References


REFERENCES


REFERENCES


REFERENCES


REFERENCES


REFERENCES


REFERENCES


REFERENCES


REFERENCES


REFERENCES


0-1 linear knapsack problem, 159, 161, 205, 336, 342, 344
   branch-and-bound method, 162
   dynamic programming, 163
0-1 linear programming problem, 20
0-1 linearization method, 159, 204
Additive algorithm, 20, 352–353, 357, 364
Back-track, 17, 21, 320, 339
   augmented solution, 351
   converted solution, 351
   inconsistency, 350
   partial solution, 17, 350
   typical completion, 18, 350
   underlined element, 18
Branch-and-bound method, 155, 217, 269, 277, 285
Branch-and-bound method
   backtracking
      best first, 320
      depth-first, 162, 310, 320
   branching, 15
      lowest-index-first, 267
      most fractional integer variable, 267
      pseudo-costs, 267
   constrained polynomial 0-1 programming, 319–320, 347
   continuous relaxation, 17, 24, 150, 162, 194, 266, 376
      KKT conditions, 151
      multiplier search, 152
      pegging method, 157, 204, 262
      fathoming, 15
   general framework, 15
      implicit enumeration, 15
      incumbent, 15
      subproblem and node, 15
   Lagrangian relaxation, 17, 25, 174, 339
      mix-integer programming, 375
Branch-and-bound method
   node selection
      estimation, 268
newest node, 268
   node with lowest bound, 268
   variable fixation, 310, 339
Complexity, 164, 307, 335, 342
   N P-complete, 10, 342
   N P-hard, 10
class N P, 10
class P, 10
Concave knapsack problem, 181
domain cut and linear approximation method, 185
Constrained polynomial 0-1 programming, 315, 349
   p-norm surrogate constraint method, 360
   cutting plane method, 321
   linearization method, 317
   objective level cut method, 369
two-level solution method, 364
Continuous bound vs Lagrangian bound, 26–27
Continuous solution and integer solution
   linear integer program, 29
   separable convex integer program, 31
   unconstrained convex integer program, 32
Contour cut method, 245
   indefinite objective function, 254
   multiple constraints, 250
   quadratic contour cut, 241
      concave case, 245
      convex case, 243
   ellipse contour, 242
   ellipsoid, 242
Convergent Lagrangian methods, xxii
   contour cut method, 245
   decomposition method, 270
domain cut method, 164
   objective level cut method, 224, 368
Convex integer programming, 2, 25
Convex knapsack problem, 150, 156, 159, 190, 268
Convex mixed-integer programming, 375
   generalized Benders decomposition, 377
REFERENCES

