

Selected Topics in Discrete Optimization

April 19, 2018

Contents

1	A 5-minute overview of every assigned topic (All)	1
2	Estimates in Integer Programming (Elena Mille)	1
3	Total Dual Integrality (Thomas Eberhard)	2
4	Integer Feasibility Problem (Felix Ackermann)	2
5	Split Cuts (Yuchang Zhang)	2
6	Mixed Integer Gomory Cuts (Fabian Schaipp)	2
7	Lift and Project (Ulrich Jakob Oberhofer)	2
8	Benders' Decomposition (Yangrui Ruan)	3
9	Cuts Comparison (Anastasia Litinetskaya)	3

1 A 5-minute overview of every assigned topic (All)

19.04.18.

2 Estimates in Integer Programming (Elena Mille)

26.04.18. Sources: [7] (chapters 16 and 17)

- Short introduction to ILP and LP relaxation
- Representation of $I(P)$
- Distance of optimum solutions

3 Total Dual Integrality (Thomas Eberhard)

03.05.18. at 13:00 Sources: [7] (chapter 22)

- Rational Polyhedra and TDI
- Hilbert bases and minimal TDI-systems
- ILP and TDI-systems algorithmically

4 Integer Feasibility Problem (Felix Ackermann)

17.05.18. Sources: [4] (section 14.8)

- Flatness Theorem
- Lenstra's Algorithm

5 Split Cuts (Yuchang Zhang)

24.05.18. Sources: [2, 3, 4, 5]

- Split cuts
- Split closure of rational polyhedra

6 Mixed Integer Gomory Cuts (Fabian Schaipp)

12.07.18. Sources: [3, 4, 5]

- Mixed integer Rounding inequalities
- Mixed integer Gomory cuts
- Strengthening of mixed integer cuts

7 Lift and Project (Ulrich Jakob Oberhofer)

12.07.18. Sources: [1, 2] (section 5.4), [4] (section 11.7)

- Lift and Project procedure
- Lift and Project cuts
- Improving mixed integer Gomory cuts by Lift and Project

8 Benders' Decomposition (Yangrui Ruan)

14.07.18. at 10:15 Sources: [2, 6]

- Decomposition (Master Problem, Subproblem)
- Benders' decomposition algorithm
- Variants for ILP

9 Cuts Comparison (Anastasia Litinetskaya)

14.07.18. at 12:30 Sources: [2, 3, 4, 5]

- Overview and examples

References

- [1] E. Balas, S. Ceria, and G. Cornuéjols. A lift-and-project cutting plane algorithm for mixed 0–1 programs. *Mathematical Programming*, 58(1):295–324, Jan 1993.
- [2] M. Conforti, G. Cornuéjols, and G. Zambelli. *Integer Programming*. Graduate Texts in Mathematics. Springer International Publishing, 2014.
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- [4] M. Jünger, T.M. Liebling, D. Naddef, G.L. Nemhauser, W. R. Pulleyblank, G. Reinelt, G. Rinaldi, and L.A. Wolsey. *50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the-Art*. Springer Berlin Heidelberg, 2009.
- [5] H. Marchand, A. Martin, R. Weismantel, and L. Wolsey. Cutting planes in integer and mixed integer programming. *Discrete Applied Mathematics*, 123(13):397–446, 2002.
- [6] R. Rahmaniani, T. G. Crainic, M. Gendreau, and W. Rei. The Benders decomposition algorithm: A literature review. *European Journal of Operational Research*, 259(3):801–817, 2017.
- [7] A. Schrijver. *Theory of Linear and Integer Programming*. John Wiley & Sons, Inc., New York, NY, USA, 1986.