Curriculum Vitae

ADAM SHWARTZ

Date: October 2019

PERSONAL DATA

Citizenship:	Israeli
Birth:	May 1, 1953, Tel-Aviv, Israel
Family status:	Married, three children
Military service:	Active service 1971-1977. Reserve duty: 1977–2001. Rank: Major.
Work address:	Electrical Engineering, Technion—Israel Institute of Technology
	Haifa, 32000, Israel
	Phone: (972) (4) 8294743
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Home address:	13 Hasela St., P.O. Box 183, Atlit 30300, Israel

EDUCATION

1979	B.Sc. (Cum Laude), Electrical Engineering, Ben-Gurion University, Israel
1979	B.Sc. (Cum Laude), Physics, Ben-Gurion University, Israel
1981	Sc.M. Applied Mathematics, Brown University, Providence, R.I., U.S.A.
1983	Ph.D. Electrical Engineering, Brown University, Providence, R.I., U.S.A. Thesis advisor: Prof. H.J. Kushner.

ACADEMIC EMPLOYMENT

1982–1983	Visiting Assistant Professor, Division of Applied Mathematics, Brown University.
1983–1984	Visiting Assistant Professor, Electrical Engineering Department, University of Maryland,College Park.
1984–present	Electrical Engineering, Technion, Israel.
1990–1991	Systems Research Center, University of Maryland, College Park.
1996–1997	Mathematical Research Center, Bell Laboratories.
Jan-July 1997	Management Science and Information Systems, Graduate School of Business, Rutgers University.

2003–   Professor, Electrical Engineering, Technion, Israel.

2006–   The Julius M. and Bernice Naiman Chair in Engineering, Technion.

2014–2016   Visiting Professor, Cornell Tech, Cornell, NYC.

TEACHING EXPERIENCE

1. At the Technion:

A] UNDERGRADUATE LEVEL:

044130 Signals and Systems
044202 Random Signals 044105 Electrical Engineering "M"
044261 Structure and intepretation of computer programs I.

B] GRADUATE LEVEL:

048868 Stochastic Processes in Communication and Control
048868 Foundations of Stochastic Processes (new name)
048944 Large Deviations and Applications

C] GRADUATE LEVEL—NEW COURSES INTRODUCED:

048913 Stochastic Control.
048928 Adaptive Estimation—Stochastic Methods.
048846 Asymptotic methods—Large Deviations
048876 Topics in computer communication networks III:
           Asymptotic methods. 048962 Topics in computer communication networks IV:
           Stochastic models. With Dr. Rami Atar.
048846 Topics in computer communication networks I: Modelling and optimization of
           computer communications networks.

2. At the University of Maryland, College Park:

ENEE 608	Graduate seminar: topics in Control and Communication	Fall 1983, Spring 1984
Faculty seminar on Large Deviations		Spring 1984
ENEE 608J	Graduate seminar: Large Deviations	Fall 1990

3. Elsewhere:

Columbia University

Graduate course: Large deviations	Autumn 1994/5

Rutgers University, Graduate School of Business

Business Statistics	Spring 1996/7

SCIENTIFIC SOCIETIES

Senior Member — IEEE.

Member—AMS, $\Sigma\Xi$, SIAM, INFORMS, Israel Mathematical Union, Operations Research Society of Israel.

PROFESSIONAL ACTIVITIES

Area Editor (Stochastic Systems), Mathematics of Operations Research, 2013-2016

Associate Editor, Mathematics of Operations Research, 2009–2012.

Associate Editor, Stochastic Systems, 2009-2011.

Associate Editor, QUESTA, 2002–2009.

Reviewer for Mathematical Reviews, 2000–

Associate Editor, SIAM J. Control and Optimization, 1994–2002.

Associate Editor, IEEE Transactions on Automatic Control, 1990–1992.

ACADEMIC HONORS

D. Ben Aharon Research award for "Contributions to Adaptive Control of Markov chains", Technion, 1988.

New England Academic Award for 1987/88, for "Contributions in the field of Stochastic Control," Technion, 1988.

LIST OF PUBLICATIONS

A. Refereed journal papers

1) Published or accepted for publication

1. H.J. Kushner, A. Shwartz, "An invariant measure approach to the convergence of Stochastic Approximations with state-dependent noise," *SIAM J. Control Opt.* **22** no. 1, pp. 13-27, 1984.

2. H.J. Kushner, A. Shwartz, "Weak convergence and asymptotic properties of adaptive filters with constant gains,"*IEEE Trans. Info. Theory* **IT-30** No. 1, pp. 177-182, 1984.

