

# Curriculum Vitae

**Professor Matthias Ehrgott, Dr. habil. Dr rer. nat.**

## **University Address**

Department of Management Science  
Lancaster University Management School

## Education

- **Habilitation (Dr. habil.) in Mathematics** July 2001. University of Kaiserslautern
- **PhD (Dr. rer. nat.) in Mathematics** July 1997. University of Kaiserslautern
- **MSc (Dipl. math. oec.) in Management Mathematics** December 1992. University of Kaiserslautern

## Scientific Career

- **August 2014 - July 2017:** Head of Department of Management Science, Lancaster University
- **April 2013 - present:** Professor, Department of Management Science, Lancaster University
- **February 2011 - January 2013:** Head of Department, Department of Engineering Science, The University of Auckland
- **February 2011 - March 2013:** Professor, Department of Engineering Science, The University of Auckland
- **October 2006 - May 2008:** Directeur de Recherche Centre National de la Recherche Scientifique, Laboratoire d'Informatique de Nantes Atlantique
- **February 2004 - January 2011:** Associate Professor, Department of Engineering Science, The University of Auckland
- **February 2002 - January 2004:** Senior Lecturer, Department of Engineering Science, The University of Auckland
- **February 2000 - January 2002:** Lecturer, Department of Engineering Science, The University of Auckland
- **December 1997 - February 2000:** Assistant Professor, Department of Mathematics, University of Kaiserslautern

## Visiting Professorships

- University of Valenciennes, France, July 2004 and July 1999
- DFG Mercator Visiting Professor, University of Kaiserslautern, August - September 2003 and December 2003 - February 2004
- University of Copenhagen, October 2003 - November 2003

## Awards

- Edgeworth-Pareto Award of the International Society on Multiple Criteria Decision Making 2011
- Emerging Research Excellence Award, The University of Auckland 2002
- Wiley Prize for Best Applied Paper in Multicriteria Decision Analysis 2002

## Professional Societies

- President of the International Society on Multiple Criteria Decision Making 2019-2023
- President of the INFORMS Section on Multiple Criteria Decision Making 2015
- Vice President of the Operations Research Society of New Zealand 2008 - 2012

## Professional Activities

During my career I have supervised three post-doctoral researchers and been the supervisor or co-supervisor of 17 successfully defended PhD theses (currently one active supervision). Moreover, I have examined 15 PhD theses as external examiner. In editorial work, I have been on the editorial board of 11 journals, including Management Science, in various roles (currently 5 active roles). I have been invited as plenary or keynote speaker at about 15 international conferences, including the 11th Triennial International Conference of the [s] Association of Asia Pacific Operational Research Societies (APORS) 2018 and have given short courses on multi-objective optimisation in various countries.

## Research Interests

My area of research is in the broad field of Operations Research. Operations Research is a scientific method to solve decision making problems involving the use of scarce resources. Following an interdisciplinary approach, it employs data analysis, statistics, mathematical modelling, optimisation and computing to assist decision making in organisations, industry, and many sectors of society.

Within Operations Research my specific interest and expertise lies in multi-objective optimisation. This area deals with optimisation problems which model decision making problems in which several conflicting goals are pursued at the same time.

With my research I contribute to the theory, methodology and application of multi-objective optimisation. On the theoretical side I am interested in different solution concepts, properties of solutions, relationships to single objective optimisation and computational complexity. Methodologically, I develop exact and heuristic algorithms to approximate and represent solutions of multiobjective problems, and in applications I am working on real-world problems arising in transportation systems, transportation scheduling, medicine and radiation oncology, location planning, and portfolio optimisation. I have attracted about 600.000 Euros of Research Funding.

