Lecture 20

CSE 331

Oct 20, 2021

Please have a face mask on

Masking requirement

UB requires all students, employees and visitors – regardless of their vaccination status – to wear face coverings while inside campus buildings.

https://www.buffalo.edu/coronavirus/health-and-safety/health-safety-guidelines.html

Project deadlines coming up

Fri, Oct 29	Counting Inversions F19 F18 F17 x²	[KT, Sec 5.3] (**Project (Problem 1** `Coding` **) in**)
Mon, Nov 1	Multiplying large integers F19 F18 F17 x²	[KT, Sec 5.5] (**Project (Problem 1** `Reflection` **) in**) *Reading Assignment:* Unraveling the mystery behind the identity
Wed, Nov 3	Closest Pair of Points F19 F18 F17 x²	[KT, Sec 5.4]
Fri, Nov 5	Kickass Property Lemma F19 F18 F17 x²	[KT, Sec 5.4] (**Project (Problem 2** `Coding` **) in**)
Mon, Nov 8	Weighted Interval Scheduling F19 F17 x²	[KT, Sec 6.1] (**Project (Problem 2** `Reflection` **) in**)

Group formation instructions

Autolab group submission for CSE 331 Project

The lowdown on submitting your project (especially the coding and reflection) problems as a group on Autolab.

Follow instructions **EXACTLY** as they are stated

The instruction below are for Coding Problem 1

You will have to repeat the instructions below for EACH coding AND reflection problem on project on Autolab (with the appropriate changes to the actual problem).

Form your group on Autolab

Groups on Autolab will NOT be automatically created

You will have to form a group on Autolab by yourself (as a group). Read on for instructions on how to go about this.

Mid-terms graded

note @351

stop following 61 views

Mid term 2 graded

Thanks to your awesome TAs (who graded a mid-terms even in the midst of preparing and taking their own mid-terms) mid-term 1 has now been graded ahead of schedule as well the scores and feedback released on Autolab.

(Please see the re-grade policy as well as the grading rubric below before contacting us with questions on grading.)

Here are the stats:

Mid-term 2

Problem	Mean	Median	StdDev	Max	Min
2(a) Algo idea	9.5	12.0	5.9	15.0	0.0

Mid-term temp grades

note @359 10 views

Mid-term temp grade

(For details on grading of mid-term exam, see @350 and @351. More details on one-on-one meetings will be up here by tomorrow-- Wed, Oct 20.)

Your temp letter grades have been assigned. To calculate your grade, you must first calculate your raw score R as follows:

- Add up your HW scores from HW1-3 to calculate H (out of a max of 300)
- Let Q be your quiz 1 score (out of a max of 10)
- Let M be your mid-term score (out of a max of 100).

Then R is calculated as follows (out of a maximum possible of 55:

$$R = \frac{30}{300} \cdot H + Q \cdot \frac{3}{10} + \frac{22}{100} \cdot M.$$

(I know the above does not fully follow the grading rubric since it does not drop any HW score and does not substitute the quiz score with the HW score if you do better on the latter. However, since this is just supposed to give you an idea of where you stand in the course, I think the above is fine as a proxy.)

Here are the stats of the raw score:

- Average: 19.5

Some other stuff coming up

note @322 ☆ stop following 61 views

What's next?

Now that the mid-terms are done, hope y'all take some time to decompress! Some of you might have questions on how you're doing in the course, how you did in the mid-term exams and perhaps some of you think you'd like to come and chat with me.

I just wanted to give y'all some heads up on this:

- (As a tangent, note that HW 4 is already out: @321)
- Our goal is to be able to finishing grading (both the) mid-terms by early to mid next week.
  - Your TAs also have mid-terms so we appreciate your patience as they grade your mid-terms!
  - Once that is done, as with the HWs, I'll release the stats as well as the grading rubric. The usual re-grade policy will apply (though keep @320 in mind).
- Once the mid-terms are graded I'll assign temporary letter grades to y'all (based on your scores of HWs1-3, Quiz 1 and mid-terms) just so that y'all get a sense of where you stand in the course currently.
  - I'll put up a piazza post with the details once the temp. letter grades have been assigned.
  - Note that this will *not* be the same as the mid-semester grade that I need to submit to HUB (mainly because the mid terms will not be graded by this Friday, which is when the mid-semester grades are due).
- Those who have a D+ or below in their temporary letter grade, I'll send email asking you to setup a one-on-one meeting (<=10 mins).
  - Even if you have a better grade than D+ but want to chat about your performance, you can also sign up (but those with D+ or below will get preference for a slot)
  - I'll put up a piazza post with details once I finalize the meeting slots.

mid-term grading

edit good note 0 Updated 20 hours ago by Atri Rudra

HW 5 is out

Homework 5

Due by **8:00am, Wednesday, October 27, 2021**.

Make sure you follow all the homework policies.

All submissions should be done via Autolab.

Care package on topological ordering could be useful for Question 2.

