Announcements: Monday, May 3

- Last week of classes!!!!
- Quiz 3 (attempt 2) and Quiz 4 (attempt 1) are end of this week
  - See Piazza note about quiz-window
  - Yes, things are rushed…. ☹
- Module 4 hard deadline is May 10
  - Yes, this is during exams. See Piazza note. You can think of this as you being meant to be done by Thursday night, but you can have extra time.
  - No Module 4 soft deadline really
- Recommended: do whatever Module 4 HWs you need to meet your goal
- Today: another reduction!

Lecture Planning

- There are *n* total guest lectures that can be given
- There are *l* guest lectures to be given (one per week) during the first "half" of the course
  - For each week, a different set of lectures are available
  - There may be more guest lectures than the *l* slots
- During the second "half" of the course, there are *p* projects to be completed, one each week
  - Each project requires one of a set of guest lectures
- Can you schedule *l* guest lecturers (one per week) such that all *p* the projects can be completed?

Lecture planning Inputs

- *l* (the number of weeks of lectures)
- *p* (the number of projects)
- *n* (the number of possible guest lecturers)
- Availability of lecturers for each week, L_i
  - $L_1 = \{A, B, C\}$, $L_2 = \{A, D\}$, …
- Which lectures/lecturers are needed for each of the projects, P_i
  - $P_1 = \{B, C\}$, $P_2 = \{A, B, D\}$, $P_3 = \{C, D\}$, …

Remember: reduction means transforming one input to another…

Lecture planning example

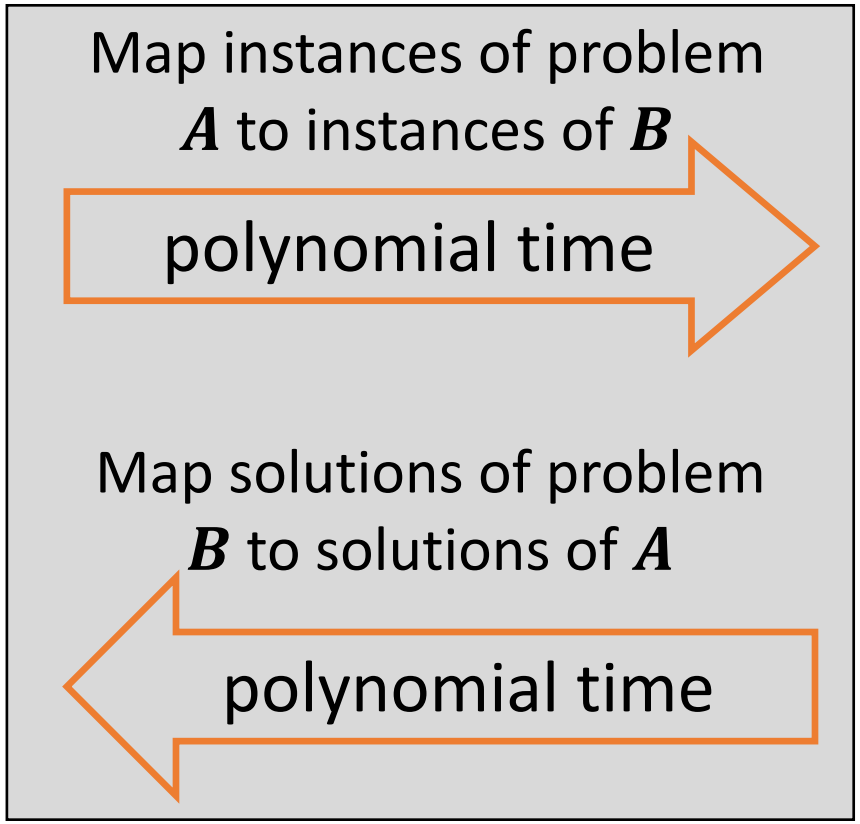
- *l* (the number of weeks of lectures) = 2
- *p* (the number of projects) = 3
- *n* (the number of possible guest lecturers) = 4
- L_i, the availability for the two weeks:
  - L_1 = {A, B, C}, L_2 = {A, D}
- P_i, which lectures/lecturers are needed for each of the 3 projects:
  - P_1 = {B, C}, P_2 = {A, B, D}, P_3 = {C, D}
- Of the 4 lecturers, can we schedule 2 of them such that all 3 of the projects can be completed?
  - Yes, we can schedule B in the first week and D in the second week
  - Solution for search-problem: *{ (i,j), … }* where lecturer *i* scheduled for week *j* for all *l* weeks.

3-SAT $\leq_p$ ***Lecture Planning***

3-SAT

$(x \vee y \vee z) \wedge (x \vee \bar{y} \vee y) \wedge (u \vee y \vee \bar{z})$

$x = \text{true}$
$y = \text{false}$
$z = \text{false}$
$u = \text{true}$



polynomial-time reduction

$LecturePlanning$

l, p, n, L_i, P_i

Solution for ***LP***

Mapping of lecturers to weeks

Prove that Lecture Planning is NP-complete

- Can reduce from 3-SAT
  - Can you do it?
  - Will you see this later on a quiz?
  - Maybe ;)
  - Actually…no you won't
  - Is he lying?
  - I'm confused!

- Seriously though…this is a really good example of how to approach a reduction