Karlsruhe Institute of Technology

WeGotYouCovered

The Winning Solver from the PACE 2019 Implementation Challenge, Vertex Cover Track

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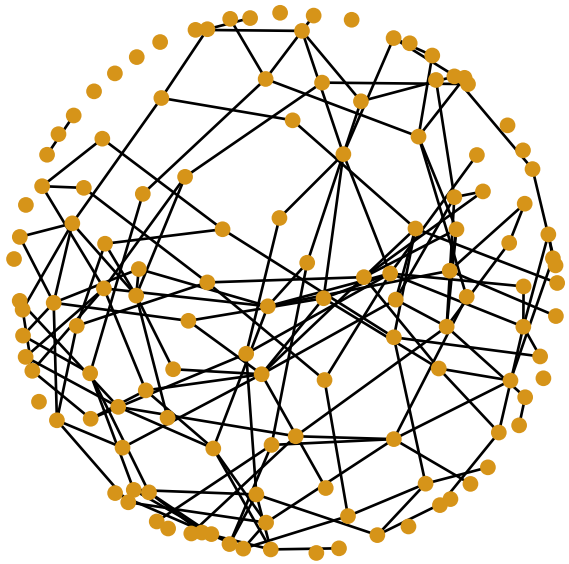
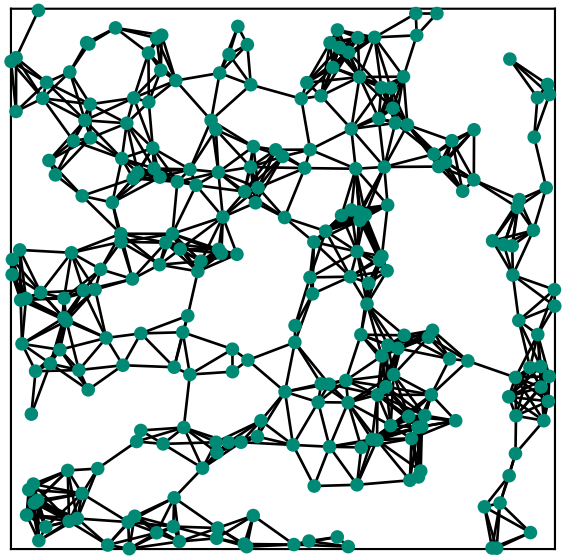
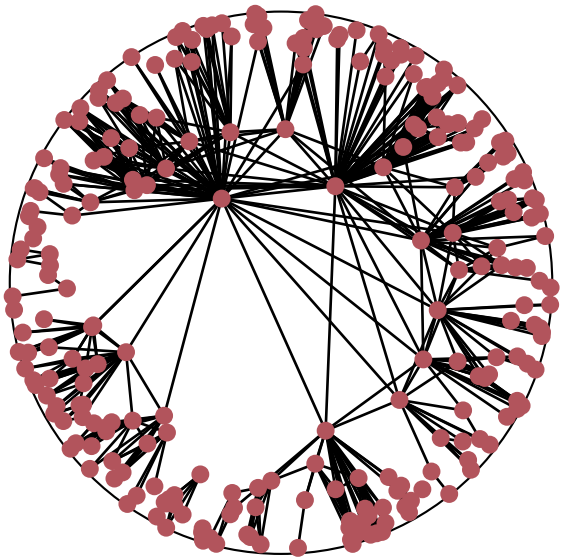
Demian Hespe, Sebastian Lamm, Christian Schulz, Darren Strash

