

Algorithms and Data Structures

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May 23
2013

Speciale

MADALGO – CTIC 6 : 3

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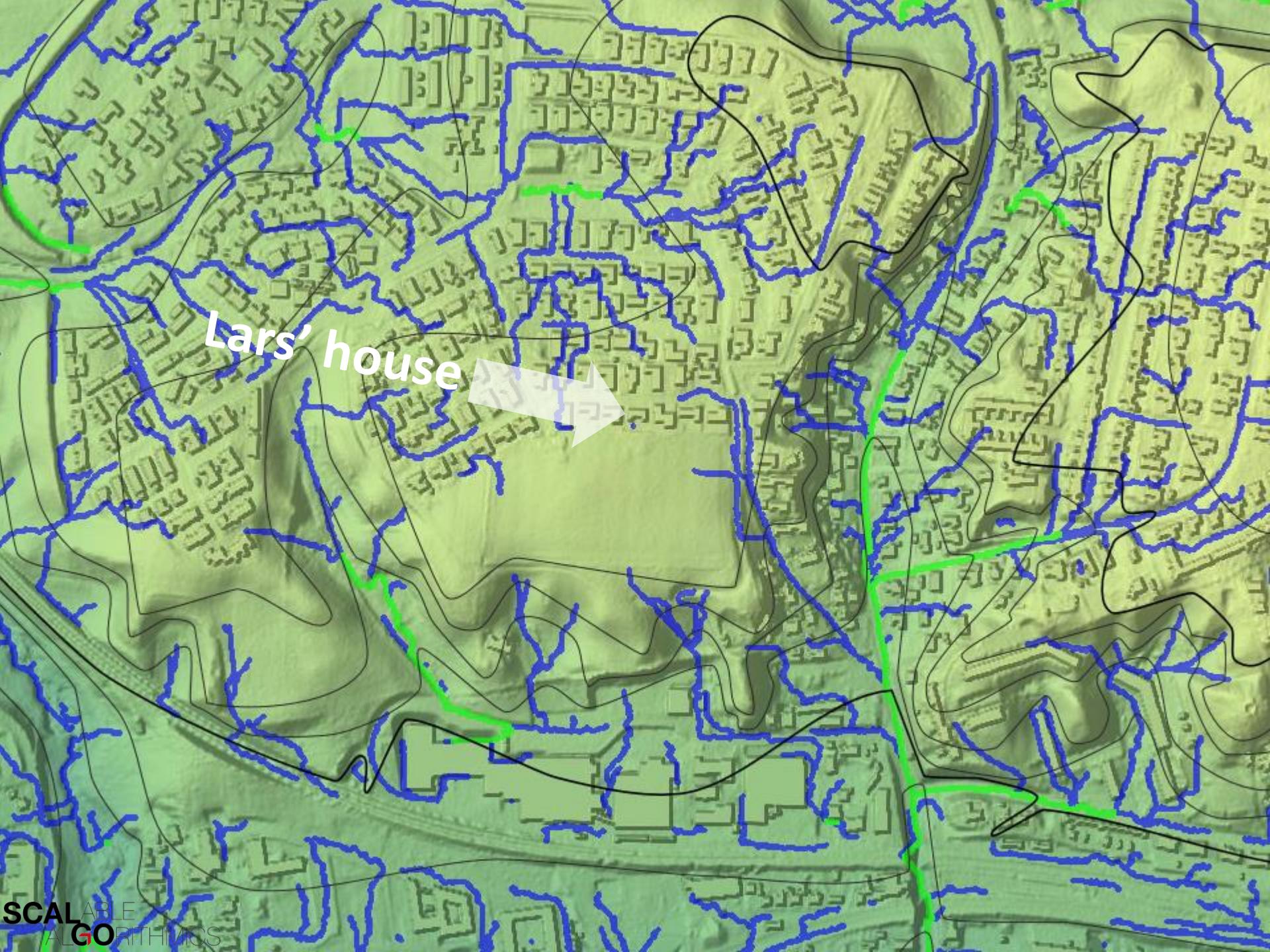