## Selected Publications

### Books, Book Chapters, Edited Proceedings and Journal Issues

1. M Ehrgott, I Ljubić, SN Parragh (ed.). *Feature cluster: Recent advances in exact methods for multi-objective optimisation*. European Journal of Operational Research 260(3), 2017.
2. S. Greco, M. Ehrgott, J.R. Figueira (ed.). *Multiple Criteria Decision Analysis - State of the Art Surveys*, International Series in Operations Research & Management Science Volume 233. New York, Springer, 1346 pages, 2016. 4235 citations.
3. M. Ehrgott, J.R. Figueira, S. Greco (ed.). *Trends in Multiple Criteria Decision Analysis*. New York, Springer, 410 pages, 2010. 312 citations
4. M. Ehrgott, B. Naujoks, T.J. Stewart, J. Wallenius (ed.). *Multiple Criteria Decision Making for Sustainable Energy and Transportation Systems*. Volume 634 of Lecture Notes in Economics and Mathematical Systems, Berlin, Springer, 2010.
5. M. Ehrgott, C.M. Fonseca, X. Gandibleux, J.-K. Hao, M. Sevaux (ed.). *Evolutionary Multi-Criterion Optimization*. Volume 5467 of Lecture Notes in Computer Science, Berlin, Springer, 586 pages, 2009.
6. V. Barichard, M. Ehrgott, X. Gandibleux, V. T'Kindt (ed.). *Multiobjective Programming and Goal Programming - Theoretical Results and Practical Applications*. Volume 618 of Springer Lecture Notes in Economics and Mathematical Systems. Springer, 2009.
7. M.M. Wiecek, M. Ehrgott, G. Fadel, J. Figueira (ed.). *Multiple Criteria Decision Making for Engineering*. Omega. Volume 36(3), 2008.
8. M. Ehrgott, J. Figueira, X. Gandibleux (ed.). *Multiobjective Discrete and Combinatorial Optimization*. Annals of Operations Research. Volume 147, 2006.
9. M. Ehrgott. *Multicriteria Optimization (Second Edition)*. Springer Verlag, Berlin, 2005. 4134 citations.
10. J. Figueira, S. Greco, M. Ehrgott (ed.). *Multiple Criteria Decision Analysis: State of the Art Surveys*. Springer Verlag, New York, 2005.
11. M. Ehrgott, M.M. Wiecek, Multiobjective programming, In: J. Figueira, S. Greco, M. Ehrgott, (ed.), *Multiple Criteria Decision Analysis: State of the Art Surveys*, 667-722. Springer Verlag, New York, 2005. 255 citations.
12. M. Ehrgott, M. Luptacik (ed.). *Applications of Multicriteria Decision Analysis*. Journal of Multi-Criteria Decision Analysis. Volume 12(1), 2004.
13. M. Ehrgott (ed.). *Proceedings of the 37<sup>th</sup> Annual Conference of the Operational Research Society of New Zealand, Auckland 29-30 November 2002*. The University of Auckland, 2002.
14. M. Ehrgott, X. Gandibleux (ed.). *Multiple Criteria Optimization: State of the Art Annotated Bibliographic Surveys*. Kluwer Academic Publishers, Boston, 2002.
15. M. Ehrgott, X. Gandibleux, Multiobjective combinatorial optimization - Theory, methodology, and applications, In: M. Ehrgott and X. Gandibleux (ed.), *Multiple Criteria*

- Optimization: State of the Art Annotated Bibliographic Surveys*, 369-444. Boston, Kluwer Academic Publishers, Boston, 2002. 206 citations.
16. M. Ehrgott. *Multicriteria Optimization*. Springer Verlag, Berlin, 2000.
  17. M. Ehrgott (ed.). *Decision Analysis Using Optimization Software*. Shaker Verlag, Aachen, 1999.
  18. M. Ehrgott. *Multiple Criteria Optimization - Classification and Methodology*. Shaker Verlag, Aachen, 1997. 113 citations.
  19. M. Ehrgott, H.W. Hamacher (ed.). *Education: Private or Public Affair?* Shaker Verlag, Aachen, 1997.
  20. M.Ehrgott, H.W. Hamacher (ed.) *Finanzierung ohne Zinsen - Utopie oder Realitat?* Shaker Verlag, Aachen, 1997.