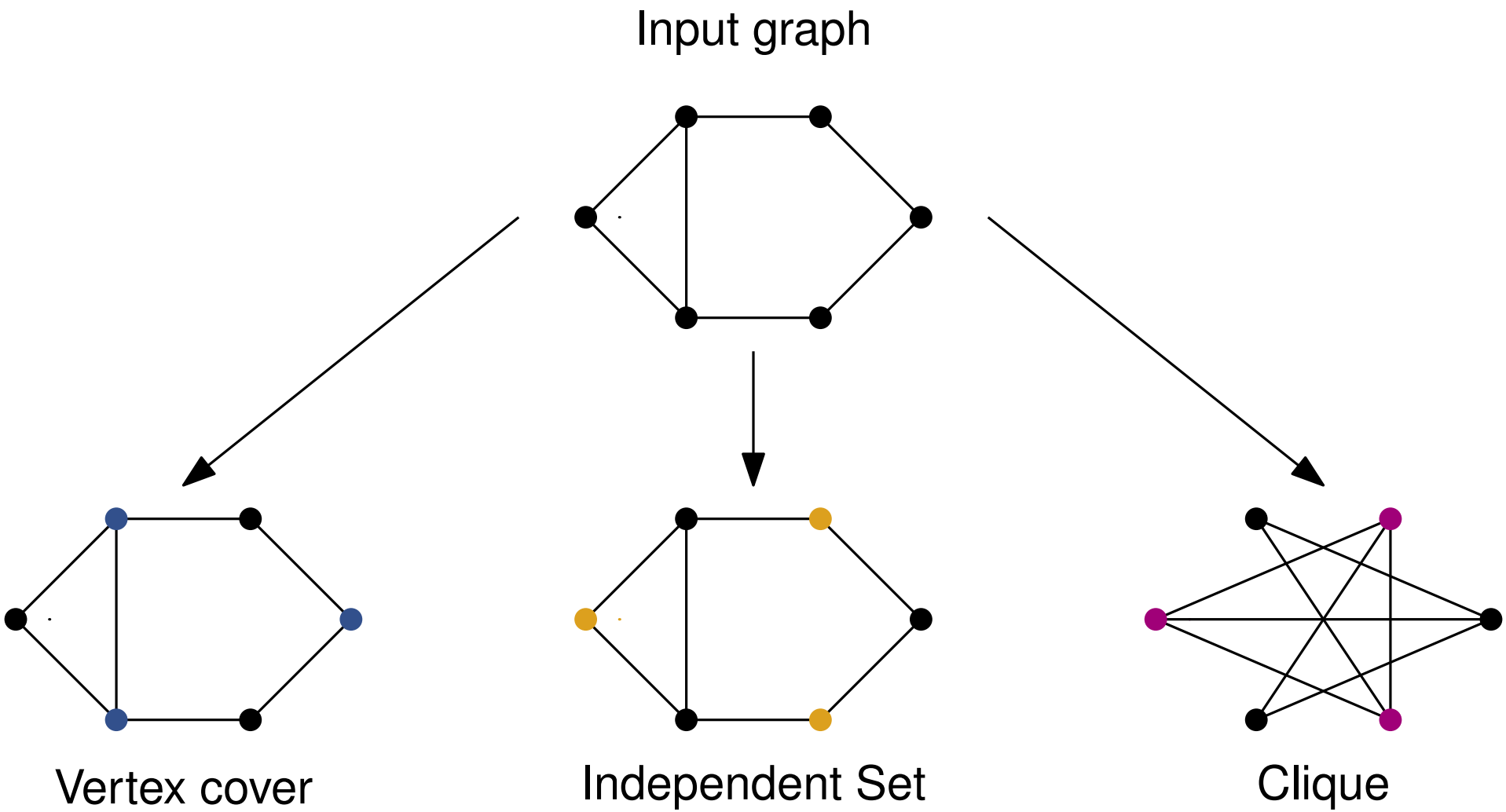
INSTITUTE OF THEORETICAL INFORMATICS · ALGORITHMICS GROUP





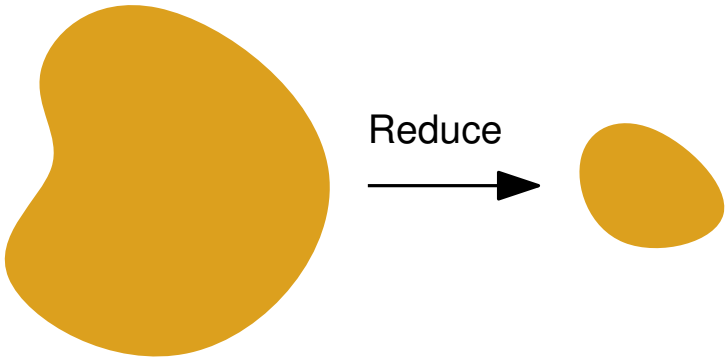


Vertex Cover and Complementary Problems

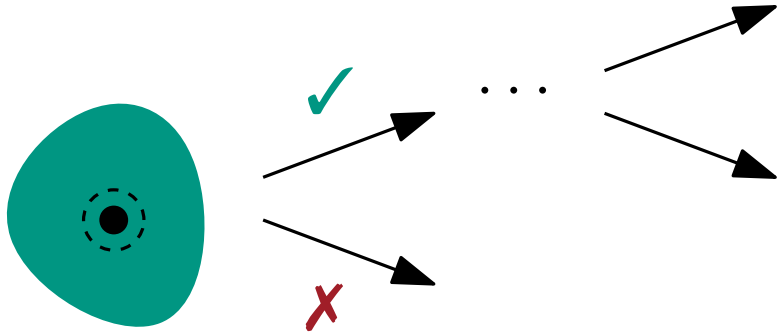


Techniques

