




































Lecture 12

CSE 331

Sep 23, 2024

Quiz 1 next Monday

Mon, Sep 23	Breadth First Search  F23  F22  F21  F19  F18  F17 x^2	[KT, Sec 3.2]
Tue, Sep 24		(HW 3 out, HW 2 in)
Wed, Sep 25	Explore algorithm  F23  F22  F21  F19  F118  F17 x^2	[KT, Sec 3.3]
Fri, Sep 27	Runtime Analysis of BFS algorithm  F23  F22  F21  F19  F18  F17 x^2	[KT, Sec 3.3, 3.6] <i>Reading Assignment:</i> [KT, Sec 3.3, 3.4, 3.5, 3.6] <i>Reading Assignment:</i> Care package on topological ordering
Mon, Sep 30	More graph stuff  F23  F22  F21  F19  F18  F17 x^2	[KT, Sec 3.3, 3.6] (Quiz 1) (Group Registration on Autolab due)
Tue, Oct 1		(HW 3 in)
Wed, Oct 2	Interval Scheduling Problem  F23  F22  F21  F19  F18  F17 x^2	[KT, Sec 4.1] (Project out) <i>Reading Assignment:</i> [KT, Sec 4.1, 4.2]
Fri, Oct 4	Greedy Algorithm for Interval Scheduling  F23  F22  F19  F18  F17 x^2	[KT, Sec 4.4] <i>Reading Assignment:</i> Care package on minimizing maximum lateness
Mon, Oct 7	Mid-term exam: I	
Wed, Oct 9	Mid-term exam: II	

Autolab Project Group Registration

Also due next Monday

note @110

stop following

27 views

Actions

Register your project groups on Autolab

Now that all the project groups have been assigned (@109), it is time for the next project deadline **your group needs to register on Autolab by 11:30pm on Monday, September 30.**

(I was originally planning to have Autolab start t

Make sure to EXACTLY follow the instructio

MISSING THIS DEADLINE ALSO MEANS TH

by the deadline of Sep 30. *Note that completing* ~~some steps~~ ~~before the deadline~~ ~~is important~~ ~~to~~ ~~make~~ ~~sure~~ ~~that~~ ~~you~~ ~~and~~ ~~your~~ ~~group~~ ~~are~~ ~~well~~ ~~in~~ ~~advance~~ ~~of~~ ~~the~~ ~~deadline.~~ make sure you get this done

A request: This is the first time we are doing project group registration on Autolab so I would appreciate it is some of you could test out the instructions and confirm that you were successfully able to follow the instruction on Autolab. Thanks!

project

autolab

Edit

good note

0

Updated 15 hours ago by Atri Rudra

If you miss this deadline then you will get a ZERO on the ENTIRE project

Read the instruction carefully

Autolab group registration for CSE 331 Project

- Project Overview
- Project Autolab page
- Group signup form

The lowdown on registering your [project group](#) on Autolab.

Fill in the Group Composition form FIRST

Make sure you fill in [this Google form](#) to submit your group composition. Please see the [project overview page](#) for more details on this.

You HAVE to submit the Google form

You **have** to submit [this Google form](#) by **11:30pm on Friday, September 20**. If you do not fill in the form on time, then you will not be able to register your group on Autolab and **will get a ZERO (0) on the ENTIRE project**.

Register your group on Autolab

Groups on Autolab will NOT be automatically registered

Even after filling the Google form for your group composition you will have to register your group on Autolab by yourself (as a group). Read on for instructions on how to go about this.

