Lecture 27

CSE 331

Nov 6, 2023

Reflection P1+2 due TODAY

Mon, Nov 6	Kickass Property Lemma F22 F21 F19 F18 F17 x²	[KT, Sec 5.4] (**Project (Problems 1 & 2 `Reflection`) in**)
Tue, Nov 7		(**HW 6 out**)
Wed, Nov 8	Weighted Interval Scheduling F22 F21 F19 F17 x²	[KT, Sec 6.1]
Fri, Nov 10	Recursive algorithm for weighted interval scheduling problem F22 F21 F19 F17 x²	[KT, Sec 6.1]
Mon, Nov 13	Subset sum problem F22 F21 F19 F18 F17 x²	[KT, Sec 6.1, 6.2, 6.4]
Tue, Nov 14		(**HW 7 out, HW 6 in**)
Wed, Nov 15	Dynamic program for subset sum F22 F21 F19 F18 F17 x²	[KT, Sec 6.4]
Fri, Nov 17	Shortest path problem F22 F21 F19 F18 F17 x²	[KT, Sec 6.8]
Mon, Nov 20	Bellman-Ford algorithm F22 F21 F19 F18 F17 x²	[KT, Sec 6.8]
Wed, Nov 22	**No class**	Thanksgiving Break
Fri, Nov 24	**No class**	Thanksgiving Break
Mon, Nov 27	The P vs. NP problem F22 F21 F19	[KT, Sec 8.1]
Tue, Nov 28		(**HW 8 out, HW 7 in**)
Wed, Nov 29	More on reductions, P and NP F22 F21 F19	[KT, Sec 8.1]
Fri, Dec 1	NP-Completeness F22 F21 F19	[KT, Sec 8.3, 8.4] (**Project (Problem 3 `Coding`) in**)
Mon, Dec 4	The SAT problem F22 F21 F19	[KT, Sec. 8.2] (**Quiz 2**) (**Project (Problem 3 `Reflection`) in**)
Tue, Dec 5		(**HW 8 in**)
Wed, Dec 6	*k*-coloring problem F22 F21 F19	[KT, Sec 8.7]
Fri, Dec 8	*k*-coloring is NP-complete F22 F21 F19	[KT, Sec 8.7] (**Project (Problems 4 & 5 `Coding`) in**)
Mon, Dec 11	Wrapup	
Tue, Dec 12		(**Project (Problems 4 & 5 `Reflection`) in**) (**Project Survey in**)
Wed, Dec 13	**Final Exam**	(**12:00-2:30pm** in **NSC 201 (usual classroom)**)

Group formation instructions

Autolab group submission for CSE 331 Project

The lowdown on submitting your project (especially the coding and reflection) problems as a group on Autolab.

Follow instructions **EXACTLY** as they are stated

The instruction below are for Coding Problem 1

You will have to repeat the instructions below for EACH coding AND reflection problem on project on Autolab (with the appropriate changes to the actual problem).