3. H.J. Kushner, A. Shwartz, "Stochastic approximations in Hilbert space: identification and optimization of linear continuous-parameter systems," *SIAM J. Control Opt.* **23** no. 2, pp. 774–793, 1985.

4. F. Baccelli, A. M. Makowski and A. Shwartz, "The Fork-Join queue and related systems with synchronization constraints: Stochastic Ordering and computable bounds," *Advances in Applied Probability* **21**, pp. 629-660, 1989.

5. E. Altman and A. Shwartz, "Optimal priority assignment: a time sharing approach," *IEEE Transactions on Automatic Control* **AC-34**, pp. 1098-1102, 1989.

6. A. Shwartz and N. Berman, "Abstract stochastic approximations and applications", *Stochastic Proc. Appl.* **31** pp. 133-149, 1989.

7. A. Shwartz, M. Sidi, "Erasure, capture and noise errors in controlled multiple-access networks", *IEEE Trans. Comm. Theory* **37** No. 11, pp. 1228-1231, 1989.

8. A. Shwartz and A. M. Makowski, "Comparing policies in Markov decision processes: Mandl's lemma revisited," *Math. Operations Research* **15** pp. 155–174, 1990.

9. D. -J. Ma, A. M. Makowski and A. Shwartz, "Stochastic approximation for finite state Markov chains," *Stochastic Processes and Their Applications* **35** pp. 27–45, 1990.

10. E. Altman and A. Shwartz, "Adaptive Control of constrained Markov chains," *IEEE Trans. Auto. Control* **36**, pp. 454–462, 1991.

11. E. Altman and A. Shwartz, "Adaptive Control of constrained Markov chains: criteria and policies," *Annals of Operations Research* **28** pp. 101–134, 1991.

12. E. Altman and A. Shwartz, "Sensitivity of constrained Markov decision processes," *Annals of Operations Research* **32**, pp. 1-22, special volume on "Stochastic Models and their Application," F.J. Radermacher and U. Rieder Editors, 1991.

13. E. Altman and A. Shwartz, "Markov decision problems and state-action frequencies," *SIAM J. Control and Optimization* **29** pp. 786–809, 1991.

14. J.D. Biggins, B. Lubachevsky, A. Shwartz and A. Weiss, "A Branching Random Walk with a Barrier," *Annals of Applied Probability* **1** pp. 573–581, 1991.

15. B. Lubachevsky, A. Shwartz and A. Weiss, "An analysis of rollback-based simulations," *ACM Transactions on Modelling and Computer Simulation* **1** no. 2, pp. 154–193, 1991.

16. A. M. Makowski and A. Shwartz, "Stochastic approximations and adaptive control of a discrete-time single-server network with random routing," *SIAM J. Control Opt.* **30**, pp. 1476–1506, 1992.

17. A. M. Makowski and A. Shwartz, "On constrained optimization of the Klimov network and related Markov decision processes," *IEEE Trans. Automatic Control* **38** No. 2 pp. 354–359, 1993.

18. E. Altman and A. Shwartz, "Time-sharing policies for controlled Markov chains," *Operations Research*, 1993.

19. N. Shimkin and Adam Shwartz, "Guaranteed performance regions for Markovian systems with competing decision makers," *IEEE Trans. Auto. Control* **38** No. 1 pp. 84–95, 1993.

20. A. Shwartz and A. Weiss, "Induced rare events: analysis via large deviations and time reversal," *Journal of Applied Prob.* **25** pp. 667–689, 1993.

21. David Levanony, Adam Shwartz and Ofer Zeitouni, "A Uniform decay and equicontinuity for normalized, parameter dependent Ito integrals," *Stochastics* **43**, pp. 9–28, 1993.

22. E. Feinberg and A. Shwartz, "Markov decision models with weighted discounted criteria," *Math. of Operations Research* **19** pp. 152–168, 1994.

23. David Levanony, Adam Shwartz and Ofer Zeitouni, "Recursive identification in continuous-time stochastic processes," *Stoch. Proc. and their Applications* **49**, pp. 245–275, 1994.

24. E. Feinberg and A. Shwartz, "Constrained Markov decision models with weighted discounted criteria," *Math. of Operations Research* **20** pp. 302–320, 1995.

25. N. Shimkin and A. Shwartz, "Asymptotically Efficient Adaptive Strategies in Repeated Games, Part I: Certainty Equivalence Strategies," *Math. of Operations Research* **20** pp. 743–767, 1995.

26. N. Shimkin and A. Shwartz, "Asymptotically Efficient Adaptive Strategies in Repeated Games, Part II: Asymptotic Optimality," *Math. of Operations Research* **21** pp. 487–512, 1996.

