

Adi Ben-Israel

MANAGEMENT SCIENCE & INFORMATION SYSTEMS

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Google Scholar: <https://scholar.google.com/citations?user=y2CF030AAAAJ&hl=en>

EDUCATION

- 1955 B.Sc. (Mechanical Engineering), Technion-Israel Institute of Technology
- 1956 Diploma (Mechanical Engineering), Technion-Israel Institute of Technology
- 1959 M.Sc. (Operations Research/Statistics), Technion-Israel Institute of Technology
- 1962 Ph.D. (Engineering Science/Applied Mathematics), Northwestern University

PROFESSIONAL EXPERIENCE

- 1988–present **Distinguished Professor of Business**, Rutgers University
- Professor II of Mathematics**, Rutgers University
- 1996 Acting Chairman, Department of Management Science and Information Systems, Rutgers University
- 1976-1988 H. Fletcher Brown Professor of Mathematics, University of Delaware
- 1976-1979 Chairman, Operations Research Program, University of Delaware
- 1970-1975 Professor of Applied Mathematics, Technion-Israel Institute of Technology
- 1973-1975 Chairman, Department of Applied Mathematics, Technion-Israel Institute of Technology
- 1969-1970 Professor of Engineering Science and Applied Mathematics, Northwestern University
- 1966-1968 Associate Professor of Engineering Science, Northwestern University
- 1965-1966 Associate Professor of Systems Engineering, University of Illinois at Chicago Circle
- 1963-1965 Senior Lecturer of Mathematics and Industrial Engineering, Technion-Israel Institute of Technology

Visiting Professor (visit longer than one month):

University of Tampere, Tampere, Finland, 2008

Indian Institute of Technology, Kanpur, India, April–May, 1995

Indian Statistical Institute, New Delhi, India, January–March, 1995

Institute of Applied Mathematics, Academia Sinica, Beijing, China, 1991

Institutes of Informatics (Computer Sciences) and Economics, University of Bergen, Norway, 1987

Departments of Mathematics and Economics, Bar-Ilan University, Ramat-Gan, Israel, 1986

Department of Science and Technology, The Chr. Michelsen Institute, Bergen, Norway, 1985

Department of Mathematics, La Trobe University, Melbourne, Australia, 1985

National Research Institute of Mathematical Sciences, CSIR, Pretoria, South Africa, 1981

Operations Research Program, Graduate School of Business, Tel-Aviv University, Israel, 1980-81

Department of Industrial Engineering and Management Sciences, Northwestern University, 1975-76

Center for Cybernetic Studies, School of Business, University of Texas at Austin, 1974

Department of Engineering Sciences/Applied Mathematics, Northwestern University, 1972-73

US Army Mathematics Research Center, University of Wisconsin at Madison, 1970 and 1973

Grad. School of Business Administration, Carnegie Institute of Technology (Carnegie-Mellon University), 1962-63

WORTH MENTIONING

1997-present **Editor** of *Mathematical Inequalities & Applications*, an International Journal

1995-present **Series Editor** of *Computation in Education: Mathematics, Science and Engineering*, Gordon & Breach Publishers.

1995 – awarded **Fulbright Professorship** to carry out research in India.

1992 – An **International Symposium on Linear Algebra and Optimization**, honoring my contributions to these areas, held in Haifa in June, 1992. The symposium was sponsored jointly by the Technion–Israel Institute of Thechnology, Haifa University and the International Linear Algebra Society.

AREAS OF CURRENT RESEARCH

MATHEMATICS	Convexity and Inequalities. Matrix Theory. Optimization Theory: Nonsmooth Analysis. Symbolic Computation.
APPLIED MATHEMATICS	Numerical Linear Algebra. Linear and Nonlinear Programming.
STATISTICS	Clustering and Classification. Stochastic Optimal Control and Dynamic Programming.
ECONOMICS	Mathematical Economics. Economics of Uncertainty.
OPERATIONS RESEARCH	Facilities Location. Management of Natural Resources.

STUDENTS SUPERVISED

PH.D.

