

Lecture 18

CSE 331

Oct 14, 2022

HW 4 is out

Homework 4

Due by 11:30pm, Tuesday, October 18, 2022.

Make sure you follow all the [homework policies](#).

All submissions should be done via [Autolab](#).

The [care package](#) on minimizing the maximum lateness problem would be useful for Q3 and *might* be useful for Q2(b) as well.

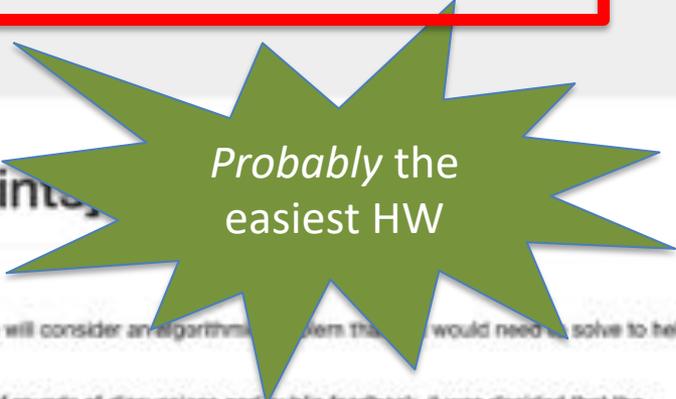
Question 1 (High Speed Internet) [50 points]

The Problem

We come back to the issue of many USA regions not having high speed internet. In this question, you will consider an algorithmic problem that you would need to solve to help out a (fictional) place get high speed internet.

You are the algorithms whiz in the effort to bring high speed internet to `SomePlaceInUSA`. After lots of rounds of discussions and public feedback, it was decided that the most cost-effective way to bring high speed internet to `SomePlaceInUSA` was to install high speed cell towers to connect all houses in `SomePlaceInUSA` to high speed internet. There are two things in your favor:

1. It just so happens that all of the n houses in `SomePlaceInUSA` are on the side of a straight road that runs through the town.



Probably the
easiest HW

Please pay attention to instructions

note @206

stop following 1 view

Actions

Pay attention to submission requirements (for Q1+Q2)

When we say you will get a zero if you do not follow an instruction, it is NOT a gentle suggestion. So please make sure you pay attention to the warnings. E.g.:

! Submit part (a) and (b) separately

You need to submit **two (2) PDF** files to Autolab: one for part (a) and one for part (b). While you can assume part (a) as a given for part (b), to get credit for part (a) you have to submit your solution for part (a) separately from part (b).

Make sure you submit the correct PDF to the correct submission link on Autolab. If you do not (e.g. if you submit Q1(a) PDF to Q2(a) or even Q1(b)), then you will lose ALL points.

We recommend that you typeset your solution but we will accept scans of handwritten solution — you have to make sure that the scan is legible.

and this:

! PDF only please

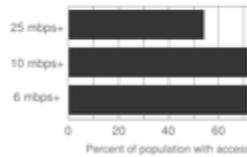
If Autolab cannot display your file, (irrespective of the reason) then you will get a zero (0) on the entire question.

Autolab might not be able to display files in formats other than PDF (e.g. Word cannot be displayed). **Note that Autolab will "accept" your submission even if you submit non-PDF file, so it is YOUR responsibility to make sure you submit in the correct format.** However, after submission, Autolab will try and display your non-PDF submission and it should give an error message then. Also the file size has to be **at most 3MB**.

Make broadband more available

Cattaraugus County

Population: 79518
Median Income: \$41,368.88
Access to any cable technology: 67.5%
Access to two or more wireline providers: 61.2%

