Lecture 20

CSE 331

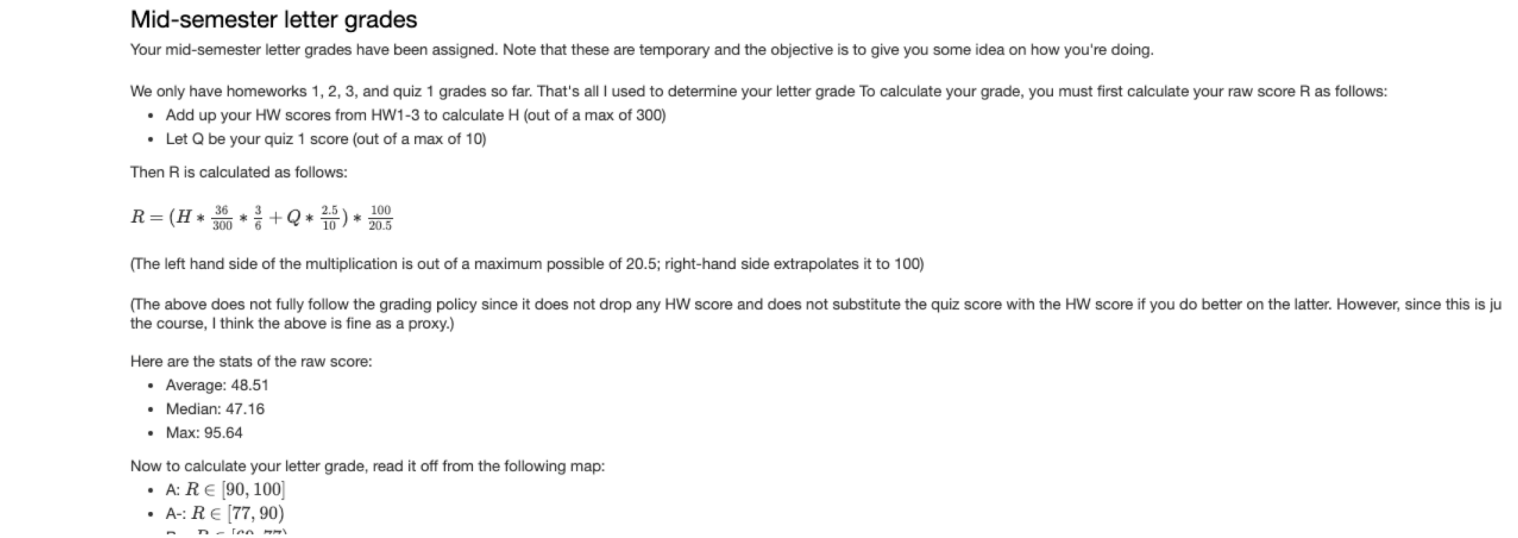
Mar 22, 2021

Midterm is over

- Did you check the solutions?
- What went well? What went wrong?
  - What could you do better for preparation?
- You can still get an A even if you get zero for all HWs 1,2,3; Quiz 1; and midterms!

Mid-semester grades

- Out of only 20.5 points



Mid-semester letter grades

Your mid-semester letter grades have been assigned. Note that these are temporary and the objective is to give you some idea on how you're doing.

We only have homeworks 1, 2, 3, and quiz 1 grades so far. That's all I used to determine your letter grade 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)

Then R is calculated as follows:

$$R = (H * \frac{36}{300} * \frac{3}{6} + Q * \frac{2.5}{10}) * \frac{100}{20.5}$$

(The left hand side of the multiplication is out of a maximum possible of 20.5; right-hand side extrapolates it to 100)

(The above does not fully follow the grading policy 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 ju the course, I think the above is fine as a proxy.)