27. E. Feinberg and A. Shwartz, "Constrained discounted dynamic programming," *Math. of Operations Research* **21** pp. 922–945, 1996.

28. Eugene A. Feinberg and Adam Shwartz, "Constrained dynamic programming with two discount factors: applications and an algorithm," IEEE Transactions on Automatic Control TAC-44 pp. 628–630, 1999.

29. E. Altman and A. Shwartz, "Constrained Markov Games: Nash Equilibria," *Annals of Dynamic Games* **6** pp. 213–221, V. Gaitsgory, J. Filar and K. Mizukami, editors, Birkhäuser, 2000.

30. E. Altman, E. Feinberg and A. Shwartz, "Weighted Discounted Stochastic Games with Perfect Information," *Annals of Dynamic Games* **6** pp. 303–323, V. Gaitsgory, J. Filar and K. Mizukami, editors, Birkhäuser, 2000.

31. Martin I. Reiman and Adam Shwartz, "Call Admission: A New Approach to Quality of Service," *Queueing Systems* **38** pp. 125–148, 2001.

32. Arie Hordijk and A. Shwartz, "Performance bounds for queues via generating functions," *IEEE Trans. Aut. Control* **46** pp. 137–142, 2001.

33. A. Shwartz, "Death and discounting," *IEEE Trans. Auto. Control* **46** pp. 644-647, 2001.

34. R. Atar, P. Dupuis and A. Shwartz, "An escape time criterion in queueing networks: Asymptotic risk-sensitive control via differential games," *Math. of Operations Research* **28** pp. 801–835, 2003.

35. M. Jacobson, N. Shimkin and A. Shwartz, "Markov decision processes with slow scale periodic decisions," *Math. of Operations Research* **28** pp. 777–800, 2003.

36. R. Atar, P. Dupuis and A. Shwartz, "Explicit solutions for a network control problem in the large deviations regime," *QUESTA* **46** pp. 159–176, 2004.

37. A. Shwartz and A. Weiss, "Large Deviations with diminishing rates." *Math. of Operations Research* **30** pp. 281–310, 2005.

38. A. Ridder and A. Shwartz, "Large deviations without principle: join the shortest queue." *Math. Methods of Operations Research* **62 no. 3** pp. 467–483, December 2005. See also the expanded versions in ps or pdf format. Special volume for Hordijk.

39. A. Zadorojniy and A. Shwartz, "Robustness of policies in constrained Markov Decision processes," *IEEE Trans. Auto. Control* **51** pp. 635–638, April 2006. ps version.

40. A. Leizarowitz and A. Shwartz, "Exact finite approximations of average-cost countable Markov Decision processes," *Automatica* **44** pp. 1480–1487, June 2008. CCIT Report 616, EE PUB 1573, April 2007.

41. R. Atar and A. Shwartz, "Efficient routing in heavy traffic under partial sampling of service times," *Math. Opererations Research* **33** pp. 899–909, Nov. 2008. CCIT Report 640, EE PUB 1597, October 2007.

42. Y. Carmon and A. Shwartz, "Markov decision processes with exponentially representable discounting," Operations Research Letters **37** pp. 51–55, Jan. 2009. CCIT Report 675, March 2008.

43. E. Altman, K. Avrachenkov, I. Menashe, G. Miller, B. Prabhu and A. Shwartz, "Dynamic discrete power control in cellular networks," CCIT Report 675, December 2007. IEEE Trans. Auto. Control **54** pp. 2328–2340, Oct. 2009.

44. A. Zadorojniy G. Even and A. Shwartz, "A strongly polynomial algorithm for controlled queues." MOR **34** pp. 992–1007, Nov. 2009. Co-winner of the Mahrez best student paper, ORSIS, 2010. Finalist—Nicholson Student paper competition, INFORMS, 2010.

45. A. Shwartz and A. Weiss, "Uniqueness of a variational problem, with applications to large deviations for buffer overflow," IEEE Trans. Auto. Control **55** pp. 425–430, Feb. 2010. CCIT Report 646, EE PUB 1603,.

46. Rami Atar, Yair Y. Shaki and Adam Shwartz, "A blind policy for equalizing cumulative idleness," CCIT Report 270, 2.2009. QUESTA **67** pp. 275–293, 2011.

47. Amarjit Budhiraja, Xin Liu and Adam Shwartz, "Action time sharing policies for ergodic control of Markov chains," SIAM J. Control Opt. **50** pp. 171-195, 2012. Preprint.

48. E. Altman, P. Nain, A. Shwartz and Y. Xu, "Predicting the impact of measures against P2P networks: trasient behavior and phase transition." IEEE/ACM Trans. on Networking **21** pp. 935–049, 2013. Preprint.