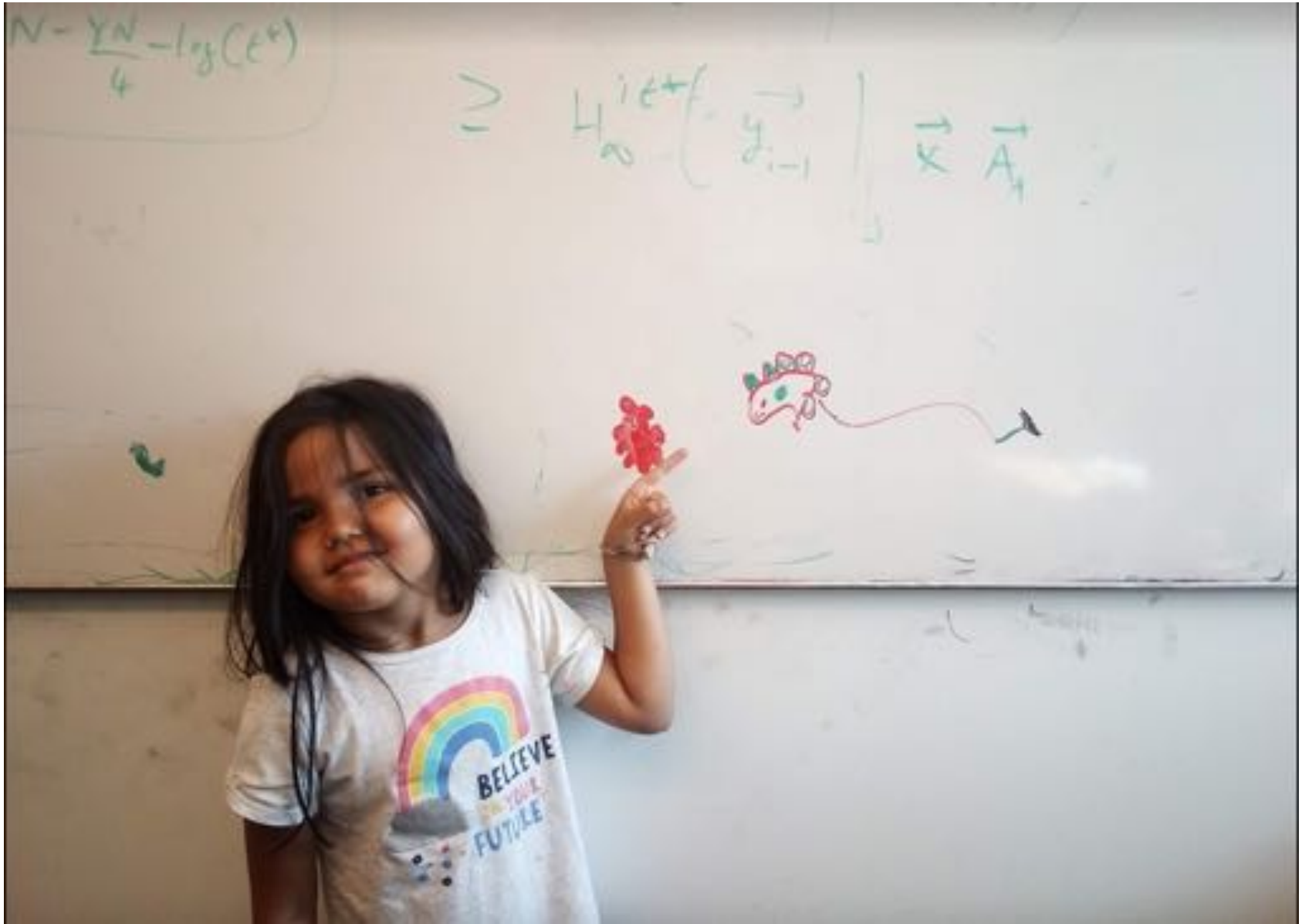
Check the week 8 recitation notes for this homework.

Question 1 (Computing Set Intersection on a Network) [50 points]

The Problem

In this problem, we will take a break from trying to minimize the runtime of the algorithm and focus on an important resource in distributed computing: the total number of bits communicated over a network by the algorithm.

Questions/Comments?



Make broadband more available

BOTH technical and societal issues

Say you are tasked to come up with the infrastructure

Building a fiber network

Lay down fibers to connect n locations

All n locations should be connected

Laying down a fiber costs money

What is the cheapest way to lay down the fibers?

Today's agenda

Minimum Spanning Tree (MST) Problem

Greedy algorithm(s) for MST problem

On to the board…

Minimum Spanning Tree Problem

Input: Undirected, connected $G = (V,E)$, edge costs c_e

Output: Subset $E' \subseteq E$), s.t. $T = (V,E')$ is connected
$C(T)$ is minimized

If all $c_e > 0$, then T is indeed a tree

Rest of today's agenda

Greedy algorithm(s) for MST problem

Discuss: Greedy algorithm!