1. **Robert D. Davis**, *On the Delivery Problem and some Related Topics*, Operations Research, Northwestern University, June 1968
2. **Philip D. Robers**, *Interval Linear Programming*, Operations Research, Northwestern University, August 1968
3. **Claude Cohen**, *An Investigation of the Geometry of Subspaces for some Multivariate Statistical Models*, Industrial Engineering, University of Illinois at Urbana, June 1969
4. **Luis Pascual**, *Constrained Maximization of Posynomials and Vector-Valued Criteria in Geometric Programming*, Operations Research, Northwestern University, August 1969
5. **Robert A. Abrams**, *Nonlinear Programming in Complex Space*, Applied Mathematics, Northwestern University, June 1970
6. **Sanjo Zlobec**, *Contributions to Mathematical Programming and Generalized Inverses*, Applied Mathematics, Northwestern University, June 1970
7. **Abraham Berman**, *Linear Inequalities in Matrix Theory*, Applied Mathematics, Northwestern University, August 1970
8. **Prabha Gaiha**, *Matrix Theory over Cones in Complex Space*, Applied Mathematics, Northwestern University, August 1970
9. **Aharon Ben-Tal**, *Contributions to Geometric Programming and Generalized Convexity*, Applied Mathematics, Northwestern University, August 1973
10. **Yair Censor**, *Contributions to Optimization Theory: Multiobjective Problems*, Mathematics, Technion-Israel Institute of Technology, August 1975
11. **Michael Epelman**, *On the Structure of Convex Sets and its Applications*, Applied Mathematics, Technion-Israel Institute of Technology, August 1975
12. **William S. Lovejoy**, *Policy Bounds for Markov Decision Processes with Applications to Fisheries Management*, Operations Research/Marine Studies, University of Delaware, December 1983 (supervised jointly with Prof. Lee G. Anderson.)
13. **Sjur D. Flåm**, *Resource Management under Uncertainty*, Operations Research/ Mathematics, University of Delaware, June 1984 (supervised jointly with Prof. Lee G. Anderson.)
14. **Matthias Kramp**, *Models of Switching: Multi-Purpose Fleets in Fisheries, Multi-Armed Bandits and Gittins Indices*, Operations Research/Mathematics, University of Delaware, May 1987
15. **Malini Krishnamurti**, *Uncertainty and Duality in Economic Models and Effects of Policy on the West German Diary Industry*, Operations Research/ Mathematics, University of Delaware, May 1989 (supervised jointly with Prof. Joachim Elterich.)
16. **Xueqing Tang**, *Topics in Optimization and Combinatorics*, Operations Research, Rutgers University, May 1992
17. **Jianming Miao**, *Topics in Matrix Theory and Applications in Statistics and Approximation*, Operations Research, Rutgers University, May 1995
18. **Fuan Zhao**, *Envelope Theorem and Duality of Optimization Problems*, Operations Research, Rutgers University, September 1998
19. **Yuri Levin**, *Directional Newton Methods in n Variables*, Operations Research, Rutgers University, August 2001
20. **Cem Iyigun**, *Probabilistic Distance Clustering* Operations Research, Rutgers University, November 2007
21. **Chris Gaffney**, *Deductible Insurance and the Transfer of Risk*, September 2014

M.Sc.

1. **Igal Adiri**, *An Application of the Pontryagin Maximum Principle to Inventory and Production Models*, Operations Research, Technion-Israel Institute of Technology, June 1965
2. **Uzi Eilam**, *On the Solution of the Assignment Problem by the Multipliers Method*, Operations Research, Technion-Israel Institute of Technology, June 1965
3. **Ronald J. Stern**, *Generalized Constrained Derivatives in Nonlinear Programming*, Operations Research, Northwestern University, January 1970