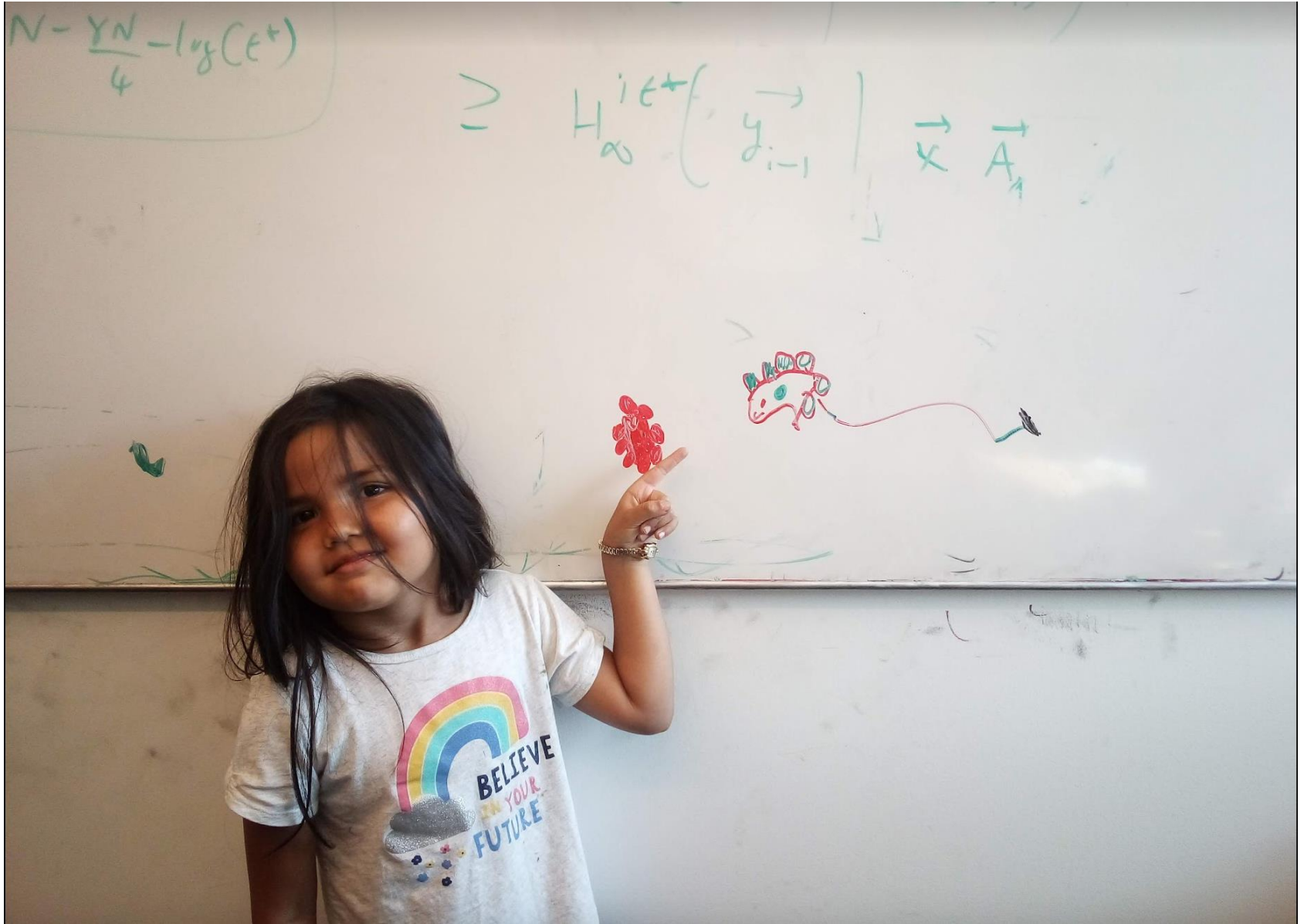
However, once you register your group on Autolab you will **not** have to form your group for the coding and reflections submissions.