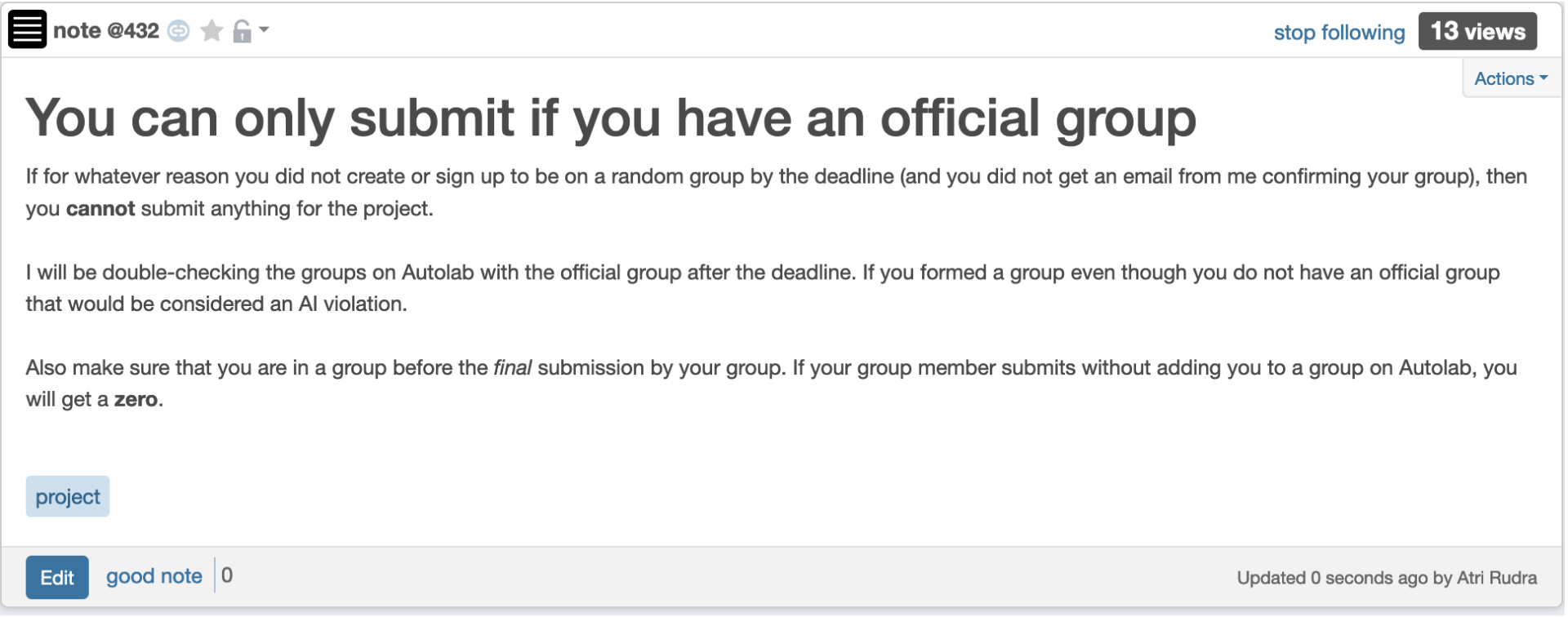
Form your group on Autolab

Groups on Autolab will NOT be automatically created

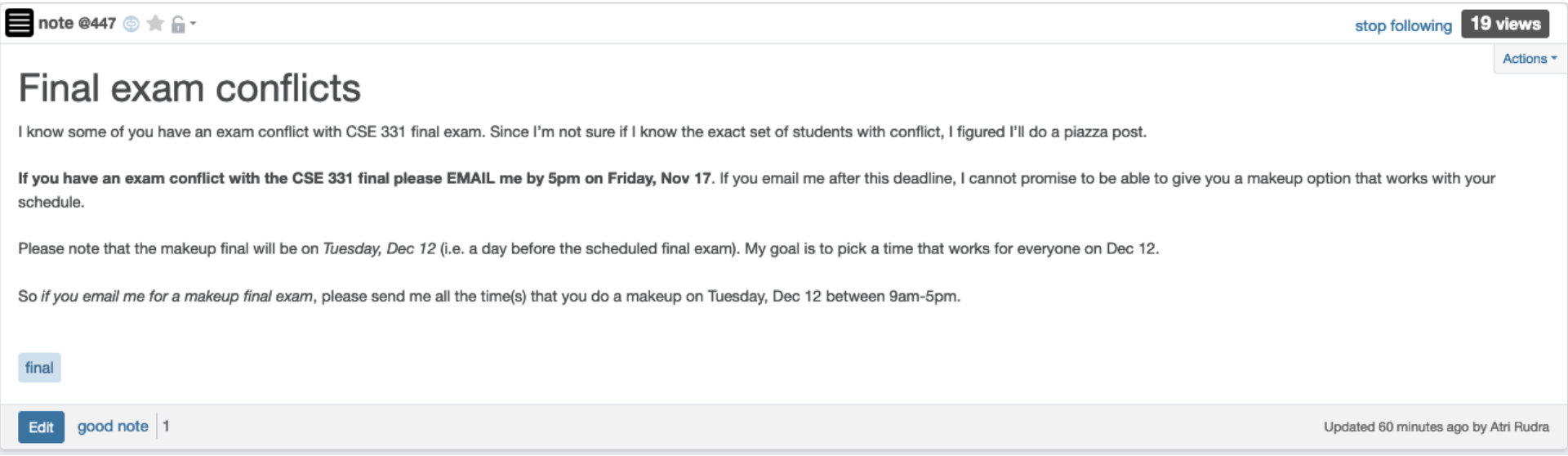
You will have to form a group on Autolab by yourself (as a group). Read on for instructions on how to go about this.

Click to add notes

No project group => no submission



Final exam conflict


note @447

stop following 19 views

Actions

Final exam conflicts

I know some of you have an exam conflict with CSE 331 final exam. Since I'm not sure if I know the exact set of students with conflict, I figured I'll do a piazza post.

If you have an exam conflict with the CSE 331 final please EMAIL me by 5pm on Friday, Nov 17. If you email me after this deadline, I cannot promise to be able to give you a makeup option that works with your schedule.

Please note that the makeup final will be on *Tuesday, Dec 12* (i.e. a day before the scheduled final exam). My goal is to pick a time that works for everyone on Dec 12.

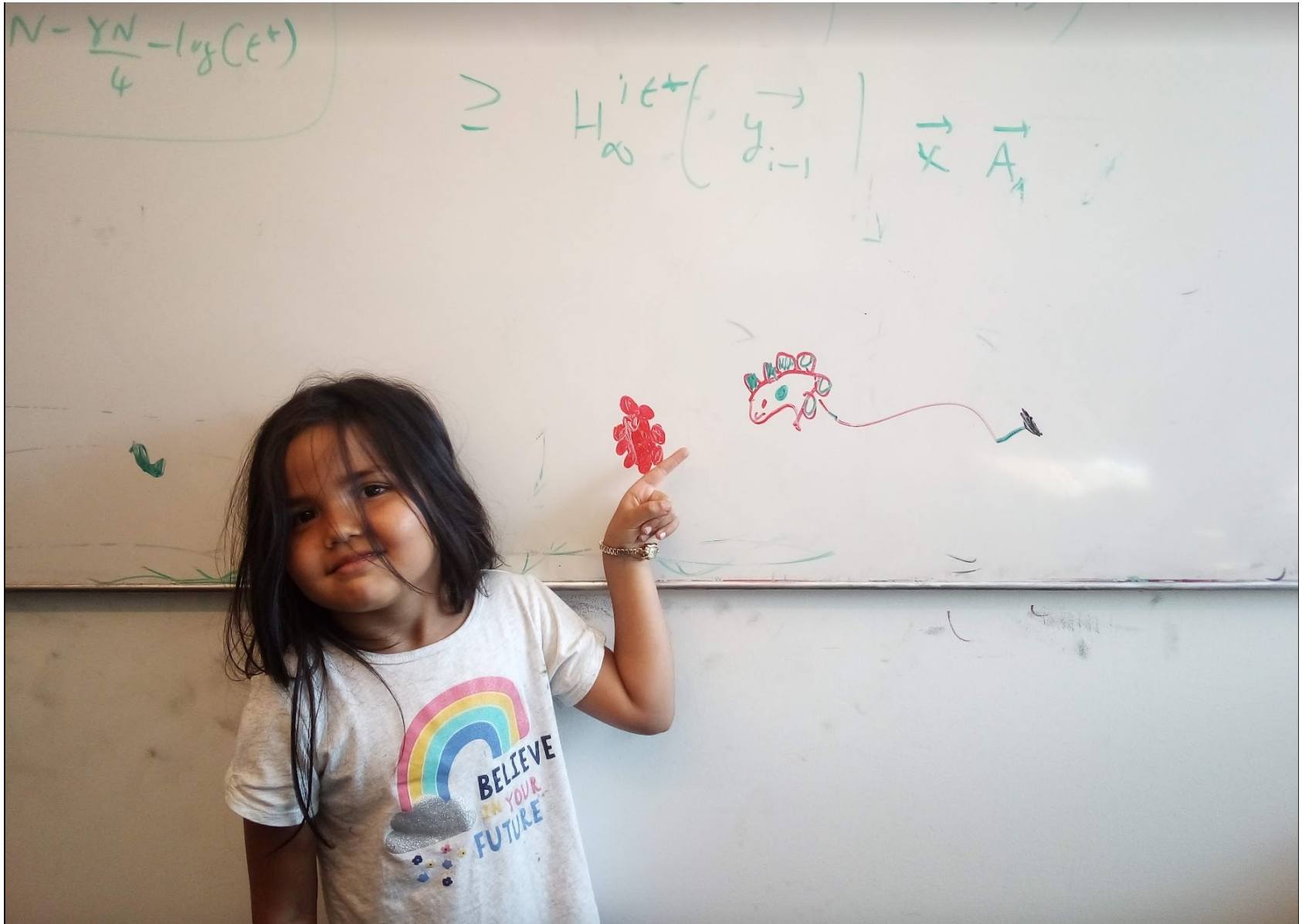
So *if you email me for a makeup final exam*, please send me all the time(s) that you do a makeup on Tuesday, Dec 12 between 9am-5pm.

