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EDUCATION

B.Sc.	1963	Mathematics & Physics	Bombay University Bombay, India
M.S.	1965	Operations Research	Columbia University, New York School of Eng. & Applied Science
Eng.Sc.D.	1971	Operations Research	Columbia University, New York School of Eng. & Applied Science

Professors Philip Wolfe (IBM/Columbia), and S.B. Littauer (Columbia), Doctoral Dissertation Advisors

30-Graduate Credits	1967-1968	Mathematics	Columbia University, New York Department of Mathematics

ACADEMIC EMPLOYMENT EXPERIENCE

ASSOCIATE PROFESSOR OF OPERATIONS AND INFORMATION MANAGEMENT
September 1987-present
MEM Program CO-Director
August 2001-present
University of Connecticut
Business School
Storrs, CT 06269

VISITING PROFESSOR OF OPERATIONS RESEARCH
September 1985-1987
Yale University
School of Org. and Mgmt.
New Haven, CT 06511

PROFESSOR OF MANAGEMENT SCIENCE
September 1978-1985
Shippensburg University
Shippensburg, PA 17257

ASSOCIATE PROFESSOR IN BUSINESS MANAGEMENT
September 1975-1978
Bryant College
Smithfield, RI 02917

ASSISTANT/ ASSOCIATE (1973) PROFESSOR IN BUSINESS MANAGEMENT
September 1971-1975
Quinnipiac College
School of Business
Hamden, CT 06514

INDUSTRY EMPLOYMENT EXPERIENCE

STAFF CONSULTANT — IBM Corporation

CONSULTANT — IBM Corporation

SENIOR CONSULTANT — Utility Computer Systems, Inc.

DIRECTOR OF MANAGEMENT SCIENCE Evers Systems Corp.
BUSINESS MATHEMATICIAN IBM Corporation

PUBLICATIONS INFORMATION

PUBLISHED PAPERS *Journals / Refereed Proceedings*

1. *"Technology Adoption in India: A Future Perspective with Analysis of Important Variables,"* Journal of Advance Manufacturing Systems, Vol. 5, No. 2, 179-207, 2006
2. *"Successful Strategies for AMT Adoption in India: Analyzing Important Variables via Factor and Discriminant Analysis,"* Journal of Advances in Management Research, Vol. 4, No. 1, 7-18, 2007
3. *"Advanced Manufacturing Techniques and Information Technology Adoption in India: A Current Perspective and some Comparisons,"* International Journal of Advanced Manufacturing Technology (forth coming), 1-15, 2007
4. "*Price-Based Approach for Activity and Coordination in a Supply Network,*" (with Ni, Chen, and Luh), IEEE Transactions on Robotics and Automation, Vol. 19, No. 2, April, 2003, pp. 335-346 2003
5. *"Optimization-Based Manufacturing Scheduling with Multiple Resources, Setup Requirements and Transfer Lots,"* (with Chen, Luh, and Moreno), IIE Transactions on Design and Manufacturing, Vol. 35, No. 10, October 2003, pp. 973-985, 2003.
6. "*Infrastructure Development for Conversion to Environmentally Friendly Fuel,*" (with Bapna and Nair), European Journal of Operational Research, 142, pp. 480-496, 2002.
7. "*Product Line Design for Profit Maximization Using Common Parts, Features and Manufacturing Facilities,*" (with Nair and Wen), OPSEARCH (Journal of the Operations Research Society of India), 2002.
8. "*Internet-based manufacturing scheduling- Architecture and implementation," (with Tu, Luh and Ni),* Proceedings of 2002 International Conference of Robotics and Automation, (CD Rom, 8 pages), 2002.
9. "Scheduling in Supply Chains: An Asynchronous Distributed Price-Based Model," (with Chen, Luh, and Ni) Proceedings of 2001 NSF Design, Service and Manufacturing Research Conference, Tampa, Florida, January 7-10, 2001, (CD Rom: 12 pages).
10. "*An Asynchronous Distributed Price-Based Model for Scheduling in Supply Chains," (with Chen, Luh, and Ni),* Proceedings of the National Symposium on Manufacturing Engineering in Twenty First Century, IIT-Kanpur, Kanpur, India, March 2-3, 2001, pp.77-84.
11. *"Lagrangian Relaxation Neural Network for Job-Shop Scheduling,"* (with Luh, Zhao, and Wang), IEEE Transactions on Robotics and Automation, Vol. 16, No. 1, pp. 78-88, 2000.
12. *"A New Model and Solution Method for Product Line Design and Pricing,"* (with Nair, Wen, and Tarasewich), OR: Journal of the Operational Research Society, Vol. 51, No. 1, pp.91-101, 2000.
13. *"Scheduling Job Shops with Machine Breakdowns,"* (with Luh and Feng) Proceedings of 2000 NSF Design and Manufacturing Research Conference, Vancouver, Canada, January 3-6, 2000, (CD Rom: 13 pages).
14. *"Network-based Manufacturing Scheduling: Architecture and Implementation,"* (with Luh, Chen, and Ni), Proceedings of Third Asian Control Conference, Shanghai, China, pp.355-360, July 2000.
15. *"An Effective Approach for Job Shop Scheduling with Uncertain Parts,"* (with Luh and Chen) IEEE Transactions on Robotics and Automation, Vol. 51, No. 2, pp.328-339, 1999.
16. *"An Effective Optimization-Based Algorithm for Job Shop Scheduling with Transfer Lots,"* (with Luh and Jin), Journal of Manufacturing System, Vol. 18, No. 4, pp. 284-300, 1999.
17. *"Architectural Design of Neural Network Hardware for Job-Shop Scheduling,"* (with Luh, Zhao, Chen, Chiueh,