Connectivity

u and w are connected iff there is a path between them

A graph is connected iff all pairs of vertices are connected

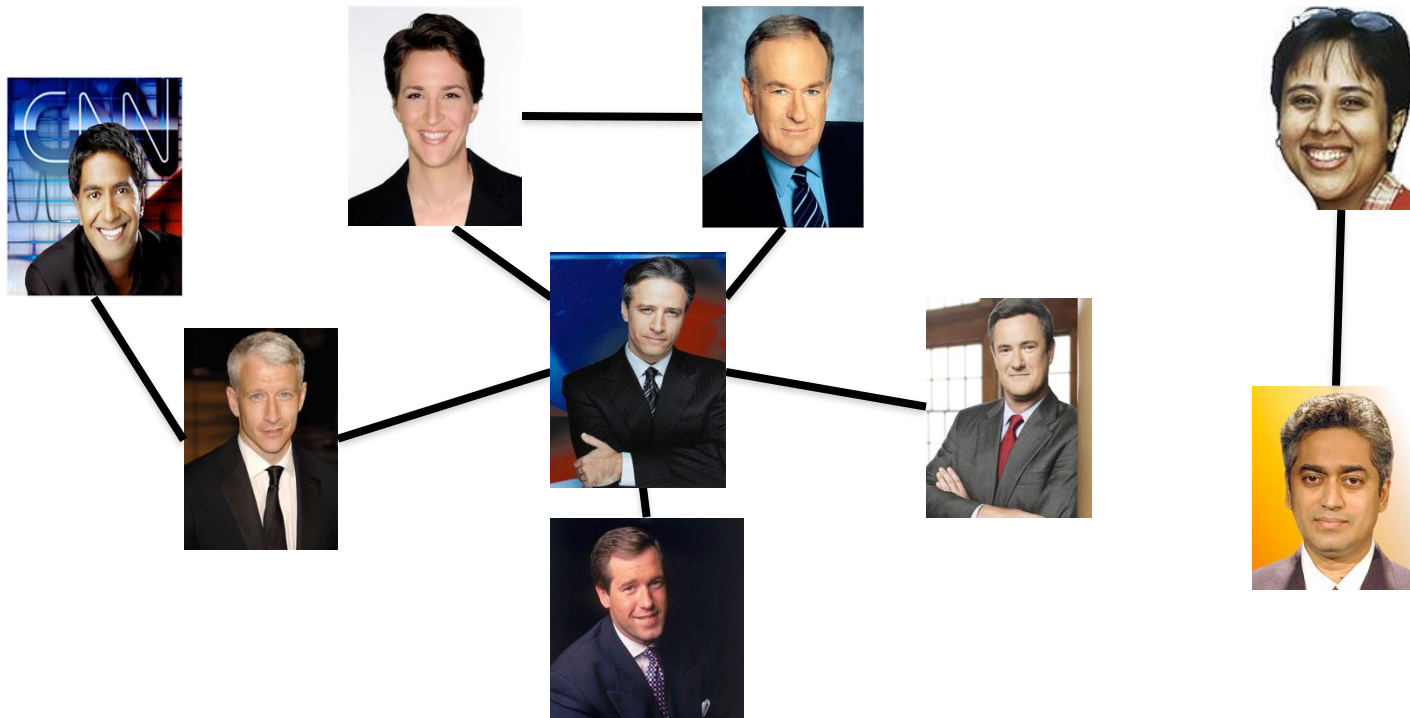
Questions/Comments?