final

Edit good note 1

Updated 60 minutes ago by Atri Rudra

Questions/Comments?

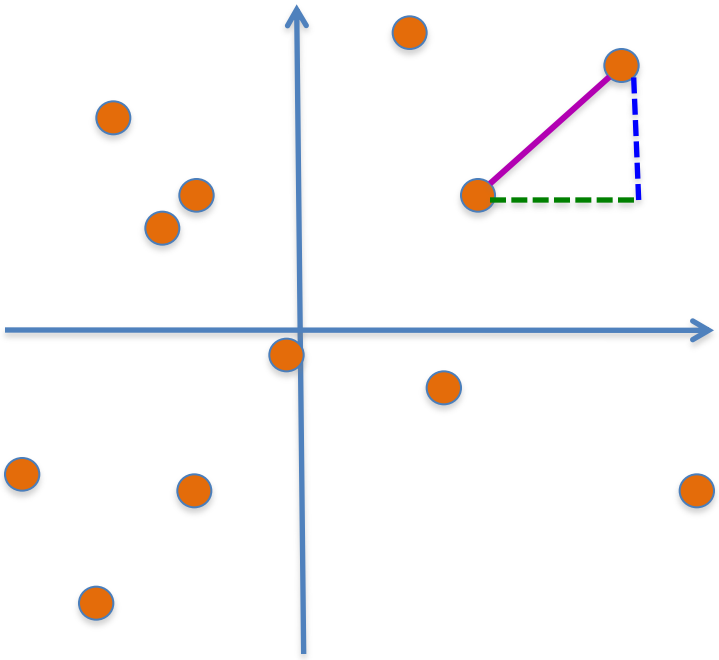


Closest pairs of points

Input: n 2-D points $P = \{p_1,\ldots,p_n\}$; $p_i=(x_i,y_i)$

$d(p_i,p_j) = ((x_i-x_j)^2+(y_i-y_j)^2)^{1/2}$

Output: Points p and q that are closest



Group Talk time

$O(n^2)$ time algorithm?

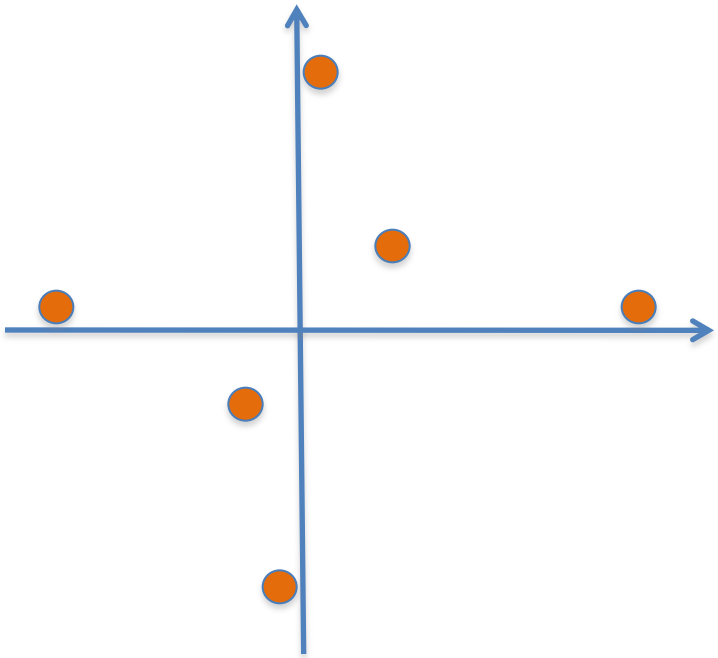
1-D problem in time $O(n \log n)$?

Sorting to rescue in 2-D?

Pick pairs of points closest in x co-ordinate

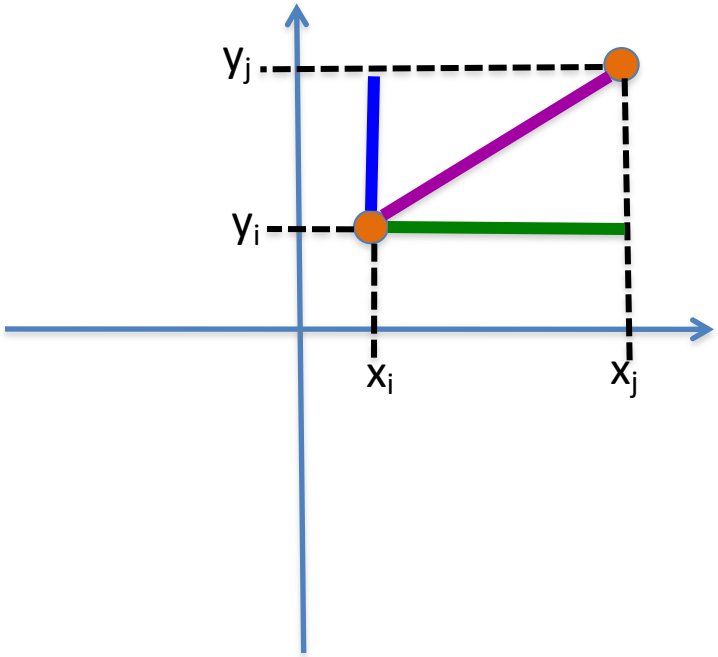
Pick pairs of points closest in y co-ordinate

