

References

- Abd El-Wahed WF, Lee SM (2006) Interactive fuzzy goal programming for multi-objective transportation problems, *Omega-International Journal of Management Science*, **34**, 158–166.
- Allen J, Bhattacharya S, Smarandache F (2003) Fuzziness and funds allocation in portfolio optimisation, *International Journal of Social Economics*, **30**, 619–632.
- Akoz O, Petrovic D (2007) A fuzzy goal programming method with imprecise goal hierarchy, *European Journal of Operational Research*, **181**, 1427–1433.
- Amiri M, Salehi-Sadaghiani J (2008) A methodology for optimizing statistical multi-response problems using fuzzy goal programming, *Scientia Iranica*, **15**, 389–397.
- Applegate DL, Bixby RE, Chvatal V, Cook WJ (2007) *The Traveling Salesman Problem: A Computational Study (Princeton Series in Applied Mathematics)*, Princeton University Press, Princeton, NJ.
- Arenas M, Bilbao A, Perez B, Rodriguez MV (2004) Fuzzy extended lexicographic Goal Programming, in *Soft Methodology and Random Information Systems*, LopezDiaz M, Gil MA, Grzegorzewski P, Hryniewicz O, Lawry J (Eds.), *Advances in Soft Computing*, Springer-Verlag, Berlin, 543–550.
- Arenas M, Bilbao A, Perez B, Rodriguez MV (2005) Solving a multiobjective possibilistic program through compromise programming, *European Journal of Operational Research*, **164**, 748–759.
- Arora SR, Gupta R (2008) Interactive fuzzy goal programming approach for bilevel programming problem, *European Journal of Operational Research*, **194**, 368–376.
- Audet C, Carrizosa E, Hansen P (2004) An exact method for fractional goal programming, *Journal of Global Optimization*, **29**, 113–120.
- Azaiez MN, Al Sharif SS (2005) A 0–1 goal programming model for nurse scheduling, *Computers & Operations Research*, **32**, 491–507.
- Baek W, Ignizio JP (1993) Pattern-classification via linear-programming, *Computers and Industrial Engineering*, **25**, 393–396.
- Baykasoglu A (2005) Preemptive goal programming using simulated annealing, *Engineering Optimization*, **37**, 49–63.
- Belton V, Stewart TJ (2002) *Multiple Criteria Decision Analysis: An Integrated Approach*, Kluwer Academic Publishers, Boston, MA.
- Bhattacharya A (2006) A goal programming approach for developing pre-harvest forecasts of crop yield, *Journal of the Operational Research Society*, **57**, 1014–1017.
- Brans JP, Vincke P, Mareschal B (1985) A preference ranking organization method, *Management Science*, **31**, 647–656.
- Bryson N (1995) A goal programming method for generating priority vectors, *Journal of the Operational Research Society*, **46**, 641–648.
- Byron M (2004) *Satisficing and Maximizing: Moral Theorists on Practical Reason*, Cambridge University Press, Cambridge.
- Caballero R, Hernandez M (2006) Restoration of efficiency in a goal programming problem with linear fractional criteria, *European Journal of Operational Research*, **172**, 31–39.

- Caballero R, Luque M, Molina J, Ruiz F (2005) MOPEN: A computational package for linear multiobjective and goal programming problems, *Decision Support Systems*, **41**, 160–175.
- Caballero R, Rey L, Ruiz F (1998) Lexicographic improvement of the target values in convex goal programming, *European Journal of Operational Research*, **107**, 644–655.
- Caballero R, Ruiz F, Uria MV, Romero C (2006) Interactive meta-goal programming, *European Journal of Operational Research*, **175**, 135–154.
- Calvete HI, Gale C, Oliveros MJ, Sanchez-Valverde B (2007) A goal programming approach to vehicle routing problems with soft time windows, *European Journal of Operational Research*, **177**, 1720–1733.
- Can EK, Houck MH (1984) Real time reservoir operations by goal programming, *Journal of Water Resources Planning and Management*, **110**, 297–309.
- Chan FTS, Swarnkar R (2006) Ant colony optimization approach to a fuzzy goal programming model for a machine tool selection and operation allocation problem in an FMS, *Robotics and Computer-Integrated Manufacturing*, **22**, 353–362.
