Local Problems on Trees from the Perspectives of Distributed Algorithms, Finitary Factors, and Descriptive Combinatorics

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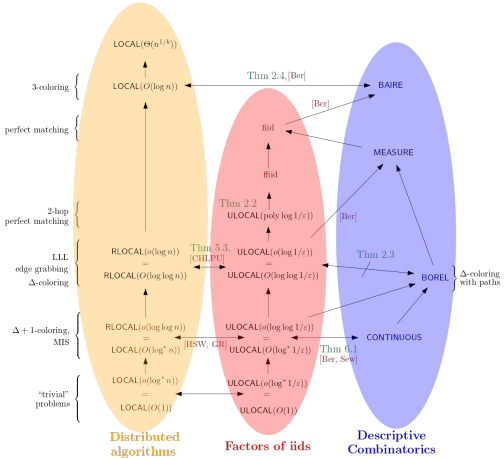
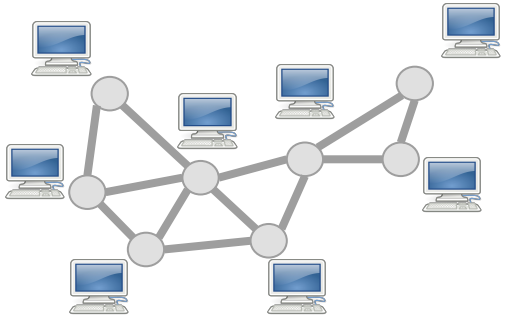
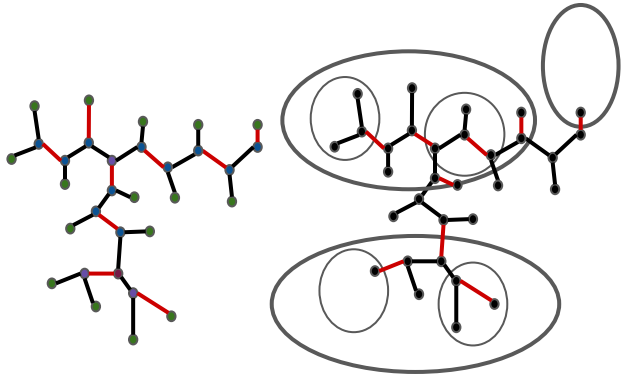






Summary

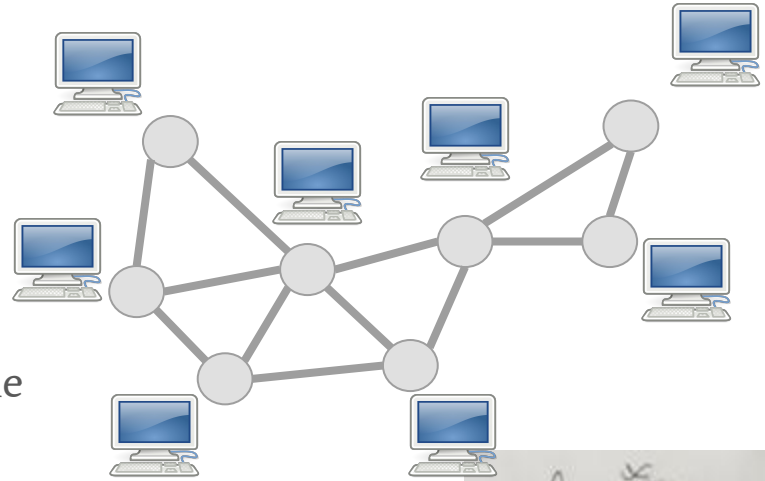
In computer science, we study *distributed algorithms* using **LOCAL** model of computing.

In *descriptive combinatorics*, mathematicians study certain “local” constructions.