Choose the better of the two



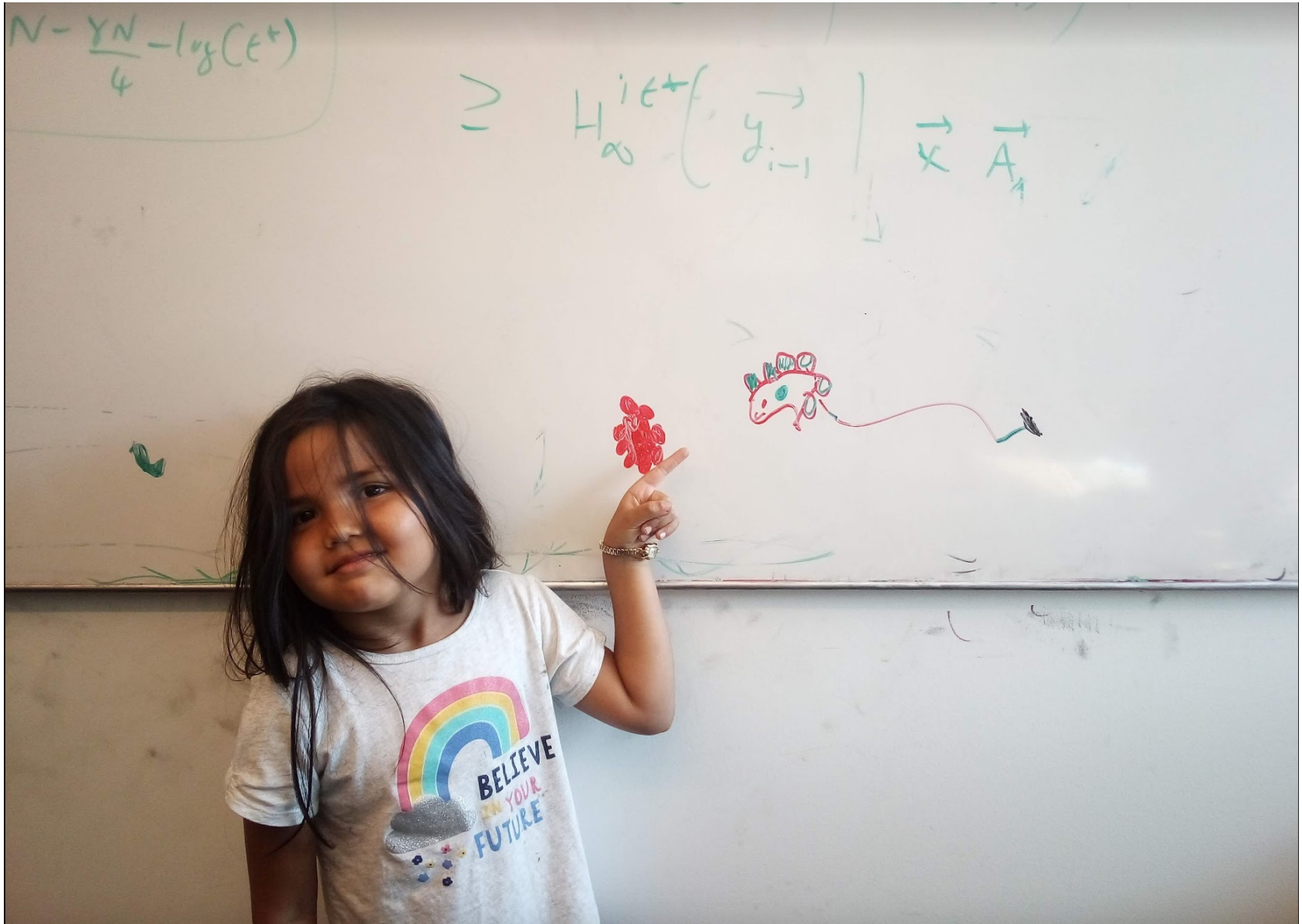
A property of Euclidean distance

$$d(p_i,p_j) = ((x_i-x_j)^2+(y_i-y_j)^2)^{1/2}$$



The distance is larger than the **x** or **y**-coord difference

Questions/Comments?