and Chang), Annals of the CIRP, Vol. 48, No.1, pp. 373-376, 1999.

18. *"Optimization-Based Algorithm for Manufacturing Scheduling with Multiple Resources and Setup Requirements,"* (with Luh and Chen) 1998 Proceedings of International Symposium on Intelligent Systems and Advanced Manufacturing, Hynes Convention Center, Boston, Massachusetts, November 1-6, pp. 314-325 , 1998.

19. *"Lagrangian relaxation Neural Network for Job Shop Scheduling,"* (with Luh, Zhao, and Wang) IEEE Proceedings of 1998 International Conference on Robotics and Automation: ICRA'98, May, Leuven, Belgium, 1998

20. *"Production Planning and Scheduling with Job Uncertainties Under Global Competition,"* (with Luh and Chen), in "Managing Economic Liberalization in South Asia" (Eds. Jayachandran, Balasubramanium, Dastagir), MacMillan India Limited, proceedings of the South Asia Conference, Chennai, India, August 10-13, pp. 619-625, 1998.

21. *"Network Infrastructure Design for Developing Countries: A Mathematical Programming Approach for Unleaded Fuel Distribution,"* (with Bapna and Nair) in "Managing Economic Liberalization in South Asia" (Eds. Jayachandran, Balasubramanium, Dastagir), MacMillan India Limited, proceedings of the South Asia Conference, Chennai, India, August 10-13, pp.634-643, 1998.

22. *"An Effective Optimization-Based Algorithm for Job Shop Scheduling with Transfer Lots,"* (with Luh and Jin), IEEE Proceedings of International Conference on Control Applications, Hartford, CT, October 5-7, 1997.

23. *"An Effective Approach for Job Shop Scheduling with Uncertain Parts,"* (with Luh and Chen) Proceedings of the 1997 NSF Design and Manufacturing Grantees Conference, January 1997, Seattle, Washington, pp. 485-486, 1997.

24. *"Modeling Uncertainty in Job Shop Scheduling,"* (with Luh and Chen**) Best Student Paper Award**, Proceedings of the 1997 First International Conference on Operations and Quantitative Management, January 1997, Jaipur, India, pp. 490-497, 1997.