### Refereed Journal Articles

1. M. Ehrgott, M. Hassanasab, A. Raith. A multi-objective optimisation approach to compute the efficient frontier in data envelopment analysis. *Journal of Multiple Criteria Decision Making* 26(3-4), 187-198, 2019.
2. D. Baatar, M. Ehrgott, H.W. Hamacher, I.M. Raschendorfer. Minimizing the number of apertures in multileaf collimator sequencing with field splitting. *Discrete Applied mathematics* 250, 87-103, 2018.
3. J.Y.T. Wang, K.N. Dirks, M. Ehrgott, J. Pearce, A.K.L. Cheung. Supporting healthy route choice for commuter cyclists: The trade-off between travel time and pollutant dose. *Operations Research for Health Care* 19, 156-164, 2018.
4. M. Ehrgott, A. Holder, O. Nohadani. *Uncertain data envelopment analysis*, *European Journal of Operational Research* 268(1), 231-242, 2018.
5. K.M. Lin, M. Ehrgott. *Multiobjective navigation of external radiotherapy plans based on clinical criteria*. *Journal of Multi-Criteria Decision Analysis* 25(1-2), 31-41, 2018.
6. G. Cabrera, M. Ehrgott, A.J. Mason, A. Raith. *A matheuristic approach to solve the multiobjective beam angle optimization problem in intensity-modulated radiation therapy*. *International Transactions in Operational Research* 25(1), 243-268, 2018.
7. J.Y.T. Wang, M. Ehrgott. *A three-objective user equilibrium model: Time surplus maximisation under uncertainty*. *Journal of Multi-Criteria Decision Analysis* 25(1-2), 3-15, 2018.
8. K.M. Lin, M. Ehrgott, A. Raith. *Integrating column generation in a method to compute a discrete representation of the non-dominated set of multi-objective linear programmes*. *4OR* 15(4), 331-357, 2017.
9. J. Simpson, A. Raith, P. Rouse, M. Ehrgott. *Considerations for using data envelopment analysis for the assessment of radiotherapy treatment plan quality*. *International Journal of Health Care Quality Assurance* 30(8), 703-716, 2017.
10. AE Phillips, CG Walker, M Ehrgott, DM Ryan. *Integer programming for minimal perturbation problems in university course timetabling*. *Annals of Operations Research* 252 (2), 283-304, 2017.
11. F. Bokler, M. Ehrgott, C. Morris, P. Mutzel. *Output-sensitive complexity of multiobjective combinatorial optimization*. *Journal of Multi-Criteria Decision Analysis* 24(1-2), 25-36, 2017.
12. R. Allmendinger, M. Ehrgott, X. Gandibleux, M.J. Geiger, K. Klamroth. *Navigation in multiobjective optimization methods*. *Journal of Multi-Criteria Decision Analysis* 24(1-2), 57-70, 2017.
13. L. Shao, M. Ehrgott. *Discrete representation of non-dominated sets in multi-objective linear programming*. *European Journal of Operational Research* 255(3), 687-698, 2016.
14. L. Shao, M. Ehrgott. *Primal and dual multi-objective linear programming algorithms for linear multiplicative programmes*. *Optimization* 65 (2), 415-431, 2016.
15. O. Perederieieva, M. Ehrgott, A. Raith, J.Y.T. Wang. *Numerical stability of path-based algorithms for traffic assignment*. *Optimization Methods and Software* 31 (1), 53-67, 2016.
16. M. Ehrgott, J.Y.T. Wang, D.P. Watling. *On multi-objective stochastic user equilibrium*. *Transportation Research Part B: Methodological* 81, 704-717, 2015.
17. L. Turner, M. Ehrgott, H.W. Hamacher. *On the generality of the greedy algorithm for solving matroid base problems*. *Discrete Applied Mathematics* 195, 114-128, 2015.

