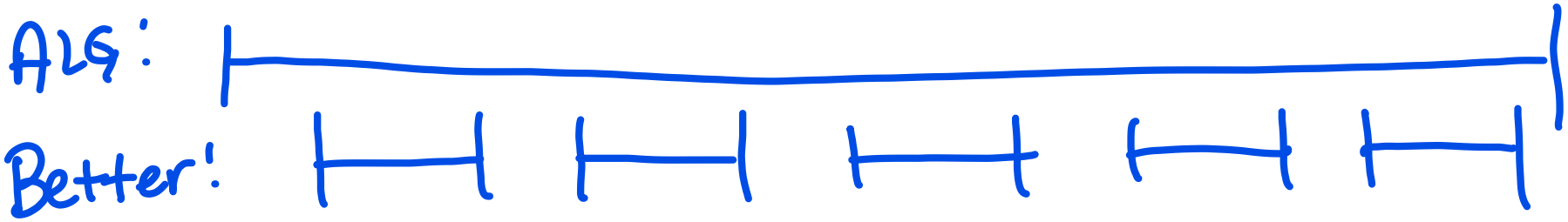
CompSci 161
Winter 2023 Lecture 17:
Greedy Algorithms:
Interval Scheduling

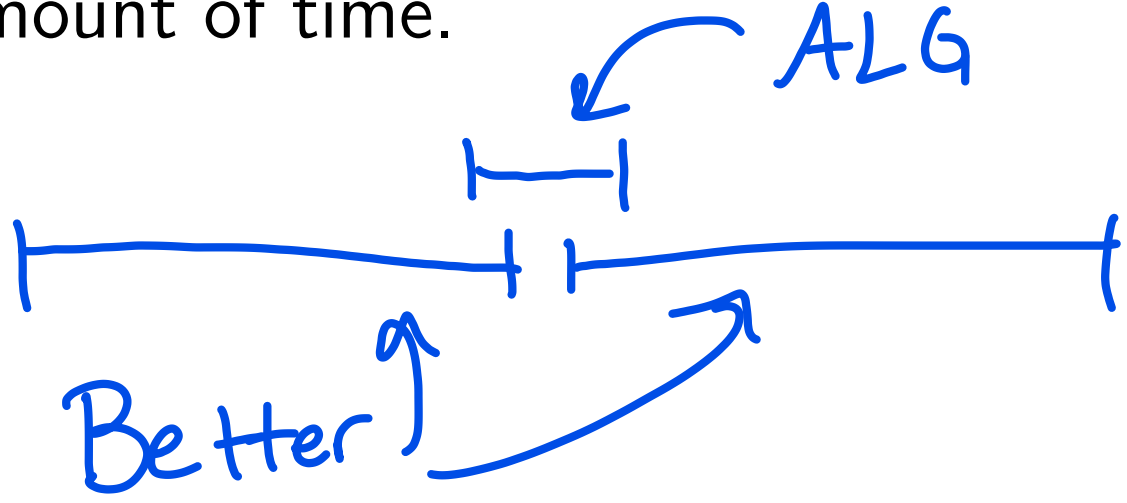
Unweighted Interval Scheduling Problem

Two possible algorithms (four on handout):

- Sign up for the class that begins earliest.



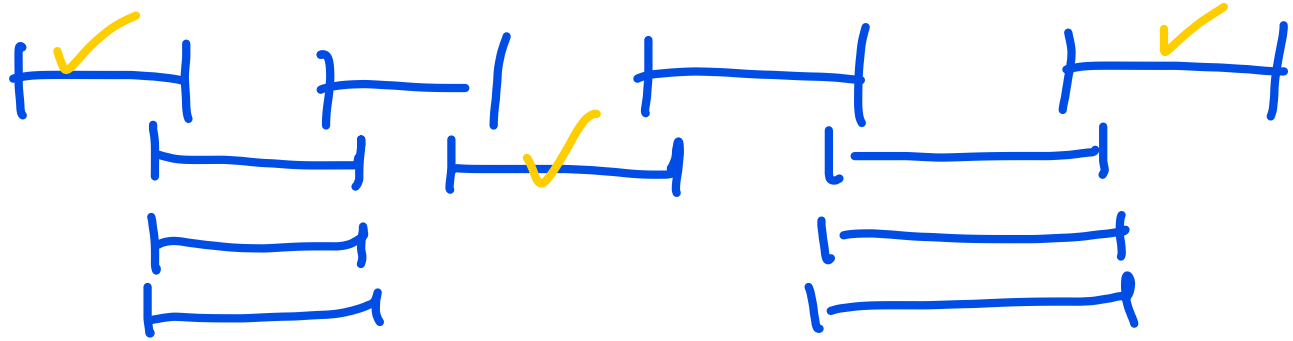
- Sign up for the class that meets for the least amount of time.



