CS501: Computer Algorithms II – Course Topics

Spring 2020: Tuesday-Thursday 9:30 pm - 10:45 am, Thomas Beckham Hall 180D

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- Theory of NP-completeness
  - Turing Reductions and the Complexity Hierarchy
  - Polynomial Reductions
  - NP Complete problems:
    - 3SAT, Clique, Vertex Cover, Max Independent Set,
    - Subset Sum,3D matching, Exact cover by 3 sets,
    - Graph coloring, Subgraph isomorphism, Steiner tree,
    - Hamiltonian Cycle/Path, Scheduling,
    - TSP, Knapsack, Bin Packing, …
  - NP hardness, PSPACE
- Approximation Algorithms
  - Introduction to Approximation algorithms, Vertex Cover and Maximum Independent Set
  - Introduction to LP and ILP
  - ILP Approximation for Vertex Cover
  - FPTAS for Subset Sum
  - Set cover approximation
  - TSP Approximation
  - Submodular Functions and their optimization
- Randomized Algorithms
  - Introduction to randomized algorithms, Las Vegas/Monte Carlo paradigms, Randomized Quicksort, Min cut, Probabilistic kth largest, Max 3 SAT
  - Markov/Chebyshev inequalities, Chernoff bound and applications, Probabilistic classes PP and ZPP
  - Probabilistic routing, randomized rounding (Max-SAT)

subject to change without notice