- Chang CT (2006) Mixed binary interval goal programming, *Journal of the Operational Research Society*, **57**, 469–473.
- Charnes A, Collomb B (1972) Optimal economic stabilization policy: Linear goal-interval programming models, *Socio-Economic Planning Sciences*, **6**, 431–435.
- Charnes A, Cooper WW (1961) *Management Models and Industrial Applications of Linear Programming*, John Wiley & Sons, New York.
- Charnes A, Cooper WW (1962) Programming with linear fractional functionals, *Naval Research Logistics Quarterly*, **9**, 181–186.
- Charnes A, Cooper WW, Ferguson R (1955) Optimal estimation of executive compensation by linear programming, *Management Science*, **1**, 138–151.
- Charnes A, Cooper WW, Harrald J, Karwan K, Wallace W (1976) A goal interval programming model for resource allocation in a marine environmental protection problem, *Journal of Environmental Economics and Management*, **3**, 347–362.
- Charnes A, Cooper WW, Rhodes E (1978) Measuring the efficiency of decision making units, *European Journal of Operational Research*, **2**, 429–444.
- Charnes A, Cooper WW, Sueyoshi T (1988) A goal programming constrained regression review of the bell system breakup, *Management Science*, **34**, 1–26.
- Chow G (1995) Portfolio selection based on return, risk, and relative performance, *Financial Analysts Journal*, March–April, 54–60.
- Cooper WW (2005) Origins, uses of, and relations between goal programming and data envelopment analysis, *Journal of Multi-Criteria Decision Analysis*, **15**, 3–11.
- Cremers J-H, Kritzman M, Page S (2005) Optimal hedge fund allocations, *Journal of Portfolio Management*, Spring, 70–81.
- Da Silva LMS, Rodriguez LCE, Caixeta JV, Bauch SC (2006) Fitting a taper function to minimize the sum of absolute deviations, *Scientia Agricola*, **63**, 460–470.
- Deb K (2001) *Multi-Objective Optimization Using Evolutionary Algorithms*, J Wiley & Sons, New York.
- Deb K, Mohan M, Mishra S (2003) Towards a quick computation of well-spread Pareto-optimal solutions, in *Evolutionary Multi-Criterion Optimization, Proceedings*, Fonseca CM, Fleming PJ, Zitzler E, Deb K (Eds.), Thiele L, *Lecture Notes in Computer Science*, **2632**, 222–236.
- Deb K, Pratap A, Agarwal S, Meyarivan T (2002) A fast and elitist multiobjective genetic algorithm: NSGA-II, *IEEE Transactions On Evolutionary Computation*, **6**, 182–197.
- Deng X-T, Li Z-F, Wang S-Y (2005) A minimax portfolio selection strategy with equilibrium, *European Journal of Operational Research*, **166**, 278–292.
- Despotis DK (1996) Fractional minmax goal programming: A unified approach to priority estimation and preference analysis in MCDM, *Journal of the Operational Research Society*, **47**, 989–999.
- Dharmapala PS, Ghosh JB, Saber HM (2007) Market- and merit-based adjustment of faculty salaries, *Asia-Pacific Journal of Operational Research*, **24**, 1–19.

- Dufo-Lopez R, Bernal-Agustin JL (2008) Multi-objective design of PV-wind-diesel-hydrogen-battery systems, *Renewable Energy*, **33**, 2559–2572.
- Dyer JS (1973) Interactive goal programming, *Management Science*, **19**, 62–70.
- Ehrgott M (2005) *MultiCriteria Optimization*, Springer, Berlin.
- Ehrgott M, Gandibleux X (2002) Multiobjective combinatorial optimization – theory, methodology, and applications, *Multi-Criteria Optimization – State of the Art Annotated Bibliographic Surveys*, Kluwer Academic Publishers, Dordrecht, 369–444.
- Ekinci Y (2007) Demand assignment: A DEA and goal programming approach, in *Applied Mathematics for Science and Engineering*, Demiralp M, Udriste C, Bogнар G, Soni R, Nassar H (Eds.), *World Scientific and Engineering Acad and Soc*, Athens, Greece, 394–397.