Kruskal's Algorithm

Joseph B. Kruskal

Input: $G=(V,E)$, $c_e > 0$ for every e in E

$T = \emptyset$

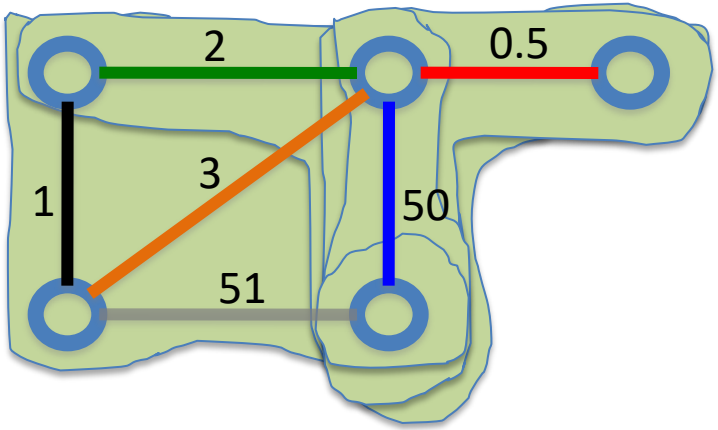
Sort edges in increasing order of their cost

Consider edges in sorted order

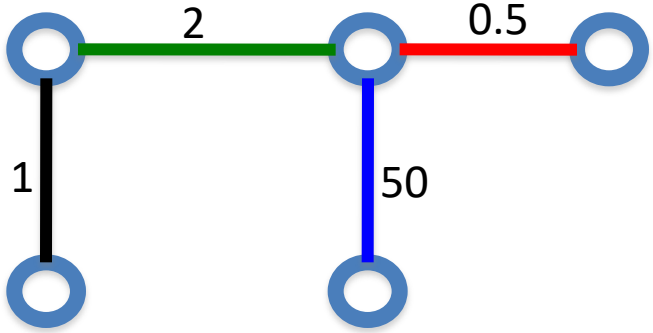
If an edge can be added to T without adding a cycle then add it to T

Prim's algorithm

Similar to Dijkstra's algorithm



Robert Prim



Input: G=(V,E), $c_e > 0$ for every e in E

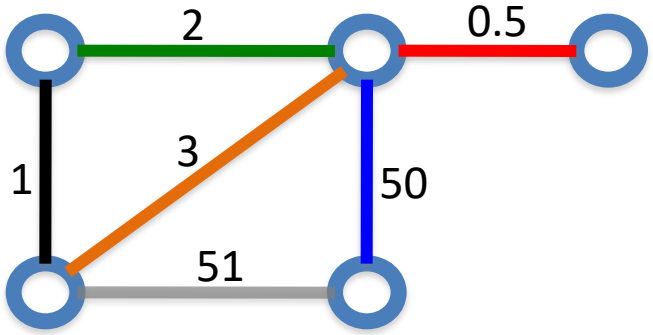
S = {s}, T = Ø

While S is not the same as V

Among edges e= (u,w) with u in S and w not in S, pick one with minimum cost

Add w to S, e to T

Reverse-Delete Algorithm



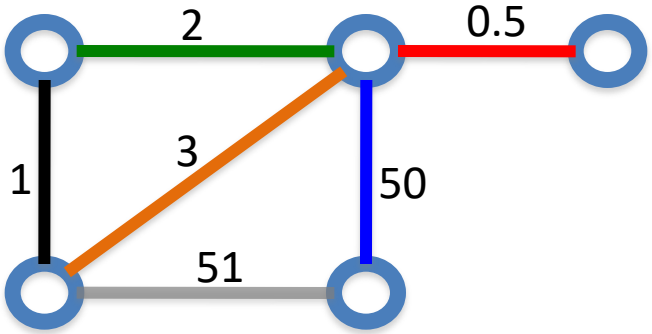
Input: G=(V,E), $c_e > 0$ for every e in E

T = E

Sort edges in decreasing order of their cost

Consider edges in sorted order

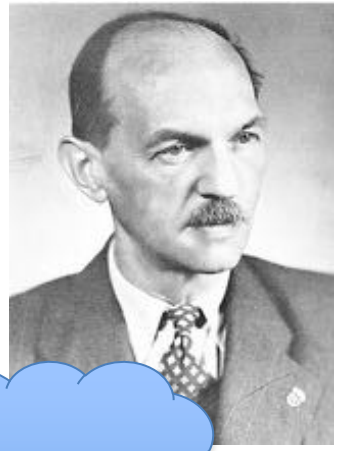
If an edge can be removed T without disconnecting T then remove it



(Old) History of MST algorithms

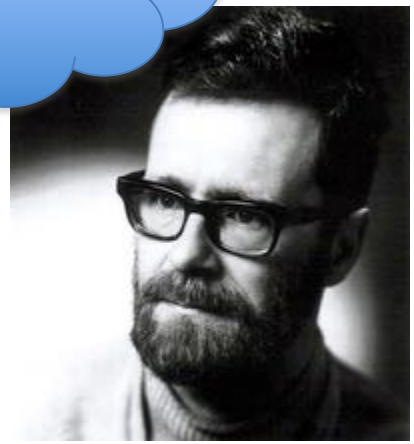
1920: Otakar Borůvka

1930: Vojtěch Jarník



Same algo!

1956: Kruskal



1957: Prim

1959: Dijkstra