25. *"An Optimization Approach towards Development of Infrastructure for Conversion to Environmental Friendly Fuel,"* (with Bapna and Nair) **Honorable mention - Student Paper**, Proceedings of the 1997 First International Conference on Operations and Quantitative Management, January 1997, Jaipur, India, pp. 661-668, 1997.

26. *"Scheduling of Job Shops with Uncertain Parts,"* (with Luh and Chen) Proceedings of the Second International Conference on Computer Integrated Manufacturing in the Process Industries: I-CIMPRO, July 1996, Eindhoven, The Netherlands, pp. 418-430, 1996.

27. *"Fuzzy optimization for scheduling of Identical Machines,"* (with Chen and Luh)**,** Proceedings of the 1996 NSF Design and Manufacturing Grantees Conference**,** pp. 327-329, Albuquerque, NM, January 1996.

28. *"Scheduling of Job Shops with Uncertain Parts"*, (with Luh and Chen), Proceedings of International Manufacturing Engineering Conference pp. 382-384 **,** Storrs, CT, August, 1996**.**

29. *"An Integer Programming Model for Locating Vehicle Emissions Testing Stations,"* (with A. Swersey, Yale School of Management, Yale University), Management Science, Vol. 41, No. 3, pp. 496-512, 1995.

30. *"Near Optimal Solutions for Product Line Design and Selection: Beam search Heuristics,"* (with S. Nair and K. Wen), to appear in Management Science, Vol. 41, No. 5, pp. 1-19, 1995.

31. ***"****Computing Near-Optimal Practical Schedules by Lagrangian Relaxation*," (with Luh, Liu, Wang), Proceedings of the International Conference on Industrial Logistics**,** TL3 pp.1-10, Ouro Preto, Brazil, December, 1995.

32. *"Uniformly Extremal Solutions in Function Spaces for the Quadratic Case: Characterization and Applications,"* Siam J. Optimization, Vol.3, No. 2, pp. 236-247, 1993.

33. *"Domain Contraction in Nonconvex Programming: Minimizing a Concave Quadratic Objective Over a*

Polyhedron," Mathematics Of Operations Research, Vol. 16, No. 2, pp. 390-407, 1991.

34. *"Constrained Optimization in L-infinity Norm: An Algorithm for Convex Quadratic Interpolation,"* J. Of Mathematical Analysis And Applications, Vol. 155, No. 1, pp. 249-263, 1991.

35. *"A Direct Algorithm for Optimal Quadratic Splines,"* Numerische Mathematik, 57, pp. 313-332, 1990.

36. *Scheduling Service Commitments to Avoid Rescheduling when Periodic Capacities are Uncertain* (with G. Campbell), Proceedings Of The Decision Sciences Institute 20th Annual Meeting, New Orleans, pp. 1-3, November 1989.

37. *"Successive Approximation in Separable Programming: An Improved Procedure for Convex Separable Programs,"* Naval Research Logistics Quarterly, Vol. 33, No. 2, pp. 325-358, 1986.

38. *"A Computable Convex Programming Characterization of Optimal Interpolatory Quadratic Splines with Free Knots,"* J. Of Mathematical Analysis And Applications, Vol. 114, No.1, pp. 278-288, 1986.

39. *"Optimal Interpolation with Convex Splines of Second Degree,"* Siam J. On Control And Optimization, Vol. 24, No. 1, pp. 157-168, 1986.

40. *"Solving Highly Nonlinear Convex Separable Programs Using Successive Approximation,"* Anthony V. Fiacco (Guest Ed.), Computers & Operation Research, Vol. 11, No. 2, pp. 113-128, 1984.

41. *"Error Analysis for Convex Separable Programs: Bounds on Optimal and Dual Optimal Solutions,"* J. Of Mathematical Analysis And Applications, Vol. 75, No. 2, pp. 486-494, 1980.