18. S. Moradi, A. Raith, M. Ehrgott. *A bi-objective column generation algorithm for the multi-commodity minimum cost flow problem*. *European Journal of Operational Research* 244 (2), 369-378, 2015.
19. O. Perederieieva, M. Ehrgott, A. Raith, J.Y.T. Wang. *A framework for and empirica! study of algorithms for traffic assignment*. *Computers & Operations Research* 54, 90-107, 2015.
20. A.E. Phillips, H. Waterer, M. Ehrgott, D.M. Ryan. *Integer programming methods for large-sca/e practical classroom assignment problems*. *Computers & Operations Research* 53, 42-53, 2015.
21. M. Ehrgott, J. Ide, A. Schobel. *Minmax robustness for multi-objective optimization problems*. *European Journal of Operational Research* 239 (1), 17-31, 2014. 177 citations
22. J.Y.T. Wang, M. Ehrgott, A. Chen. *A bi-objective user equilibrium model of trave/ time reliability in a road network*. *Transportation Research Part B: Methodological* 66, 4-15, 2014.
23. K.M. Lin, J. Simpson, G. Sasso, A. Raith, M. Ehrgott. *Quality assessment for VMAT prostate radiotherapy planning based on data enve/opment analysis*. *Physics in Medicine and Biology* 58 (16), 5753-69, 2013.
24. J.Y.T. Wang, M. Ehrgott. *Model/ing route choice behaviour in a tolled road network with a time surplus maximisation bi-objective user equilibrium model*. *Transportation Research Part B: Methodological* 57, 342-360. 2013.
25. A. Gupta, P.A. Kelly, M. Ehrgott, S. Bickerton. A surrogate model based evolutionary game-theoretic approach for optimizing non-isothermal compression RTM processes. *Composites Science and Technology* 84: 92-100, 2013.
26. R. Lusby, J. Larsen, M. Ehrgott, D. Ryan. A set packing inspired method for real-time junction train routing. *Computers & Operations Research* 40:713-724, 2013.
27. M. Ehrgott, A. Lohne, L. Shao. A dual variant of Benson's outer approximation algorithm for multiple objective linear programming. *Journal of Global Optimization* 52: 757-778, 2012.
28. R. Lusby, J. Larsen, M. Ehrgott, D. Ryan. Routing trains through railway junctions: A new set packing approach. *Transportation Science* 45:228-245, 2011.
29. M. Ehrgott, L. Shao, A. Schobel. An approximation algorithm for convex multi-objective programming problems' *Journal of Global Optimization* 50:397-416, 2011.
30. R. Lusby, J. Larsen, M. Ehrgott, D. Ryan. Railway track allocation: Models and methods. *OR Spectrum* 33(4): 843-883, 2011. 271 citations
31. O Weide, D Ryan, M Ehrgott. An iterative approach to robust and integrateci aircraft routing and crew scheduling. *Computers & Operations Research* 37 (5), 833-844. 138 citations.
32. B. Tam, M. Ehrgott, D.M. Ryan, G. Zakeri. A comparison of stochastic programming and bi-objective optimisation approaches to robust airline crew scheduling. *OR Spectrum* 33(1):49-75, 2011.
33. A. Przybylski, X. Gandibleux, M. Ehrgott, M. A two phase method for multi-objective integer programming and its application to the assignment problem with three objectives. *Discrete Optimization*, 7, 149-165, 2010. 115 citations
34. M. Ehrgott, Ç. Guler, H.W. Hamacher, L. Shao. Mathematical optimization in intensity modulateci radiation therapy. *Annals of Operations Research* 175: 309-365, 2010. 131 citations.
35. R.M. Lusby, J. Larsen, M. Ehrgott, D. Ryan. An exact method for the double TSP with multiple stacks. *International Transactions in Operational Research* 17(5): 637-652, 2010.
36. A. Eusebio, J.R. Figueira, M. Ehrgott. A primal-dual simplex algorithm for bi-objective etwork flow problems. *40R* 7:255-273, 2009.
37. A. Przybylski, X. Gandibleux, M. Ehrgott. A recursive algorithm for finding all nondominated extreme points in the outcome set of a multiobjective integer programme. *INFORMS Journal on Computing* 22: 371-386, 2010.
38. D. Pretolani, L.R. Nielsen, K.A. Andersen, M. Ehrgott. Time-adaptive and history-adaptive multicriterion routing in stochastic, time-dependent networks. *Operations Research Letters* 37:201-205, 2009.
39. A. Raith, M. Ehrgott. A comparison of solution strategies for biobjective shortest path problems. *Computers and OR* 36: 1299-1331, 2009. 206 citations