Lars

Water

Else's
rubber boots

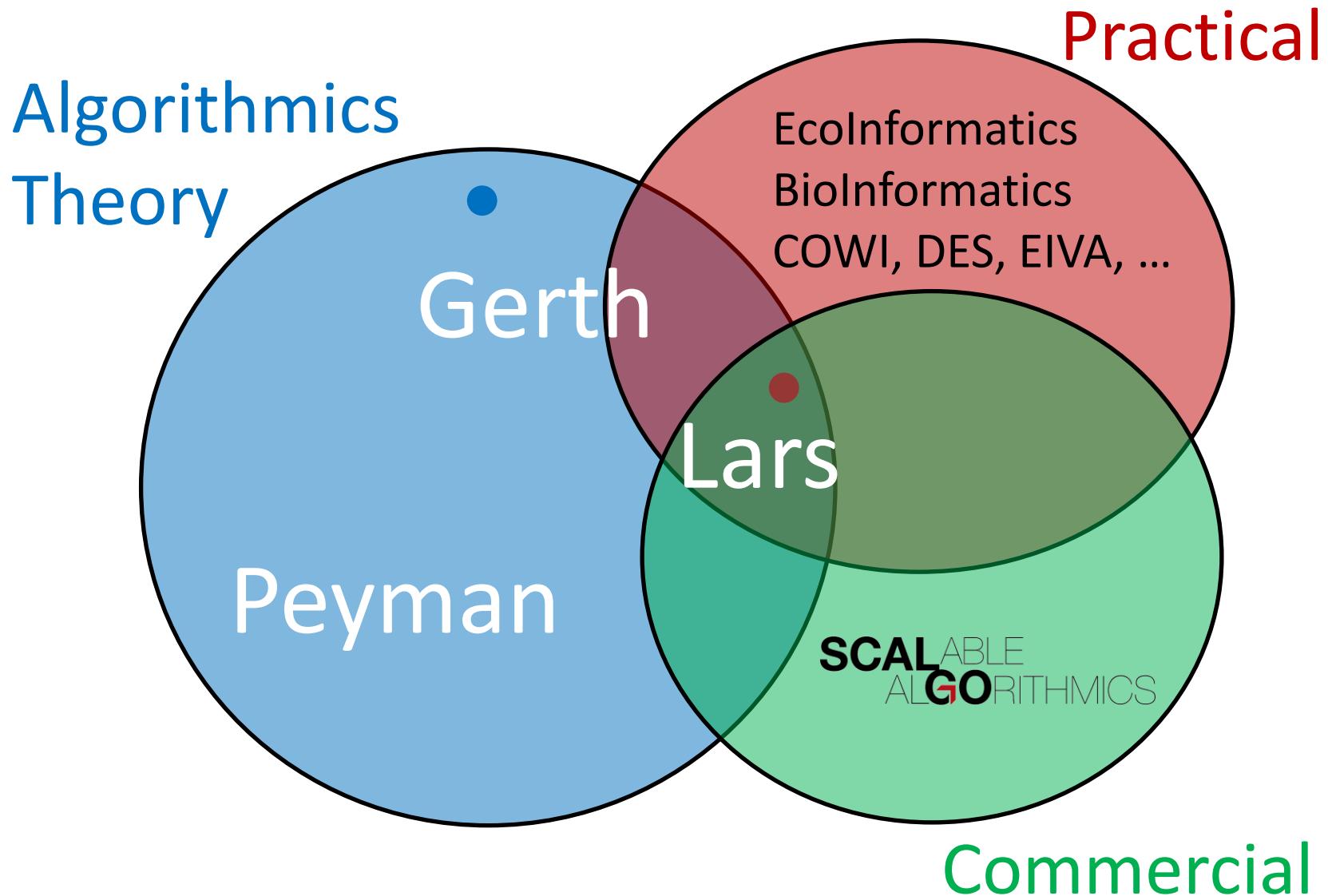




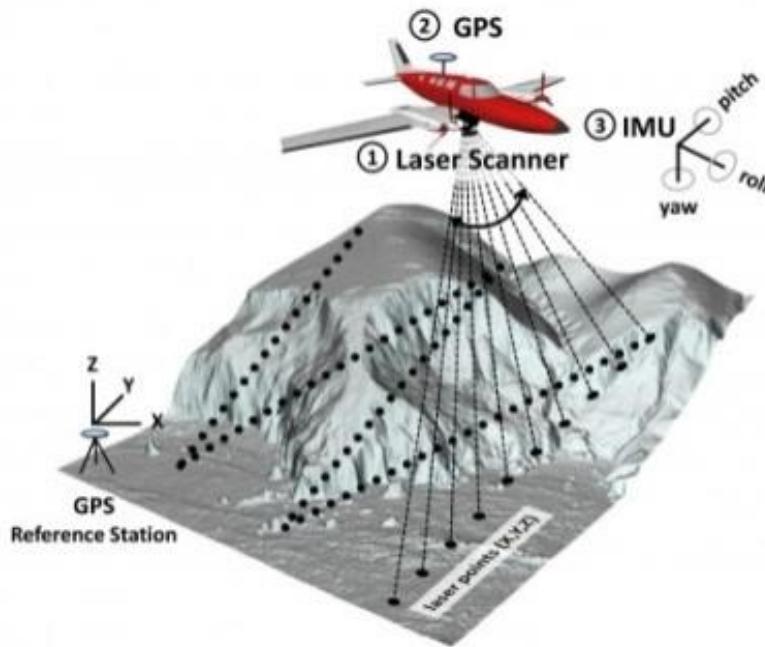
Water Level

34.40 m



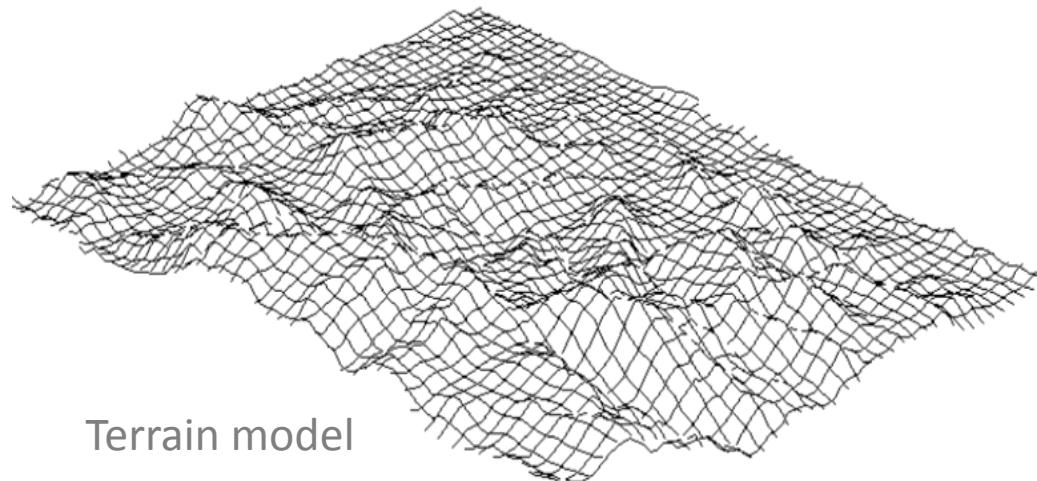


Terrain Research

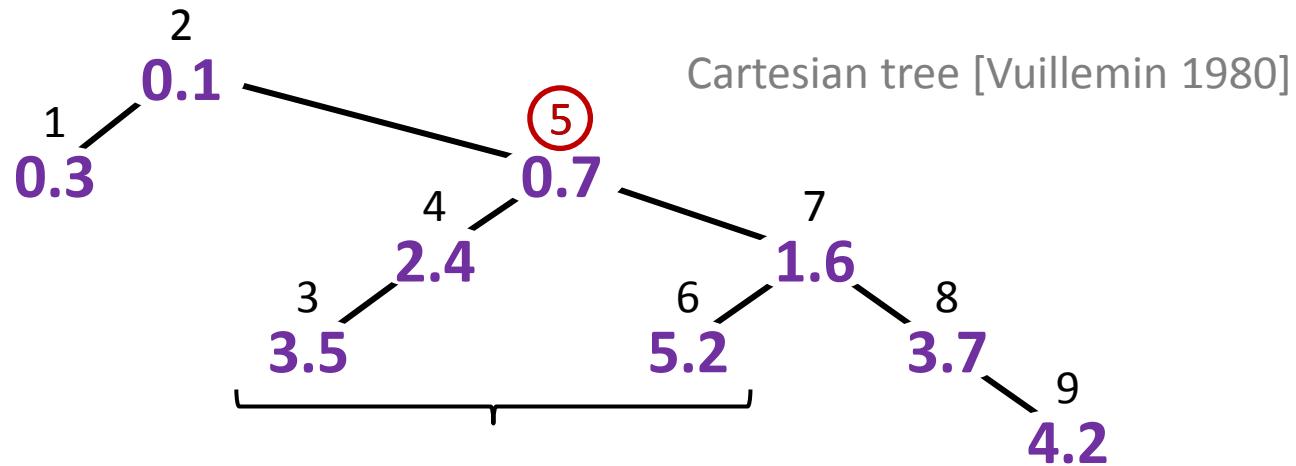
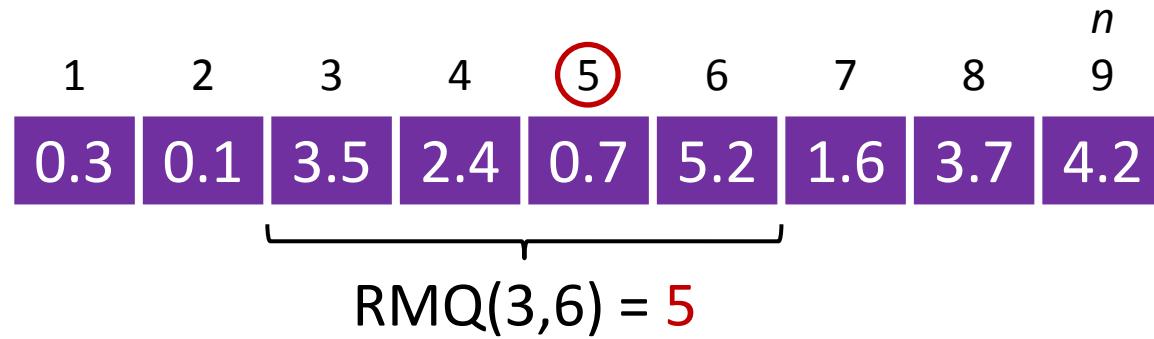


3	2	4	3	2	4
7	5	8	7	5	8