- Eldabi T, Paul RJ, Young T (2007) Simulation modelling in healthcare: Reviewing legacies and investigating futures, *Journal of the Operational Research Society*, **58**, 262–270.
- Famuyiwa O, Monplaisir L, Nepal B (2008) An integrated fuzzy-goal-programming-based framework for selecting suppliers in strategic alliance formation, *International Journal of Production Economics*, **113**, 862–875.
- Flavell RB (1976) A new goal programming formulation, *Omega*, **4**, 731–732.
- Freed N, Glover F (1981) Simple but powerful goal programming-models for discriminant problems, *European Journal of Operational Research*, **7**, 44–60.
- Freed N, Glover F (1986) Resolving certain difficulties and improving the classification power of LP discriminant-analysis formulations, *Decision Sciences*, **17**, 589–595.
- French S, Maule J, Papamichail N (2009) *Decision Behaviour, Analysis, and Support*, Cambridge University Press, Cambridge.
- Gardiner L, Steuer R (1994) Unified interactive multiple objective programming, *European Journal of Operational Research*, **74**, 391–406.
- Gass SI (1986) A process for determining priorities and weights for large scale linear goal programmes, *Journal of the Operational Research Society*, **37**, 779–785.
- Ghomi SMTF, Ashjari B (2002) A heuristic method for resource constrained allocation in multi-project scheduling, *Iranian Journal of Science and Technology*, **26**, 111–116.
- Glover F, Sueyoshi T (2009) Contributions of Professor William W. Cooper in operations research and management science, *European Journal of Operational Research*, **197**, 1–16.
- Hannan EL (1980) Nondominance in goal programming, *INFOR*, **18**, 300–309.
- Hannan EL (1981) On fuzzy goal programming, *Decision Sciences*, **12**, 522–531.
- Hemaida RS, Kwak NK (1994) A linear goal programming-model for transshipment problems with flexible supply-and-demand constraints, *Journal of the Operational Research Society*, **45**, 215–224.
- Ho W, Emrouznejad A (2009) Multi-criteria logistics distribution network design using SAS/OR, *Expert Systems with Applications*, **36**, 7288–7298.
- Hwang CL, Masud ASM (1979) *Multiple Objective Decision Making – Methods and Applications*. Springer, New York.
- Ignizio JP (1976) *Goal Programming and Extensions*, Lexington Books, Lexington, MA.
- Ignizio JP (1982) *Linear Programming in Single and Multiple Objective Systems*, Prentice-Hall, Upper Saddle River, NJ.
- Ignizio JP (1985) An algorithm for solving the linear goal programming problem by solving its dual, *Journal of the Operational Research Society*, **36**, 507–515.
- Ignizio JP (2004) Optimal maintenance headcount allocation: An application of Chebyshev goal programming, *International Journal Of Production Research*, **42**, 201–210.
- Ignizio JP, Cavalier T (1994) *Linear Programming*, Prentice-Hall, Upper Saddle River, NJ.
- Ignizio JP, Perlis JH (1979) Sequential linear goal programming: Implementation via MPSX. *Computers and Operations Research*, **6**, 141–145.
- Ijiri Y (1965) *Management Goals and Accounting for Control*, North Holland, Amsterdam.
- Inuiguchi M, Ramik J (2000) Possibilistic linear programming: A brief review of fuzzy mathematical programming and a comparison with stochastic programming in portfolio selection problem, *Journal of Fuzzy Sets and Systems*, **111**, 3–28.

- Jääskeläinen V (1976) *Linear Programming and Budgeting*, Petrocelli-Charter, New York.
- Janssen R, van Herwijnen M, Stewart TJ, Aerts JCJH (2008) Multiobjective decision support for land-use planning, *Environment and Planning B-Planning & Design*, **35**, 740–756.
- Jones DF (1995) *The Design and Development of an Intelligent Goal Programming System*, Ph.D. thesis, University of Portsmouth, UK.
- Jones DF, Collins A, Hand C (2007) A classification model based on goal programming with non-standard preference functions with application to prediction of cinema-going behaviour, *European Journal of Operational Research*, **177**, 515–524.