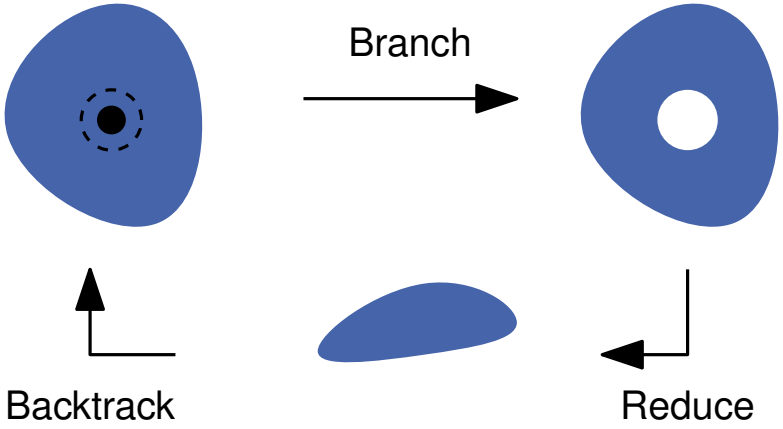
Kernelization



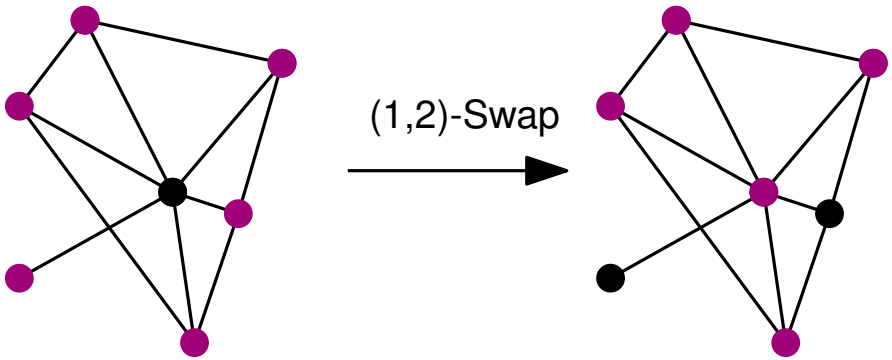
Branch-and-Bound



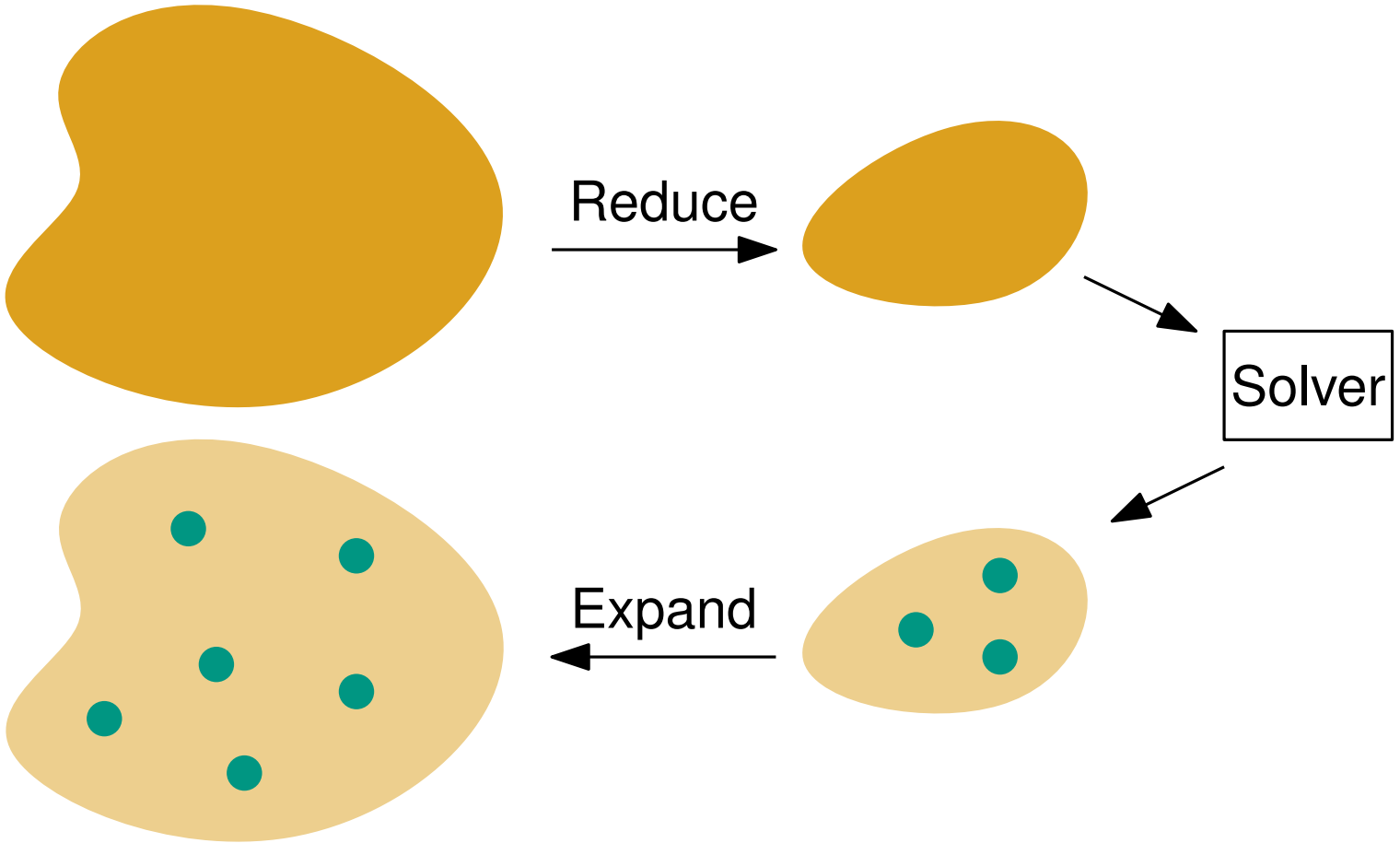
Branch-and-Reduce



Iterated Local Search

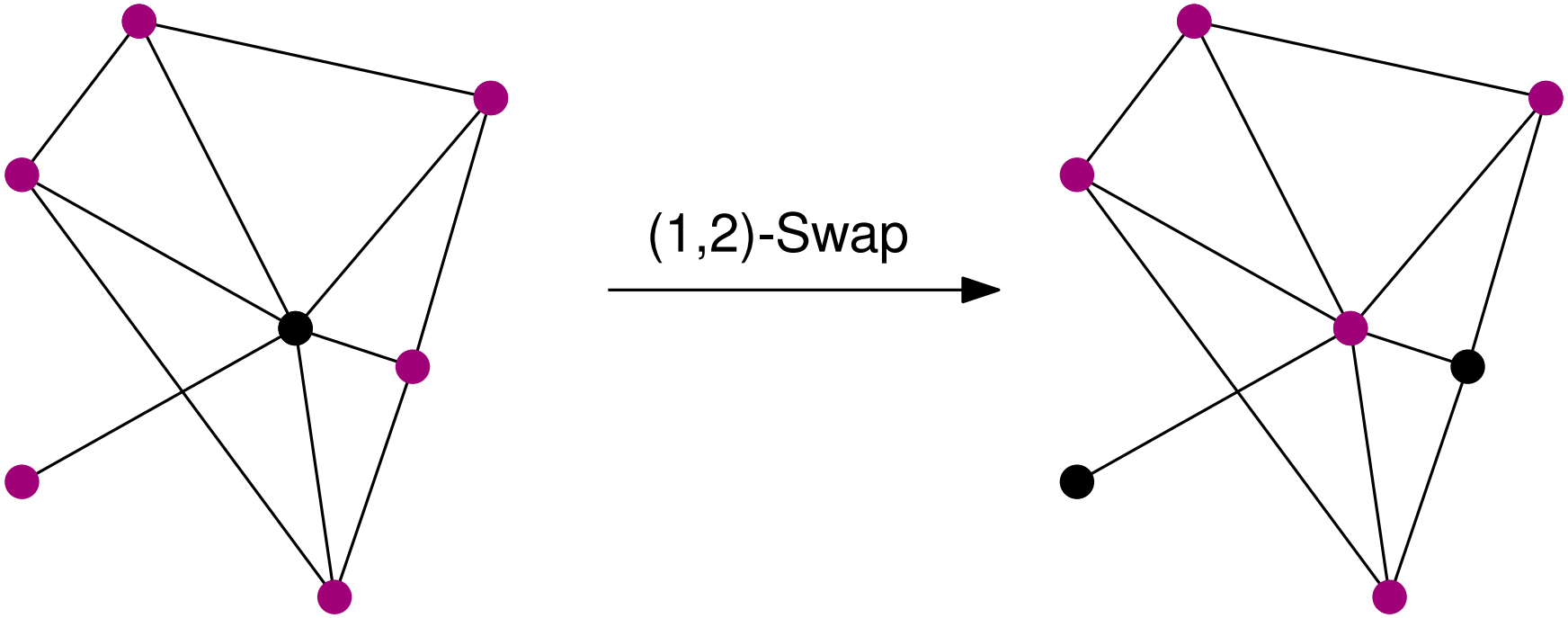


Kernelization [AI2016]



