

# Lecture 39

CSE 331

May 6, 2020

$$Y \leq_P X$$

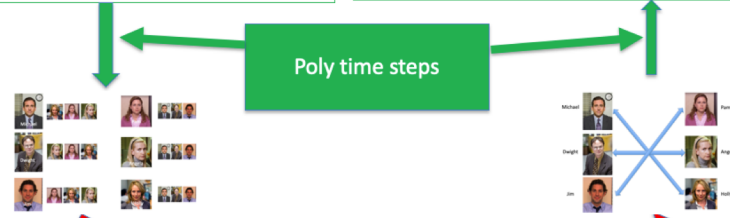
Question 2 (Big G is in town)

$\leq_P$



CSE Major	Slot 1	Slot 2	Slot 3	Slot 4
S <sub>1</sub>	E <sub>1</sub>	free	E <sub>2</sub>	free
S <sub>2</sub>	free	E <sub>1</sub>	free	E <sub>2</sub>

CSE Major	Slot 1	Slot 2	Slot 3	Slot 4
S <sub>1</sub>	E <sub>1</sub>	free	E <sub>2</sub> (truncate here)	
S <sub>2</sub>	free	E <sub>1</sub> (truncate here)		



Poly time steps

ANY algo for stable matching problem works!

All processing is poly-time

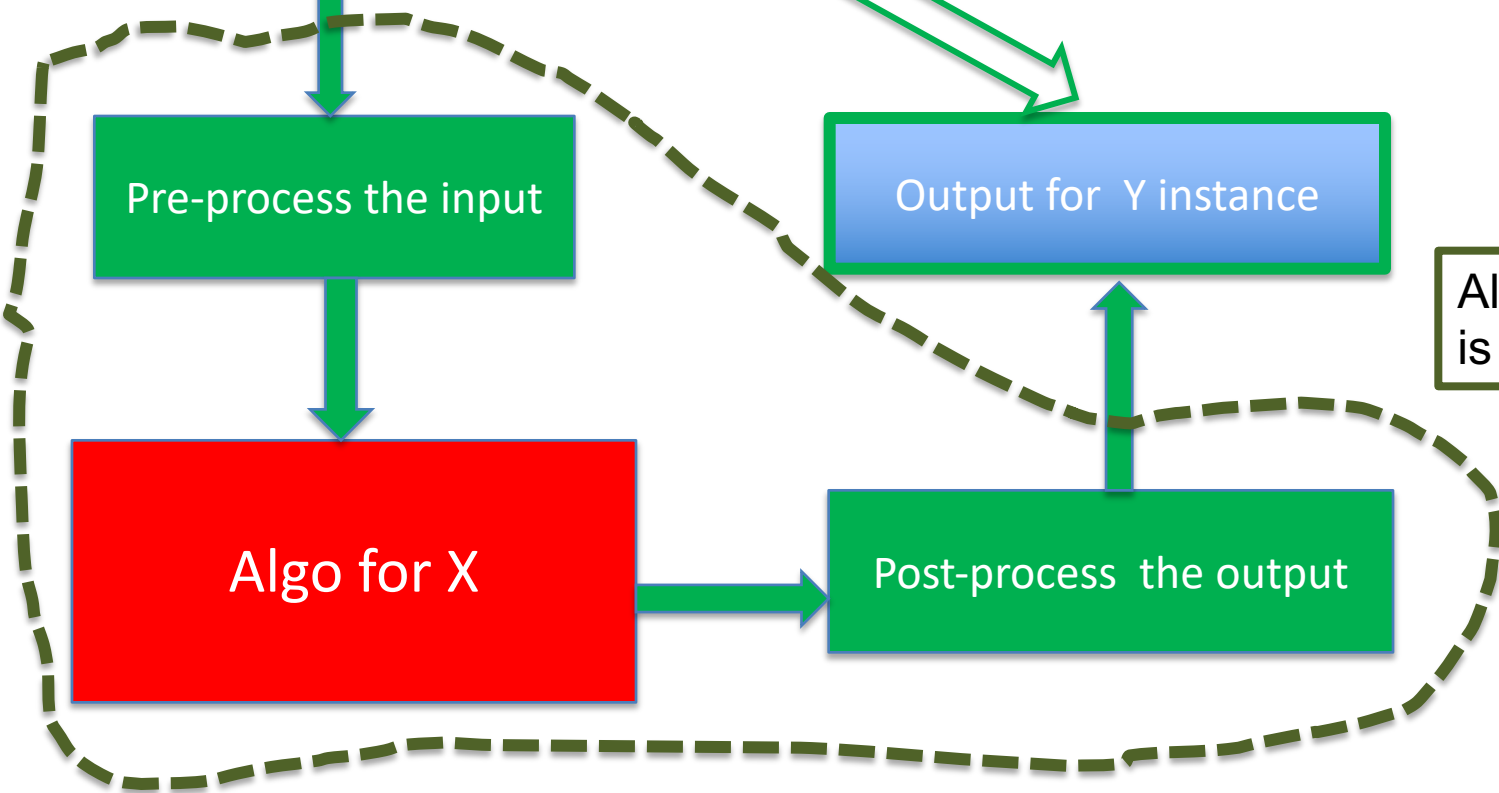
Arbitrary Y instance

Pre-process the input

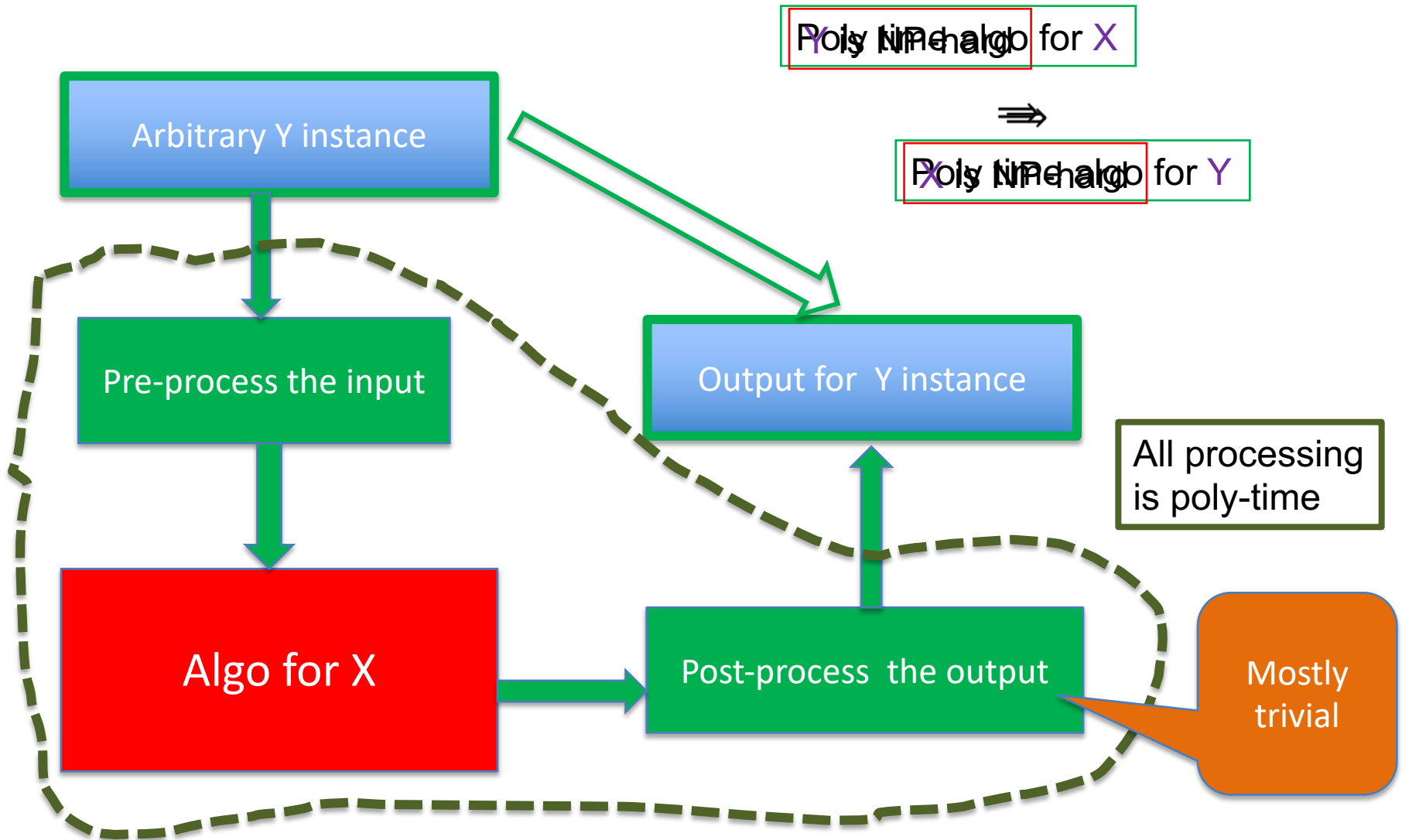
Algo for X

Output for Y instance