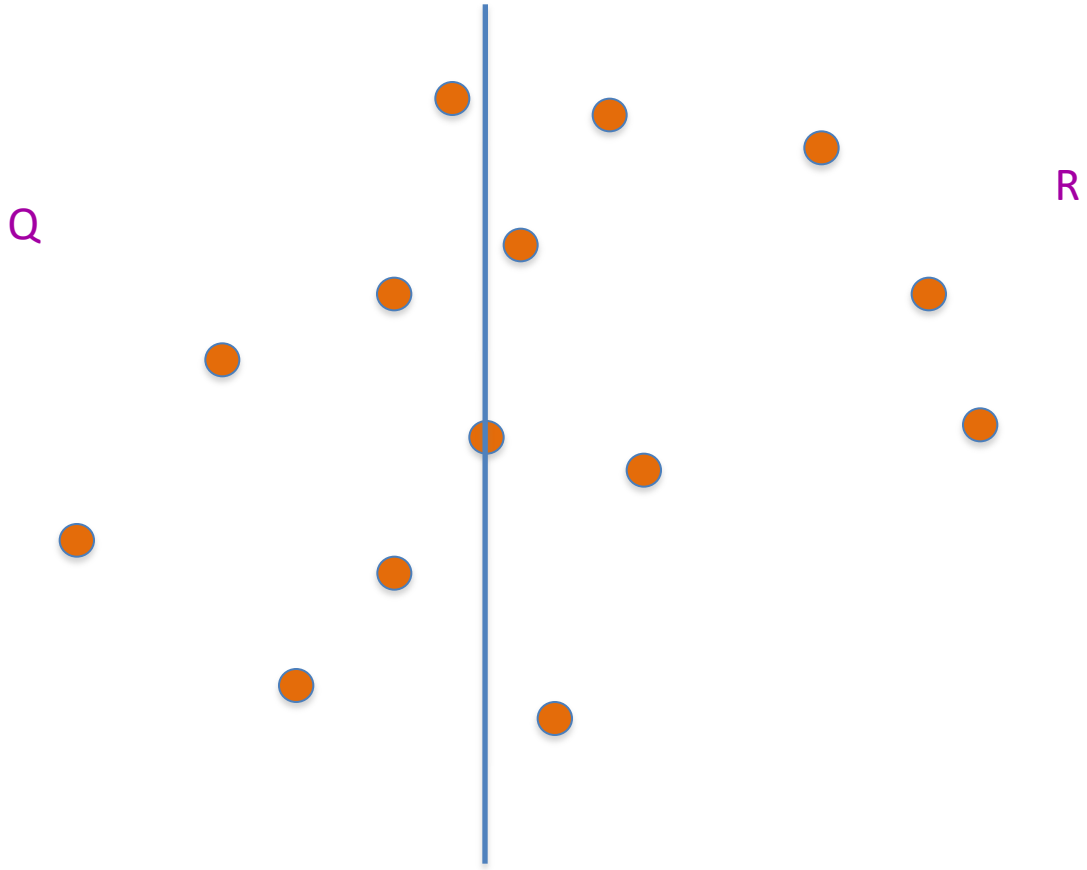


Problem definition on the board…

Rest of Today's agenda

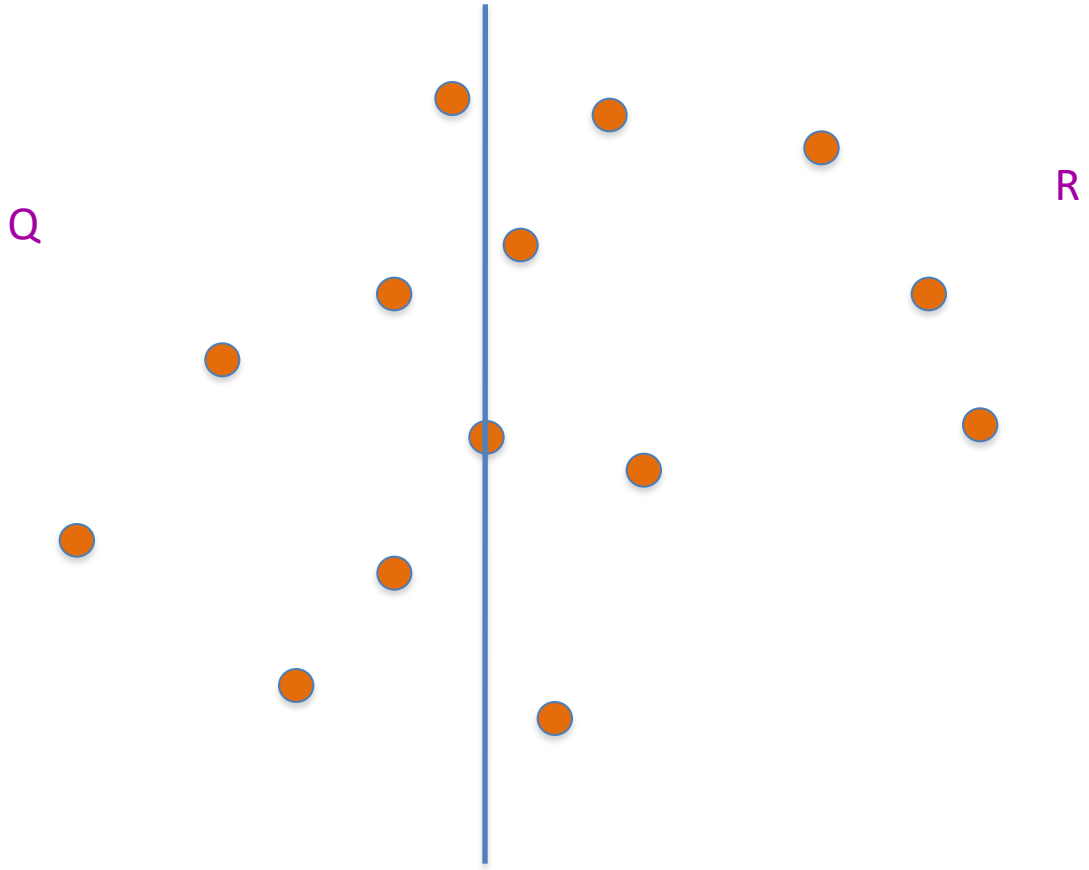
Divide and Conquer based algorithm

Dividing up P



First n/2 points according to the x-coord

Recursively find closest pairs



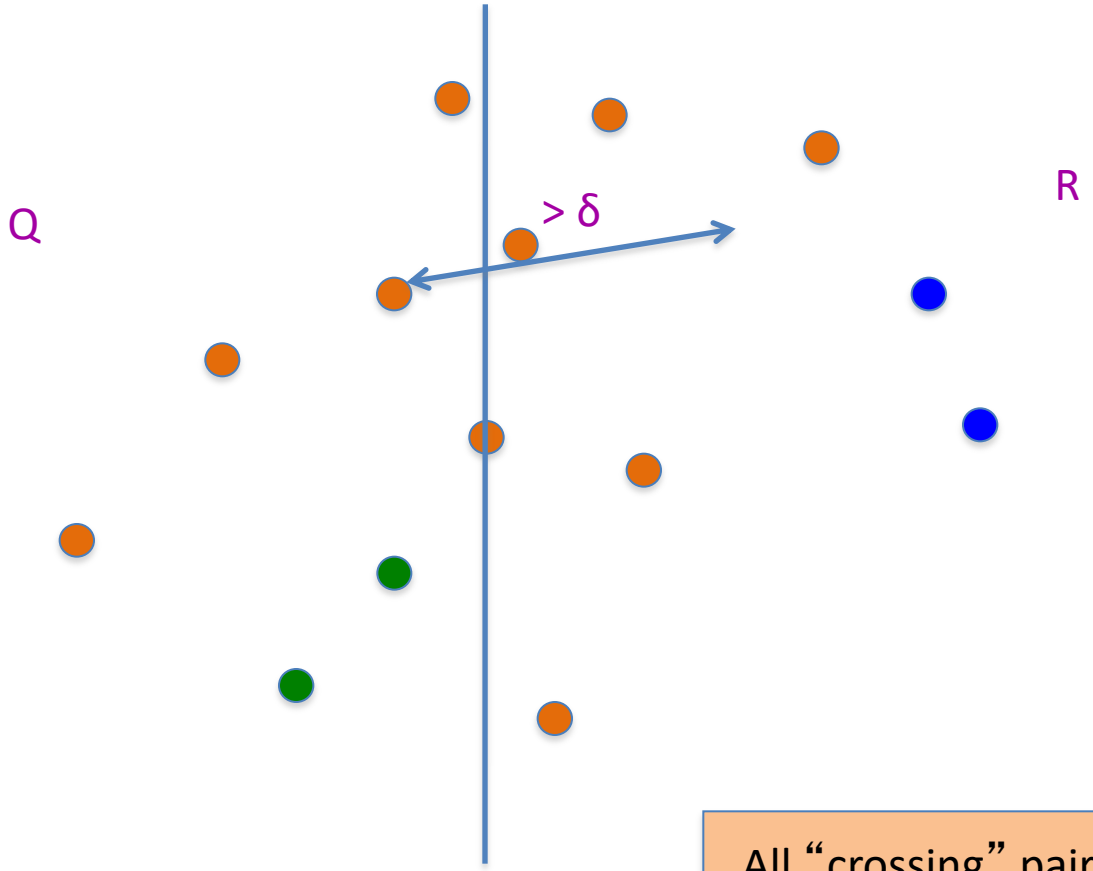
δ = min (**blue**, **green**)