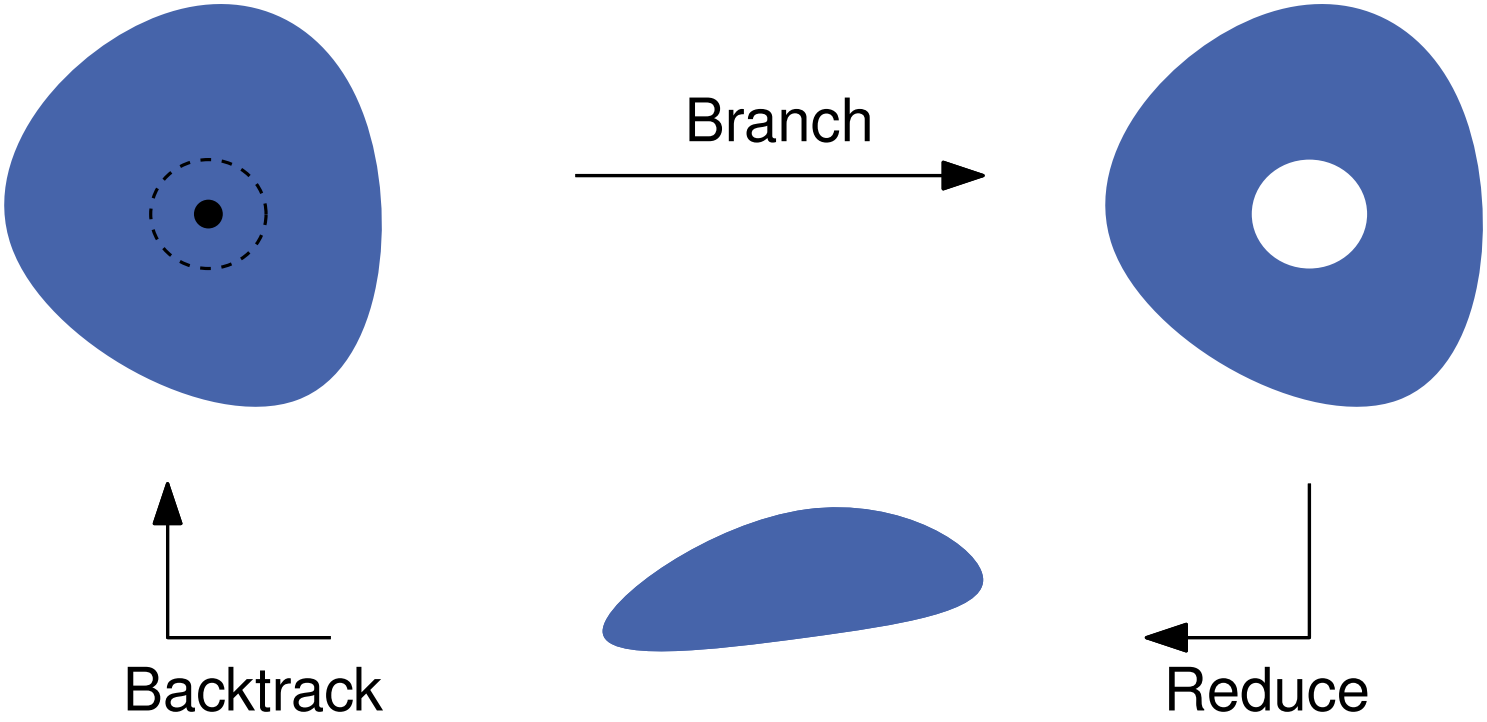
- Technique from FPT algorithms
- Applies rich set of reduction rules
- Significantly reduces graph size

Iterated Local Search [ARW2012]



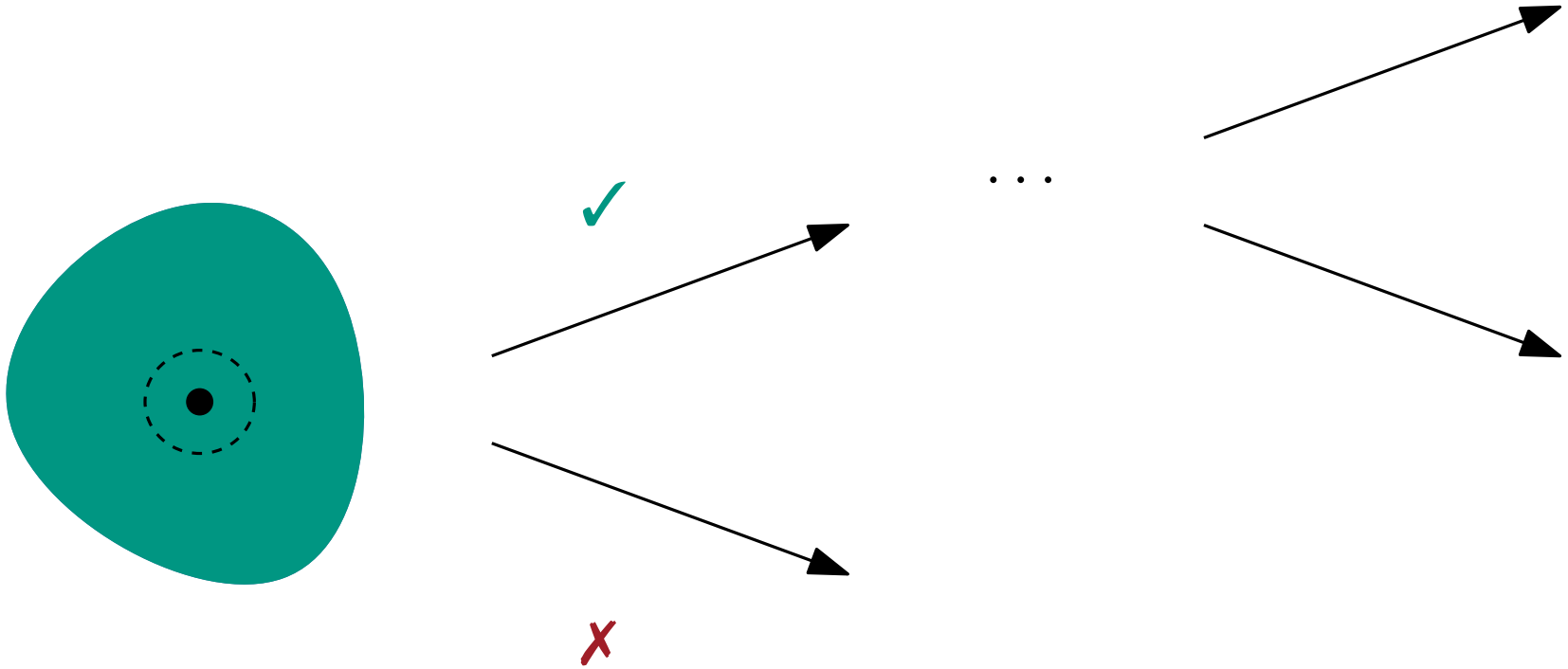
- Originally developed for independent sets
- Perturbation to escape local optima
- Can often find (near-)optimal solutions

Branch and Reduce [AI2016]



