IE 515 Graphs and Network Flows

Fall 2018

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Class schedule: Thursday 678
Location: M2171
Prerequisites: IE 202, IE 310, IE 501 or equivalent

Description

This class will cover basic graph search algorithms (depth first search, breadth first search), data structures for graphs (adjacency matrix, linked list) and network flow algorithms (heaps), variants of shortest path problems (all pair shortest paths, minimum cost-to-ratio-cycle problem, etc.); algorithms for finding maximum flows (preflow-push, scaling approaches, etc.), minimum cost flow problem and its generalizations such as convex cost flows, generalized flows and multi-commodity flows.

References

"Network Flows: Theory, Algorithms, and Applications" Ravindra K. Ahuja, Thomas L. Magnanti, James B. Orlin, 1993.
"Linear Programming and Network Flows" Mokhtar S. Bazaraa, John J. Jarvis, Hanif D. Sherali, 4th edition, 2009
"Combinatorial Optimization" William J. Cook, William H. Cunningham, William R. Pulleyblank, Alexander Schrijver, 1997

Outline

1	20/9	Introduction to graphs
2	27/9	Basic search algorithms and data structures
3	4/10	Shortest path problem
4	11/10	Shortest path problem
5	18/10	Maximum flow problem
6	25/10	Maximum flow problem
7	1/11	Minimum cost flow problem
8	8/11	Minimum cost flow problem
9	15/11	Minimum cost circulation problem
10	22/11	Convex cost flow problem
11	29/11	Generalized flows & Network simplex
12	6/12	Problems with side constraints and Lagrangean relaxation
13	13/12	Multi-commodity flows

Grading

Homeworks	25%
Project	35%
Final	35%
Class participation	5%