Lecture 20

CSE 331

Oct 13, 2017

Mid-term-I Monday

In class

1:00pm-1:50pm sharp

Eight True/False with justification Qs

Graded Quiz 1

On Autolab by tonight

Graded HW3

Hopefully by tonight

Scheduling to minimize lateness

n jobs: ith job (t_i,d_i)

start time: s

Schedule the n jobs: ith job gets interval [s(i),f(i)=s(i)+t_i)

At most one job at any time

Not the sum

Algo picks s(i)

GOAL: Minimize MAXIMUM lateness

Lateness of job i, l_i = max(0,f(i)-d_i)

The Greedy Algorithm

(Assume jobs sorted by deadline: $d_1 \leq d_2 \leq \ldots\ldots \leq d_n$)

f=s

For every i in 1..n do

Schedule job i from s(i)=f to f(i)=f+t_i

f=f+t_i

n iterations

O(1) per iteration

O(n) overall.
O(n log n) if deadlines are not sorted.

Solving end of Semester blues

Term paper

Exam study

Party!

331 HW

Project

Max lateness
= 2

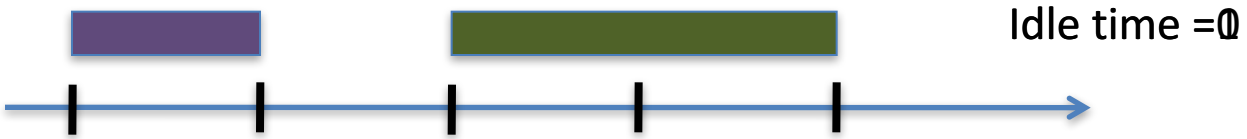
0 0 0 0 2

Party! | Exam study | 331 HW | Term paper | P

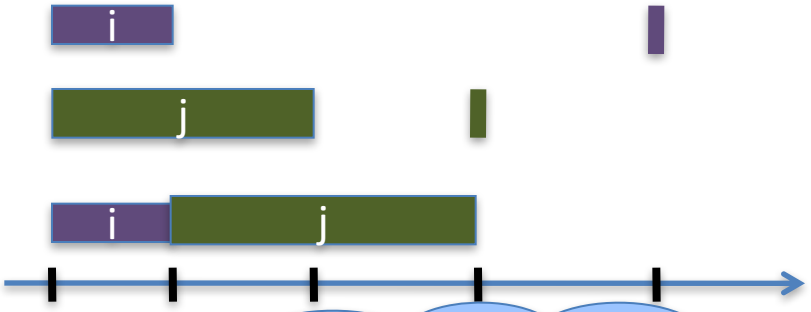
Monday Tuesday Wednesday Thursday Friday

Two definitions for schedules

Idle time — Max "gap" between two consecutively scheduled tasks



Inversion — (i,j) is an inversion if i is scheduled before j but $d_i > d_j$




```
f=1

For every i in 1..n do

    Schedule job i from s_i=f to f_i=f+t_i

    f=f+t_i
```

0 idle time and 0 inversions for greedy schedule

We will prove

Any two schedules with 0 idle time and 0 inversions have the same max lateness

Proving greedy is optimal

Any two schedules with 0 idle time and 0 inversions have the same max lateness

Greedy schedule has 0 idle time and 0 inversions

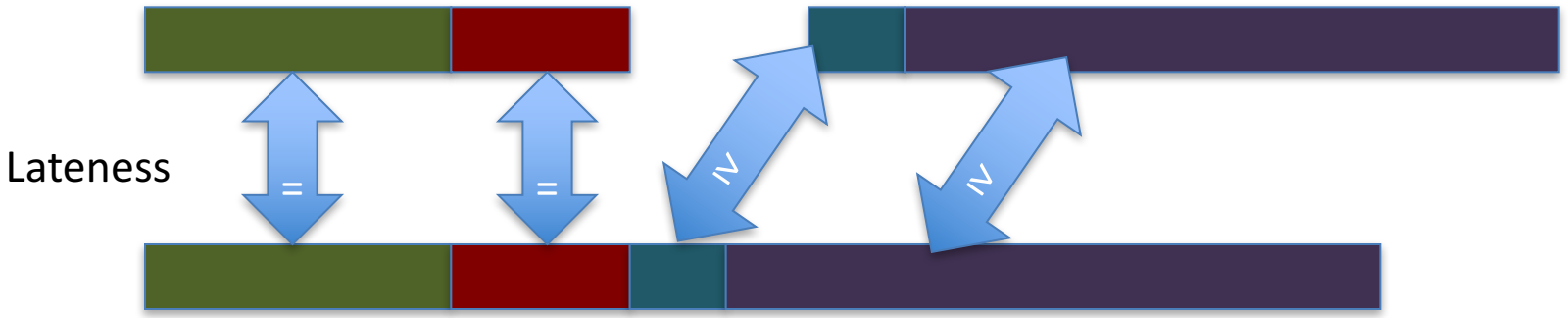
To prove

Any two schedules with 0 idle time and 0 inversions have the same max lateness

Greedy schedule has 0 idle time and 0 inversions

There is an optimal schedule with 0 idle time and 0 inversions

Optimal schedule with 0 idle time



"Only" need to convert a 0 idle optimal ordering to one with 0 inversions (and 0 idle time)

Today's agenda

Prove any schedules with 0 idle time and 0 inversions have the same L

"Exchange" argument to convert an optimal solution into a 0 inversion one