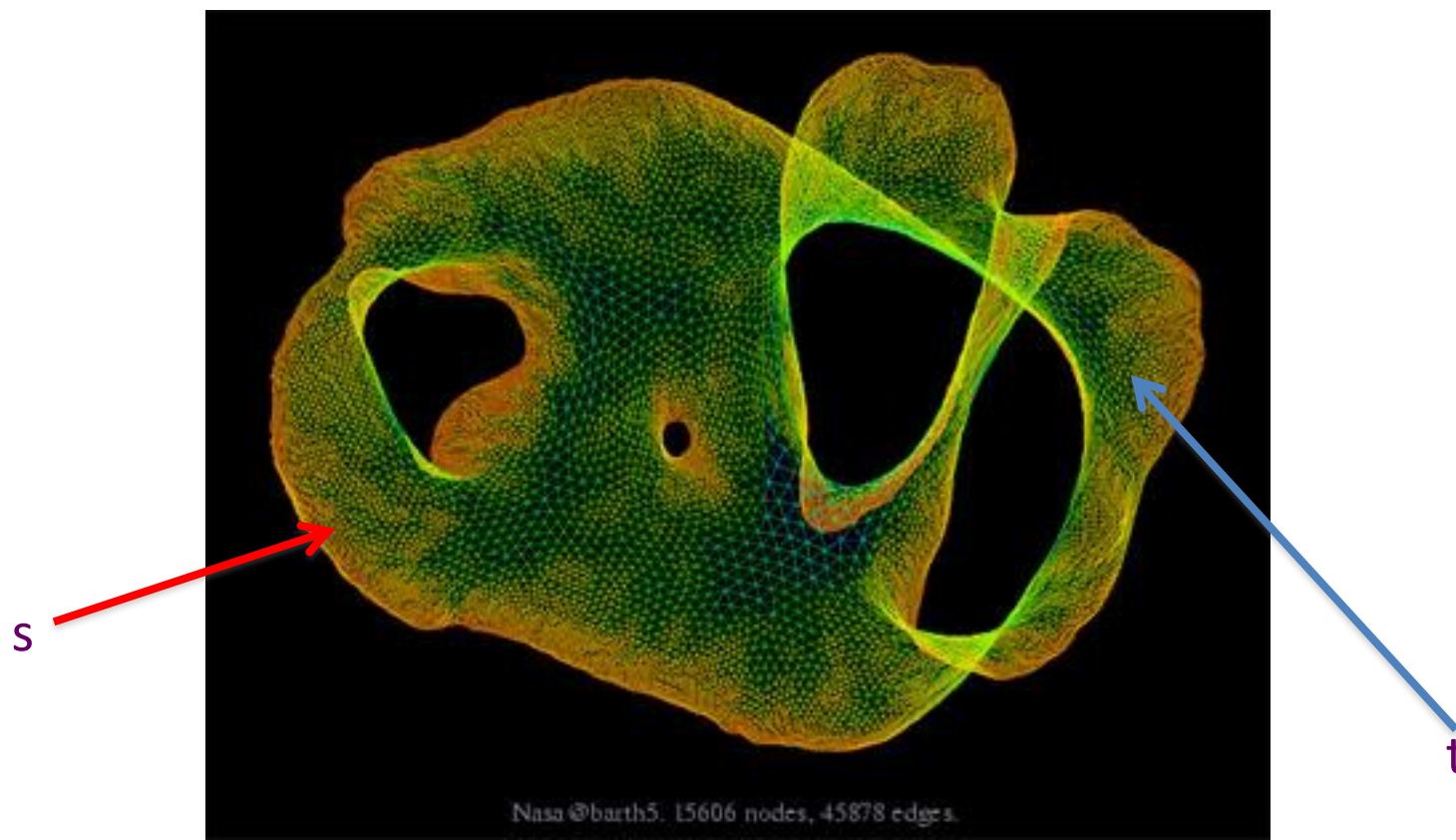
Rest of Today's agenda

Algorithms for checking connectivity

Checking by inspection



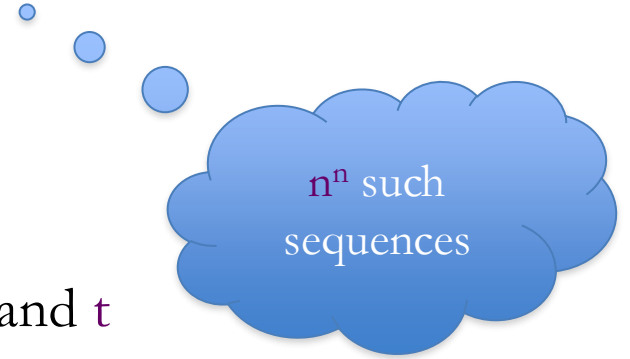
What about large graphs?



Are s and t connected?

Brute-force algorithm?