7	1	9	7	1	9
3	2	4	3	2	4
7	5	8	7	5	8
7	1	9	7	1	9

Height matrix



Range Minimum Queries (1D)



2n bit
encoding

1 0 0 1 1 1 0 0 0 1 1 0 0 1 0 1 0 0
2_L 1_L 1_R 2_R 5_L 4_L 3_L 3_R 4_R 5_R 7_L 6_L 6_R 7_R 8_L 8_R 9_L 9_R

2n+o(n) bit encoding
O(1) time queries
[Fischer, Heun 2011]

Range Minimum Queries (2D)

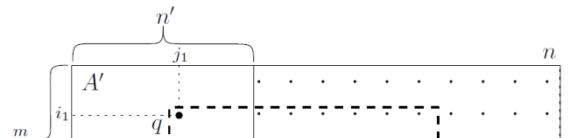
			n		
	1	2	③	4	5
1	0.3	0.1	3.5	2.4	0.7
②	5.2	1.6	0.6	4.2	8.7
m	3	1.4	3.8	6.5	4.1
	}				

$$\text{RMQ}(2,2,3,4) = (2,3)$$

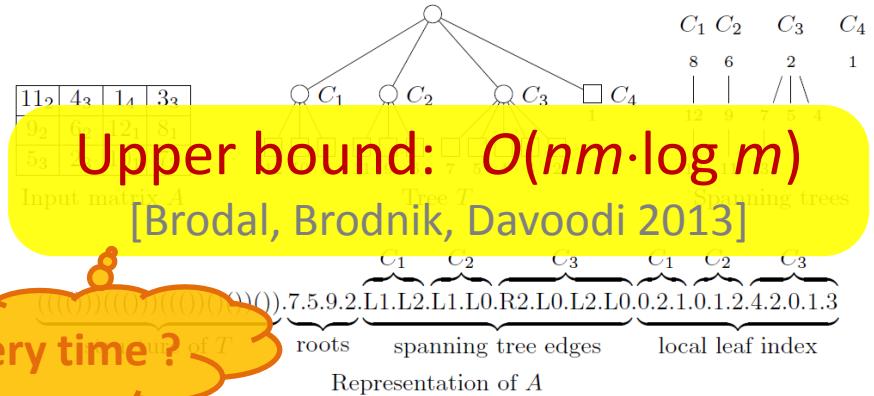
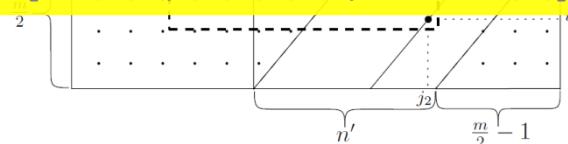
		n			
	1	2	3	4	5
1	3	1	9	8	5
2	13	7	4	12	15
m	3	6	10	14	11
	}				