- Jones DF, Mardle SJ (2004) A distance-metric methodology for the derivation of weights from a pairwise comparison matrix, *Journal of the Operational Research Society*, **55**, 869–875.
- Jones DF, Tamiz M (1995) Improving the flexibility of goal programming via preference modelling techniques, *Omega*, **23**, 41–48.
- Jones DF, Tamiz M (1997) An example of good modelling practice in goal programming: Means for overcoming incommensurability, in *Lecture Notes in Economics and Mathematical Systems*, Caballero R, Ruiz F (Eds.), Vol. 455, Springer, Berlin, 29–37.
- Jones DF, Tamiz M (2002) Goal Programming in the period 1990–2000, in *Multi-Criteria Optimization: State of the Art Annotated Bibliographic Surveys*, Ehrgott M, Gandibleux X (Eds.), Kluwer, Dordrecht, 129–170.
- Jones DF, Tamiz M, Mirrazavi SK (1998) Intelligent solution and analysis of goal programmes: The GPSYS system, *Decision Support Systems*, **23**, 329–332.
- Kahraman C, Buyukozkan G (2008) A combined fuzzy AHP and fuzzy goal programming approach for effective six-sigma project selection, *Journal of Multiple-Valued Logic and Soft Computing*, **14**, 599–615.
- Kim J, Kim Y, Shin K (2005) An algorithm for portfolio optimization problem, *INFORMATICA, Institute of Mathematics and Informatics*, **16**, 93–106.
- Konno H, Koshizuka T (2005) Mean-absolute deviation model, *IIE Transactions*, **37**, 893–900.
- Konno H, Yamazaki H (1991) Mean-absolute deviation portfolio optimization and its applications to Tokyo stock market, *Journal of Management Science*, **37**, 519–531.
- Korhonen P, Seppo S, Steuer R (1997) A heuristic for estimating nadir criterion values in multiple objective linear programming, *Operations Research*, **45**, 751–757.
- Kumar P, Philippatos G, Ezzell J (1978) Goal programming and selection of portfolio by dual-purpose funds, *Journal of Finance*, **33**, 303–310.
- Kwak NK, Schniederjans MJ (1985) Goal programming solutions to transportation problems with variable supply and demand, *Socio-Economic Planning Sciences*, **19**, 95–100.
- Law AM, Kelton WD (2000) *Simulation Modeling and Analysis*, 3rd Ed., McGraw Hill, New York.
- Lee SM (1972) *Goal Programming for Decision Analysis*, Auerback, Philadelphia, PA.
- Lee SM, Chesser DL (1980) Goal programming for portfolio selection, *Journal of Portfolio Management*, **6**, 23–25.
- Lee S, Lerro A (1973) Optimizing the portfolio selection for mutual funds, *Journal of Finance*, **28**, 1086–1101.
- Leung SCH (2007) A non-linear goal programming model and solution method for the multi-objective trip distribution problem in transportation engineering, *Optimization and Engineering*, **8**, 277–298.
- Leung SCH, Chan SSW (2009) A goal programming model for aggregate production planning with resource utilization constraint, *Computers & Industrial Engineering*, 1053–1064.
- Levary RR, Avery ML (1984) On the practical application of weighting equities in a portfolio via goal programming, *Opsearch*, **21**, 246–261.
- Li X, Beullens P, Jones D, Tamiz M (2009) An integrated queuing and multi-objective bed allocation model with application to a hospital in China, *Journal of the Operational Research Society*, **60**, 330–338.
- Liang TF (2007) Applying fuzzy goal programming to production/transportation planning decisions in a supply chain, *International Journal of Systems Science*, **38**, 293–304.
- LINDO (2009) Lindo Systems Website, accessed 26th August 2009.

- LINGO (2009) Lingo optimization modeling software for linear, nonlinear, and integer programming. Available from www.lindo.com, accessed 10 February 2010.
- Love CE, Lam KF (1994) Classifying and controlling errors in forecasting using multiple criteria goal programming, *Computers & Operations Research*, **21**, 979–989.
- Markowitz H (1952) Portfolio selection, *Journal of Finance*, **7**, 77–91.
- Martel JM, Aouni B (1990) Incorporating the decision-makers preferences in the goal-programming model, *Journal of the Operational Research Society*, **41**, 1121–1132.