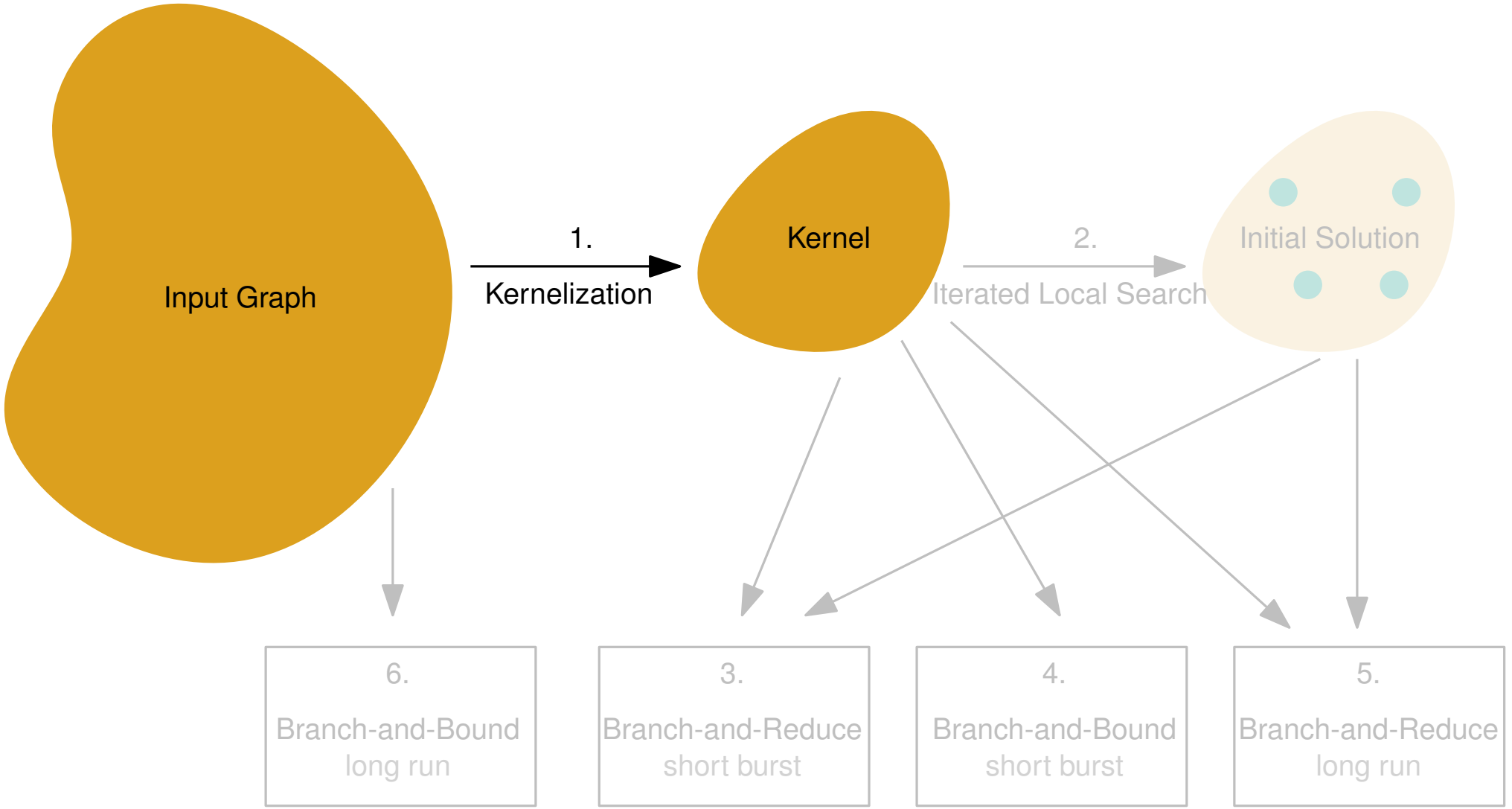
- Reduce graph after each branch
- Additional branching rules to reduce graph size
- Prune search based on lower bounds

Branch and Bound [LJM2017]



- Originally developed for maximum cliques
- Incremental MaxSAT reasoning to prune search
- Combination of static and dynamic vertex ordering

Algorithm Overview



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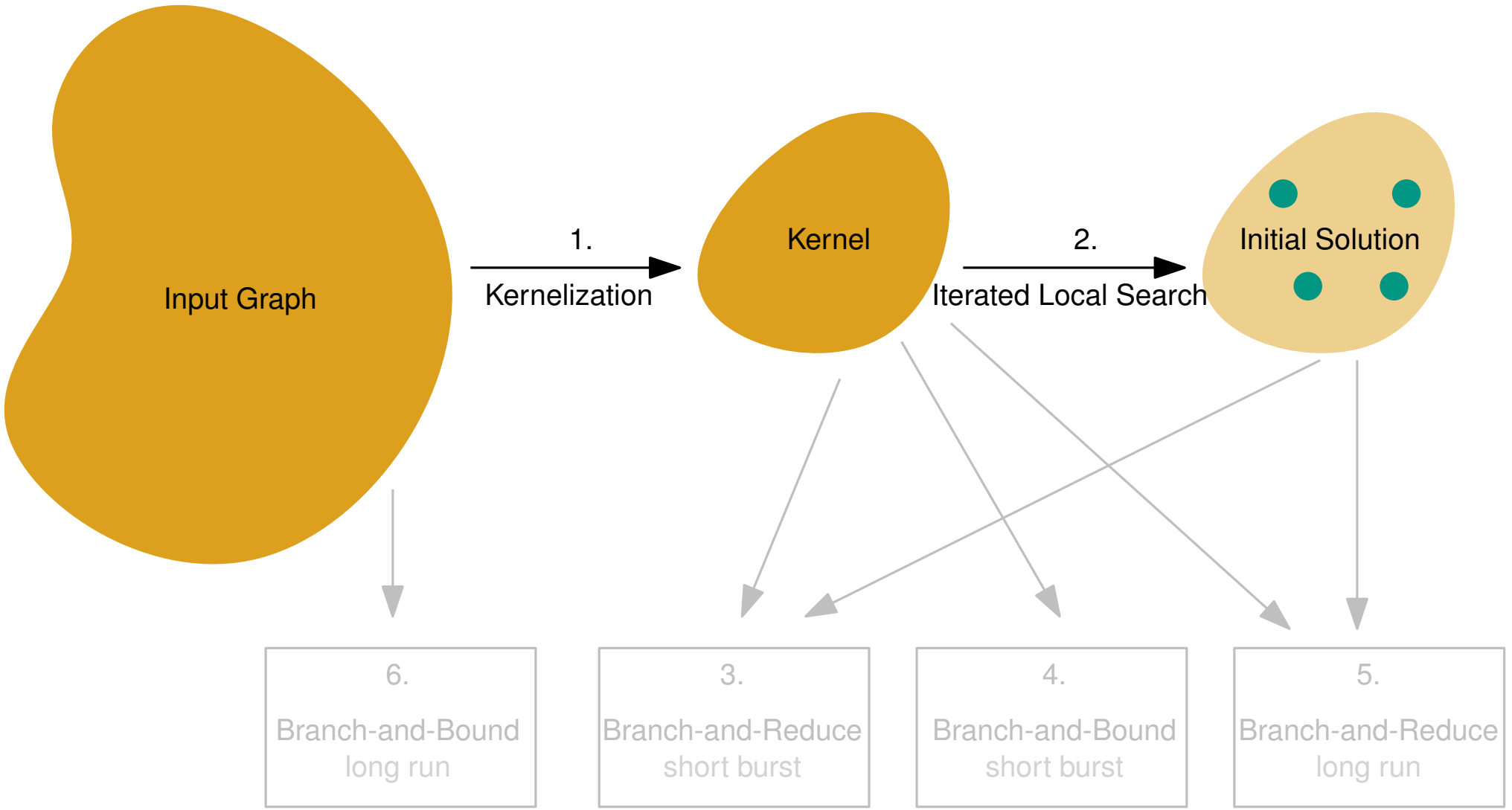

