Discrete Optimization (26:711:653)

Index 20088

3 credits

Tuesday 1:40 PM – 4:40 PM Livingston College BRR-4031

Instructor: Endre Boros

Prerequisites: Calculus, Linear Algebra and Linear Programming

Topics:

1. Light introduction to complexity theory and analysis of algorithms, graphs and hypergraphs, with some examples for basic problems.
4. Review of max-flow min-cut theorem, integrality, submodularity of cuts, uniqueness, etc. Algorithms of Ford-Fulkerson, Karzanov, Dinic and Goldberg (as time permits). Applications (as time permits): open pit mining, image segmentation, project selection.
5. Min cost flows and transshipment problems, cycle cancelling and the idea of successive approximation. As time permits: multi-commodity flows, quickest flows, flows with loss/gain.
9. Cutting-stock problems, Gilmore-Gomory algorithm, bin-packing problems and approximations. Solving some examples with CPLEX or Xpress-MP.
10. Set covering and packing problems, exact and approximation algorithms, theorems by Lovász and Stein, Chvátal, Johnson, and Papadimitriou and Steiglitz.
11. Techniques to improve bounds, Lagrangian and surrogate duality.
12. The idea of cutting planes, Chvátal-Gomory cuts.
13. Lift and project methods.
Textbooks:


Grading:

The final grade will be based on 2 take-home homework assignments (that may include computational projects.)