outer approximation method, 382
Convexification method, 277, 286, 394
concave minimization, 282
outer approximation, 282
convexity and monotonicity, 277
variable transformation, 277
nonsmooth function, 279
Discrete global descent function, 400
Discrete global descent method, 410
Domain cut and partition, 170, 172, 184, 241, 270
Domain cut method, 165, 173
multi-dimensional problem, 176
surrogate constraint problem, 176
Dynamic programming, 163, 209, 217
backward recursion, 211, 215
forward recursion, 211, 216
principle of optimality, 211
single constraint, 215
Generalized covering relaxation, 321, 324
cover, 321
minimal cover, 321
Heuristic method
0-1 linear knapsack problem, 162
canvex knapsack problem, 198
general knapsack problem, 156
generalized covering relaxation, 324
monotone integer programming, 274
quadratic 0-1 knapsack, 336
best $L_2$ approximation, 335
fill-up and exchange, 337
reliability network, 199
Hybrid method, 205, 217, 263
0-1 linear programming, 221
bound elimination, 219
domination, 218
efficient solution, 218
Lagrangian relaxation, 221
partial feasible solution, 218
residual subproblem, 219
Lagrangian decomposition, 88, 90, 269
nonseparable integer programming, 88
quadratic 0-1 knapsack problem, 341
quadratic 0-1 programming problem, 91
Lagrangian relaxation and dual
basic formulation, 25, 45
dual function, 46-47, 49, 183, 328
minimum-cut, 333
dual search, 332, 342, 369
bundle method, 68
outer Lagrangian linearization method, 57, 177, 201, 333
single constraint, 63
subgradient method, 52, 177, 201, 229, 269
duality bound, 47
duality gap, 47, 165-166, 175, 226
duality gap bound, 226
feasibility-check subproblems in MINLP, 379
lower convex envelope, 50
nonlinear continuous subproblems in MINLP, 378
optimal generating multiplier, 77
optimal primal-dual pair, 77
perturbation function, 114, 119, 129, 141
convex envelope function, 75, 115, 119, 124, 330
corner point, 71
domain decomposition, 71
envelope function, 82, 329
noninferior point, 73
solution properties, 83
primal feasibility, 84
primal infeasibility, 85
strong duality, 46
weak duality, 26, 46
Linear approximation, 159, 182, 335, 344
Linearization of polynomial inequality, 326
Local search, 301
$m$-neighborhood, 301, 398
corner point, 400
discrete local minimizer, 9
local maximizer, 301
local minimizer, 398
neighborhood, 9
steepest descent method, 399
unit $m$-neighborhood, 398
Lower bounding linear function, 325
Manufacturing capacity planning, 153
Mixed-integer nonlinear programming, 1, 373
chemical process, 7
nonconvex mixed-integer programming, 389
Monotone integer programming, 3
discrete polyblock method, 273
bisection method, 274
box selection, 274
polyblock and convexification method, 284
Nonconvex mixed-integer programming
convex relaxation, 390
convexification method, 394
Nonlinear 0-1 integer programming, 3, 17
Nonlinear integer programming problem with a quadratic objective function, 3, 241
contour cut method, 249
portfolio selection model, 259
Nonlinear knapsack problem, 3, 149
0-1 linearization method, 159
branch-and-bound method, 150
concave knapsack problem, 181
domain cut method, 165
reliability network, 188
Nonlinear Lagrangian
$p$-th power formulation, 113
optimal generating multipliers, 116
general formulation, 118
optimal generating multipliers, 113, 117, 126
optimal primal-dual pair, 122

Nonlinear Lagrangian
generalized nonlinear Lagrangian
primal feasibility, 126, 137, 143
logarithmic-exponential formulation, 127
asymptotic strong duality, 135
weak duality, 134
partial p-th power formulation, 124
Nonlinear pure integer programming, 1
Nonlinear resource allocation problem, 2
Nonlinear surrogate method, 105
Nonseparable integer programming, 3, 265
convex integer programming, 265, 268
monotone integer programming, 272
Objective level cut method, 224, 369
dynamic programming, 233
Optimality condition
binomial quadratic optimization, 39, 42
bounds, 14
Penalty function method, 37, 315
Polynomial 0-1 programming, 3, 293, 315, 349
Portfolio selection, 259
mean-variance formulation, 4
risk-free asset, 4
risky securities, 4
Quadratic 0-1 knapsack problem, 328
0-1 linearization, 346
branch-and-bound method, 347
dual search, 329
heuristics for finding feasible solution, 335
Lagrangean dual, 328
upper planes, 344
Quadratic 0-1 programming, 3, 306, 328
Quadratic knapsack problem, 152
Reliability optimization, 6
complex system, 286, 394
redundancy, 6
series-parallel system, 188
cost minimization, 154, 190
fathoming condition, 194
maximal decreasing property, 192
noninferior, 191
unit decreasing transformation, 191
Resource allocation, 4, 149
Revised Taha’s method, 357

$B_2$ recognition, 352, 356
consistency check, 352, 354
fathoming, 352
master problem, 350, 363
secondary constraints, 350, 364

