# Lecture 36

## CSE 331

# Overview of the reduction



Question 2 (Big G is in town)

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
|-----------|--------|--------|--------|--------|
| $S_1$ | $E_1$ | free | $E_2$ | free |
| $S_2$ | free | $E_1$ | free | $E_2$ |

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
|-----------|--------|--------|--------|--------|
| $S_1$ | $E_1$ | free | $E_2$ (truncate here) | |
| $S_2$ | free | $E_1$ (truncate here) | | |

NRMP
National Resident Matching Program
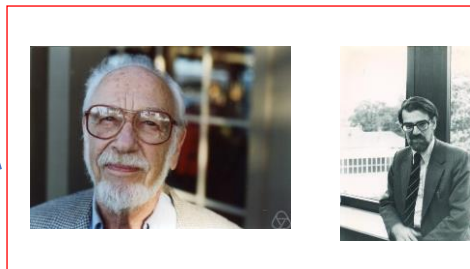
# Nothing special about GS algo



Question 2 (Big G is in town)

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
|-----------|--------|--------|--------|--------|
| $S_1$ | $E_1$ | free | $E_2$ | free |
| $S_2$ | free | $E_1$ | free | $E_2$ |

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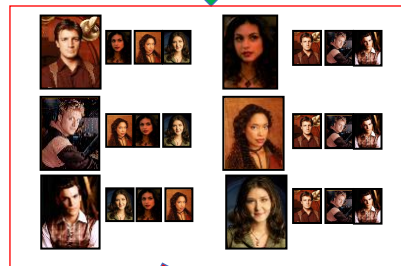
ANY algo for stable matching problem works!

# Another observation



Question 2 (Big G is in town)

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|-----------|--------|--------|--------|--------|
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| $S_2$ | free | $E_1$ | free | $E_2$ |

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Poly time steps
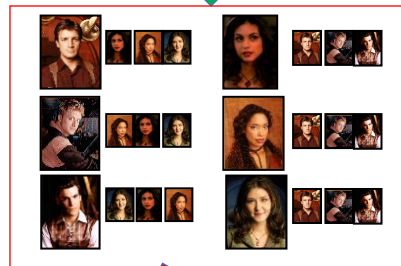
ANY algo for stable matching problem works!

# Poly time reductions
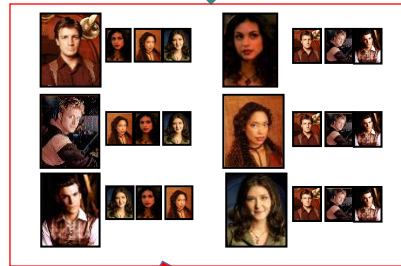


Question 2 (Big G is in town) $\leq_P$ NRMP National Resident Matching Program

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
|---|---|---|---|---|
| $S_1$ | $E_1$ | free | $E_2$ | free |
| $S_2$ | free | $E_1$ | free | $E_2$ |

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
|---|---|---|---|---|
| $S_1$ | $E_1$ | free | $E_2$ (truncate here) | |
| $S_2$ | free | $E_1$ (truncate here) | | |

Poly time steps

ANY algo for stable matching problem works!

$$Y \leq_P X$$

$$\leq_P$$

NRMP
National Resident Matching Program

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
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| $S_2$ | free | $E_1$ | free | $E_2$ |

| CSE Major | Slot 1 | Slot 2 | Slot 3 | Slot 4 |
|-----------|--------|--------|--------|--------|
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| $S_2$ | free | $E_1$ (truncate here) | | |