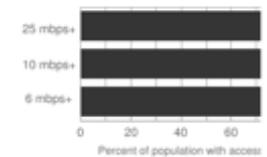


Say you are tasked to come up with the infrastructure

BOTH technical and societal issues

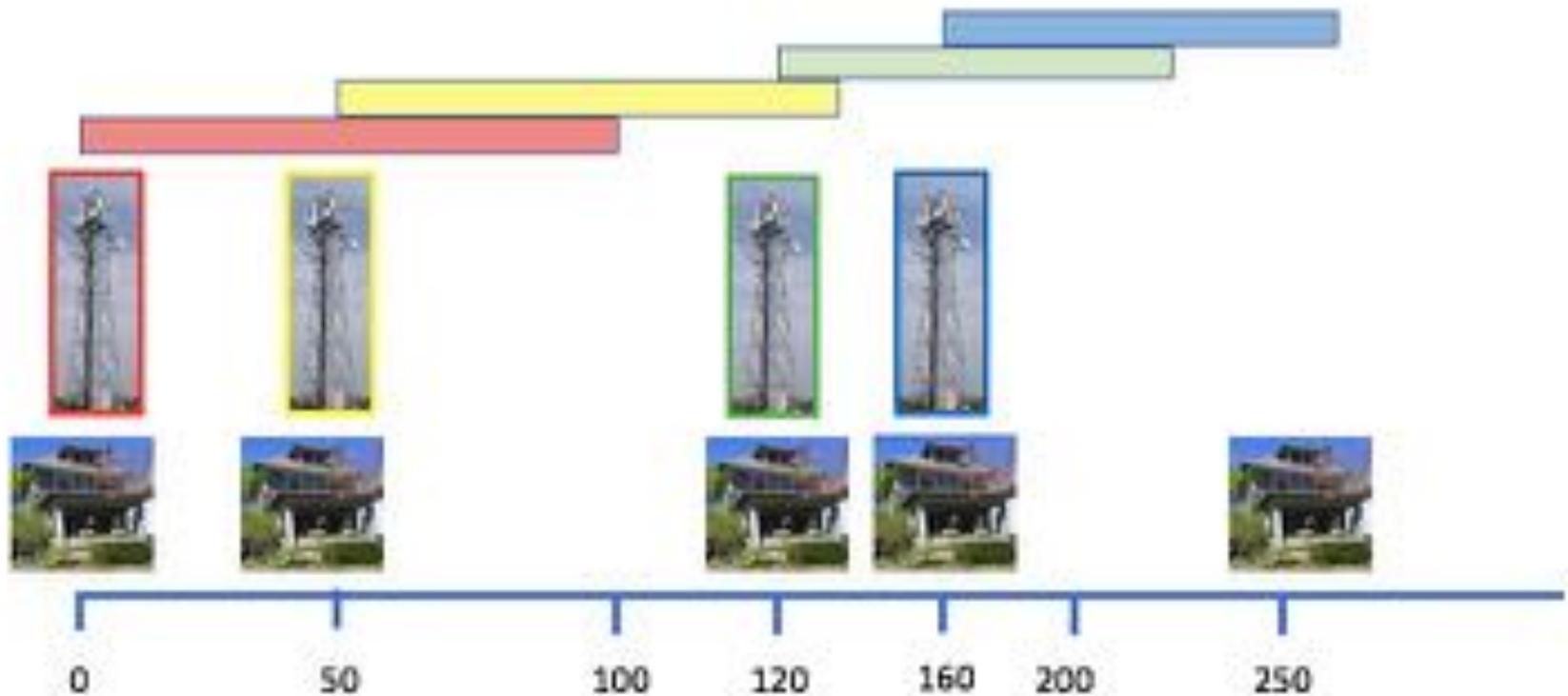
Erie County

Population: 913295
Median Income: \$49,817.67
Access to any cable technology: 98.9%
Access to two or more wireline providers: 96.8%



HW 4 Q1: How to lay down towers

Here is a quick visual argument for the above leads to continuous cell coverage:



Project deadlines coming up

Fri, Oct 28	Counting Inversions  ^{F21}  ^{F19}  ^{F18}  ^{F17} x^2	[KT, Sec 5.3] (Project (Problem 1 Coding) in)
Mon, Oct 31	Multiplying large Integers  ^{F21}  ^{F19}  ^{F18}  ^{F17} x^2	[KT, Sec 5.5] (Project (Problem 1 Reflection) in) <i>Reading Assignment:</i> Unraveling the mystery behind the identity
Wed, Nov 2	Closest Pair of Points  ^{F21}  ^{F19}  ^{F18}  ^{F17} x^2	[KT, Sec 5.4]
Fri, Nov 4	Kickass Property Lemma  ^{F21}  ^{F19}  ^{F18}  ^{F17} x^2	[KT, Sec 5.4] (Project (Problem 2 Coding) in)
Mon, Nov 7	Weighted Interval Scheduling  ^{F21}  ^{F19}  ^{F17} x^2	[KT, Sec 6.1] (Project (Problem 2 Reflection) in)

Some other stuff coming up

note 0282   

stop following  views Actions

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: [0274](#))
- 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.
- Once the mid-terms are graded I'll assign temporary letter grades to y'all (based on your scores of HWs 1-3, 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 by tomorrow (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 (<= 12 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 stats.