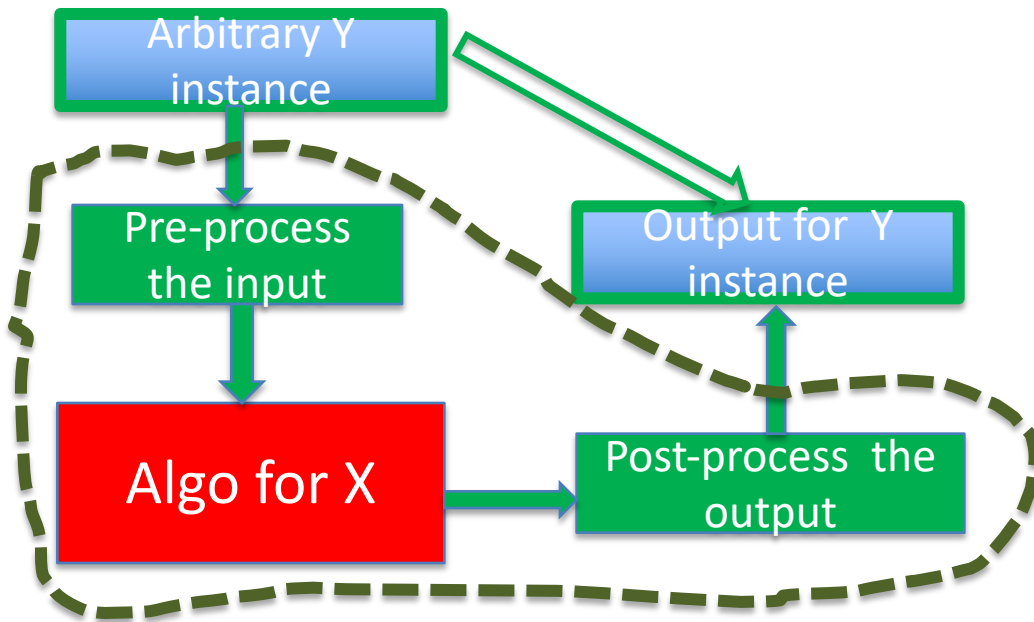
Post-process the output



# Implications of $Y \leq_p X$



# Independent Set $\leq_p$ Vertex Cover



AlgoIS ( $G, k$ )

$G' = G$

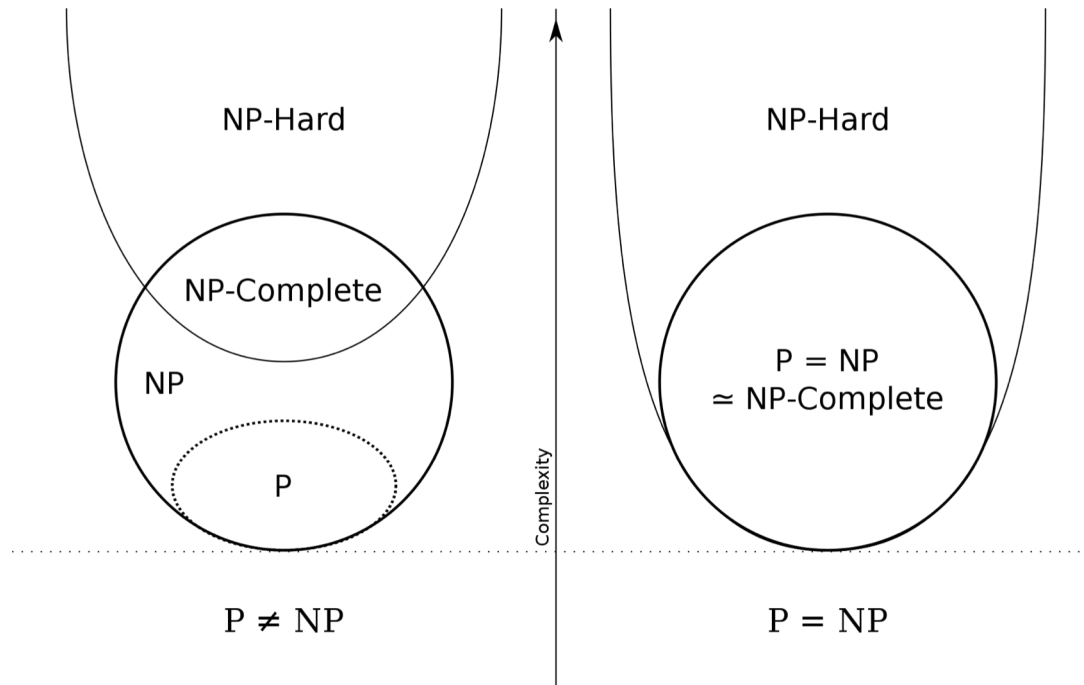
$k' = n - k$

$b = \text{AlgoVC}(G', k')$

return  $b$



# Today's agenda



NP-completeness of  $k$ -colorability

Beyond NP-completeness