4. **Ziv Eshcoli**, *On the Kuhn-Tucker Optimality Conditions in Banach Space*, Statistics/Operations Research, Tel-Aviv University, June 1973
5. **Isaac Bussel**, *Bounds and Approximations for the Expected Value of a Convex Function of Random Variables*, Mathematics, Technion-Israel Institute of Technology, October 1974
6. **Paul Rashevsky**, *On Optimality Conditions in Banach Space*, Applied Mathematics, Technion-Israel Institute of Technology, August 1975
7. **Valerie Barnes**, *On Recruiting Functions in Fisheries Dynamics*, Applied Mathematics, University of Delaware, June 1979
8. **Gary Custis**, *Optimal Allocation of Effort in Fisheries by Using Dynamic Programming*, Applied Mathematics, University of Delaware, June 1979
9. **George Treisner**, *On Switching Models in Interdependent Fisheries*, Applied Mathematics, University of Delaware, June 1980
10. **Eileen F. Beahan**, *Interactive Multiple-Objective Programming*, Operations Research/Mathematics, University of Delaware, June 1984
11. **Malini Krishnamurti**, *The Principle of Optimality in Dynamic Programming*, Operations Research/Mathematics, University of Delaware, December 1986

BOOKS

1. A. Ben-Israel and T.N.E. Greville, *GENERALIZED INVERSES: THEORY AND APPLICATIONS*, Pure and Applied Mathematics: A Wiley-Interscience Series of Texts, Monographs and Tracts, John Wiley and Sons, New York, 1974, xi + 395 pp. ; reprinted by R.E. Krieger Publishing Co., New York, 1980 ; Chinese translation 1989
2. A. Ben-Israel, A. Ben-Tal and S. Zlobec, *OPTIMALITY IN NONLINEAR PROGRAMMING: A FEASIBLE DIRECTIONS APPROACH*, Pure and Applied Mathematics: A Wiley-Interscience Series of Texts, Monographs and Tracts, John Wiley and Sons, New York, 1981, ix + 162 pp.
3. W. Koepf, A. Ben-Israel and R.P. Gilbert, *MATHEMATIK MIT DERIVE[®]* (German), Vieweg-Verlag, Berlin, 1993, xiv + 394 pp. ISBN 3-528-06549-4
4. A. Ben-Israel and R.P. Gilbert, *COMPUTER SUPPORTED CALCULUS: WITH MACSYMA[®] EXAMPLE SESSIONS*, Springer Verlag, 1000 pp. ISBN 3-211-82924-5
5. A. Ben-Israel and T.N.E. Greville, *GENERALIZED INVERSES: THEORY AND APPLICATIONS* (2nd edition), Springer-Verlag, New York, 2003, 400 pp., ISBN 0-387-00293-6 [Link](#)

BOOKS IN PREPARATION

6. A. Ben-Israel and R.P. Gilbert, *Analysis with Mathematica*, CRC
7. A. Ben-Israel, *Topics in Operations Research*, Springer
8. A. Ben-Israel, *The Matrix Volume: Theory and Applications* [Link](#)

ARTICLES

- [1] A. Ben-Israel and P. Naor, A problem of delayed service - I, *J. Royal Statist. Soc.* **B22**(1960), 245–269
- [2] A. Ben-Israel and P. Naor, A problem of delayed service - II, *J. Royal Statist. Soc.* **B22**(1960), 270–276
- [3] A. Ben-Israel and A. Charnes, On Some Problems of Diophantine Programming, *Cahiers du Centre de Recherche Operationnelle* **4**(1962), 215–280
- [4] A. Ben-Israel and A. Charnes, Contributions to the theory of generalized inverses, *J. Soc. Indust. Appl. Math.* **11**(1963), 667–699
- [5] A. Ben-Israel and A. Charnes, Generalized inverses and the Bott–Duffin network analysis, *J. Math. Anal. Appl.* **7**(1963), 428–435
- [6] A. Ben-Israel and S.J. Wersan, An elimination method for computing the generalized inverse of an arbitrary complex matrix, *J. Assoc. Comput. Mach.* **10**(1963), 532–537
- [7] A. Ben-Israel, The geometry of solvability and duality in linear programming, *Israel J. Math.* **1**(1963), 181–187
- [8] A. Ben-Israel, Notes on linear inequalities, I: The intersection of the nonnegative orthant with complementary orthogonal subspaces, *J. Math. Anal. Appl.* **9**(1964), 303–314
- [9] A. Ben-Israel, On direct sum decompositions of Hestenes algebras, *Israel J. Math.* **2**(1964), 50–54
- [10] A. Ben-Israel, An iterative method for computing the generalized inverse of an arbitrary matrix, *Math. of Comput.* **19**(1965), 452–455
- [11] A. Ben-Israel, A modified Newton-Raphson method for the solution of systems of equations, *Israel J. Math.* **3**(1965), 94–98 [PDF](#)
- [12] A. Ben-Israel, A note on an iterative method for generalized inversion of matrices, *Math. of Comput.* **20**(1966), 439–440