49. Rami Atar, Anindya Goswami and Adam Shwartz, "Risk-sensitive control for the parallel server model." SIAM J. Control Opt. **51** pp. 4363–4386, 2013. Preprint

50. Rami Atar, Anindya Goswami and Adam Shwartz, "On the risk-sensitive cost for a Markovian multiclass queue with priority." Electronic Communications in Probability **19** Article 11, 2014.

51. ALexander Zadorojniy, Adam Shwartz, Segev Wasserkrug, Sergey Zeltyn, "Operational optimization of wastewater treatment plants: a CMDP based decomposition approach," Annals of Operations Research pp. 1-18, 2016.

For other refereed papers see items 5,7 in Section B.

B. Books and chapters in books

1) Monograph

1. A. Shwartz and A. Weiss, *Large deviations for performance analysis: queues, communication and computing*, Chapman-Hall, 1995. Second printing: 1997.
This is a monograph containing previously unpublished results. These include Large Deviations for processes with discontinuous statistics, Large Deviations for a "finite levels" process, as well 5 chapters (over 160 pages) of new, unpublished material concerning various applications.

2) Edited volumes

2. Stochastic Analysis; Liber Amicorum for Moshe Zakai, Academic Press, 1991. Edited by Eddy Mayer-Wolf, Ely Merzbach and Adam Shwartz.

3. Handbook of Markov Decision Processes: Methods and Applications. Edited by Eugene A. Feinberg and Adam Shwartz. Kluwer, 2002.
This book contains refereed contributions from most of the leading experts on MDP's.

3) Chapters in books

4. A. Shwartz, "Discrete Time Markov Processes," in *The Control Handbook*, Edited by W.S. Levine, CRC Press, 1995.

5. A. Shwartz and A. M. Makowski, "The Poisson equation for countable Markov chains: probabilistic methods and interpretations," pp. 269–303 in *Handbook of Markov Decision Processes: Methods and Applications.*, A collection of refereed papers, Edited by Eugene A. Feinberg and Adam Shwartz, Kluwer, 2002.
This is a refereed research paper containing original material.

6. E. Feinberg and A. Shwartz, "Introduction," pp. 1–17 in *Handbook of Markov Decision Processes: Methods and Applications*, a collection of refereed papers, Edited by Eugene A. Feinberg and Adam Shwartz, Kluwer, 2002.
This is an introduction to the mathematical structure, as well as a brief survey of the state of the art in MDP's.

7. E. Feinberg and A. Shwartz, "Mixed criteria," pp. 209–230 in *Handbook of Markov Decision Processes: Methods and Applications.*, a collection of refereed papers, Edited by Eugene A. Feinberg and Adam Shwartz, Kluwer, 2002.
This is a refereed survey paper on Mixed criteria Markov Decision Processes.

C.1 Refereed conference papers

* denotes papers containing original material, not included in the papers listed in A. above.

1. H.J. Kushner and A. Shwartz, "Convergence of Stochastic Approximations with State Dependent Noise under Weak Conditions", Proc. 21st IEEE Conference on Decision and Control, vol.2, pp. 517-521, Orlando, Florida, December 1982.

2*. F. Baccelli, A. M. Makowski and A. Shwartz, "Simple computable bounds and approximations for the Fork-Join queue", EE pub. 527, Technion, 1985 and in *Computer Networking and Performance Evaluation*, pp. 437-450 (Proc. IFIP International Seminar, Tokyo, Japan September 1985), edited by T. Hasegawa, H. Takagi, Y. Takahashi, North-Holland 1986.

3*. A. M. Makowski and A. Shwartz, "Implementation issues for Markov decision Processes", workshop on Stochastic Differential Systems, Stochastic Control Theory and Applications, Institute of Mathematics and its applications, University of Minnesota June 1986 (invited paper), IMA volumes in Mathematics and its applications, volume 10, edited by W. Fleming and P.-L. Lions, Springer Verlag 1988, EE Pub. No. 607, Technion, November 1986.

4*. A. Shwartz, A. M. Makowski, "An optimal adaptive scheme for two competing queues with constraints", in *Analysis and Optimization of Systems*, pp. 515-532 (Proc. 7th International Conference, Antibes, France, June 1986), edited by A. Bensoussan, J. L. Lions, Lect. Notes Control and Info. Sci. no. 83, Springer Verlag 1986.

5*. A. Shwartz, "On convergence of the cost under adaptive policies," Proc. 25th IEEE Conference on Decision and Control, vol. 3 pp. 1931-1932, Athens, Greece, December 1986.