An aside: maintain sorted lists

P_x and P_y are P sorted by x-coord and y-coord

Q_x, Q_y, R_x, R_y can be computed from P_x and P_y in $O(n)$ time

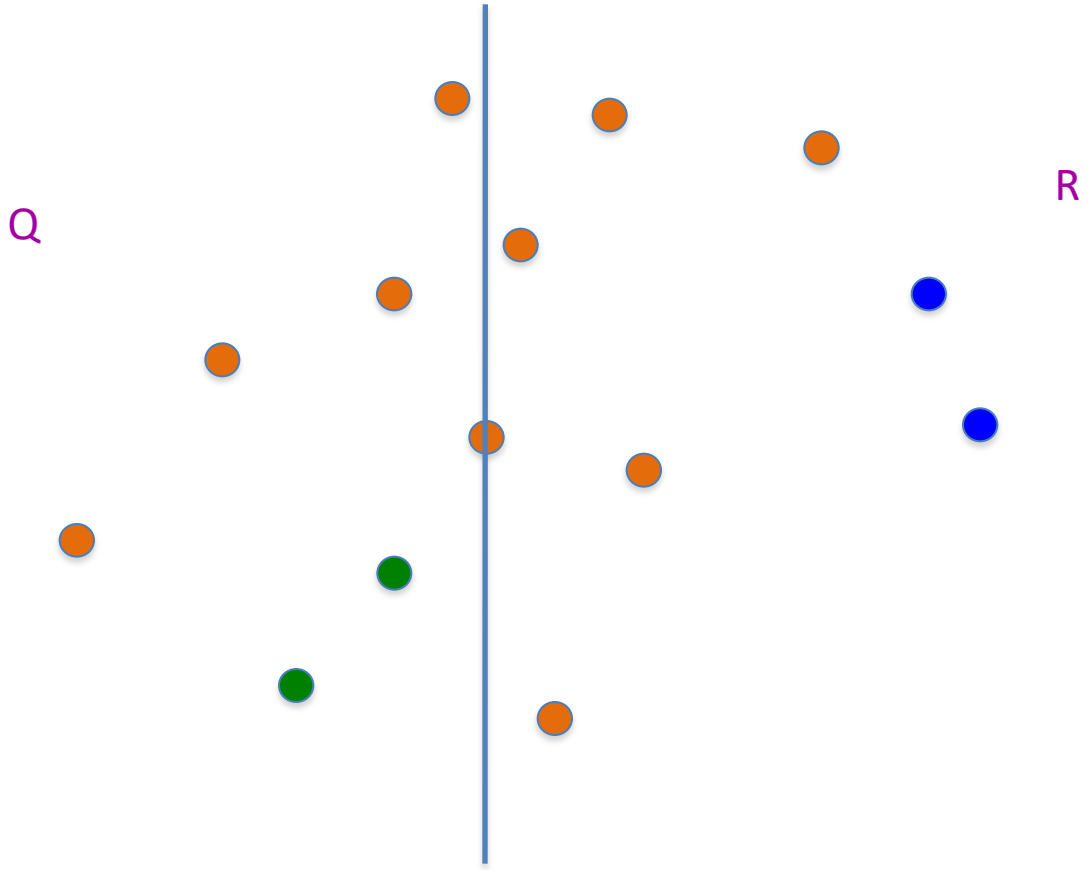
An easy case



All "crossing" pairs have distance > δ

δ = min (**blue**, **green**)