[mid-term](#) [grading](#)

[Edit](#) good note 

Updated 11 seconds ago by AMR Rudea

Ignore HUB mid-semester grade

note @284 stop following 2 views Actions

IGNORE the mid-semester grade on HUB

On HUB, you will now see a mid-semester grade for CSE 331. **Please ignore the grade.** I will be posting a more appropriate mid-semester letter grade (see @282) sometime next week. The mid-semester grade on HUB (which is only MS/MU) only takes HWs 1-3 and Quiz 1 into account. The more accurate mid-term temp. letter grade will also take your mid-term exam scores into account-- again as mentioned in @82, once I have computed that more accurate temp letter grade, I will post on piazza with more details.

UB requires that I submit a mid-semester grade by tomorrow. In previous semesters the deadline used to be after I assigned the temp. mid-term grade but UB moved up the schedule since last year, which is why I uploaded a cruder mid-semester grade for now (because I have to upload something now).

mid-term grading

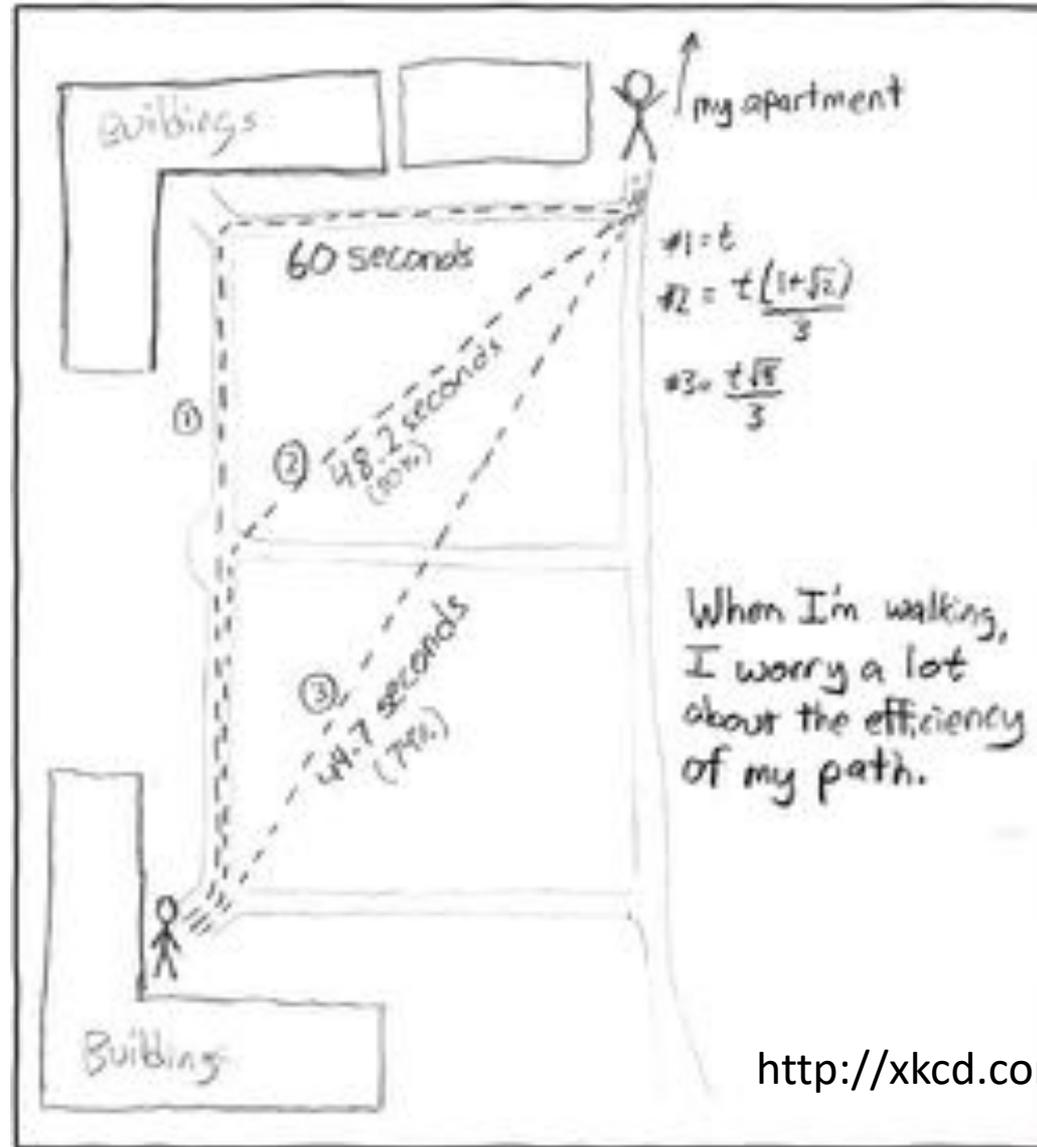
Edit good note 0

Updated 20 seconds ago by Atri Rudra

Questions?



Shortest Path Problem



Another more important application

Is BGP a known acronym for you?



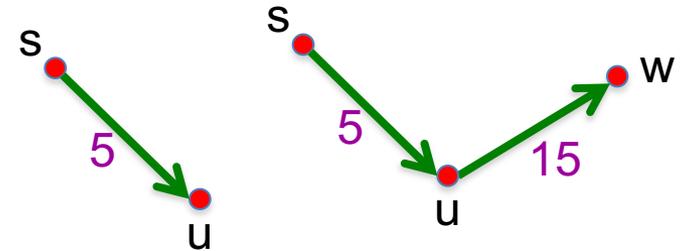
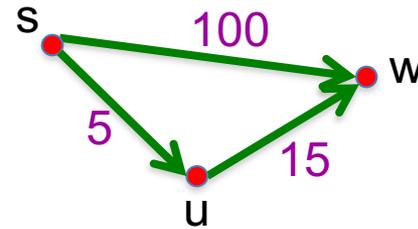
Routing uses shortest path algorithm