42. *"Error Analysis for Convex Separable Programs: The Piecewise Linear Approximation and the Bounds on the Optimal Objective Value,"* Siam J. On Applied Mathematics, Vol. 34, No. 4, pp. 704-714, 1978.

RESEARCH IN PROGRESS

1. "Function Fitting using Cubic Splines: Computing the Optimal Spline" (with P. Smith)

2. "A Manufacturer's Optimal Supply Chain Production Allotment under Demand Uncertainty for Fashion Industry" (with Suresh Nair and Jose Cruz)

3. "Applications of Quadratic and Cubic Spline Fits" (S. Tripathi)

4. "Measuring Optimality Verification Effort in Integer Programming"

Technical Reports/ Working Papers –

1. *"Supply Network Activity coordination on the Internet,"* Invention Disclosure report filed with the Center for Science & Technology Commercialization, UConn, pp. 1-18, 2002.

2. *"Network-Based Scheduling and Coordination Systems with Extensions to Supply Chains,"* Grant# 98G006, *Final* Report to Connecticut Innovation Inc., pp. 1-16, March 30, 2002

3. *"Optimization-Based Manufacturing Scheduling System on the Internet,"* Invention Disclosure filed on 7/19/01 with Center for Science & Technology Commercialization, UConn, pp. 1-17, July 2001.

4. *"Network-Based Scheduling and Coordination Systems with Extensions to Supply Chains,"* Grant# 98G006, Annual Report to Connecticut Innovation Inc., pp. 1-8, January 30, 2000.

5. *"Fuzzy Optimization for Order and Production Scheduling,"* NSF Grant # 9500037 (June 1995- May 1999), *Final* Report, pp. 1-6, June 1999.

6. *"A Model for Product Line Design and Pricing,"* (with Wen and Nair), WP95-001, School of Business Administration, University of Connecticut, pp. 1-23, 1995.

7. *"Models for Optimal Product Line Design and Advertising,"* (with Wen and Nair), WP95-002, School of Business Administration, University of Connecticut, pp. 1-24 1995.

8. *"Product Line Design Considering Common Production Facilities and Costs,"* (with Nair and Wen), WP93-006, School of Bus. Administration, University of Connecticut, pp. 1-25, 1993.

9. *"Product Line Design and Selection Using Conjoint Analysis: Models with Price and Advertising,"* (with Nair and Wen), WP92-034, School of Business Administration, University of Connecticut, pp. 1-37, 1992.

10. *"Near Optimal Solutions for Product Line Design and Selection: Beam Search Heuristics,"* (with Nair and Wen), WP92-033, School of Business Administration, University of Connecticut, pp. 1-31, 1992.

11. *"An Integer Programming Model for Locating Vehicle Emissions Testing Stations,"* (with A. Swersey), WP91-029, School of Bus. Adminis, University of Connecticut, pp. 1-32, 1991.

12. *"Spline Functions: Introduction to Applications and Computations,"* (Revised), WP91-028, School of Business Administration, University of Connecticut, pp. 1-28, 1991.

13. *"Quadratic Spline Functions: Applications and Computations,"* WP90-014, School of Business Administration, University of Connecticut, pp. 1-26, 1990.

14. *"Uniformly Extremal Solutions in Sobolev Function Spaces for the Quadratic Case: Characterization and Applications,"* WP90-015, School of Business Administration, University of Connecticut, pp. 1-20, 1990.

15. *"Domain Contraction in Nonconvex Programming: Minimizing a Quadratic Concave Objective Over a Polyhedron," (*Revised), Working Paper Series B #99, Yale School of Organization and Management, pp. 1-32, September 1986.

16. *"Characterizing Extremal Solutions: A Direct Proof of Karlin's Theorem for the Quadratic Case,"* Working Paper Seires B #98, Yale School of Organization and Management, pp. 1-30, August 1986.