- Mathirajan M, Ramanathan R (2007) A (0–1) goal programming model for scheduling the tour of a marketing executive, *European Journal of Operational Research*, **179**, 554–566.
- Mavrotas G, Georgopoulou E, Mirasgedis S, Sarafidis Y, Lalas D, Hontou V, Gakis N (2009) Multi-objective combinatorial optimisation for selecting best available techniques (BAT) in the industrial sector: The COMBAT tool, *Journal of the Operational Research Society*, **60**, 906–920.
- Miettinen K (1999) *Non-Linear Multiobjective Optimization*, Kluwer Academic Publishers, Dordrecht.
- Min H, Storbeck J (1991) On the origin and persistence of misconceptions in goal programming, *Journal of the Operational Research Society*, **42**, 301–312.
- Mirzazavi SK, Jones DF, Tamiz M (2001) A comparison of genetic and conventional methods for the solution of integer goal programmes, *European Journal of Operational Research*, **132**, 594–602.
- Mishra S, Prakesh, Tiwari MK, Lashkari RS (2006) A fuzzy goal-programming model of machine-tool selection and operation allocation problem in FMS: A quick converging simulated annealing-based approach, *International Journal of Production Research*, **44**, 43–76.
- Nakayama H, Kagaku N (1998) Pattern classification by linear goal programming and its extensions, *Journal of Global Optimization*, **12**, 111–126.
- Nakayama H, Yun YB, Asada T, Yoon M (2005) MOP/GP models for machine learning, *European Journal of Operational Research*, **166**, 756–768.
- Narasimhan R (1980) Goal programming in a fuzzy environment, *Decision Sciences*, **11**, 325–336.
- Nepal B, Monplaisir L, Singh N (2006) A methodology for integrating design for quality in modular product design, *Journal of Engineering Design*, **17**, 387–409.
- Oddoye JP, Tamiz M, Jones DF, Schmidt P (2009) Combining simulation and goal programming for healthcare planning in a medical assessment unit, *European Journal of Operational Research*, **193**, 250–261.
- Oddoye JP, Yaghoobi MA, Tamiz M, Jones DF, Schmidt P (2007) A multi-objective model to determine efficient resource levels in a medical assessment unit, *Journal of the Operational Research Society*, **58**, 1563–1573.
- Ogryczak W (2001a) Comments on Romero C, Tamiz M, Jones DF (1998) Goal programming, compromise programming and reference point method formulations: Linkages and utility interpretations, *Journal of the Operational Research Society*, **52**, 960–962.
- Ogryczak W (2001b) Comments on Romero C, Tamiz M, Jones DF (1998) Goal programming, compromise programming and reference point method formulations: Linkages and utility interpretations – Comments on reply of Romero et al., *Journal Of The Operational Research Society*, **52**, 963–964.
- Ogryczak W (2001c) On goal programming formulations of the reference point method, *Journal of the Operational Research Society*, **52**, 691–698.
- Ozcan E, Bilgin B, Korkmaz, E (2008) A comprehensive analysis of hyper-heuristics, *Intelligent Data Analysis*, **12**, 3–23.
- Panda S, Banerjee K, Basu M (2005) Determination of EOQ of multi-item inventory problems through nonlinear goal programming with penalty function, *Asia-Pacific Journal Of Operational Research*, **22**, 539–553.
- Pareto V (1896) *Course d'Economie Politique*, Rouge, Lausanne.
- Park SK, Shin Y, Lee WC (2007) Goal-Pareto based NSGA for optimal reconfiguration of cognitive radio systems, *Proceedings of 2nd IEEE International Conference on Cognitive Radio Oriented Wireless Networks and Communications*, 147–153.

- Parra M, Terol A, Uriam M (2001) A fuzzy goal programming approach to portfolio selection, *European Journal of Operational Research*, **133**, 287–297.
- Perez Gladish B, Jones DF, Tamiz M, Bilbao Terol, A (2007) An interactive three stage model for mutual fund portfolio selection, *Omega-International Journal of Management Science*, **35**, 75–88.
- Petrovic D, Akoz O (2008) A fuzzy goal programming approach to integrated loading and scheduling of a batch processing machine, *Journal of the Operational Research Society*, **59**, 1211–1219.