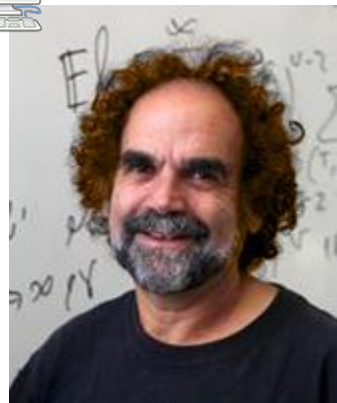
There are some pretty cool connections between the two fields! [Bernshteyn]

The **LOCAL** model of distributed graph algorithms

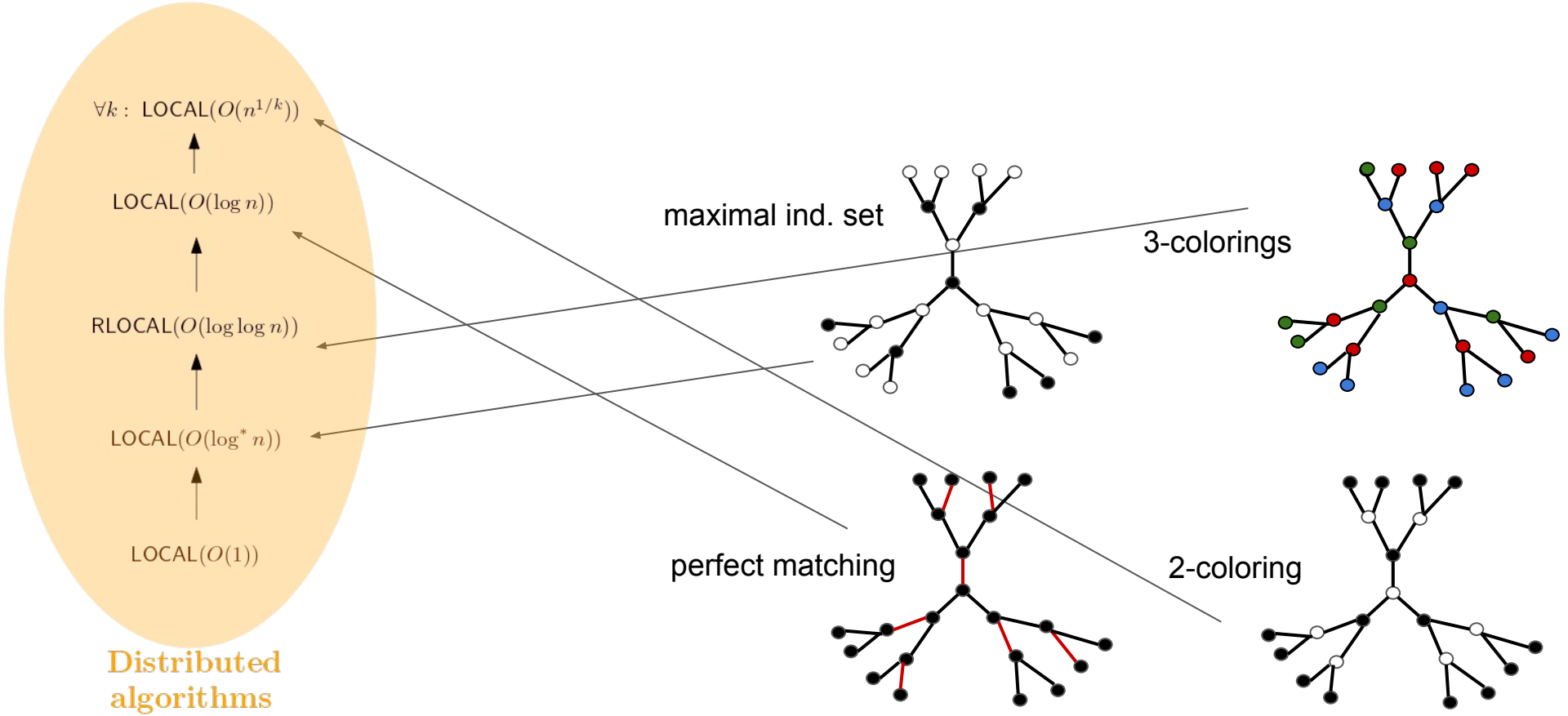
- Undirected graph on n nodes, one computer in each node
- Synchronous message passing rounds, unbounded message size and computation
- Initially, nodes know only (upper bound on) n, in the end, each node should know its part of output
- Time complexity: number of rounds
- This talk: the graph is a Δ-regular tree with Δ constant