- [13] A. Ben-Israel, A Newton-Raphson method for the solution of systems of equations, *J. Math. Anal. Appl.* **15**(1966), 243-252 [PDF](#)
- [14] A. Ben-Israel and D. Cohen, On iterative computation of generalized inverses and associated projections, *SIAM J. Numer. Anal.* **3**(1966), 410-419 [PDF](#)
- [15] A. Ben-Israel, On error bounds for generalized inverses, *SIAM J. Numer. Anal.* **3**(1966), 585-592 [PDF](#)
- [16] I. Adiri and A. Ben-Israel, An extension and solution of Arrow-Karlin type production models by the Pontryagin principle, *Cahiers du Centre de Recherche Operationnelle* **8**(1966), 146-157
- [17] A. Ben-Israel, On the geometry of subspaces in \mathbb{R}^n , *SIAM J. Appl. Math.* **15**(1967), 1184-1198
- [18] A. Ben-Israel, On iterative methods for solving nonlinear least-squares problems over convex sets, *Israel J. Math.* **5**(1967), 211-224
- [19] A. Ben-Israel and A. Charnes, On the intersection of cones and subspaces, *Bull. Amer. Math. Soc.* **74** (1968), 541-544
- [20] A. Ben-Israel, On optimal solutions of 2-person 0-sum games, *Atti Accad Naz. Lincei Rend. Cl. Sci. Fis. Mat. Natur. (8)* **44**(1968), 274-278
- [21] A. Ben-Israel and A. Charnes, An explicit solution of a special class of linear programming problems, *Oper. Res.* **16**(1968), 1166-1175
- [22] A. Ben-Israel, A. Charnes and P.D. Robers, On generalized inverses and interval linear programming, pp. 53-70 in *Theory and Applications of Generalized Inverses of Matrices: Symposium Proceedings*, Texas Technological College Mathematics Series No. 4, Lubbock, Texas, March 1968, iii + 315 pp.
- [23] A. Ben-Israel, On Applications of Generalized Inverses in Nonlinear Analysis, pp. 183-202 in *Theory and Applications of Generalized Inverses of Matrices: Symposium Proceedings*, Texas Technological College Mathematics Series No. 4, Lubbock, Texas, March 1968, iii + 315 pp.
- [24] A. Ben-Israel, On Decompositions of Matrix Spaces with Applications to Matrix Equations, *Atti Accad Naz. Lincei Rend. Cl. Sci. Fis. Mat. Natur. (8)* **45** (1968), 54-60
- [25] A. Ben-Israel, A. Charnes and K.O. Kortanek, Duality and Asymptotic Solvability over Cones, *Bull. Amer. Math. Soc.* **75**(1969), 318-324 (Erratum, *ibid* **76**(1970), 426)
- [26] C. Cohen and A. Ben-Israel, On the Computation of Canonical Correlations, *Cahiers du Centre de Recherche Operationnelle* **11**(1969), 121-132
- [27] A. Ben-Israel, A Note on Partitioned Matrices and Equations, *SIAM Review* **11**(1969), 247-250
- [28] A. Ben-Israel, Linear Equations and Inequalities on Finite- Dimensional, Real or Complex, Vector Spaces: A Unified Theory, *J. Math. Anal. Appl.* **27**(1969), 367-389