List all possible vertex sequences between s and t

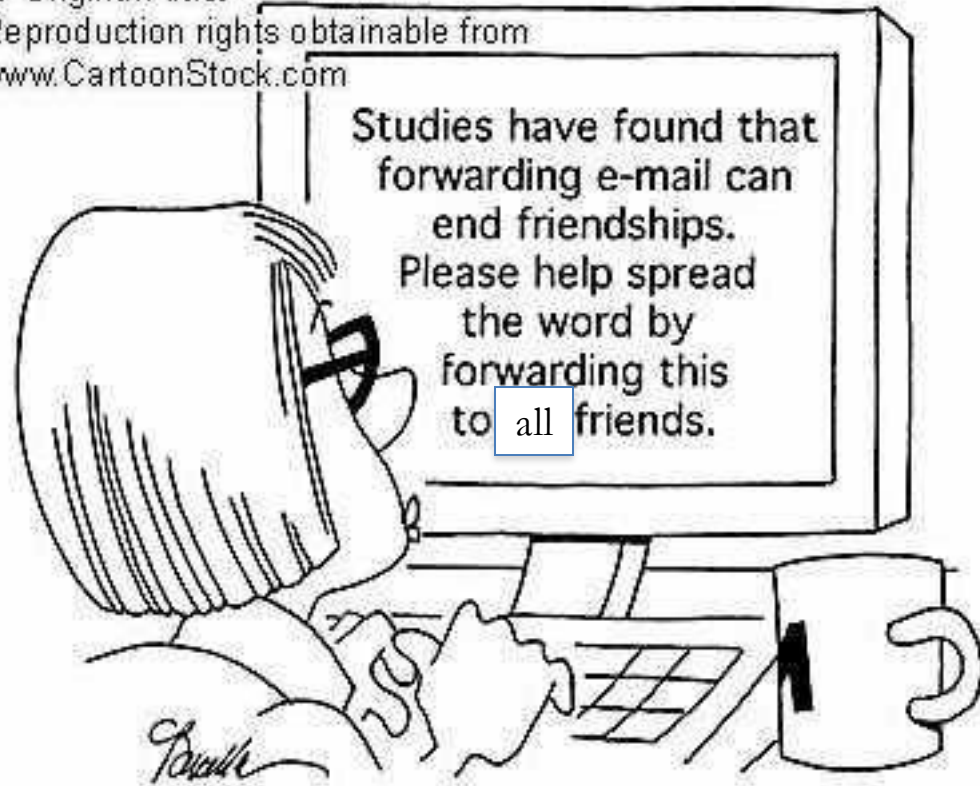


Check if any is a path between s and t

Algorithm motivation

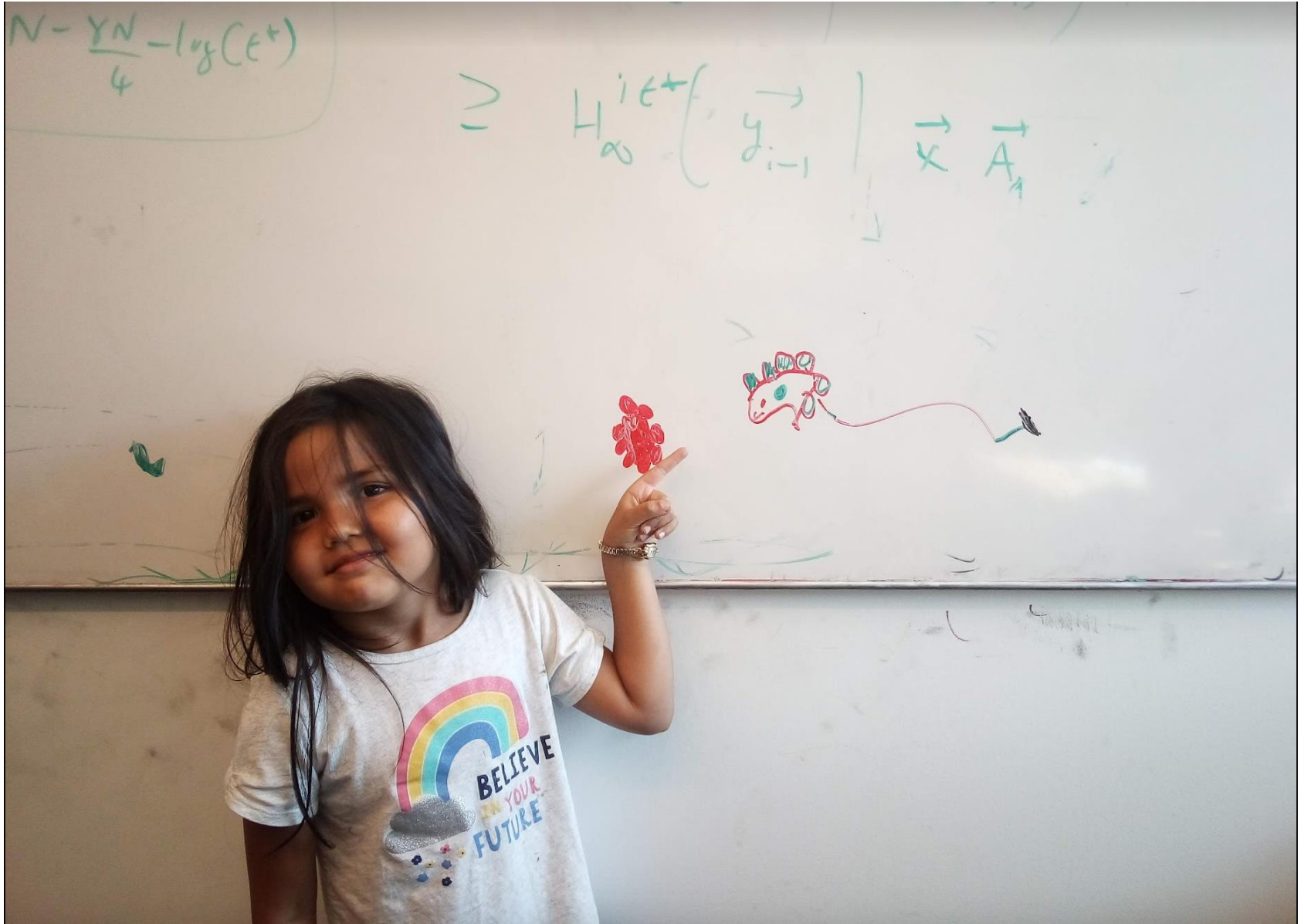
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search ID: mbcn800

Questions/Comments?