Roof duality, 293
local upper plane, 294
paved dual problem, 294
paved upper plane, 294
quadratic case, 299
roof, 295
tile, 295
upper plane, 294
Separable integer programming, 2, 209, 241
dynamic programming, 209
hybrid method, 217
objective level cut method, 224
Stratified sampling, 153
Supermodular function, 331
Supermodular knapsack problem, 332
Surrogate constraint method, 176, 234, 251
dual search, 99, 177
cutting plane method, 100
subgradient method, 103
nonlinear surrogate formulation, 104
relaxation and dual, 97
strong surrogate duality, 98
surrogate bound and Lagrangian bound, 98
weak surrogate duality, 98
Unconstrained nonlinear integer programming, 2
Unconstrained polynomial 0-1 optimization, 2
basic algorithm, 302
continuous relaxation, 304
convexification, 305
Unconstrained polynomial 0-1 optimization linearization
discrete Rhys form, 297
standard linear form, 298
local search, 300
roof duality, 293
Unconstrained quadratic 0-1 optimization, 2, 307
equivalence to maximum-cut problem, 308
polynomially solvable case, 307
roof duality, 299
variable fixation, 309
Early Titles in the
INTERNATIONAL SERIES IN
OPERATIONS RESEARCH & MANAGEMENT SCIENCE
Frederick S. Hillier, Series Editor, Stanford University

Saigal/ A MODERN APPROACH TO LINEAR PROGRAMMING
Nagurney/ PROJECTED DYNAMICAL SYSTEMS & VARIATIONAL INEQUALITIES WITH APPLICATIONS
Padberg & Rijal/ LOCATION, SCHEDULING, DESIGN AND INTEGER PROGRAMMING
Vanderbei/ LINEAR PROGRAMMING
Jaiswal/ MILITARY OPERATIONS RESEARCH
Gal & Greenberg/ ADVANCES IN SENSITIVITY ANALYSIS & PARAMETRIC PROGRAMMING
Prabhu/ FOUNDATIONS OF QUEUEING THEORY
Fang, Rajasekera & Tsaol/ ENTROPY OPTIMIZATION & MATHEMATICAL PROGRAMMING
Yu/ OR IN THE AIRLINE INDUSTRY
Ho & Tang/ PRODUCT VARIETY MANAGEMENT
El-Taha & Stidham/ SAMPLE-PATH ANALYSIS OF QUEUEING SYSTEMS
Miettinen/ NONLINEAR MULTIOBJECTIVE OPTIMIZATION
Chao & Huntington/ DESIGNING COMPETITIVE ELECTRICITY MARKETS
Weglarz/ PROJECT SCHEDULING: RECENT TRENDS & RESULTS
Sahin & Polatoglou/ QUALITY, WARRANTY AND PREVENTIVE MAINTENANCE
Tavares/ ADVANCES MODELS FOR PROJECT MANAGEMENT
Tayur, Ganeshan & Magazine/ QUANTITATIVE MODELS FOR SUPPLY CHAIN MANAGEMENT
Weyant, J./ ENERGY AND ENVIRONMENTAL POLICY MODELING
Shanthikumar, J.G. & Sumita, U./ APPLIED PROBABILITY AND STOCHASTIC PROCESSES
Liu, B. & Esogbue, A.O./ DECISION CRITERIA AND OPTIMAL INVENTORY PROCESSES
Gal, T., Stewart, T.J., Hanne, T./ MULTICRITERIA DECISION MAKING: Advances in MCDM Models, Algorithms, Theory, and Applications
Fox, B.L./ STRATEGIES FOR QUASI-MONTE CARLO
Hall, R.W./ HANDBOOK OF TRANSPORTATION SCIENCE
Grassman, W.K./ COMPUTATIONAL PROBABILITY
Pomerol, J-C. & Barba-Romero, S./ MULTICRITERION DECISION IN MANAGEMENT
Axssiter, S./ INVENTORY CONTROL
Wolkowicz, H., Saigal, R., & Vandenberghe, L./ HANDBOOK OF SEMI-DEFINITE PROGRAMMING: Theory, Algorithms, and Applications
Dar-El, E./ HUMAN LEARNING: From Learning Curves to Learning Organizations
Armstrong, J.S./ PRINCIPLES OF FORECASTING: A Handbook for Researchers and Practitioners
Balsamo, S., Personé, V., & Onvural, R./ ANALYSIS OF QUEUEING NETWORKS WITH BLOCKING
Bouyssou, D. et al./ EVALUATION AND DECISION MODELS: A Critical Perspective
Hanne, T./ INTELLIGENT STRATEGIES FOR META MULTIPLE CRITERIA DECISION MAKING
Saaty, T. & Vargas, L./ MODELS, METHODS, CONCEPTS and APPLICATIONS OF THE ANALYTIC HIERARCHY PROCESS
Chatterjee, K. & Samuelson, W./ GAME THEORY AND BUSINESS APPLICATIONS
Hobbs, B. et al./ THE NEXT GENERATION OF ELECTRIC POWER UNIT COMMITMENT MODELS
Vanderbei, R.J./ LINEAR PROGRAMMING: Foundations and Extensions, 2nd Ed.
Kimms, A./ MATHEMATICAL PROGRAMMING AND FINANCIAL OBJECTIVES FOR SCHEDULING PROJECTS
Baptiste, P., Le Pape, C. & Nuijten, W./ CONSTRAINT-BASED SCHEDULING
Feinberg, E. & Shwartz, A./ HANDBOOK OF MARKOV DECISION PROCESSES: Methods and Applications
Ramik, J. & Vlach, M./ GENERALIZED CONCAVITY IN FUZZY OPTIMIZATION AND DECISION ANALYSIS
Song, J. & Yao, D./ SUPPLY CHAIN STRUCTURES: Coordination, Information and Optimization
Kozan, E. & Ohuchi, A./ OPERATIONS RESEARCH/ MANAGEMENT SCIENCE AT WORK
Bouyssou et al./ AIDING DECISIONS WITH MULTIPLE CRITERIA: Essays in Honor of Bernard Roy
Early Titles in the
INTERNATIONAL SERIES IN
OPERATIONS RESEARCH & MANAGEMENT SCIENCE
(Continued)

