

Dynamic Programming III

Sept 9, 2025

"Not just on arrays"

3.10 of Erickson's DS+Algs book

Defⁿ: an **independent set** in a graph $G=(V, E)$ is a set $X \subseteq V$ such that $\nexists u, v \in X$ such that $(u, v) \in E$

Theorem: In the general case, **indepSet** \in NP-c.

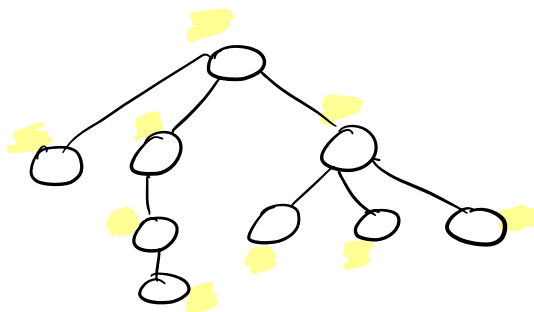
What about when the graph is a **tree**?

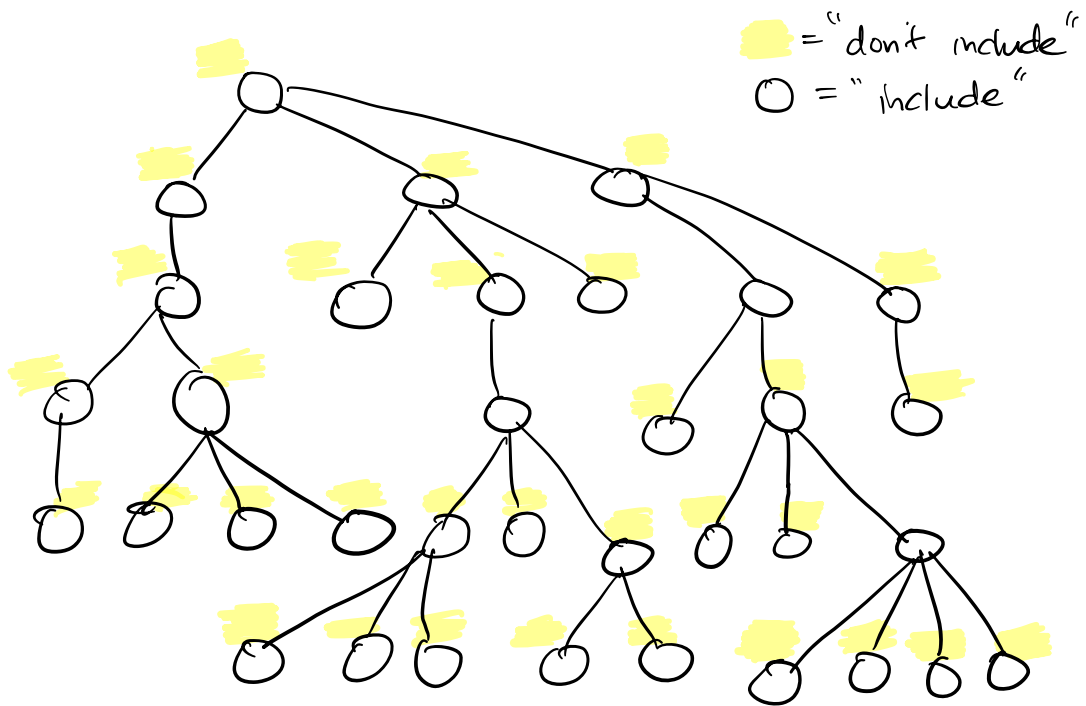
... and let us suppose it is a **rooted tree** - has a root vertex identified

Definitions

- w is a **descendent** of v if the unique path from w to the root contains v .
- $w \downarrow v$ means " w is a child of v "
- "**subtree rooted at v** " for any node v is all the descendents of v and the edges that connect them.

Let **MIS(v)** denote the size of the maximum indepSet in the subtree rooted at v .





recurrence relation:

$MIS(v) =$

algorithm:

Tree $MIS()$:

$v.MIS_{yes} = 1$

$v.MIS_{no} = 0$

for each child w of v

return $\max()$