Unweighted Interval Scheduling Problem

Two more algorithms (four on handout):

- Sign up for the class that conflicts with the fewest other classes.



ALG better: top 4

- Sign up for the class that ends earliest.

Interval Scheduling Problem (proof)

Correct Algorithm:

- Sign up for the class that ends earliest.
- Remove it and all overlapping classes from the set of available classes.
- Repeat this process until no classes remain.

Claim: There is an optimal solution that includes the first-ending class.

Proof of Claim: Suppose all optimal solutions do not. Select an arbitrary optimal solution OPT.

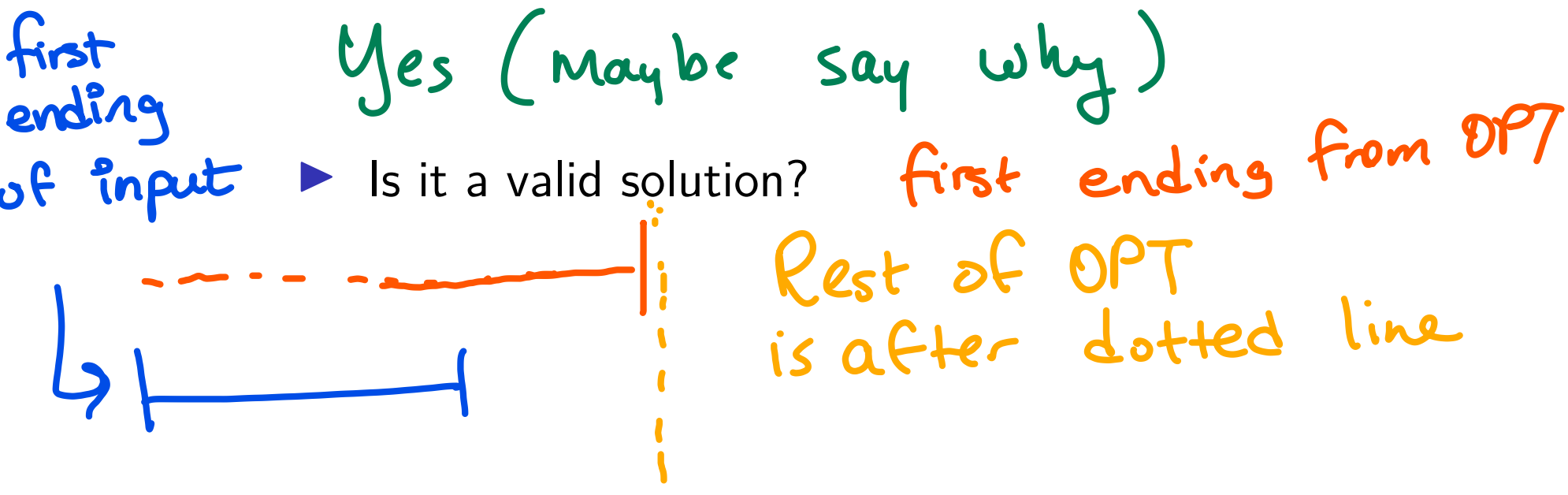
OPT' : OPT, remove the first ending from OPT
add first ending from input

Proof of Correctness

- We began with an arbitrary optimal set OPT
  - Its first element was not first-ending.
  - We removed that one
  - We added our first one: the first-ending.
  - This forms a set we'll call OPT′
- **Claim:** OPT′ is an optimal solution.
  - Is it the same size as every optimal solution?

Yes (Maybe say why)

- Is it a valid solution?



Additional Slide (if needed)

"How To Prove It"
by Daniel Velleman (spelling?)

Proof of Correctness

- We proved that an optimal solution exists that includes the first-ending class.
- What does the full proof look like?