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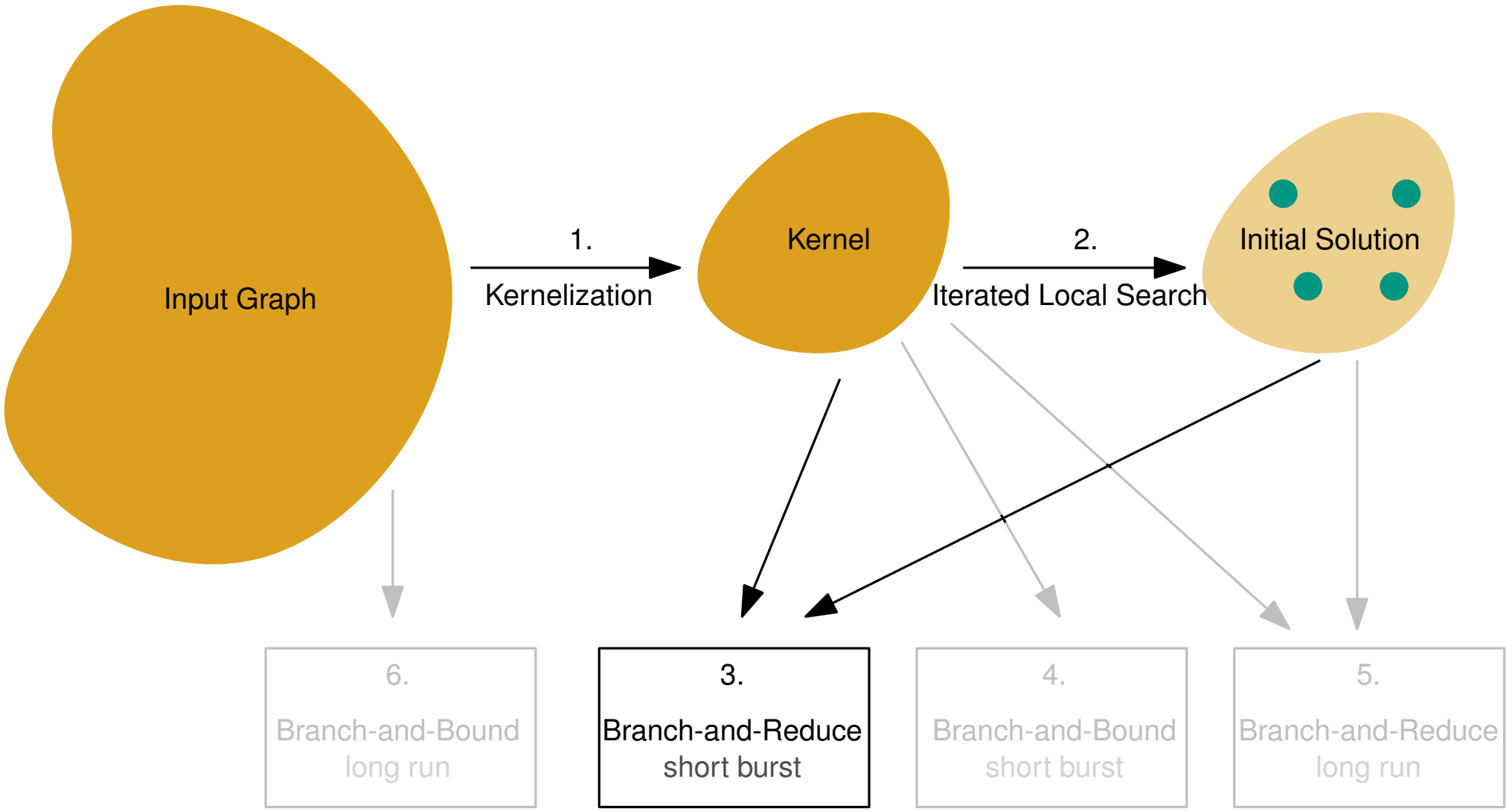

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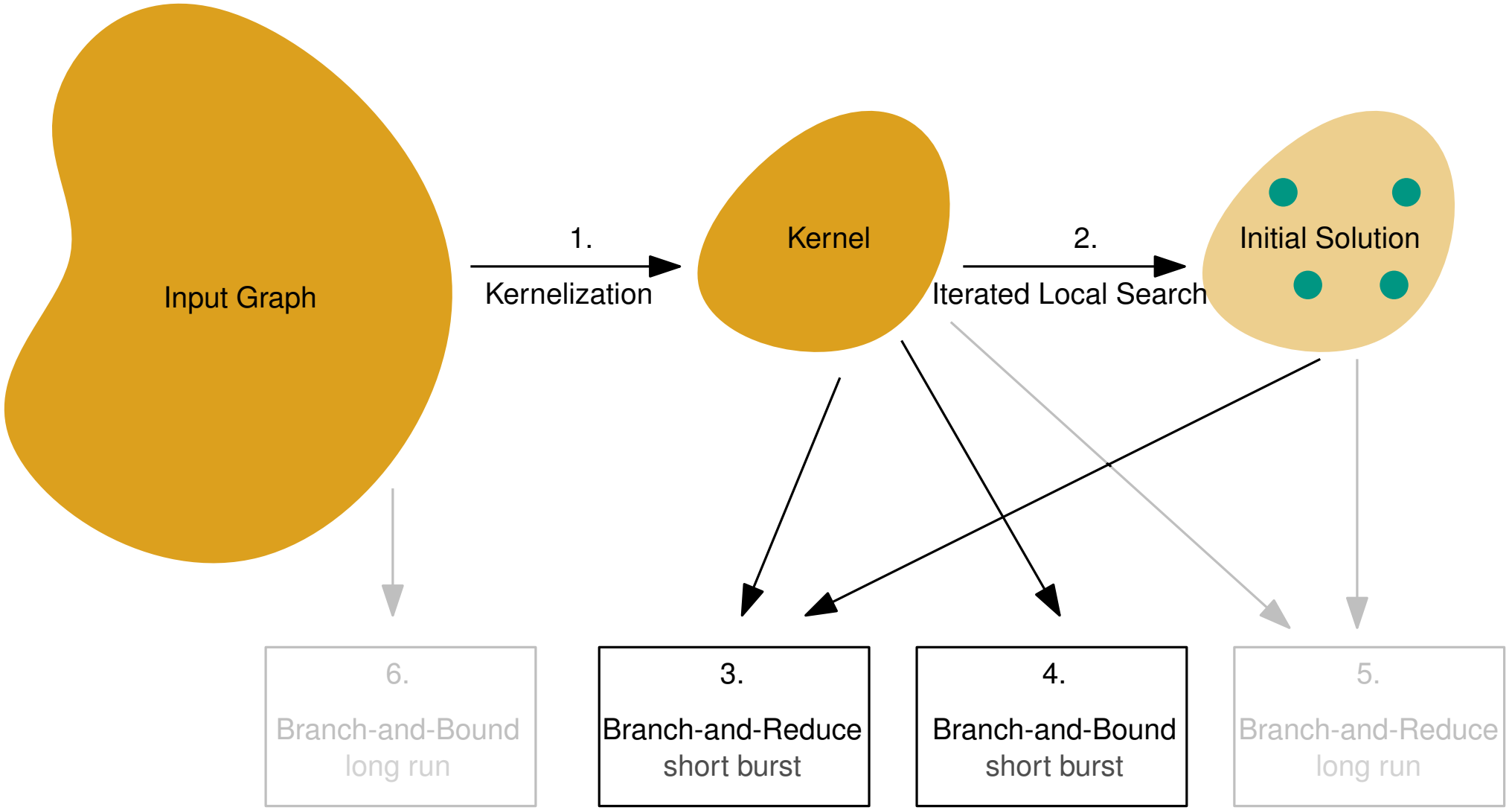

