Lecture 20

CSE 331

Mar 23, 2020

See the changes in syllabus!

note @433

Changes in syllabus for distance learning

Hi All,

Hope y'all doing well and keep your physical and mental health good. As I said earlier, I made some changes to the syllabus and the gene changes will not interfere much with your 331 routines. I also updated the 331 webpage with the changes; canceled items are striked thro deadlines), homework policy (a small change), and mini video project (deadlines).

- **Homeworks:** I'm not going to change anything about the homeworks and their deadlines. The only thing is I will not be able to distribute downloaded. This is to prevent sharing across different semesters. Note that you're not allowed to share those documents; and there will graduated at that time). Regarding the homework deadlines, I'll be more flexible only when the student has an emergency **(coronavirus-re** is packed; the last five homeworks will be one after another (starting April 3rd, you'll get a new homework every Friday).

- **Office hours:** All will be online and continue to be on the scheduled times. Each TA (and me) will be available in his/her WebEx room at t **tool provided by UB**. WebEx links for all TAs and myself are added to the syllabus (UB just got Zoom today; if WebEx is overloaded we m

- **Lectures:** I'll record the lectures and give links in the schedule as we did so far (we also have lecture recordings from earlier offerings; ch from the university administration and there are multiple reasons, such as scalability problems in recording tools, non-standard internet co I'll do my best to provide the same quality you had so far (I'll write on paper for proofs etc.)

- **Recitations:** Each week, we will put a pre-recorded recitation video where a TA screen-records himself/herself (only voice) while going o due to the reasons listed above. It's unlikely to have 50 mins recordings since the recitations are meant to be interactive sessions. Note th **recitation-related questions.**

- **Mini video-project:** Will stay same. I just extended the deadlines by ten days to give you more time: the new deadline for the video subr

- **Quiz 2:** It'll be a take-home exam for 15 mins at the same day/time as scheduled (**May 4, 2:00pm;** I'll consider accommodations for diffe solutions to AutoLab in 15 minutes. You will write the solutions to blank sheet(s), take readable photo(s), and upload to AutoLab. You can t **be in a similar format) regarding the photo-taking, uploading etc. I'll just give 8/10 pts to anyone who successfully submits each q** more details a week before the quiz 2.

- **Final exam:** (This is my current plan, it's tentative but unlikely to change) The final will be a take-home exam for 3 hrs during the schedul for that). As in Quiz 2, questions will be released at the beginning and you'll upload the photos of your solutions to AutoLab in 3 hrs. The ti precautions to prevent cheating issues, don't worry about that. I'll give more details a week before the final exam.

- **Grading:** Due to this unprecedented situation and the mental/physical damage it gives to all of us, **I will be more generous when assig**

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

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

Kruskal's Algorithm

Joseph B. Kruskal

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

$T = \emptyset$

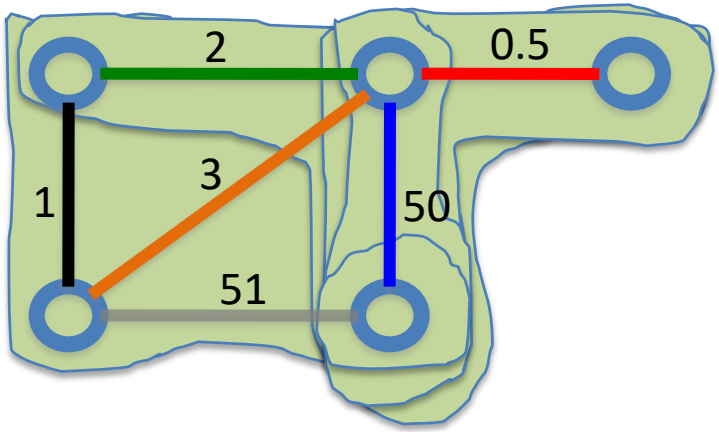
Sort edges in increasing order of their cost