Rank matrix

$nm \cdot \lceil \log(nm) \rceil$ bit encoding

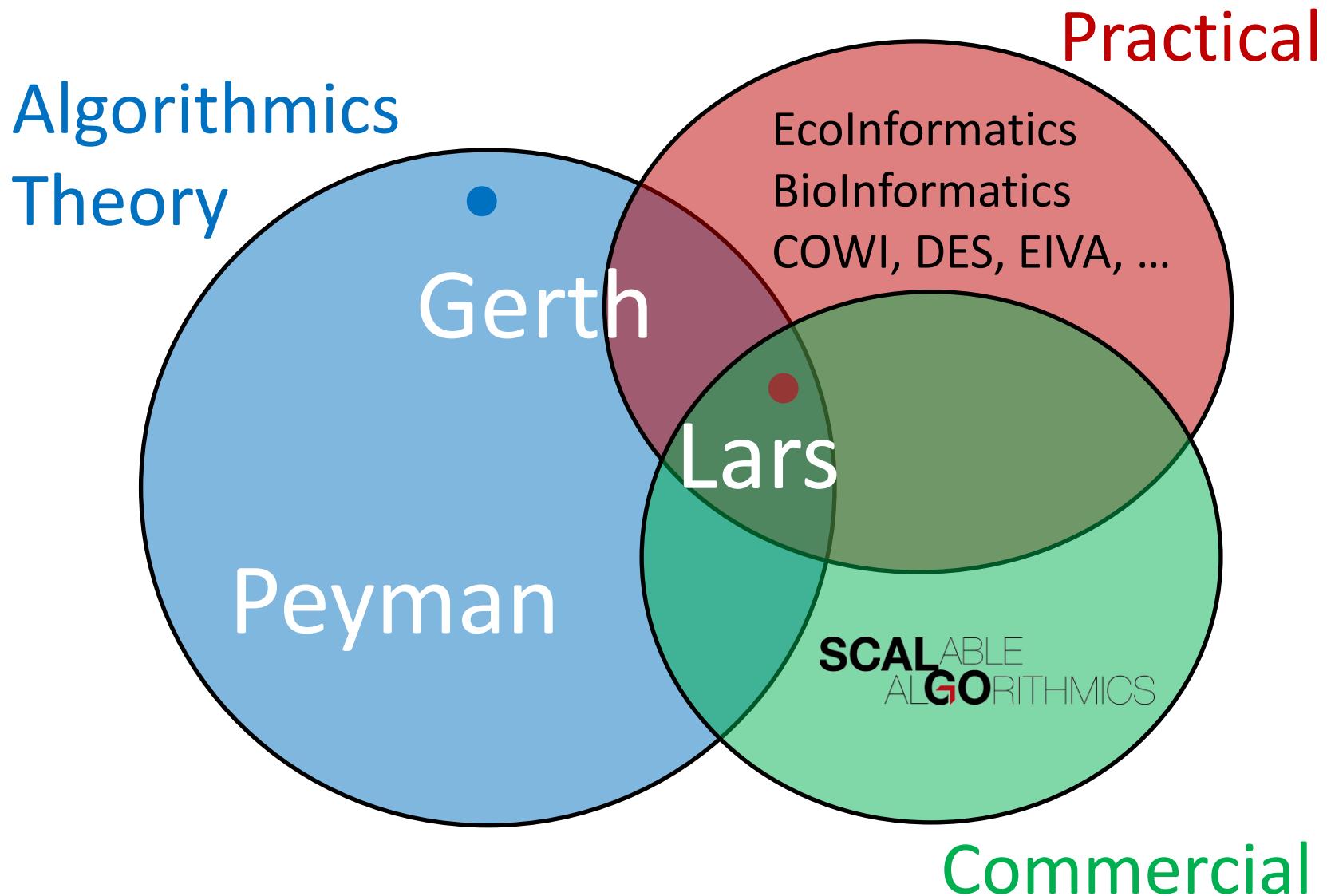


Lower bound: $\Omega(nm \cdot \log m)$
[Brodal, Davoodi, Rao 2012]



Query time?

Representation of A



Thank you

Gerth Stølting Brodal