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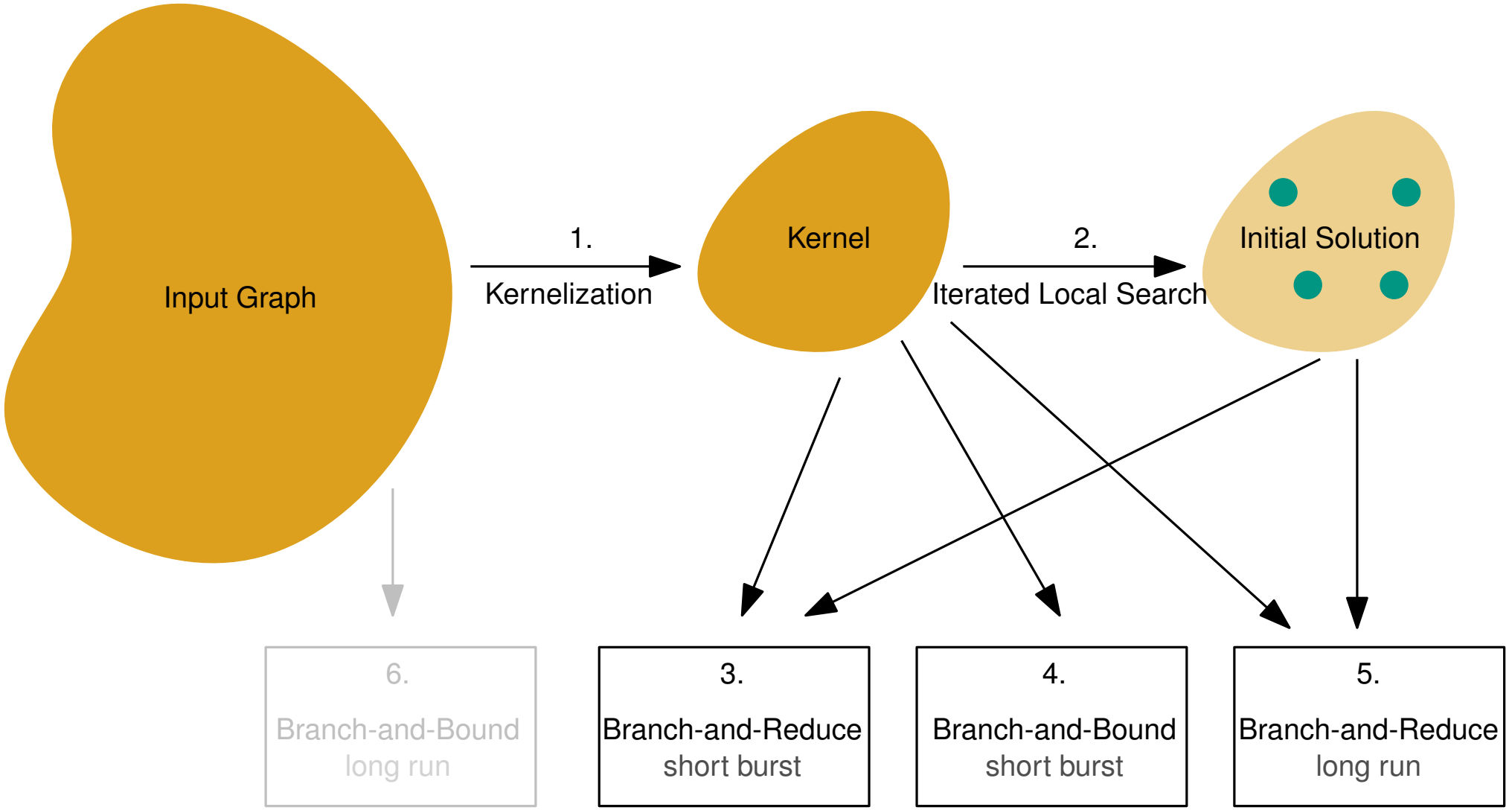