- [29] A. Ben-Israel, Theorems of the Alternative for Complex Linear Inequalities, *Israel J. Math.* **7**(1969), 121-136 (Erratum *ibid* **7**(1969), 293)
- [30] A. Ben-Israel, On Matrices of Index Zero or One, *SIAM Review* **17**(1969), 1118-1121
- [31] P.D. Robers and A. Ben-Israel, Interval programming: A new approach to linear programming with applications to chemical engineering problems, *I & EC Process Design and Development Quarterly* **8**(1969), 496-501
- [32] P.D. Robers and A. Ben-Israel, An interval programming algorithm for discrete L_1 approximation problems, *J. Approximation Th.* **2**(1969), 323-336
- [33] A. Ben-Israel and P.D. Robers, Interval linear programming: Theory, computational methods and applications, *A.I.I.E. 20th Annual Institute Conference and Convention*, May 1969, Houston, Technical Papers pp. 349-358
- [34] P.D. Robers and A. Ben-Israel, On the theory and applications of interval linear programming, *Advanced Technical Paper RAC-TP-379*, Research Analysis Corporation, McLean, Virginia, October 1969, 37 pp.
- [35] A. Ben-Israel, A unified theory of equations, inequalities and programming, real or complex, *Proceedings of the ORSIS-ORSA Joint Conference on Operations Research*, Tel-Aviv, July 1969
- [36] A. Ben-Israel, A. Charnes, A.P. Hurter and P.D. Robers, On the explicit solution of a special class of linear economic models, *Oper. Res.* **18**(1970), 462-479
- [37] R.A. Abrams and A. Ben-Israel, A duality theorem for complex quadratic programming, *J. Optimiz. Th. Appl.* **4**(1969), 244-252
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- [39] A. Ben-Israel, A. Charnes and M.J.L. Kirby, On Stochastic Linear Approximation Problems, *Oper. Res.* **18**(1970), 555-558
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- [42] R.A. Abrams, A. Ben-Israel and A. Charnes, On the Fourtes-Hodgkin feedback model, *Math. Biosc.* **6**(1970), 75-83
- [43] R.A. Abrams and A. Ben-Israel, On the key theorems of Tucker and Levinson for complex linear inequalities, *J. Math. Anal. Appl.* **29**(1970), 640-646
- [44] A. Ben-Israel, On Newton's method in nonlinear programming, pp. 339-352 in *Proceedings of the Princeton Symposium on Mathematical Programming* (H.W. Kuhn, Editor), Princeton University Press, Princeton, 1970, vi + 620 pp.
- [45] A. Ben-Israel, Linear inequalities and mathematical programming in finite dimensional complex spaces: Theory and applications, *Seminaire sur la convexite et ses applications*, Centre de Recherches mathematiques, Universite de Montreal, Montreal, Quebec, March 1970
- [46] P.D. Robers and A. Ben-Israel, A decomposition method for interval linear programming, *Management Sci.* **16**(1970), 374-387