6*. T. Shukhman and A. Shwartz, "On random multiple access with unknown interference probabilities", Proc. 25th IEEE Conference on Decision and Control, Vol. 3 pp. 2090-2091, Athens, Greece, December 1986.

7. A. Shwartz and M. Sidi, "Erasure, capture and noise errors in controlled multiple access networks", Proc. 25th IEEE Conference on Decision and Control, vol. 2 pp. 1333-1334, Athens, Greece, December 1986 (Invited paper).

8*. D. -J. Ma, A. M. Makowski and A. Shwartz, "Estimation and optimal control for constrained Markov chains", EE Pub. 605, Technion, October 1986, Proc. 25th IEEE Conference on Decision and Control, vol. 2 pp. 994-999, Athens, Greece, December 1986 (Invited paper).

9*. D. -J. Ma, A. M. Makowski and A. Shwartz, "Stochastic Approximations for Constrained Markov Decision Processes", EE Pub. 625, May 1987, Proc. of the 1987 International Symposium on the Mathematical Theory of Networks and Systems, Phoenix, Arizona June 1987 (Invited paper). In *Analysis and Control of Nonlinear Systems*, pp. 45-50 Edited by C. I. Byrnes, C. F. Martin and R. E. Saeks, North Holland, Amsterdam 1988.

10. E. Altman and A. Shwartz, "Markov optimization problems: state-action frequencies revisited", 27th IEEE Conference on Decision and Control, Austin, Texas, Vol. 1 pp. 640–645, December 1988 (Invited paper).

11*. N. Shimkin and A. Shwartz, "Control of queues under partial information", 28th IEEE Conference on Decision and Control, Florida, December 1989 (Invited paper).

12. B. Lubachevsky, A. Shwartz and A. Weiss, "Rollback sometimes works … if filtered", Winter Simulation Conference, Washington DC, December 1989.

13. E. Feinberg and Adam Shwartz, "Weighted discounted dynamic programming," 30th IEEE Conference on Decision and Control, Breighton, England, Vol. 1 pp. 485–486, December 1991.

14. A.M. Makowski and Adam Shwartz, "Optimal index policies for Markov decision processes with a constraint," 30th IEEE Conference on Decision and Control, Breighton, England, Vol. 1 pp. 471–476, December 1991.

15. N. Shimkin and Adam Shwartz, "Guaranteed performance regions for Markov models," SRC 91-7, University of Maryland, 30th IEEE Conference on Decision and Control, Breighton, England, Vol. 1 pp. 459–464, December 1991.

16. Y. Carmon and A. Shwartz, "Eventually-stationary policies for Markov decision processes with non-constant discounting," ValueTools, Athens, October 2008.

17. E. Altman, P. Nain, A. Shwartz and Y.D. Xu, "Predicting the impact of measures against P2P networks on the trasient behaviors," Proc. INFOCOM 2011.

C.2 Other Conference papers

1. N. Shimkin and A. Shwartz, "Guaranteed performance regions for multi-user Markovian models," proceedings of workshop, University of Kansas, September 1991, In *Stochastic Theory—Adaptive Control,* Edited by T.E. Duncan and B. Pasik-Duncan, Lecture Notes in Control and Information Sciences 184, Springer Verlag, New York 1992.

2. A. Shwartz and R. Levi, "Throughput-Delay tradeoff with impatient arrivals," Proc. 23 Allerton Conference on Communications, Control and Computing, Illinois, 1994,

3. A. Shwartz, "Large Deviations for performance analysis," Proc. of The Lunteren Conference, Lunteren, Holland, January 1995, and CC PUB 126, Electrical Engineering, Technion, 1995.

4. E. Altman and A. Shwartz, "Optimal priority assignment with general constraints", Proceedings of the 24th Allerton Conf., Illinois, October 1986.

5. N. Berman and A. Shwartz, "Stochastic Approximations for Distributed Parameter Systems", Proc. 25th Allerton Conference on Communication, control and computing, Allerton House, University of Illinois at Urbana-Champaign, Illinois, October 1987.

6. B. Lubachevsky, A. Weiss and A. Shwartz, "Efficiency of a Rollback simulation algorithm", 1989 SIAM Annual Meeting, San Diego, California, July 1989.

7. E. Altman and A. Shwartz, "Adaptive Control of constrained Markov chains" 14th Symposium on Operations Research, Ulm, Germany, September 1989.

8. D. Levanony, A. Shwartz and O. Zeitouni, "Continuous time recursive identification", BILCON 1990, Turkey, in *Communication, Control and Signal Processing*, E. Erikan Ed., pp. 1725-1732, Elsevier 1990.