LOCAL model
[Linial FOCS'87]



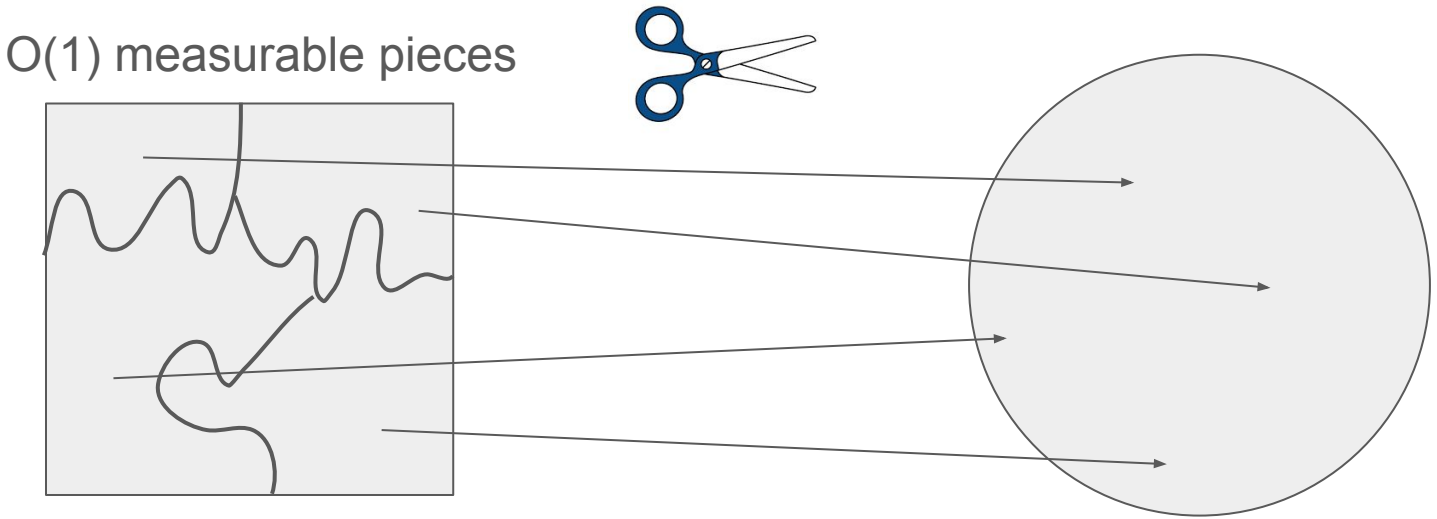
A lot is known! [Many papers in past 10 years]




and now it's time for something
completely different

Descriptive Combinatorics - Circle Squaring

Can you do this?