17. *"A computable Convex Programming Characterization of Optimal Interpolatory Quadratic Splines with Free knots,"* Working Paper Series, Frehn Center for Management, Shippensburg University, Shippensburg, PA, pp. 1-14, 1983.

18. *"A Warranty Service Planning System," IBM* Internal Systems Report, pp. 1-200, August 1978.

19. *"Stochastic Chance Constrained Programming Equivalents," IBM* Internal Report, pp. 1-18, August 1969.

20. *"A Scheduling Problem with Emergency and Non-Emergency Demands,"* IBM Internal Report, pp 1-15, September 1969.

RESEARCH AWARDS / *SCHOLARSHIP*

2002-2003 *Ackerman Scholar Award - Years 2002, 2003* ($15,000)– March 8, 2002

1993 *Business School International Business Scholar Fellowship* ($2500). Presentations and visits to various Universities and Companies in Japan, including Tokyo University, Tokyo Institute of Technology, Aoyama Gakuin University; NEC and Mitubishi.

RESEARCH / *GRANTS/ SUPPORT*

2004 *CIBER Research Grant "Applications of Advanced Manufacturing Technology (AMT-Adoption) in Indian Industries: Measurement, Comparison and Impact" PHASE –II* in collaboration with Professor V.K. Jain, IIT-Kanpur, and
"Global Supply Chain Models for Procurement Efficiency and High Precision Manufacturing," in collaboration with Professor Y. Narahari, IISc- Bangalore.

2003 *CIBER Research Grant* **"***Applications of Advanced Manufacturing Technology in Indian High Tech Industries: Measurement, Comparison and Impact Phase-I"* in collaboration with Professor V. K. Jain, IIT-Kanpur.
CIBER International Travel Grant Scientific Committee Member and presenter, ICIL – 2003 International Conference on Industrial Logistics -2003) Vaasa, Finland, June 16-19, 2003**.**

1998-2001 *NSF Grant Proposal for October 1998–September 2001: DMI-9813176* ($ 207,408) (with Peter Luh/ Engr.). Funded amount from NSF is $ 207,408 for three years 98-99, 99-00, and 00-01 (no-cost extension to 2002). Date granted June 26, 1998. Industry Cosponsor matching funds in the budget

support: UT Research Center $ 150,000, and a small business J. M. Products (Waterbury) $31,570; for the 3 year period. Proposal title - *A New Generation of Neural Network Optimization Techniques with Applications to Manufacturing Scheduling*.

1998-2000 *Yankee Ingenuity Initiative (CT Econ Development) Project- 98G006* ($98,446)*:* Funds granted $98,446 (with Peter Luh/ Engr.), two year program 99-00 and 00-01 (no-cost extension to 2001). Industry support: Delta Industries $45,000, Cannondale $50,000. Title: *Network Based Scheduling and Coordination Systems with Extensions to Supply Chains*. Date granted November 9,1998.

1999 *Optimization-Based Scheduling System for Delta Industries* ($8000). To expedite and assist Delta in the data collection computer system and general implementation of the scheduling model developed for Delta under NSF Grant this support was given as stipend for one graduate student.

1995-98 *National Science Foundation 1995-1998:DMI-9500037* ($180,000), "Fuzzy Optimization for Order and Production Scheduling," co-principal investigator (with Professor Peter B. Luh/ School of Engineering, PI). Industry cosponsors' matching funds: Cannondale $150,000 and Delta Industries $115,015; for the 3 year period (95-96, 96-97, 97-98).

1997 *"Winning Manufacturing Strategies for Time - Based Competition," University of Connecticut Research Foundation* ($33,922)- Student Support Grant Funds for the interim period 6/97- 5/98.

1993 *Corporate Associates Research Fellowship* ($5000), "Optimal Function Fits by Mathematical Programming," School of Business Administration, University of Connecticut.

1992 *Corporate Associates Research Fellowship* ($5000), "Computing Optimal Solutions of Convex Cost Network Flow Distribution Problems," School of Business Administration, University of Connecticut.