- Proudlove NC, Black C, Fletcher A (2007) OR and the challenge to improve the NHS: Modelling for insight and improvement in in-patient flows, *Journal of the Operational Research Society*, **58**, 145–158.
- Rawls J (1973) *A Theory of Justice*, Oxford University Press, Oxford.
- Reeves CR (1995) *Modern heuristic techniques for combinatorial problems*, McGraw Hill.
- Robinson S (2004) *Simulation: The Practice of Model Development and Use* (2nd ed.), John Wiley and Sons Ltd, New York.
- Rodriguez MV, Caballero R, Ruiz F, Romero C (2002) Meta-goal programming, *European Journal of Operational Research*, **136**, 422–429.
- Romero C (1991) *A Handbook of Critical Issues in Goal Programming*, Pergamon Press, Oxford.
- Romero C (2001) Extended lexicographic goal programming: A unifying approach, *Omega*, **29**, 63–71.
- Romero C (2004) A general structure of achievement function for a goal programming model, *European Journal of Operational Research*, **153**, 675–686.
- Romero C, Tamiz M, Jones DF (1998) Goal programming, compromise programming and reference point method formulations: Linkages and utility interpretations, *Journal of the Operational Research Society*, **49**(9), 986–991.
- Romero C, Tamiz M, Jones DF (2001) Comments on Romero C, Tamiz M, Jones DF (1998) Goal programming, compromise programming and reference point method formulations: Linkages and utility interpretations – Reply to Professor Ogryczak, *Journal of the Operational Research Society*, **52**, 962–963.
- Royston G (2005) Modelling and simulation in health-potential achievement and challenge Presentation for MASHnet launch Available from <http://www.pms.ac.uk/mashnet/> accessed 24 July 2009.
- Saaty TL (1981) *The Analytical Hierarchy Process*, McGraw-Hill, New York.
- Schniederjans MJ (1995) *Goal Programming, Methodology and Applications*, Kluwer Publishers, Boston.
- Sedeno-Noda A, Gonzalez-Davila E, Gonzalez-Martin C, Gonzalez-Yanes A (2009) Preemptive benchmarking problem: An approach for official statistics in small areas, *European Journal of Operational Research*, **196**, 360–369.
- Selim H, Ozkarahan I (2008) A supply chain distribution network design model: An interactive fuzzy goal programming-based solution approach, *International Journal of Advanced Manufacturing Technology*, **36**, 401–418.
- Simon HA (1957) *Models of Man*, J. Wiley & Sons, New York.
- Sharma H, Sharma D (2006) A multi-objective decision-making approach for mutual fund portfolio, *Journal of Business & Economics Research*, **4**, 13–24.
- Steuer RE (1986) *Multiple Criteria Optimization: Theory, Computation, and Application*, John Wiley & Sons.
- Sheth C, Triantis K, Teodorovic D (2007) Performance evaluation of bus routes: A provider and passenger perspective, *Transportation Research Part E-Logistics and Transportation Review*, **43**, 453–478.
- Steuer R, Qi Y, Hirschberger M (2007) Suitable-portfolio investors, nondominated frontier sensitivity, and the effect of multiple objectives on standard portfolio selection, *Annals of Operations Research*, **152**, 297–317.
- Stewart TJ, Janssen R, van Herwijnen M (2004) A genetic algorithm approach to multiobjective land use planning, *Computers & Operations Research*, **31**, 2293–2313.

- Sueyoshi T (1997) Least absolute value estimation, *Journal of the Operations Research Society of Japan*, **40**, 261–275.
- Taleizadeh, AA, Niaki, STA, Hoseini, V (2009) Optimizing the multi-product, multi-constraint, bi-objective newsboy problem with discount by a hybrid method of goal programming and genetic algorithm, *Engineering Optimization*, **41**, 437–457.
- Tamiz M (2009) www.mopgp.com, accessed 8th September 2009.
- Tamiz M, Hasham R, Jones DF, Hesni B, Fargher EK (1996) A two staged goal programming model for portfolio selection, in *Multi-Objective Programming and Goal Programming*, Springer Lecture Notes in Economics and Mathematical Systems, **432**, Tamiz M (Ed.), 286–299.