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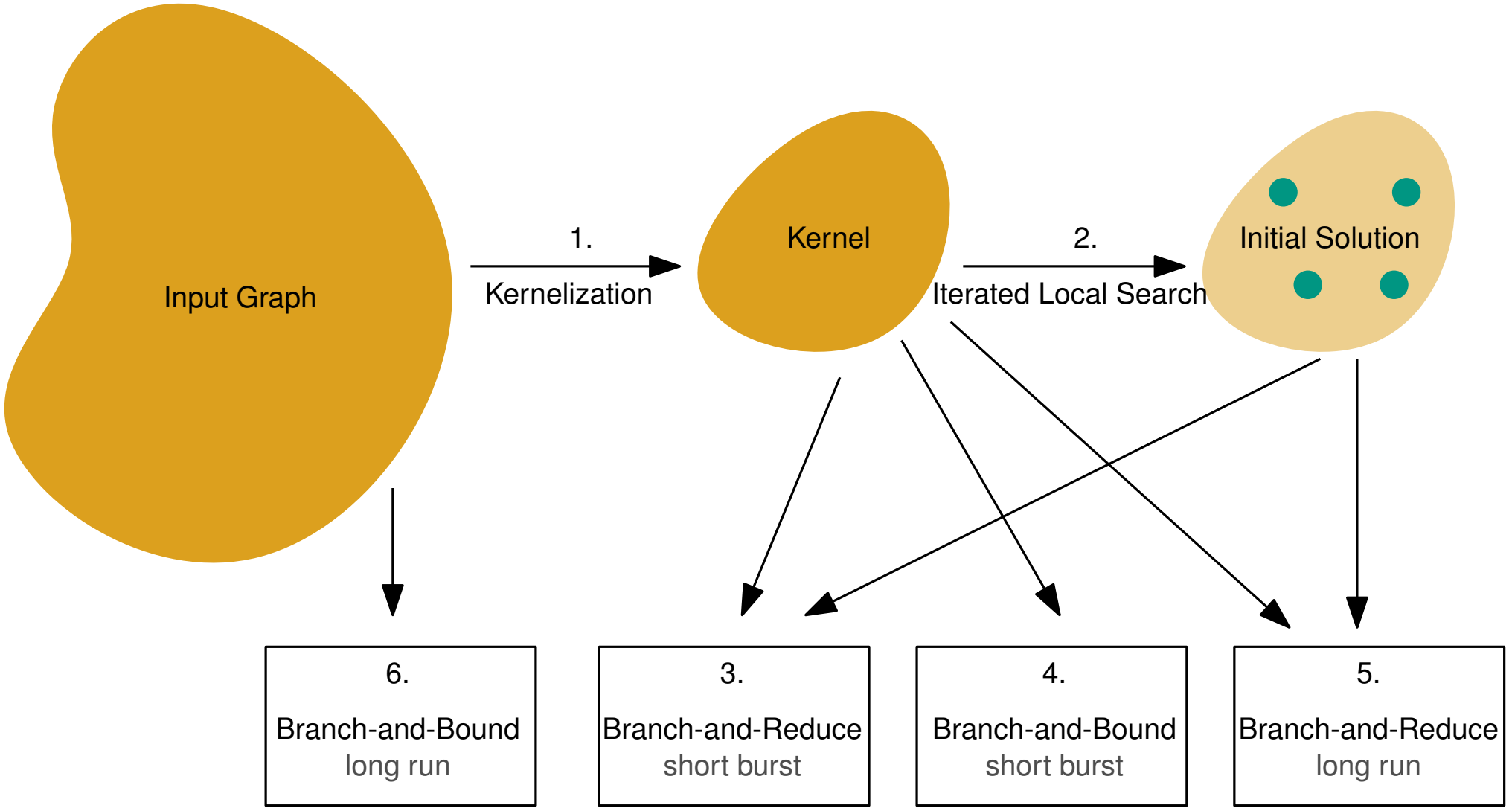
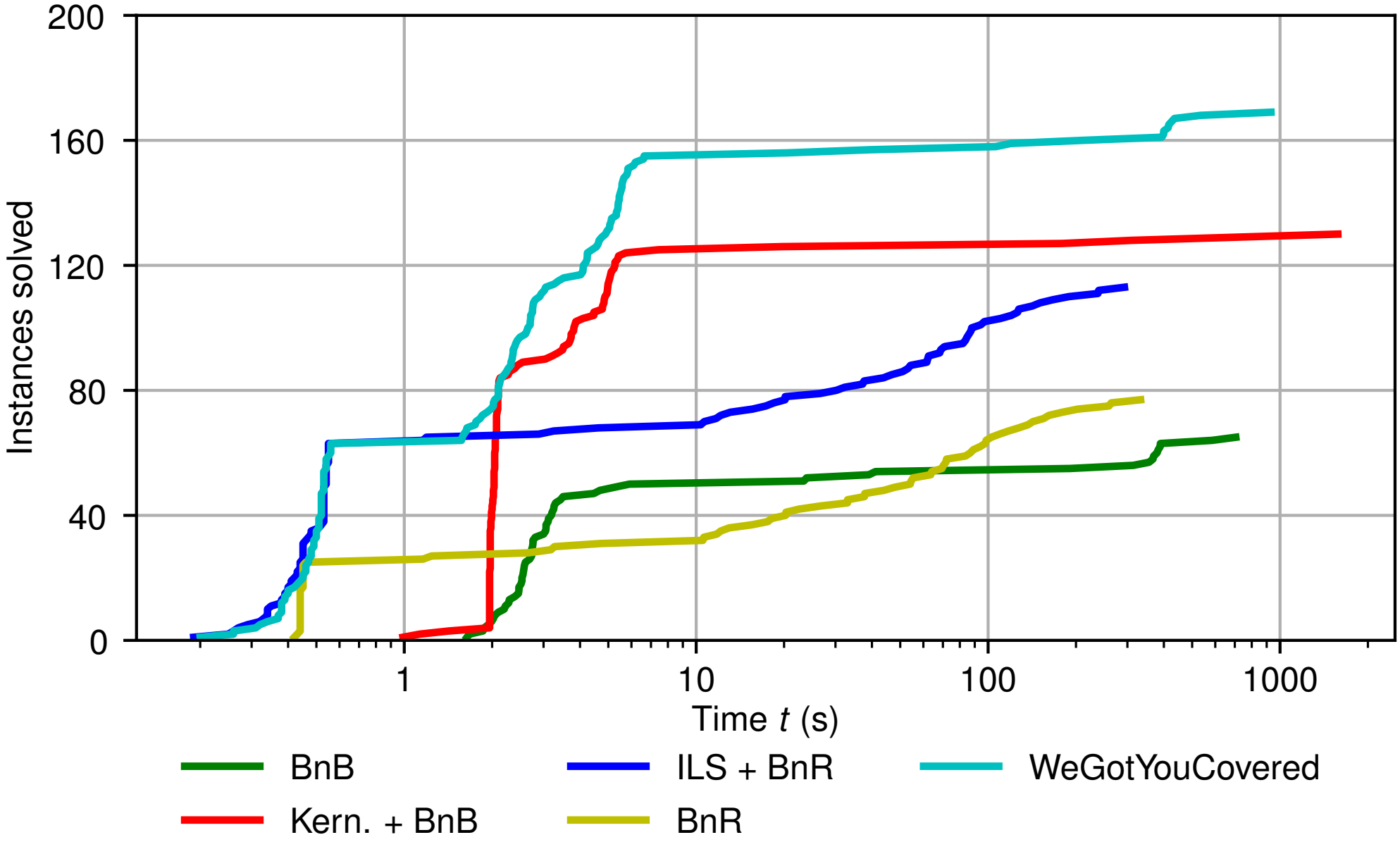


Instances Solved Over Time



References

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- Li, Chu-Min, Hua Jiang, and Felip Manyà. “On minimization of the number of branches in branch-and-bound algorithms for the maximum clique problem.” Computers & Operations Research 84 (2017): 1-15.