

Index

- AdWords problem, 200
- AdWords problem
 - strict capacity constraint, 212
- Bahncard problem, 21
- bin packing
 - BestFit algorithm, 50
 - competitive ratio lower bound, 60
 - deterministic algorithms, 50
 - FirstFit algorithm, 50
 - Harmonic algorithm, 55
 - problem formulation, 49
 - randomized algorithms, 63
- bipartite matching
 - problem formulation, 161
 - unweighted graph, 162
 - unweighted graph
 - deterministic algorithm, 163
 - lower bound randomized algorithms, 164
 - optimal randomized algorithm
 - RANKING, 167
 - weighted graph, 172
 - weighted graph
 - 8-competitive sample and threshold algorithm, 173
 - almost optimal algorithm, 179
- bipartite unweighted matching
 - primal dual algorithm, 205
- competitive ratio, 3
- convex body chasing, 391
- facility location, 218
- facility location
 - lower bound, 220
 - non-uniform facility opening cost, 229
 - randomized algorithm, 223
 - uniform facility opening cost, 223
- k*-Means clustering, 230
- k*-means clustering
 - randomized algorithm, 231
- k*-server problem, 107
 - one-dimensional case, 108
- KKT conditions, 436
 - deadline constrained scheduling, 356
- knapsack problem
 - 1/10 e -competitive randomized algorithm, 144
 - expected capacity constraint, 155
 - linear programming relaxation, 139
 - problem formulation, 139
- list accessing
 - lower bound deterministic algorithms, 29
 - lower bound randomized algorithms, 34
 - optimal deterministic algorithm, 30
 - problem formulation, 27
 - randomized algorithm BIT, 39
- load balancing, 247
- load balancing
 - doubling trick, 265
 - networks, 268
 - permanent jobs, 247
 - permanent jobs
 - identical machines, 254
 - non-identical machines, 254
 - power of d choices algorithm, 249
 - random algorithm, 248
 - temporary jobs, 258
 - temporary jobs
 - identical machines, 258
 - non-identical machines, 260
- lookahead
 - paging, 85

464 Index

- matroids, 424
- maximum flow problem
 - non-polymatroidal, 417
 - polymatroidal, 418
- metrical task system, 98
 - lower bound, 99
 - upper bound, 102
 - work function algorithm, 102
- multi-commodity flow, 397
- multi-commodity routing
 - splittable case, 399
 - unsplittable case, 404
- oblivious adversary, 7
- online convex optimization
 - algorithm, 384
 - dynamic regret, 392
 - static regret, 394
 - switching constraint, 381
- paging
 - deterministic algorithm LRU, 70
 - lower bound deterministic algorithms, 69
 - lower bound randomized algorithms, 73
 - multiple cache problem, 88
 - near optimal randomized algorithm
 - Marking, 76
 - optimal offline algorithm, 69
 - problem formulation, 68
 - randomized algorithms, 73
 - stochastic input, 85
- potential function argument
 - list accessing, 35
 - load balancing, 269
 - online convex optimization, 384
 - paging, 79
 - scheduling with deadlines, 334
- prediction augmented algorithm
 - paging, 80
 - scheduling with deadlines, 339
 - secretary, 135
 - ski-rental, 25
- primal–dual algorithms
 - AdWords problem, 200
 - bipartite unweighted matching, 205
 - competitive ratio bounding strategy, 192
 - facility location, 230
 - primer, 190
 - set cover problem, 193
 - ski-rental, 213
 - TCP acknowledgement
 - problem, 214
- randomized algorithm
 - k -means clustering, 231
- randomized algorithms, 7
- recall, algorithms with
 - knapsack, 152
 - secretary problem, 128
- resource augmentation, algorithms with
 - knapsack, 152
 - scheduling
 - SRPT, 298
- resource constrained scheduling, 410
- resource constrained scheduling
 - competitive ratio lower bound, 414
 - optimal algorithm, 411
- routing, 397
- scheduling, 280
- scheduling
 - flow-time minimization, 280
 - flow-time minimization
 - lower bound SRPT, 283
 - universal lower bound, 284
 - speed scaling, 306
 - speed scaling
 - multi-server SRPT algorithm, 317
 - multiple servers, 316
 - recipe for lower bound, 306
 - single server case, 307
 - weighted flow-time, 326
 - SRPT algorithm, 289
 - with common deadlines, 345
 - with common deadlines
 - multiple servers, 354
 - online algorithm, 348
 - with deadlines
 - energy minimization, 329
 - online algorithm, 332
 - optimal offline algorithm, 329
 - single server, 329
 - with prediction, 339

- secretarial input
 - bipartite matching, 172
 - facility location, 224
 - knapsack, 142
 - secretary problem, 120
- secretary problem
 - expected capacity constraint, 131
 - multiple secretary problem, 125
 - optimal algorithm, 123
 - problem formulation, 119
 - sample and price algorithm, 121
 - unknown number of items, 129
- set cover problem, 193
- set cover problem
 - lower bound randomized algorithms, 211
- ski-rental
 - deterministic algorithms, 12
 - lower bound for randomized algorithms, 18
 - primal-dual algorithm, 213
 - problem formulation, 11
 - randomized algorithms, 14
- Steiner tree, 378
- submodular functions, 422
- submodular functions
 - curvature, 422
 - discriminant, 425
- submodular welfare maximization, 423
- submodular welfare problem, 421
- TCP acknowledgement problem, 21
- TCP acknowledgement problem
 - 2-competitive algorithm, 25
 - primal-dual algorithm, 214
- travelling salesman problem
 - graph formulation, 367
 - graph formulation
 - algorithm `SHORTCUT`, 369
 - metric formulation, 361
 - metric formulation
 - algorithm `Plan At Home`, 365
 - lower bounds, 362
- types of adversaries, 7, 433
- Yao’s lower bound
 - ski-rental problem, 18
 - facility location problem, 241
 - list accessing, 34
 - paging, 73
 - secretary, 130
 - set cover problem, 211
- Yao’s lower bound recipe, 17