Here are the stats of the raw score:

- Average: 48.51
- Median: 47.16
- Max: 95.64

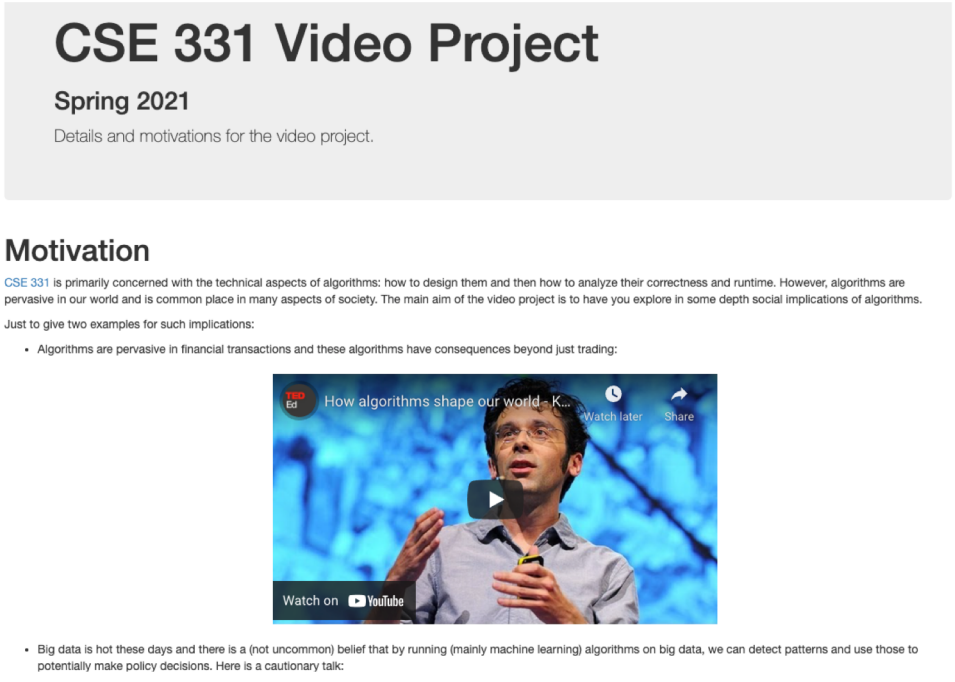
Now to calculate your letter grade, read it off from the following map:

- A: $R \in [90, 100]$
- A-: $R \in [77, 90)$

- Just to give you some idea, don’t take it too seriously

Reminders

- Video-project deadline: April 14
  - Check the website; it has everything you need!
  - Rubric for how we'll grading is there too!



CSE 331 Video Project

Spring 2021

Details and motivations for the video project.

Motivation

CSE 331 is primarily concerned with the technical aspects of algorithms: how to design them and then how to analyze their correctness and runtime. However, algorithms are pervasive in our world and is common place in many aspects of society. The main aim of the video project is to have you explore in some depth social implications of algorithms.

Just to give two examples for such implications:

- Algorithms are pervasive in financial transactions and these algorithms have consequences beyond just trading:

- Big data is hot these days and there is a (not uncommon) belief that by running (mainly machine learning) algorithms on big data, we can detect patterns and use those to potentially make policy decisions. Here is a cautionary talk:

Dijkstra's shortest path algorithm

P_u shortest s-u path in "Dijkstra tree"

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

Input: Directed $G=(V,E)$, $l_e \geq 0$, s in V

$R = \{s\}$, $d(s) = 0$

While there is a (u,x) in E s.t. u in R and x not in R

Pick w among all x with smallest $d'(w)$ value

Add w to R

$d(w) = d'(w)$

Lemma 1: At end of each iteration, if u in R, then P_u is a shortest s-u path

Lemma 2: If u is connected to s, then u in R at the end

Dijkstra's shortest path algorithm

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Input: Directed $G=(V,E)$, $l_e \geq 0$, s in V

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While there is a (u,x) in E s.t. u in R and x not in R

Pick w among all x with smallest $d'(w)$ value

Add w to R

$d(w) = d'(w)$

At most n iterations

$\sum_{x \in V} O(IN_x) = O(m+n)$ time

$O((m+n)n)$ time bound is trivial

$O((m+n) \log n)$ time implementation with priority Q

Reading Assignment

Sec 4.4 of [KT]

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