Cox, Louis Anthony, Jr. / RISK ANALYSIS: Foundations, Models and Methods
Dror, M., L'Ecuyer, P. & Szidarovszky, F. / MODELING UNCERTAINTY: An Examination of Stochastic Theory, Methods, and Applications
Dokuchaev, N. / DYNAMIC PORTFOLIO STRATEGIES: Quantitative Methods and Empirical Rules for Incomplete Information
Sarker, R., Mohammadian, M. & Yao, X. / EVOLUTIONARY OPTIMIZATION
Gazis, D.C. / TRAFFIC THEORY
Zhu / QUANTITATIVE MODELS FOR PERFORMANCE EVALUATION AND BENCHMARKING
Ehrgott & Gandibleux / MULTIPLE CRITERIA OPTIMIZATION: State of the Art Annotated Bibliographical Surveys
Bienstock / Potential Function Methods for Approx. Solving Linear Programming Problems
Matsatsinis & Siskos / INTELLIGENT SUPPORT SYSTEMS FOR MARKETING DECISIONS
Alpern & Gal / THE THEORY OF SEARCH GAMES AND RENDEZVOUS
Hall / HANDBOOK OF TRANSPORTATION SCIENCE - 2nd Ed.
Glover & Kochenberger / HANDBOOK OF METAHEURISTICS
Graves & Ringuest / MODELS AND METHODS FOR PROJECT SELECTION: Concepts from Management Science, Finance and Information Technology
Hassin & Haviv / TO QUEUE OR NOT TO QUEUE: Equilibrium Behavior in Queueing Systems
Gershwin et al / ANALYSIS & MODELING OF MANUFACTURING SYSTEMS

* A list of the more recent publications in the series is at the front of the book *