Consider edges in sorted order

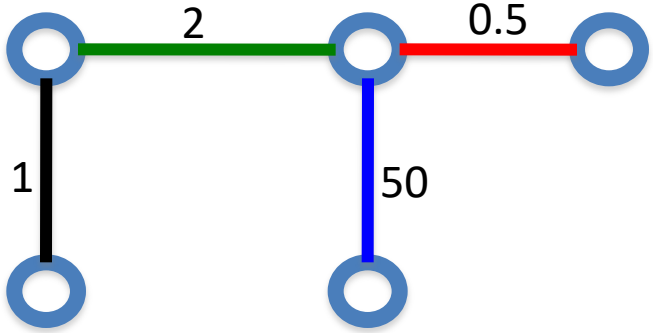
If an edge can be added to T without adding a cycle then add it to T

Prim's algorithm

Similar to Dijkstra's algorithm



Robert Prim



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

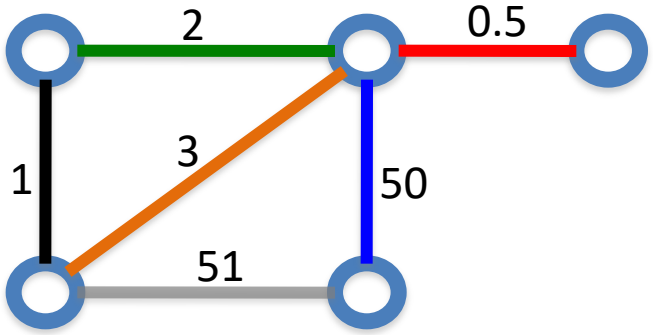
S = {s}, T = Ø

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



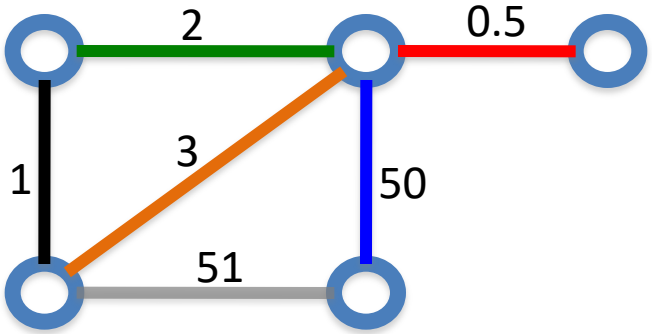
Input: G=(V,E), $c_e > 0$ for every e in E

T = E

Sort edges in decreasing order of their cost

Consider edges in sorted order

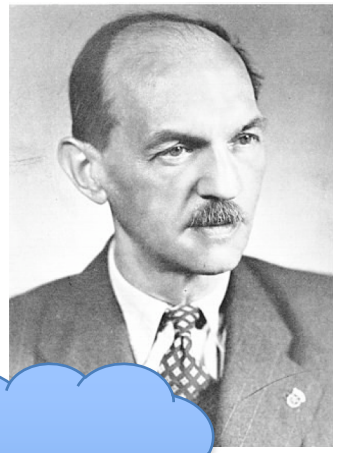
If an edge can be removed T without disconnecting T then remove it



(Old) History of MST algorithms

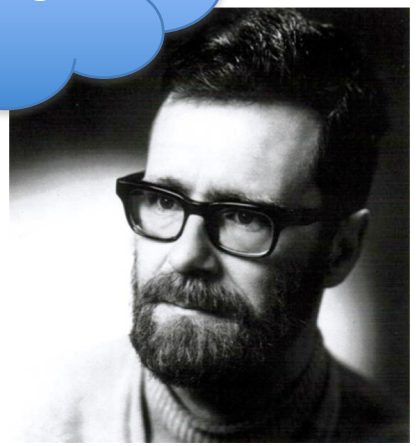
1920: Otakar Borůvka

1930: Vojtěch Jarník



Same algo!

1956: Kruskal



1957: Prim

1959: Dijkstra