9. A. Shwartz and A. Weiss, "Bit dropping in ATM: a large deviations analysis," Proc. Workshop on ATM Traffic Management, Ecole Nationale Superieure des Telecommunications (ENST), Paris, France, December 1995, CC PUB 126, Electrical Engineering, Technion, November 1995.

D. Selected Reports

- Neil O'Connell and Adam Shwartz, "Tunneling from random walks to Markov chains," Report, BRIMS, HP-Labs, Bristol, March 1998.

- A. Shwartz and A. Weiss, "Multiple time scales in Markovian ATM models I. Formal calculations." CC PUB 267, pp. 1–50, Electrical Engineering, Technion, 1999.

- M. Jacobson, N. Shimkin and A. Shwartz, "Piecewise stationary Markov Decision Processes - I: Constant gain." CC PUB 296, pp. 1-29, Nov. 1999.

- M. Jacobson, N. Shimkin and A. Shwartz, "Piecewise stationary Markov Decision Processes - II: State-dependent gain." CC PUB 297, pp. 1-28, Nov. 1999.

- A. Ridder and A. Shwartz, "Large Deviations methods and the Join the Shortest Queue model." EE PUB 1467, CCIT PUB 516, Technion, FEb. 2005. An expanded version of the MMOR paper, 2005.

INTERNATIONAL CONFERENCES

* denotes conferences where attendence is limited, by personal invitation.

1. 21st IEEE Conference on Decision and Control, Orlando, Florida, December 1982; "Convergence of Stochastic Approximations with State Dependent Noise under Weak Conditions", with H. J. Kushner.

2. 7th International Conference on Analysis and Optimization of Systems, Antibes, France, June 1986; "An optimal adaptive scheme for two competing queues with constraints", with A. M. Makowski.

3. 24th Allerton Conference on Communication, control and computing, Allerton House, University of Illinois at Urbana-Champaign, Illinois, October 1986; "Optimal priority assignment with general constraints", with E. altman.

4. 25th IEEE Conference on Decision and Control, Athens, Greece, December 1986;
"On Convergence of the Cost Under Adaptive Policies".
"On Random Multiple Access with Unknown Interference Probabilities", with T. Shukhman.
"Erasure Capture and Noise Errors in Controlled Multiple Access Networks", with M. Sidi. "Estimation and Optimal Control for Constrained Markov Chains", with D. -J. Ma and A. M. Makowski.

5. First International Conference on Industrial and Applied Mathematics, Paris, July 1987; "Non Stationary Control Policies with Applications to Adaptive Control of Queues", with E. Altman.

6. International Conference on Modeling and Control of Queueing Networks, France 1987; "Non Stationary Policies for Markov Chains and Discrete Time Queues" (Invited paper).

7. 25th Allerton Conference on Communication, control and computing, Allerton House, University of Illinois at Urbana-Champaign, Illinois, October 1987; "Stochastic Approximations for Distributed Parameter Systems", with N. Berman.

8. EURO IX—TIMS XXVIII, Universite Paris IX—Dauphine, Paris, July 1988;
"Non stationary optimal policies for Markov chains and for queueing systems" (invited paper), with E. Altman.
"Time sharing policies for Markov decision problems", with E. Altman.

9. 27th IEEE Conference on Decision and Control, Austin, Texas, December 1988; "Markov optimization problems: state-action frequencies revisited", with E. Altman.

10. 14th Symposium on Operations Research, Ulm, Germany, September 1989;
"Adaptive Control of Stochastic Systems" (invited paper),
"Adaptive Control of constrained Markov chains", with E. Altman.

11. International Conference on Game Theory and Economics, SUNY at Stony Brook, July 1990;
"Approachability for irreducible stochastic games with vector payoffs", with N. Shimkin.

12. The Sixth Yale Conference on Adaptive Control, Yale, New Haven, August 1990; "Adaptive Control of Constrained Markov Chains", with E. Altman.

13. ORSA/TIMS Special Interest Conference on Applied Probability in the Engineering, Informational and Natural Sciences, Monterey, California January 1991; "Optimal scheduling under constraints".

14. * Stochastic Theory—Adaptive Control, workshop, University of Kansas, September 1991, "Guaranteed performance regions for Markov models," with N. Shimkin.

15. 30th IEEE Conference on Decision and Control, Brighton, England, December 1991.
"Weighted discounted dynamic programming," with E. Feinberg.
"Optimal index policies for Markov decision processes with a constraint," with A.M. Makowski.
"Guaranteed performance regions for Markov models," with N. Shimkin.

16. SIAM Conference on Control and its Applications, IMA, University of Minnesota, MN, September 1992, "Markov decision processes with weighted discounted rewards," with E. Feinberg.