Descriptive Combinatorics - Circle Squaring

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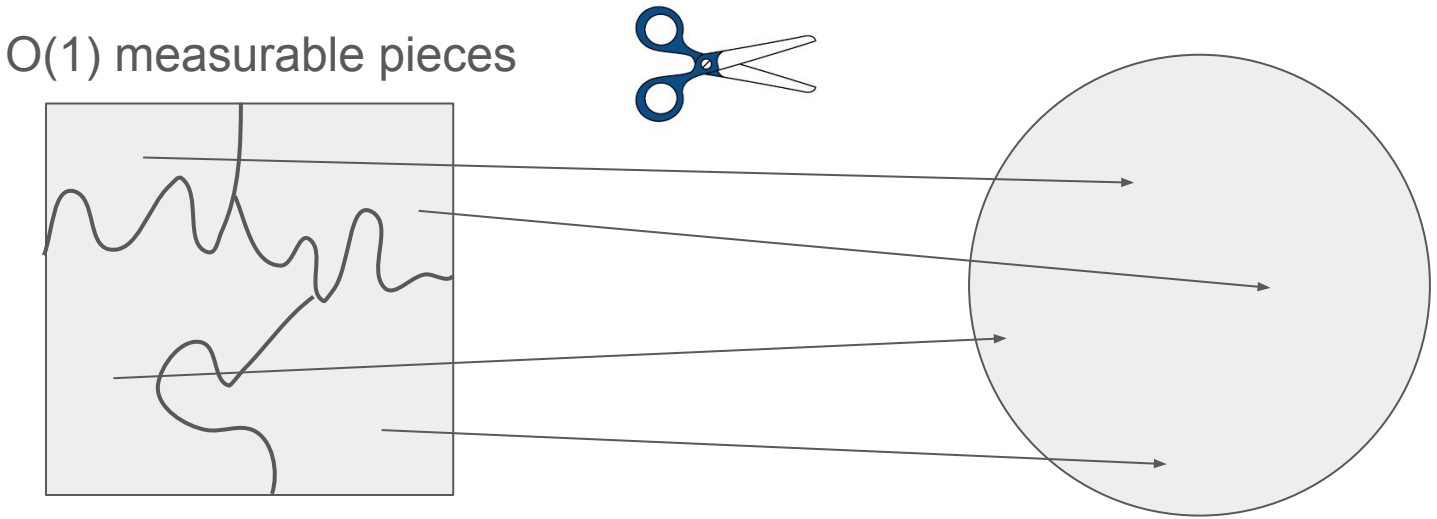
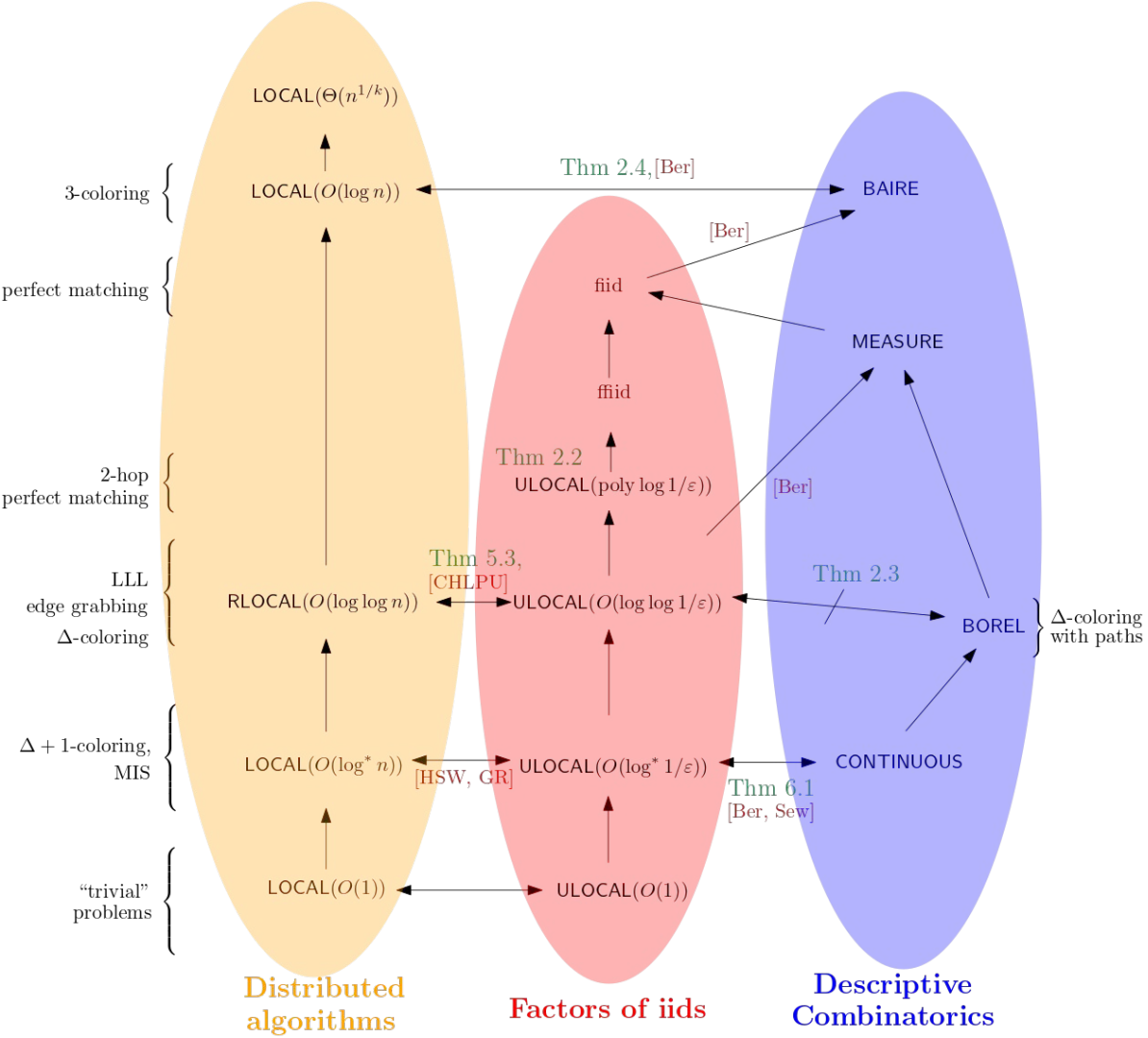
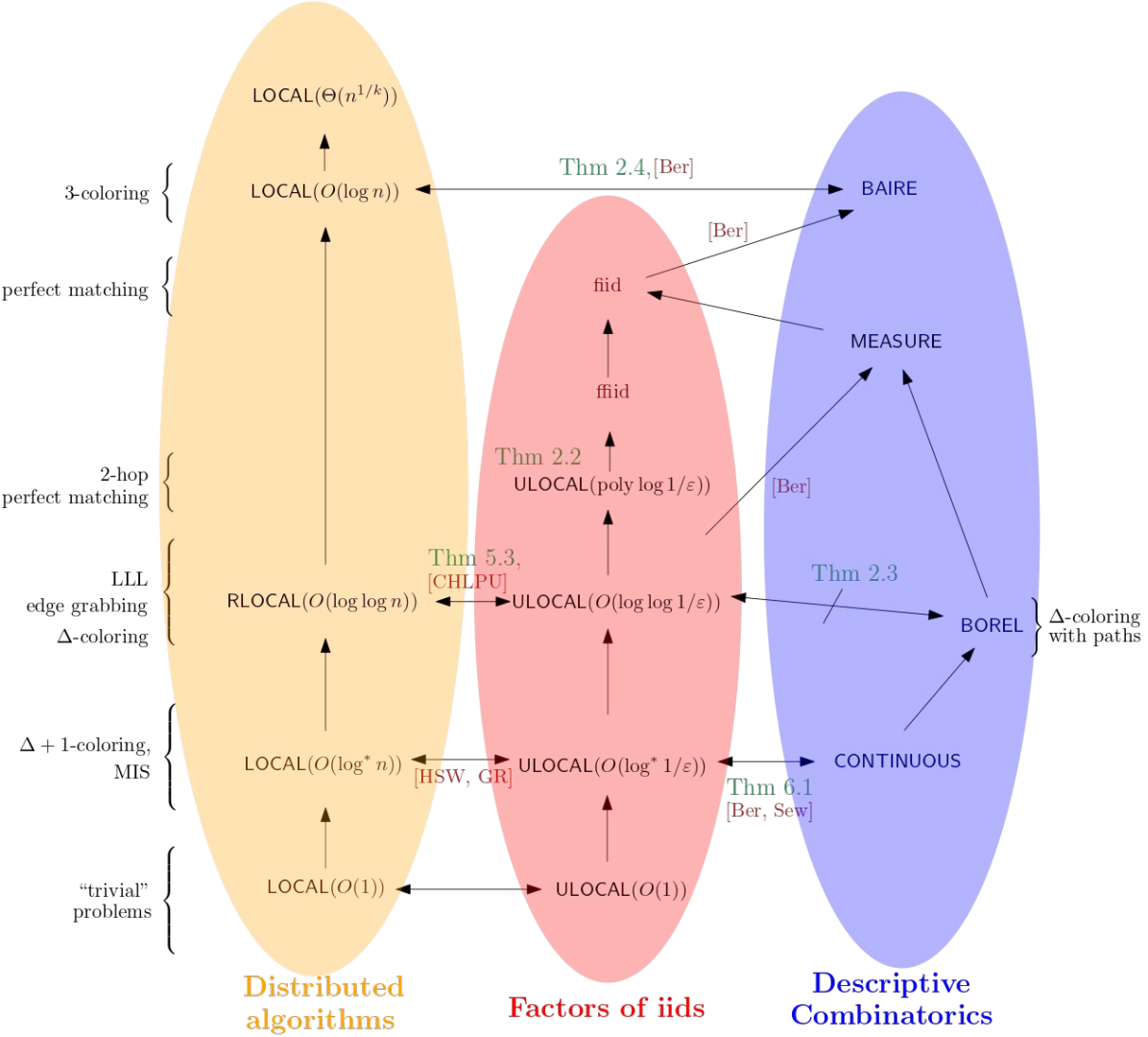