1991 *Corporate Associates Research Fellowship* ($5000), "Locating Connecticut Vehicle Emissions Testing Stations: Modeling and Analysis," School of Business Administration, University of Connecticut.

1990 *Corporate Associates Research Fellowship* ($5000), "Solving Portfolio Selection Models by Network Domain Contraction," School of Business Administration, University of Connecticut.

1964-1968 *Teaching Assistantship*, Department of Industrial Engineering, Columbia University, NY.

1963 *Research Assistantship*, Department of Civil Engineering, Columbia University, NY.

EDITORIAL ACTIVITIES

ASSOCIATE EDITOR: **NAVAL RESEARCH LOGISTICS** 1988- 2003 This is one of School of Business Administration's quality journals in our OR/MS area. The basic areas I handle are:

(i) Scheduling,
(ii) Mathematical programming, and
(iii) Miscellaneous papers using advanced mathematical concepts.

SCIENTIFIC COMMITTEE MEMBER for Proceedings of the International Conference in Business Logistics, International conference in Business Logistics, **June 16-19,** Vassa, Finland, 2003

EDITORIAL COMMITTEE Special issue of OPSEARCH: Journal of the operational society of India on Modeling Industrial logistics in III World -Guest Editor Lilian Barros, Co-Editors Michael Riley and David Brown, 2001**.**

EDITORIAL COMMITTEE Member Springer –Verlag Industrial Logistics Proceedings - based on the best

papers of the "*The Third International Conference on Industrial Logistics", June 16-19, 1997, Chico, CA*" and some new papers, the conference Chair in England has gotten Springer-Verlag to publish a book on logistics of the papers selected by the board**.**

EDITOR BOARD MEMBER- Industrial Engineering Applications and Practice: Users' Encyclopedia -- ISBN- 0-9654599-0-X in CD-ROM, by international Journal of industrial Engineering, Appointed one of the Editors among many (managing editors, editors, and associate editors), contributed to keyword selection and obtained authors for two topics: Bundle Methods for Nondifferential Optimization, Scheduling Permutation Shops.

PHD DISSERTATION/ (MS THESIS) ADVISING

Yan Tu (Internet Based Manufacturing Scheduling: Architecture and implementation, Associate Advisor 2000)
Ni, Ming (Price Based Approach for Price Coordination in Supply Chains, Associate Advisor, 1999)
Lieu Fang (Scheduling of design projects with Uncertain Number of Iterations, Associate Advisor 1997)
X. Zhao (Lagrangian relaxation Neural Networks for Job shop Scheduling, Associate Advisor 1997)
Dong Chen (An effective Approach for job Shop scheduling with Uncertain Processing requirements, Associate Advisor, 1996)
D. Zhang (Job Shop Scheduling with Group-Dependent setups, Finite buffers, and long Time Horizons, Associate Advisor 1996)
Y. Zhang , (Scheduling with Model Changes and Capacity Adjustments, Associate Advisor, 1996)
Guandong Liu, (Scheduling of Permutation Flow Shops, current, Associate Advisor, 1996)
Ling Gou, (Uncertainty in Flow Shop/ Job Shop Scheduling via Fuzzy Set Theory, current, Associate Advisor, 1995)
Frances Wang, (MS Thesis: Lot Sizing in Job Shop Scheduling, completed 1995, Associate Advisor, 1995)
Bala Prasannan, (MS Thesis: Optimization-based Hydrothermal Scheduling and Power Transactions, completed 1995, Associate Advisor, 1995)
OPIM Department Doctoral Students (2-5) - Initial advisor as Dept. Ph.D. Coordinator –1992-95

PROFESSIONAL MEMBERSHIPS:

INFORMS 1995 - Full Member
Operations Research Society of America (merged in INFORMS 1995)
The Institute of Management Sciences (merged in INFORMS 1995)
Mathematical Programming Society