Announcements

A few course policies

1. **Regrade requests are due within 1 week of the grade opening on Gradescope**
2. Recall: **Participation** & completion of course eval part of you grade (3%).
    a. Poll Everywhere, with ≥75% credit is full credit
    b. Section participation (after the quiz), missing up to 2 sections is full credit
    c. Course eval response
3. Will drop 2 of your worst quiz scores
4. We **do not drop** any hw scores

Prelim 1: Thursday, Feb 12. Statler Auditorium. Fill out this form **today**, if you have a conflict.

Greedy and Dynamic Programming: Covers hw1-2, sections weeks1-2, lectures through 2/4

Section this week is DP quiz and then review.

Other prelim info and practice questions posted on Canvas, solutions will be posted after sections

Join by Web **PollEv.com/evatardos772**

How much time did you spend on hw2

A. <3 hours coding and prob 2&3
B. 3-6 hours, most on the coding
C. 3-6 hours, more on prob 2&3
D. 7-10 hours, most on the coding
E. 7-10 hours, more on prob 2&3
F. 10-15 hours, most on the coding
G. 10-15 hours, most on prob 2&3
H. >15 hours, most on the coding
G. >15 hours, most on prob 2&3

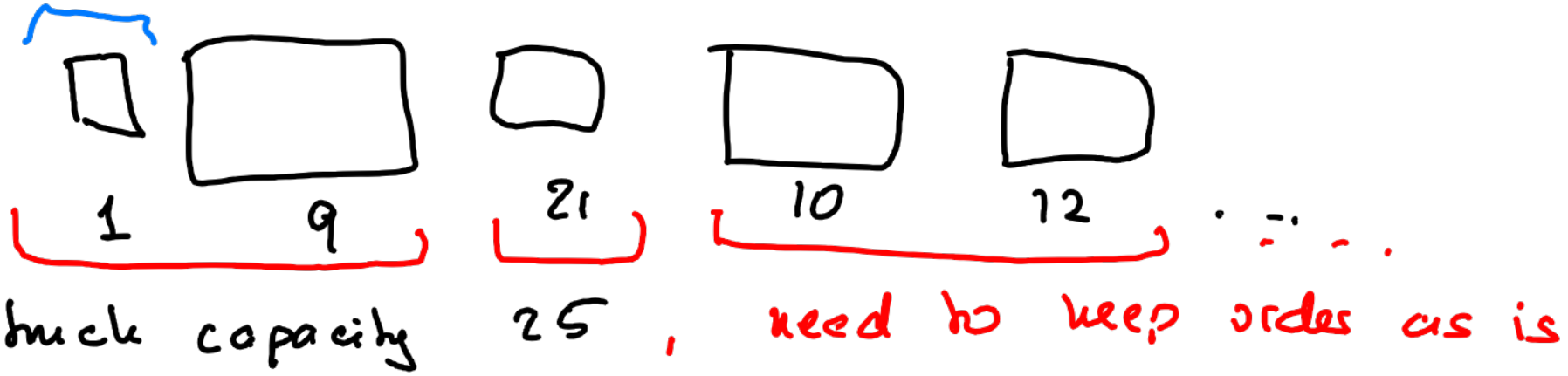
Greedy review

Greedy styles: **Min cost Spanning Tree**

order by time and make decisions in this order. Interval scheduling, scheduling checkups (hw1)

Today example: trucking problem

Packages to be shipped on trucks. Must maintain order, but trucks have wait limits.



greedy: take max # you can up to weight limit
Can you take less trips

Greedy review

ordered load scheduling

Proof options:

- **greedy stays ahead: What is the statement you want to prove by induction**
- exchange: proof by contradiction

Statement: every trip i carried as many packages till now as possible

Opt didn't carry more packages

proof:

base $i=1$ by definition of greedy

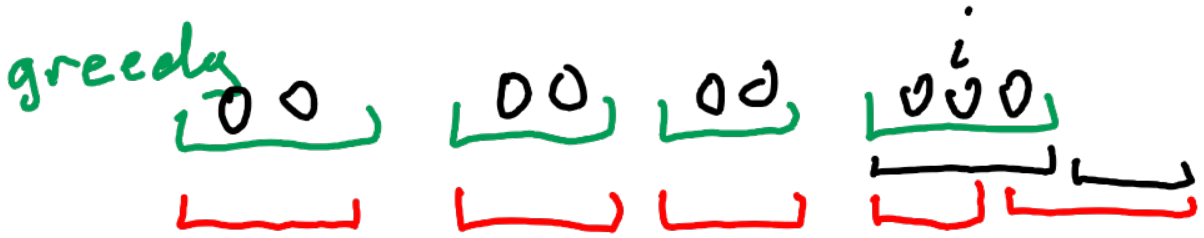
induction step:

Greedy review

Proof options:

- greedy stays ahead: What is the statement you want to prove by induction
- **exchange: proof by contradiction**

suppose not true: take Opt that agrees with greedy for as many steps as possible



change Opt to agree with our greedy. Contradiction

add extra packages to Opt i

Common mistake: need to modify Opt: greedy is set

Dynamic programming Review (Styles of problems)

- Order decisions: last decisions: what do you need for subproblems
  - Opt(i): best solutions with items 1…i: weighted interval scheduling
    - Should we include last item
  - Opt(i): best solutions with items 1…i: segmented least squares
    - What should be the last segment
  - Opt(i): best solutions with items 1…i with item i included:
    - highway planning: where should be the previous gas station
  - Opt(k,v): min cost path to v using $\leq k$ edges: min cost path
    - What is the last edge
  - Opt(i,j): best solutions for $x_1 x_2 \ldots x_i$ and $y_1 y_2 \ldots y_j$ sequence alignment
    - Should we align the last letters

Reduction

also OK for greedy:

hw 1 q2: island planning

Word segmentation (from section)

Meetateight

Theyouthevent

meet at eight

the youth event

the you the vent

input sequence of letters $x_1 \ldots x_n$

quality$(x_1 \ldots x_k)$ for all sequences $k \leq n$

quality (event) >>0

quality (ent) = 0

quality (the) >>0

- Design a dynamic program
- Reduction to problem we have solved

↑ today

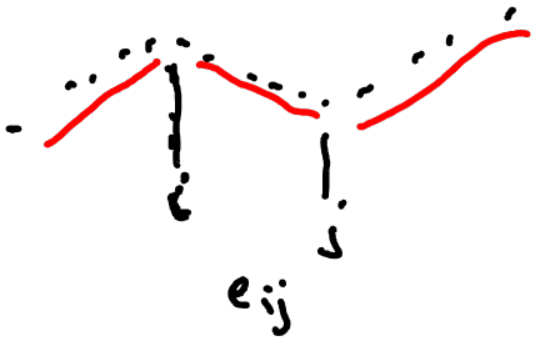
Reduction: segmented least squares

Step 1: find similar enough problem we solved

explain how new problem converts to segmented least squares

input way e_{ij} = cost of segment ij

- $e_{ij} = -\text{quality}(x_i \dots x_j)$, $C = 0$



- max sum of qualities = min sum of e_{ij} on a segmentation

note solution works = even with negative e_{ij}

Proof:
- solution to new problem is an option segmented least squares will consider
- solution to seg. least squares produces valid solution
- cost / value same