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- [48] S. Zlobec and A. Ben-Israel, On explicit solutions of interval linear programs, *Israel J. Math.* **8**(1970), 12–22
- [49] L.D. Pascual and A. Ben-Israel, Constrained maximization of posynomials by geometric programming, *J. Optimiz. Th. Appl.* **5**(1970), 73–80
- [50] L.D. Pascual and A. Ben-Israel, On the solution of maximization problems of optimal design by geometric programming, *J. Engineering Math.* **4**(1970), 349–360
- [51] L.D. Pascual and A. Ben-Israel, Vector-valued criteria in geometric programming, *Oper. Res.* **19**(1971), 98–104
- [52] A. Berman and A. Ben-Israel, More on linear inequalities with applications to matrix theory, *J. Math. Th. Appl.* **33**(1971), 482–496
- [53] A. Berman and A. Ben-Israel, Linear inequalities, mathematical programming and matrix theory, *Math. Programming* **1**(1971), 291–300
- [54] A. Berman and A. Ben-Israel, A note on pencils of Hermitian or symmetric matrices, *SIAM J. Appl. Math.* **21**(1971), 51–54
- [55] A. Ben-Israel, A. Charnes and K.O. Kortanek, Asymptotic duality over closed convex cones, *J. Math. Anal. Appl.* **35**(1971), 677–690
- [56] A. Ben-Israel, A. Charnes and K.O. Kortanek, Asymptotic duality in semi-infinite programming and the convex core topology, *Rendiconti di Matematica (4)* **4**(1971), 751–767
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- [59] R.A. Abrams and A. Ben-Israel, Nonlinear programming in complex space: Necessary conditions, *SIAM J. Control* **9**(1971), 606–620
- [60] A. Ben-Israel, Complex linear inequalities, pp. 23–38 in *Inequalities III: Proceedings of the 3rd Symposium on Inequalities* (O. Shisha, Editor), Academic Press, New York, 1972, xxii + 367 pp.
- [61] I. Erdelyi and A. Ben-Israel, Extremal solutions of linear equations and generalized inversion between Hilbert spaces, *J. Math. Anal. Appl.* **39**(1972), 298–313
- [62] A. Berman and A. Ben-Israel, Linear equations over cones with interior: A solvability theorem with applications to matrix theory, *Lin. Algeb. Appl.* **7**(1973), 139–149
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- [64] S. Zlobec and A. Ben-Israel, Explicit solutions of interval linear programs, *Oper. Res.* **21**(1973), 390–393
- [65] R.J. Stern and A. Ben-Israel, On linear optimal control problems with multiple quadratic criteria, pp. 366–372 in *Multiple Criteria Decision Making* (J.L. Cochrane and M. Zeleny, editors), University of South Carolina Press, Columbia, S.C. 1973, xiv + 816 pp.
- [66] R.J. Stern and A. Ben-Israel, An interior penalty function method for the construction of efficient points in a multiple criteria control problem, *J. Math. Anal. Appl.* **46**(1974), 768–776
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- [69] A. Ben-Israel and T.N.E. Greville, Some topics in generalized inverses of matrices, pp. 125–147 in *Generalized Inverses and Applications* (M.Z. Nashed, Editor), Academic Press, New York, 1976, xiv + 1054 pp.
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- [91] A. Griewank, A. Ben-Israel, A. Ben-Tal and S. Zlobec, Optimality in Nonlinear Programming: A Feasible Direction Approach, *Interfaces* **14**(1984), 118–119
- [92] A. Ben-Israel and B. Mond, On sufficient optimality conditions for mathematical programs with equality constraints, *J. Optimiz. Th. Appl.* **47**(1985), 253–255
- [93] D.F. Karney, J.N. Morse and A. Ben-Israel, Specifying the systematic risk of portfolios: A closed form solution, *R.A.I.R.O. Recherche Opérationnelle* **19**(1985), 243–246
- [94] A. Ben-Israel and B. Mond, What is invexity?, *J. Austral. Math. Soc. Ser. B* **28**(1986), 1–9 [PDF](#)
- [95] A. Ben-Israel, Generalized inverses of matrices: A perspective of the work of Penrose, *Proc. Cambridge Philos. Soc.* **100**(1986), 407–425
- [96] A. Ben-Tal and A. Ben-Israel, Ordered incidence geometry and the geometric foundations of convexity theory, *J. Geometry* **30**(1987), 103–122 [PDF](#)
- [97] A. Ben-Israel, A \mathbf{Z} -simplex algorithm with partial updates, *BIT* **27** (1987), 50–61
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- [99] A. Ben-Israel and S.D. Flâm, Input optimization for infinite horizon discounted programs, *J. Optimiz. Th. Appl.* **61**(1989), 347–357 [PDF](#)
- [100] A. Ben-Israel and S.D. Flâm, Support prices of activities in linear programming, *Optimization* **20**(1989), 561–579
- [101] S.D. Flâm and A. Ben-Israel, Approximating saddle points as equilibria of differential inclusions, *J. Math. Anal. Appl.* **141**(1989), 264–277
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- [104] A. Ben-Israel and S.D. Flâm, A continuous approach to oligopolistic market equilibrium, *Oper. Res.* **38**(1990), 1045–1051
- [105] A. Ben-Tal and A. Ben-Israel, A recourse certainty equivalent for decisions under uncertainty, *Annals of Oper. Res.* **30**(1991), 3–44 [PDF](#)
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