

CSCI 270 Lecture 28: 3-D Matching

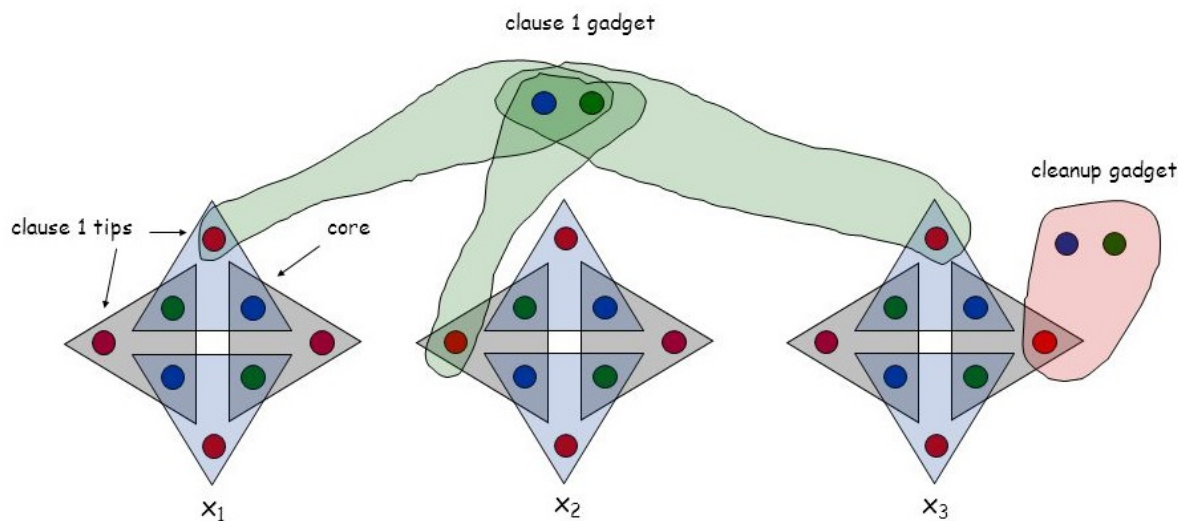
3-D Matching

Given n instructors, n courses, n times, and a list of 3-tuples listing valid pairings of courses, times, and instructors, find an assignment where all instructors teach, and all classes are taught at different times.

(Aaron, 270, MW 2-3:20), (Aaron, 170, TTh 11-12:20), (Aaron, 104, TTh 11-12:20)

(Kuan, 170, MW 2-3:20), (Kuan, 104, TTh 11-12:20)

(Pegah, 104, TTh 2-3:20), (Pegah, 170, TTh 2-3:20), (Pegah, 270, TTh 11-12:20)



Theory of Computation

Suppose you are given some computer code, and the input which the code will receive. You want to know whether the code will halt, or enter an infinite loop.

Compilers can catch some very simple examples, but they can't catch the more complicated examples. It would be great if someone clever enough came along and wrote a program which could solve this problem. Why do you suppose no one has done this?

This problem is referred to as the **Halting Problem**.

The Barber Paradox

There is a barber in a small village. The barber cuts the hair of exactly the villagers who do not cut their own hair.

- What is the paradox?
- Is this really a paradox?

An algorithm that solves the Halting Problem is the “barber”. If we assume such an algorithm exists, we reach a paradox. The only conclusion is that such an algorithm cannot possibly exist.

Countable versus Uncountable

Consider two sets of numbers: the set of natural numbers $\{1, 2, 3, \dots\}$, and the set of even natural numbers $\{2, 4, 6, \dots\}$. Which set is larger?

Given two sets of infinite size, A and B , if there is a bijective function f which maps A to B , then these two sets are the same size.

In less formal terms, if you can pair each number in A with a unique number in B such that every number in B is paired exactly once, then A and B have the same size. Any infinite set of size equal to the natural numbers is called **countable** or **countably infinite**.

- Are the set of even integers countable?
- Are the set of positive rational numbers countable?
- Are the set of real numbers countable?