…Yes! [Laczkovich, Grabowski et al., MarksUnger, Mathé et al., ...]



Main point of the paper:

we try to do the same as in complexity theory, i.e., define lots of complexity classes and prove some inclusions



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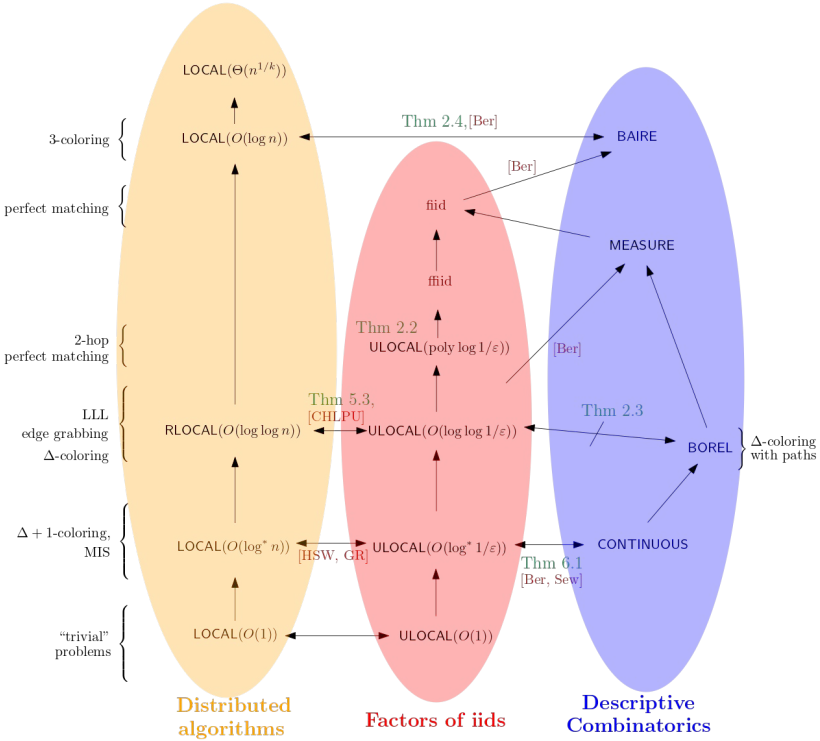
Also:

- introduce the ID graph trick,
- new LOCAL & BOREL lower bounds by generalization of Marks' technique
- …

It seems there is a lot things waiting to be discovered!



Big thanks to Rotem, Mark, and other organizers!