17. Conference on Applied Probability—INRIA/ORSA/TIMS/SMAI, Paris, June 1993,
"Markov decision models with weighted discounted rewards," with E. Feinberg.
"Aloha, Aloha," with A. Weiss.
"Guaranteed performance regions for multi-user semi-Markov models," with R. Levi and N. Shimkin.

18. * Large Deviations—Stanford, August 5–6, 1993, "Aloha, Aloha," with A. Weiss.

19. ORSA/TIMS Conference, Boston, April 1994 (Applied Probability Cluster);
    "Bit Dropping in ATM via Large Deviations," with A. Weiss,
    "Large deviations for jump-Markov processes via time-change and contraction," with O. Zeitouni.
    "New policies for discounted Markov Decision processes under constraints," with E. Feinberg.

20. 23 Allerton Conference on Communications, Control and Computing, Illinois, September 1994,
    "Throughput-Delay tradeoff with impatient arrivals," with R. Levi.

21. * Applied Probability, Oberwolfach, December 1994, "New models and policies in discounted
    dynamic programming," with E. Feinberg (invited speaker).

22. * Stochastic Models, Leiden, Holland, December 1994, "Markovian Models: performance re-
    gions, approachability and stochastic games." (invited speaker).

23. Applied Probability Conference, Atlanta, Georgia, June 1995, "Throughput-Delay Tradeoff with
    Impatient Arrivals," with R. Levi.
    "Constrained Discounted and Weighted Discounted Markov Decision Processes," with E. Fein-
    berg.

24. * Workshop on Problems in the Theory and Application of Networks, Edinburgh, Scotland,
    August 1995, "Controlling ATM networks: A large deviations analysis," with A. Weiss. (invited
    speaker).

25. Workshop on ATM Traffic Management, Ecole Nationale Superieure des Telecommunications
    (ENST), Paris, France, December 1995, "Bit dropping in ATM: A large deviations analysis,"
    with A. Weiss.

26. * The Lunteren Conference, Lunteren, Holland, January 1996, "Large Deviations for Perfor-
    mance Analysis," invited minicourse: 3 two-hour lectures.

27. INFORMS Applied Probability section Conference, Boston, June 1997, "Models of packet trans-
    mission: asymptotic analysis," with A. Weiss.

28. * Stochastic modelling and analysis of communication networks Lund, Sweden, October 1-3,
    1998, "Sample path large deviations" (keynote lecture).

29. * Stochastic networks; large deviations, stability and fluid models, The Lorentz center, Leiden
    University, Holland, October 26-30, 1998, "Sample-path large deviations for some network mod-
    els" (invited speaker).

30. * Oberwolfach conference on Stochastic Networks, Oberwolfach, Germany, November 30-December
    6, 1998, "Large deviations for some two-queue models." (invited speaker).

31. Applied Probability conference, Ulm, Germany, July 26-28 1999. "Two time scale Markov deci-
    sion processes," with M. Jacobson and N. Shimkin.

32. * Modern Problems in Applied Probability, Sobolev Institute of Mathematics, Novosibirsk, Rus-
    sia, August 21-26, 2000 "Join the shortest queue: large deviations without principle," with A. Rid-
    der. (invited speaker).

33. * International workshop on stochastic optimization and adaptation, Cochin, Karela, India, December 19-22 2000, "Large deviations without principle: Join the shortest queue," with A. Ridder. (invited speaker).

34. Applied Probability conference, New York, New York, July 25–27, 2001. "Asymptotic risk sensitive exit time in controlled queueing networks via differential games," with R. Atar and P. Dupuis.

35. * Mathematics of Stochastic Networks, EURANDOM, Eindhoven, Holland, 29.10–2.11, 2001. "Asymptotic risk sensitive exit time in controlled queueing networks via differential games," with R. Atar and P. Dupuis. (invited speaker).

36. * Stocahstic networks, Stanford Univ., 26–29.6.02. "Asymptotic Exit in Queueing Networks: Optimal Risk Sensitive Control via Differential Games," with R. Atar and P. Dupuis.

37. * Modern problems in Applied Probability, Heriot-Watt Univ., Edinbourgh, 22–28.8.02. "Large Deviations with diminishing rates," with A. Weiss. (invited speaker). "Optimally controlled queueing networks in large deviations regime," with R. Atar and P. Dupuis.

38. * Applied Probability, Oberwolfach, December 2003, "Optimal stochastic control in the large deviations domain," with R. Atar, P. Dupuis and N. Shimkin.

39. 12th INFORMS/APS Conference, Beijing, China, June 23–25, 2004, "Optimal stochastic control in the large deviations domain," with R. Atar, P. Dupuis and N. Shimkin.