Shortest Path problem

Input: *Directed* graph $G=(V,E)$

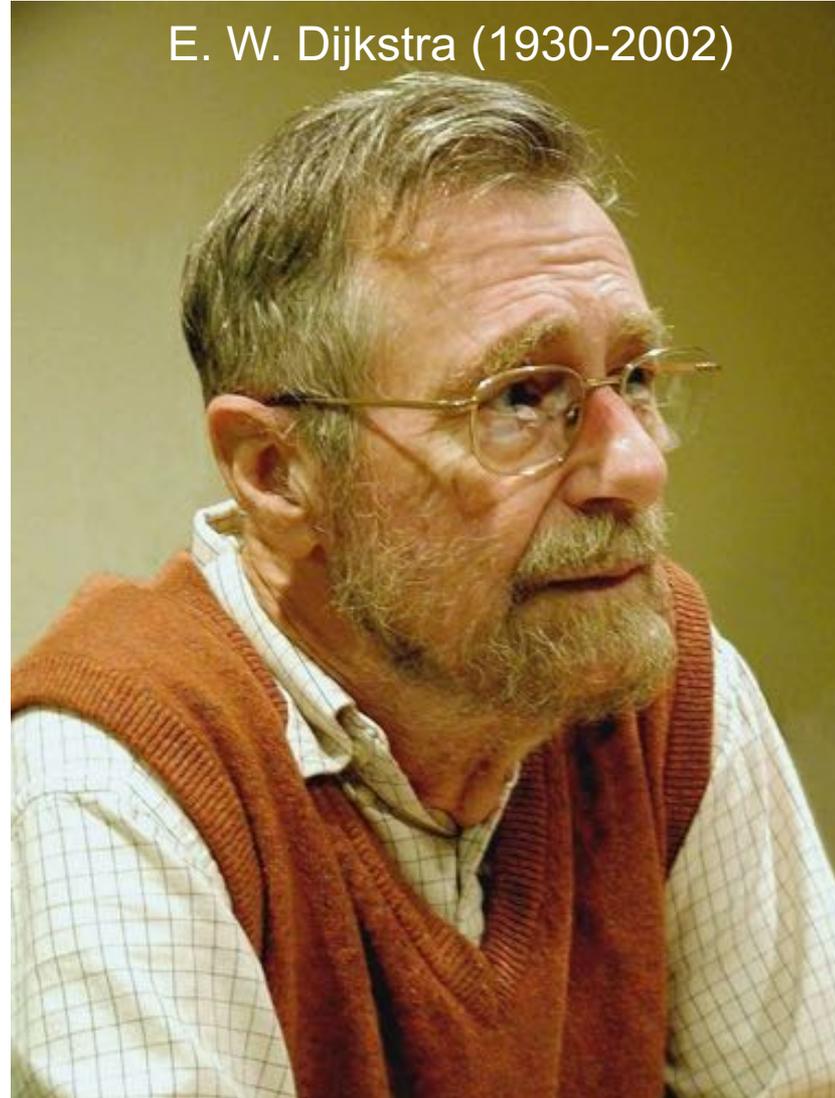
Edge lengths, l_e for e in E

“start” vertex s in V

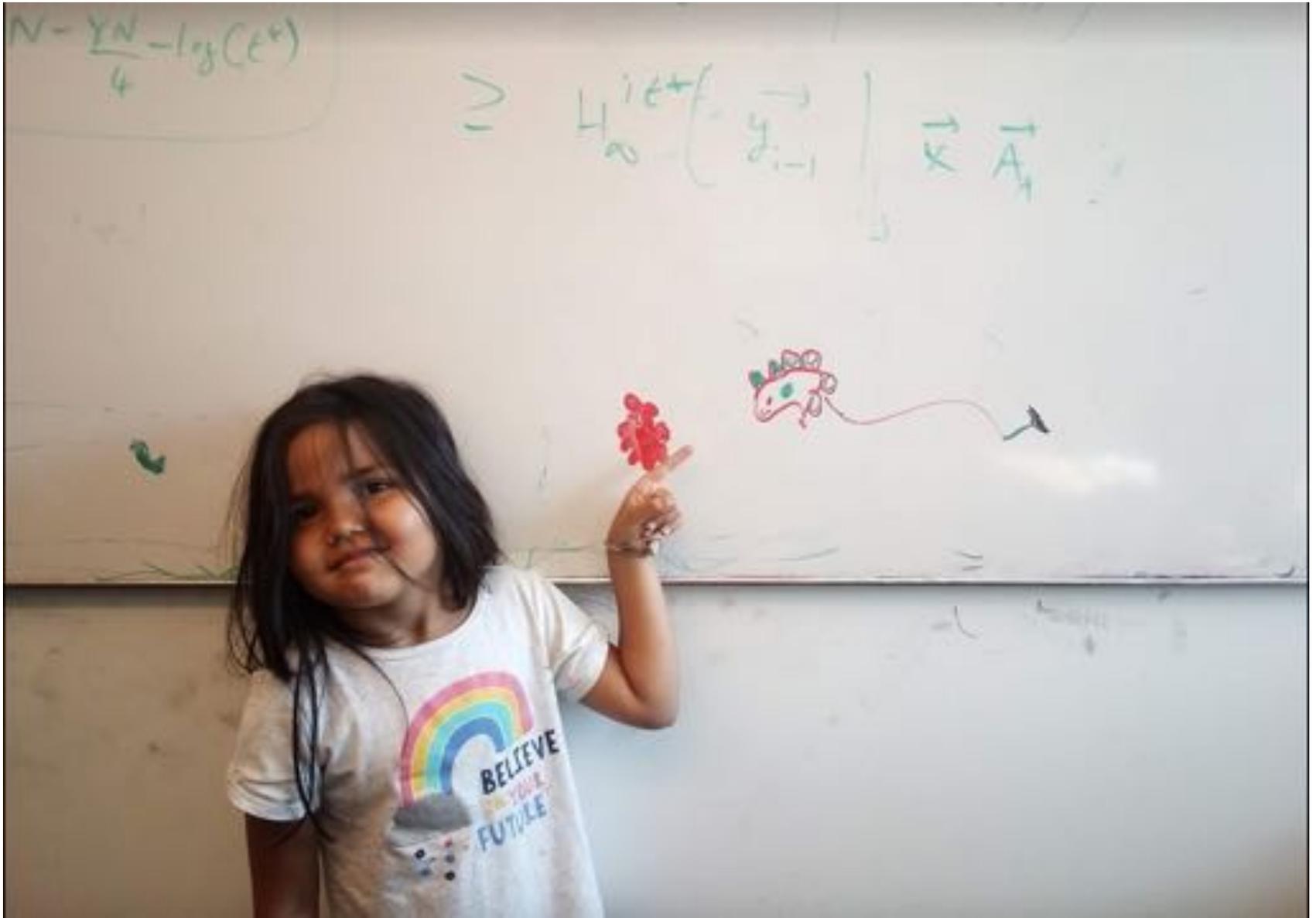


Output: Length of shortest paths from s to all nodes in V

Dijkstra's shortest path algorithm



Questions/Comments?



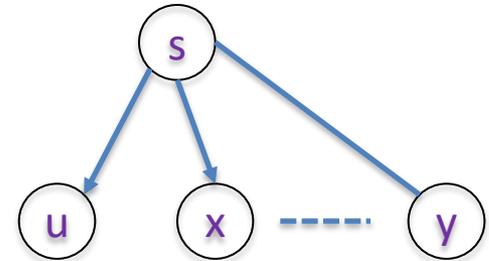