Life is not so easy though



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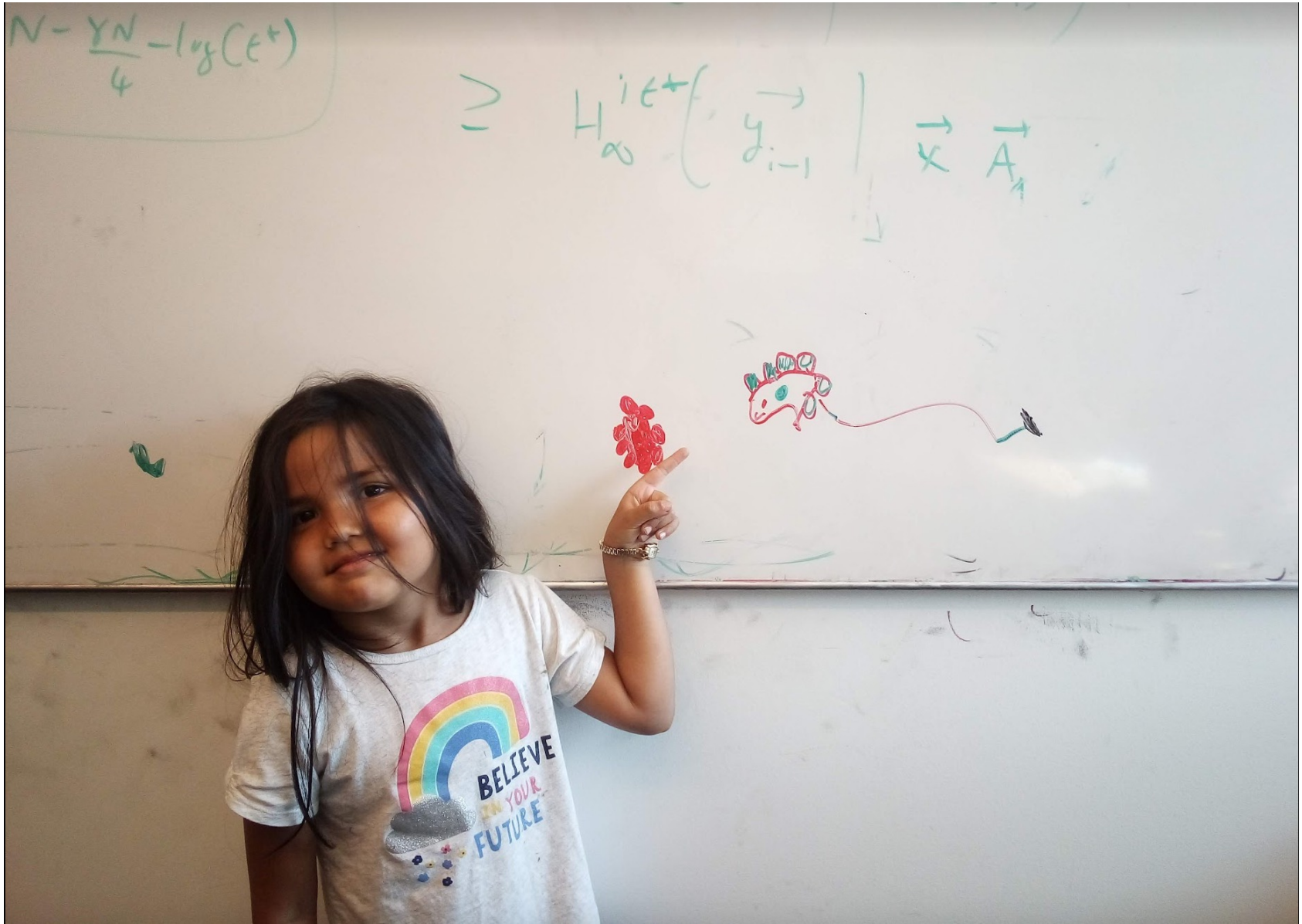
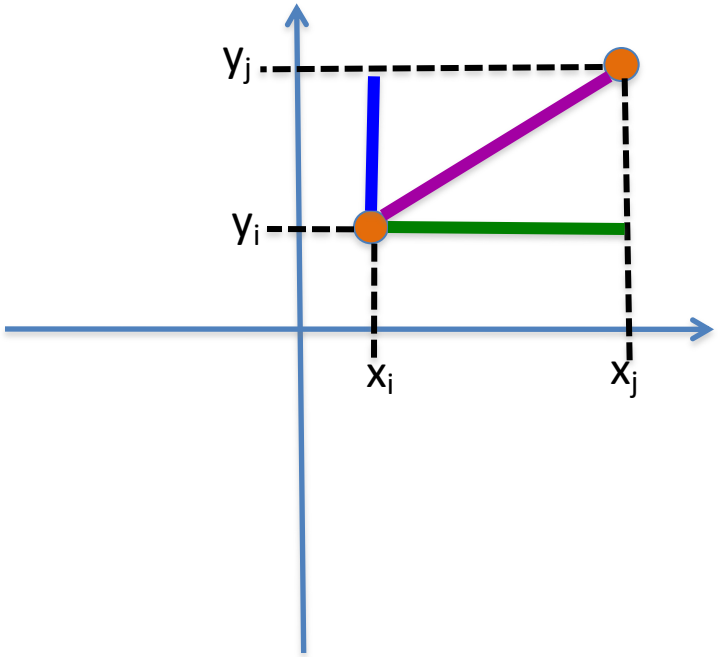
Questions/Comments?



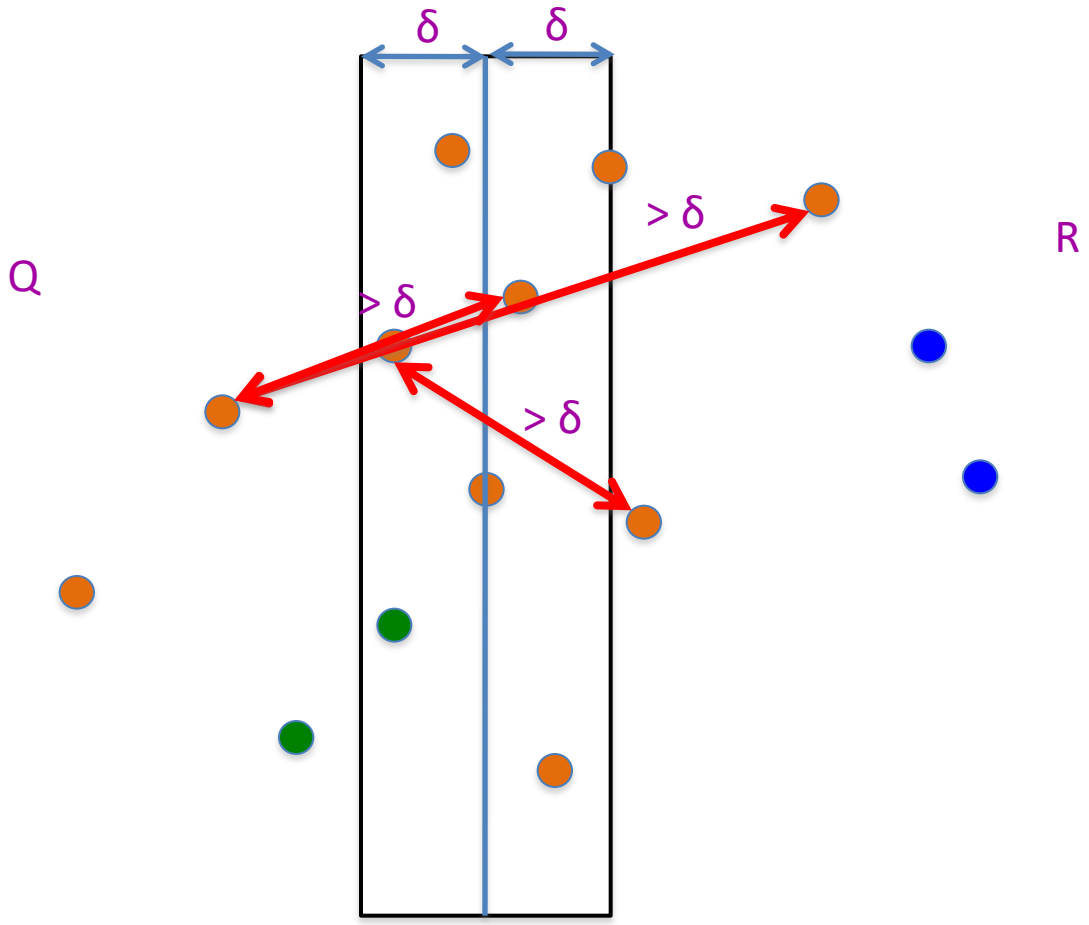
Euclid to the rescue (?)