Poly time steps

ANY algo for stable matching problem works!
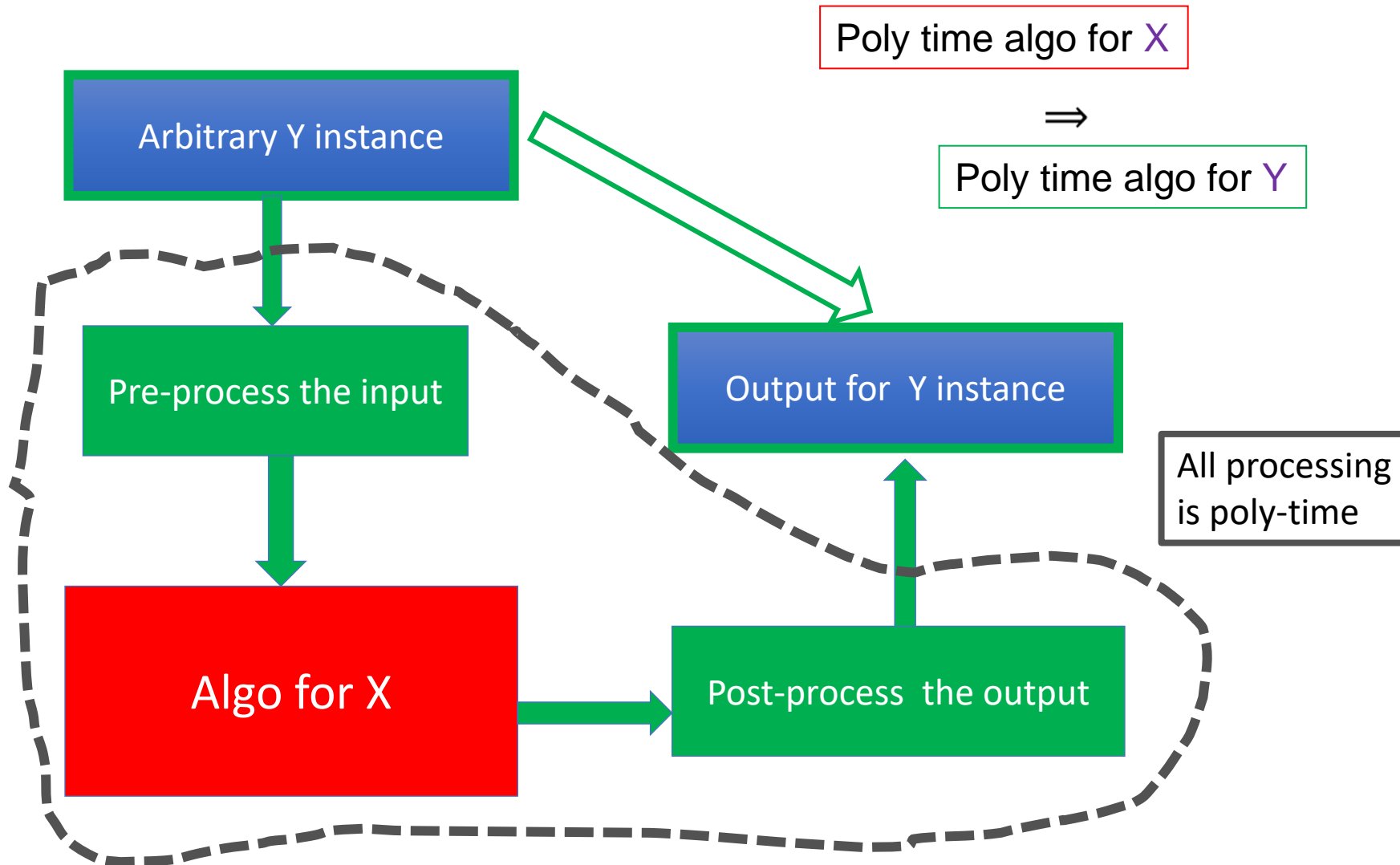
**Arbitrary Y instance**

**Pre-process the input**

**Output for Y instance**

All processing is poly-time

**Algo for X**

**Post-process the output**

# Implications of $Y \leq_P X$

$$A \implies B$$

$$!B \implies !A$$

# Implications of $Y \leq_P X$



Polynomial algo for Y
$\Rightarrow$
Polynomial algo for X

Arbitrary Y instance

Pre-process the input

Output for Y instance

Algo for X

Post-process the output

All processing is poly-time