CS602

Applied Algorithms

Convex Programming in Combinatorial Optimization

Instructor: Rohit Gurjar
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https://www.cse.iitb.ac.in/~rgurjar/CS602_2021/CS602.html

Course Contents

- Pre-requisites:
  - CS218/CS601 (not a hard pre-req)
  - Linear Algebra (Vector Space, Basis, Null space, Matrix Rank)
  - Graph Theory

- Course Contents:
  - Linear Programming Basics, Duality, Primal Dual Approach.

  - LP in Combinatorial Optimization: Matching, Flow, Shortest Path,
  - Semidefinite Programming (SDP), Convex Programming, Duality, Algorithms

  - Approximation Algorithms: Steiner Tree, Max SAT, Max Cut
  - Online Algorithms: Matching, Load Balancing
  - Continuous Methods for Flow/matching. Submodular Functions

How will we do it

- Live lectures on Webex + Recordings on Moodle

- Mon 10:35 Tue 11:35 Thu 8:35

- Take home assignments. Will try to give regular short Moodle quizzes.

- Possibly have student presentations.

- Weightage: Moodle quizzes (10%), End-sem (40%), Assignments+Presentations (30+20).

References

- Last year's course <u>website</u> on my homepage.

- Alexander Schrijver, Combinatorial Optimization Polyhedra and Efficiency, Vol A,B. Springer, 2004.

- David B. Shmoys and David P. Williamson, The Design of Approximation Algorithms.

- Vijay Vazirani, Approximation Algorithms, Springer, 2003

- Niv Buchbinder and Joseph Naor, The design of competitive online algorithms via a primal-dual approach.

- Nisheeth K. Vishnoi. Algorithms for Convex Optimization