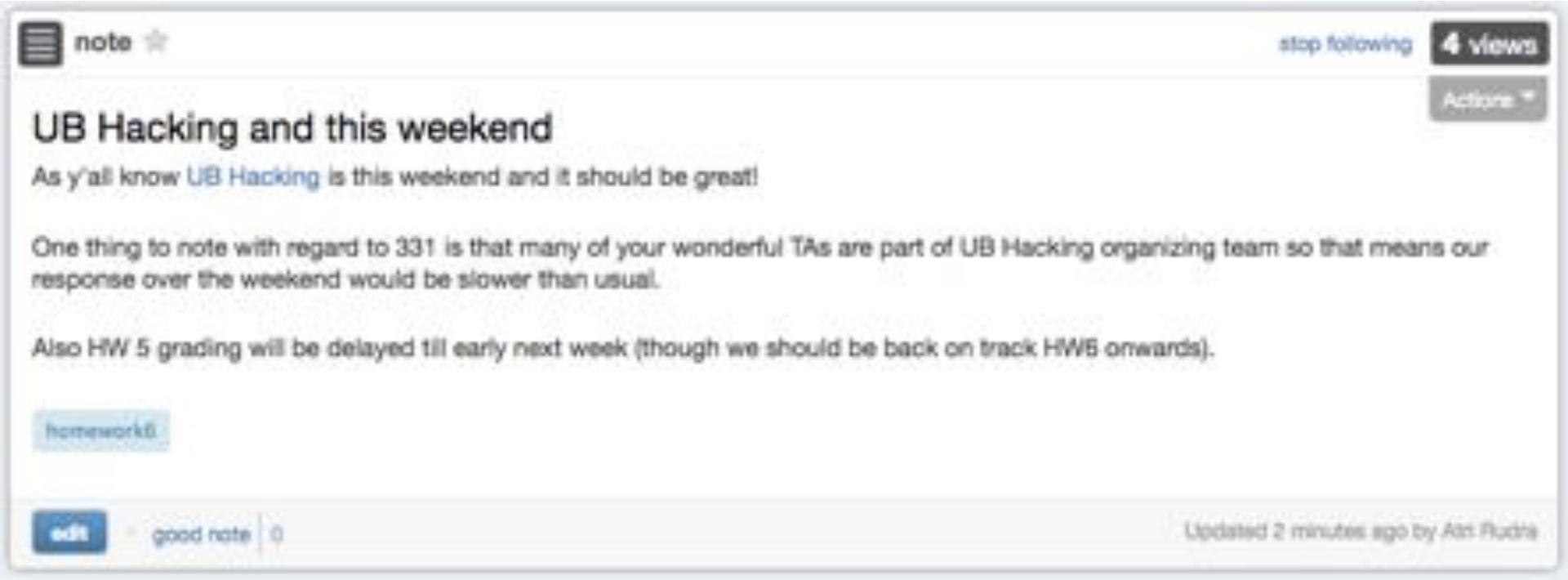
Lecture 27

CSE 331

Nov 4, 2016

HW 5 grading and the like



HW 7 posted

Homework 7

Due by **12:30pm, Friday, November 11, 2016**.

Make sure you follow all the homework policies.

All submissions should be done via Autolab.

Question 1 (Programming Assignment) [40 points]

</> Note

This assignment can be solved in either Java, Python or C++ (you should pick the language you are most comfortable with). Please make sure to look at the supporting documentation and files for the language of your choosing.

The Problem

In this problem, we will explore weighted graphs.

Solutions for HW 6

At the END of the lecture

Mergesort algorithm

Input: $a_1, a_2, \ldots, a_n$

Output: Numbers in sorted order

```
MergeSort( a, n )
    If n = 1 return the order a_1

    a_L = a_1,..., a_n/2

    a_R = a_n/2+1,..., a_n

    return MERGE ( MergeSort(a_L, n/2), MergeSort(a_R, n/2) )
```

Correctness

Input: $a_1, a_2, \ldots, a_n$

Output: Numbers in sorted order

```
MergeSort( a, n )
  If n = 1 return the order a_1

  a_L = a_1,..., a_{n/2}

  a_R = a_{n/2+1},..., a_n

  return MERGE ( MergeSort(a_L, n/2) MergeSort(a_R, n/2) )
```

By induction on n

Inductive step follows from correctness of MERGE

Rest of today's agenda

Analyze runtime of mergesort algorithm

Divide and Conquer

Divide up the problem into at least two sub-problems

Recursively solve the sub-problems

“Patch up” the solutions to the sub-problems for the final solution

Improvements on a smaller scale

Greedy algorithms: exponential → poly time

(Typical) Divide and Conquer: $O(n^2)$ → asymptotically smaller running time

Multiplying two numbers

Given two numbers a and b in binary

$a=(a_{n-1},..,a_0)$ and $b = (b_{n-1},\ldots,b_0)$

Compute c = a x b