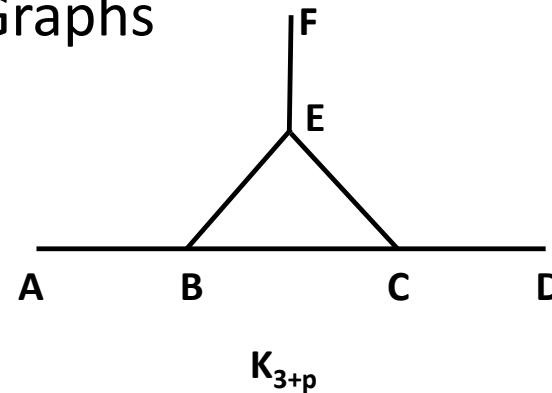
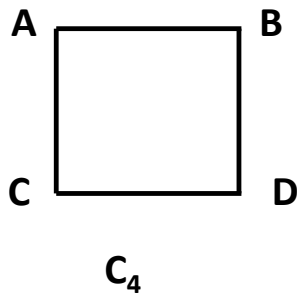
Graph G



Intervals corresponding to Graph G



- Some forbidden Subgraphs of Interval Graphs



Research Problem

- For a competition graph to be an interval graph, both it and its complement must be chordal (no cycles of size 4 or more). Why?
- Can we characterize the directed graphs whose corresponding competition graphs are interval graphs?
- Most directed graphs do not have competition graphs which are interval graphs, yet statistically most actual food webs have interval competition graphs. What ecological characteristics of food webs lead to this?

Direction of research

- Computationally look at some large food webs
- Construct their competition graphs, and analyze their cycles
- Randomly generate food webs and analyze their cycles
- Conclusions