40. A. Raith, M. Ehrgott. A two-phase algorithm for the biobjective integer minimum cost flow problem. *Computers and OR* 36: 1945-1954, 2009.
41. M. Ehrgott. Multiobjective optimization. *AI Magazine* 29: 47-57, 2008.
42. M. Ehrgott, Ç. Göler, H.W. Hamacher, L. Shao. Mathematical optimization in intensity modulated radiation therapy. *4OR* 6(3):199-162, 2008.
43. L. Shao, M. Ehrgott. Approximately solving multiobjective linear programmes in objective space and an application in radiotherapy treatment planning. *Mathematica/ Methods of Operations Research* 68:257-276, 2008.
44. L. Shao, M. Ehrgott. Approximating the nondominated set of an MOLP by approximately solving its dual problem. *Mathematica/ Methods of Operations Research* 68:469-492, 2008.
45. M. Ehrgott, S. Ruzika. Improved E-constraint method for multiobjective programming. *Journal of Optimization Theory and Applications* 138(1):375-396, 2008. 106 citations
46. M. Ehrgott, A. Holder, J. Reese. Beam selection in radiotherapy design. *Linear Algebra and its Applications*. 428:1272-1312, 2008.
47. A. Przybylski, X. Gandibleux, M. Ehrgott. Two-phase algorithms for the bi-objective assignment problem. *European Journal of Operational Research* 185:509-533, 2008. 129 citations.
48. M. Ehrgott, A. Rodriguez-Chia, J. Puerto. Primal-dual simplex algorithm for multiobjective linear programming. *Journal of Optimization Theory and Applications*, 134:483-497, 2007.
49. M. Ehrgott, X. Gandibleux. Bound sets for biobjective combinatorial optimization problems. *Computers & Operations Research*. 34 : 2674 - 2694, 2007. 119 citations.
50. M. Ehrgott. A discussion of scalarization techniques for multiple objective integer programming. *Annals of Operations Research* 147:343-360, 2006. 165 citations.
51. D. Baatar, H.W. Hamacher, M. Ehrgott, G. Woeginger. Decomposition of integer matrices and multileaf collimator sequencing. *Discrete Applied Mathematics* 152:6-34, 2005.
52. M. Ehrgott, X. Gandibleux. Approximate solution methods for multiobjective combinatorial optimization. *TOP* 12(1) 1-88, 2004. 219 citations
53. M. Ehrgott, K. Klamroth, C. Schwehm. An MCDM approach to portfolio optimization. *European Journal of Operational Research* 155(3) 752-770, 2004. 331 citations
54. M. Ehrgott, D. Tenfelde-Podehl. Computation of ideal and nadir values and implications for their use in MCDM methods. *European Journal of Operational Research* 151(1) 119-139, 2003. 136 citations
55. C. Blum, M. Ehrgott. Local search algorithms for the k-cardinality tree problem. *Discrete Applied Mathematics* 128(2-3) 511-540, 2003.
56. M. Ehrgott, D.M. Ryan. Constructing robust crew schedules with bicriteria optimization. *Journal of Multicriteria Decision Analysis* 11 139-150, 2002. 242 citations
57. M. Ehrgott, X. Gandibleux. A survey and annotated bibliography of multicriteria combinatorial optimization. *OR Spektrum* 22 425-460, 2000. 927 citations
58. M. Ehrgott. Approximation algorithms for combinatorial multicriteria optimization problems. *International Transactions in Operational Research* 7 5-31, 2000. 154 citations
59. M. Ehrgott, K. Klamroth. Connectedness of efficient solutions in multiple criteria combinatorial optimization. *European Journal of Operational Research* 97 159-166, 1997.
60. M. Ehrgott. On matroids with multiple objectives. *Optimization* 38 73-84, 1996.