- Tamiz M, Jones DF (1996) Goal programming and Pareto efficiency, *Journal of Information and Optimization Sciences*, **17**, 291–307.
- Tamiz M, Jones DF (1997) Interactive frameworks for investigation of goal programming models: Theory and practice, *Journal of Multi-Criteria Decision Analysis*, **6**, 52–60.
- Tamiz M, Jones DF, El-Darzi E (1995) A review of goal programming and its applications, *Annals of Operations Research*, **58**, 39–53.
- Tamiz M, Jones DF, Romero C (1998) Goal programming for decision making: An overview of the current state-of-the-art, *European Journal of Operational Research*, **111**, 569–581.
- Tamiz M, Jones DF, Romero C (2001) Comments on Romero C, Tamiz M, Jones DF (1998) Goal programming, compromise programming and reference point method formulations: Linkages and utility interpretations – Final reply to the comments of Professor Ogryczak, *Journal of the Operational Research Society*, **52**, 964–965.
- Tamiz M, Mirrazavi SK, Jones DF (1999) Extensions of Pareto efficiency analysis to integer goal programming, *Omega*, **27**, 178–188.
- Tiwari RN, Dhahmar S, Rao JR (1987) Fuzzy goal programming: An additive model, *Fuzzy Sets and Systems*, **24**, 27–34.
- Wang CS, Chang CT (2008) Integrated genetic algorithm and goal programming for network topology design problem with multiple objectives and multiple criteria, *IEEE-ACM Transactions on Networking*, **16**, 680–690.
- Wang YM (2007) A goal programming method for obtaining interval weights from an interval comparison matrix, *European Journal of Operational Research*, **177**, 458–471.
- Watada, J (1997) Fuzzy portfolio selection and its application to decision making, *Tatra Mountains Mathematical Publications*, **13**, 219–248.
- Wey WM, Wu KY (2007) Using ANP priorities with goal programming in resource allocation in transportation, *Mathematical and Computer Modelling*, **46**, 985–1000.
- Wierzbicki AP (1982) A mathematical basis for satisficing decision making, *Mathematical Modelling*, **3**, 391–405.
- Williams HP (1993) *Model Solving in Mathematical Programming*, J Wiley and Sons, New York.
- Williams HP (2009) *Logic and Integer Programming*, Springer, New York.
- Willis K, Jones DF (2008) Multi-objective simulation optimization through search heuristics and relational database analysis, *Decision Support Systems*, **46**, 277–286.
- Winston W (2004) *Operations Research: Applications and Algorithms*, Duxbury Press, Pacific Grove, CA.
- Wolsey LA (1998) *Integer Programming*, J Wiley and Sons, New York.
- Yaghoobi MA, Jones DF, Tamiz M (2008) Weighted additive models for solving fuzzy goal programming problems, *Asia-Pacific Journal of Operational Research*, **25**, 715–733.
- Yaghoobi M, Tamiz M (2006) On improving a weighted additive model for fuzzy goal programming problems, *International Review of Fuzzy Mathematics*, **1**, 115–129.
- Yang LX, Feng Y (2007) A bicriteria solid transportation problem with fixed charge under stochastic environment, *Applied Mathematical Modelling*, **31**, 2668–2683.
- Yu PL (1973) A class of solutions for group decision problems, *Management Science*, **19**, 936–946.
- Zadeh LA (1965) Fuzzy sets, *Information and Control*, **8**, 338–353.
- Zeleny M (1982) *Multi Criteria Decision Making*, McGraw Hill, New York.

- Zhai, JH, Zhang, SF, Wang, XZ (2006) An overview of pattern classification methodologies, *Proceedings of 2006 International Conference on Machine Learning and Cybernetics*, 1–7, 3222–3227.
- Zitzler E, Thiele L (1999) Multiobjective evolutionary algorithms: A comparative case study and the strength Pareto approach, *IEEE Transactions on Evolutionary Computation*, **3**, 257–271.
- Zolfaghari S, Jaber MY, Hamoudi H (2004) A goal programming approach for a multi-period task assignment problem, *INFOR*, **42**, 299–309.

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