Breadth First Search (BFS)

BFS via examples

In which we derive the breadth first search (BFS) algorithm via a sequence of examples.

Expected background

These notes assume that you are familiar with the following:

- Graphs and their representation. In particular,
 - Notion of connectivity of nodes and connected components of graphs
 - Adjacency list representation of graphs
 - Notation:
 - $G = (V, E)$
 - $n = |V|$ and $m = |E|$
 - $CC(s)$ denotes the connected component of s
- Trees and their basic properties

The problem

In these notes we will solve the following problem:

Connectivity Problem

Input: Graph $G = (V, E)$ and s in V

Output: All t connected to s in G



Connected component
of s

Breadth First Search (BFS)

Build layers of vertices connected to s

$$L_0 = \{s\}$$

Assume L_0, \dots, L_j have been constructed

L_{j+1} set of vertices not chosen yet but are connected by an edge to L_j

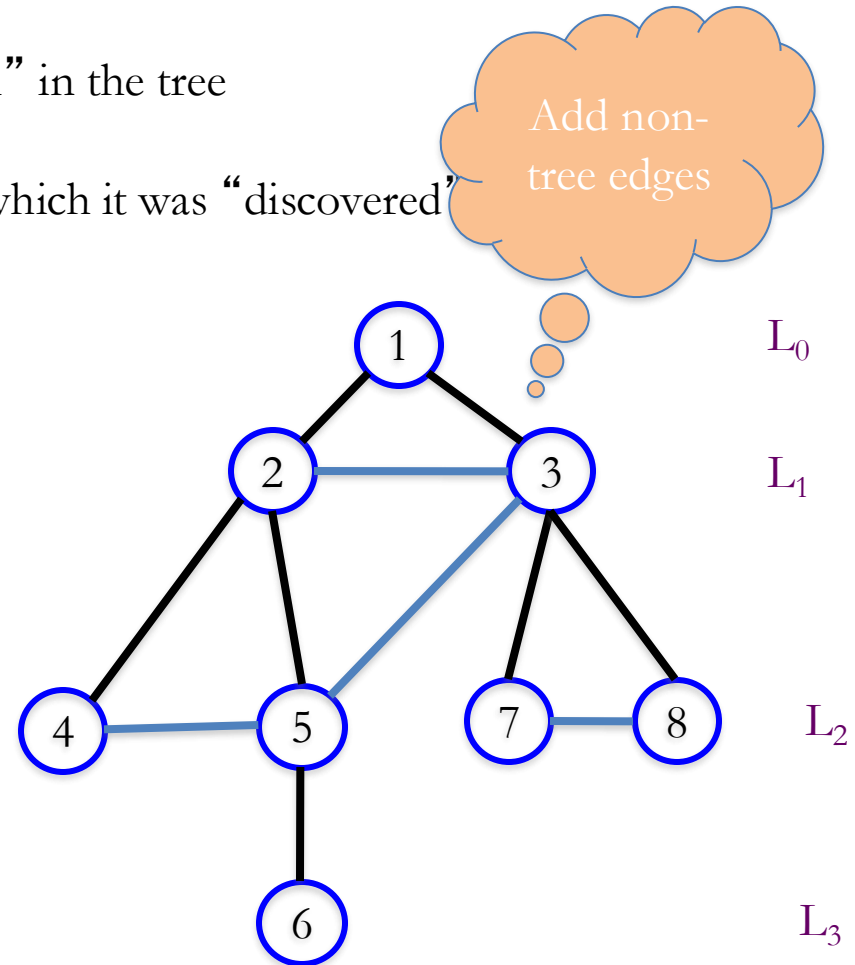
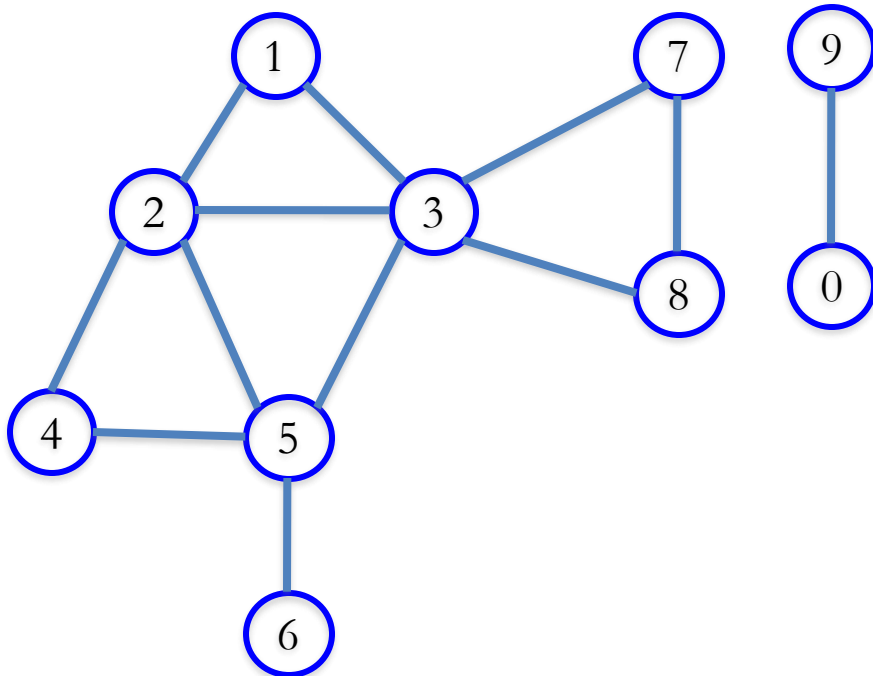
Stop when new layer is empty