On to the board...



Towards Dijkstra's algo: part ek

Determine $d(t)$ one by one

$$d(s) = 0$$



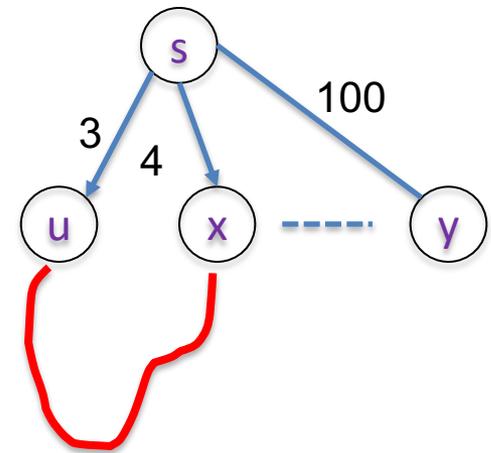
Towards Dijkstra's algo: part do

Determine $d(t)$ one by one

Let u be a neighbor of s with smallest $l_{(s,u)}$

$$d(u) = l_{(s,u)}$$

Not making any claim
on other vertices



Length of  is ≥ 0

Towards Dijkstra's algo: part teen

Determine $d(t)$ one by one

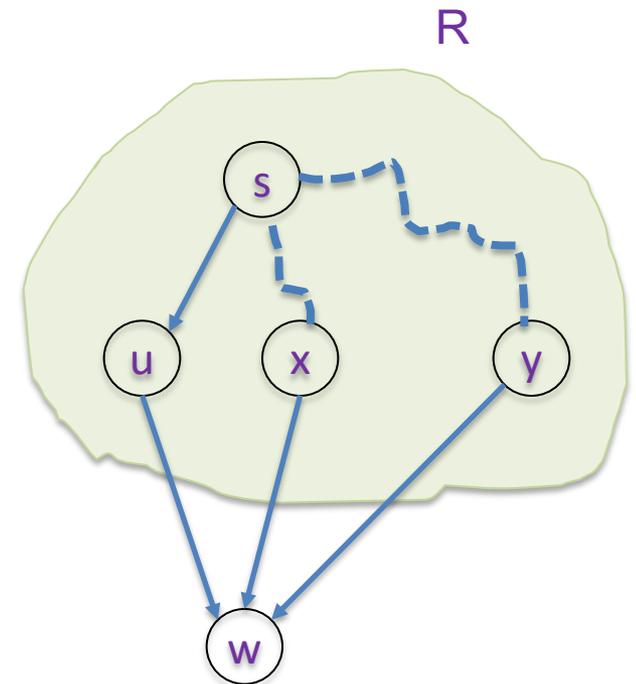
Assume we know $d(v)$ for every v in R

Compute an upper bound $d'(w)$ for every w not in R

$$d(w) \leq d(u) + l_{(u,w)}$$

$$d(w) \leq d(x) + l_{(x,w)}$$

$$d(w) \leq d(y) + l_{(y,w)}$$



$$d'(w) = \min_{e=(u,w) \text{ in } E, u \text{ in } R} d(u) + l_e$$