Combinatorial Optimization

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1. Review − Greedy algorithms, Matroid Axioms, Independence systems, Linear, graphic, uniform, direct sum, maximal independent subsets.
2. The weighted matroid problem.
3. The Greedy algorithm for the weighted matroid problem.
4. Matroids exhibit the greedy choice property.
5. Lemma 16.8 and its corollary.
6. Matroids exhibit the optimal-substructure property.
7. The weighted matroid algorithm is correct.
8. Dependent sets of a matroid.
9. Circuits. Proper definition, e.g. cycles in graphs.
10. Circuit properties. Proof of circuit-elimination property.
11. Clutter and vertex packing on a start.
12. For any independence system including matroids, $C(M)$ determines $I(M)$.
13. Fano Matroid.
14. Representations of linear matroids. Minimal representations and projective equivalence.
15. Fano matroid representation proposition without proof.
16. Revisiting the greedy algorithm.
17. Rank and base of an independence system M.
18. How to find the base of an independent systems?
19. The algorithm works for matroids but not for independence systems, e.g. vertex packing.
20. Finding maximum-weight independent subsets S_k of cardinality k, for all $0 \leq k \leq r_M(E(M))$.
21. Greedy algorithm and proof of correctness.
22. Does greedy algorithm work for more general independence systems than matroids? Greedy characterization theorem.