BFS Tree

BFS naturally defines a tree rooted at s

L_j forms the j th “level” in the tree

u in L_{j+1} is child of v in L_j from which it was “discovered”



Argue on the board...



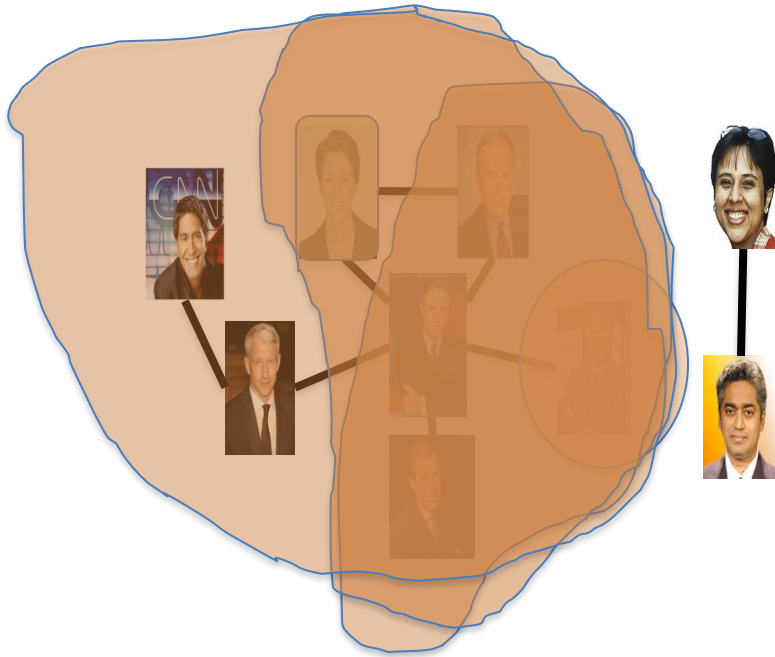
Two facts about BFS trees

- (1) All non-tree edges are in the same or consecutive layer
- (2) If u is in L_i then $\text{dist}(s,u) = i$

Rest of today's agenda

Computing Connected component

Computing Connected Component



Explore(s)

Start with $R = \{s\}$

While exists (u,w) edge w not in R and u in R

Add w to R

Output $R^* = R$

BFS (Build layers of vertices)

$L_0 = \{s\}$

Assume L_0, \dots, L_j have been constructed

L_{j+1} set of vertices not chosen yet but are connected to L_j

Stop when new layer is empty

Argue correctness on the board...