$$d(p_i,p_j) = ((x_i-x_j)^2+(y_i-y_j)^2)^{1/2}$$



The distance is larger than the **x** or **y**-coord difference

Life is not so easy though



δ = min (**blue**, **green**)

All we have to do now

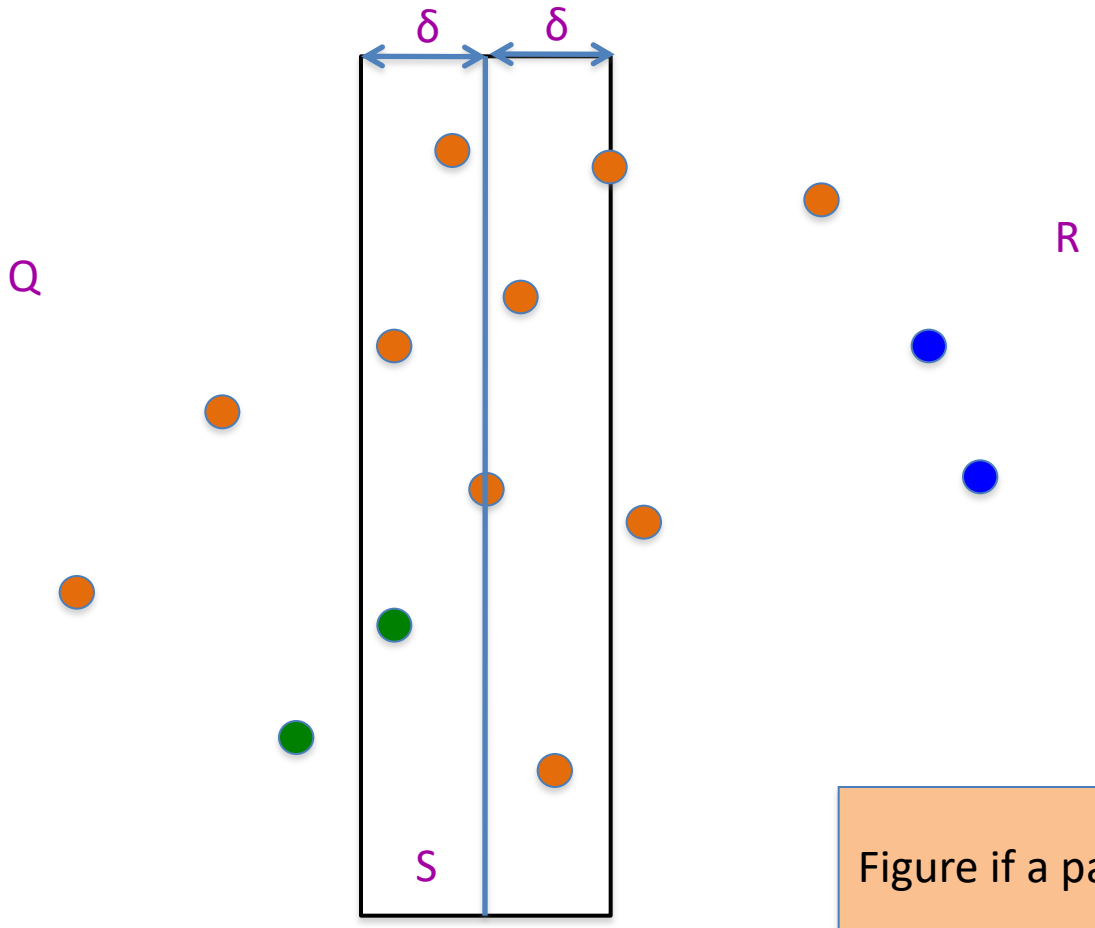


Figure if a pair in S has distance < δ

δ = min (**blue**, **green**)

The algorithm so far…

$O(n \log n) + T(n)$

Input: n 2-D points $P = \{p_1,\ldots,p_n\}$; $p_i=(x_i,y_i)$

Sort P to get P_x and P_y — $O(n \log n)$

Closest-Pair (P_x, P_y)

If $n < 4$ then find closest point by brute-force

$T(< 4) = c$

$T(n) = 2T(n/2) + cn$

Q is first half of P_x and R is the rest — $O(n)$

Compute Q_x, Q_y, R_x and R_y — $O(n)$

(q_0,q_1) = Closest-Pair (Q_x, Q_y)

(r_0,r_1) = Closest-Pair (R_x, R_y)

$O(n \log n)$ overall

$\delta = \min (d(q_0,q_1), d(r_0,r_1))$ — $O(n)$

S = points (x,y) in P s.t. $|x - x^*| < \delta$ — $O(n)$

return Closest-in-box (S, (q_0,q_1), (r_0,r_1)) — Assume can be done in $O(n)$