40. * Stochastic Systems, Leiden, Holland, March 16-19, 2005. "Large deviations methods: some applications," with A. Ridder (invited speaker).

41. Workshop on rare events and stochstic networks, Fields Institute, University of Ottawa, July 4–5, 2005. "Large Deviations with diminishing rates," with Alan Weiss.

42. 13th INFORMS/APS Conference, Ottawa, Canada, July 6–8, 2005. "Large deviations for systems with hysteresis: a polling example," with Maxim Ioresh.

43. Networks, queues, performance and stochastic modelling, Shefayim, Israel, May 17-19 2006. "Large deviations for polling systems," with Maxim Ioresh.

44. 14th INFORMS/APS Applied Probability Conference, Eindhoven, Holland, July 9–11, 2007. "Exact approximations for Markov Decision processes," with Arie Leizarowitz.

45. INFORMS Conference, Washington D.C., October 2008. "Eventually-stationary policies for Markov decision processes with non-constant discounting," with Y. Carmon.

46. ValueTools 2008, Athens, October 2008. "Eventually-stationary policies for Markov decision processes with non-constant discounting," with Y. Carmon.

47. 15th INFORMS Applied Probability Society Conference, Cornell, Ithaca, NY, July 2009. "Exact finite approximations of countable state MDPs," with Arie Leizarowitz.

48. 15th INFORMS Applied Probability Society Conference, Cornell, Ithaca, NY, July 2009. "Blind, fair allocation between large server pools," with Rami Atar and Yair Shaki.

49. Onesimo's Fest, San Luis Potosi, Mexico, March 2011. "Action time sharing policies for ergodic control of Markov chains," with Amarjit Budhiraja and Xen Liu.

50. INFORMS Applied Probability Society Conference, Stockholm, Sweden, July 2011. "Action time sharing policies for ergodic control of Markov chains," with Amarjit Budhiraja and Xen Liu.

51. Workshop on Optimization, Scheduling and Queues, Honouring Gideon Weiss, Haifa, June 6-9 2012. "Control of queueing networks in the large deviations limit." (Invited lecture).

52. International Workshop on Applied Probability (IWAP 2012), June 11-14 2012, Jerusalem. "Cesaro limits of actions and ergodic control of Markov chains." (Invited lecture).

53. Applied Probability Conference, San Jose, Costa Rica July 15-17 2013, "Asymptotics of epidemic-like models with applications to peer-to- peer networks."

54. German Probability and Statistics Days, March 4-7 2014, Ulm, Germany. "Peer-to-peer networks: asymptotics via branching, epidemics and fluid models." 3rd Rutgers Applied Probability Conference: stochastic models and algorithms for intelligent business systems, Piscataway, NJ, June 6-7, 2014, "Cesaro limits of actions and ergodic control of Markov chains," with Amarjit Budhiraja and Xen Liu.

Post-doctoral mentoring

Iddo Eliazar, 1997-8. currently with the Holon Institute of Technology.

Yair Shaki (jointly with Rami Atar), 2008-2010.

Silke Meiner, 2009.

Anindya Goswami (jointly with Rami Atar), 2010-2011.

GRADUATE STUDENTS

Ph. D.
Eitan Altman: "Controlled Markov chains under constraints"; Ph. D., June 1990. Currently Director of Research, INRIA, Sophia Antipolis and Invited Professor at the University of Avignon, Agroparc campus.

Nahum Shimkin: "Stochastic Control of Distributed Systems"; Ph. D., April 1992. Currently Professor and Chair, Electrical Engineering, Technion.

David Levanony: "Recursive methods for identification in continuous-time stochastic Processes"; Ph. D., May 1992. Co-advisor: Prof. O. Zeitouni. Currently Senior Lecturer, Electrical and Computer Engineering, Ben Gurion University.

Gady Zalman: (temporary: permanent advisor: Ofer Zeitouni), June 1994–February 1995.

Rami Atar: (temporary: permanent advisor: Ofer Zeitouni. Substitute advisor: Prof. Zakai), December 1994–5 Currently Professor, Electrical Engineering, Technion.

Silke Meiner: "Large Deviations of Generalised Jackson Networks," Ph.D. Magna Cum Laude, Mathematics, Berlin Institute of Technology, 9.2008. Principal Advisor: Prof. J. D. Deuschel.

_M.Sc._

Avital Wierzba: "Estimation of Random Telegraph signal from its noisy integral" (principal advisor: Prof. M. Zakai), August 1986. Ph.D., Weizman institute. Currently holding a senior position at Elta.

Michael Nehorai: "Recursive estimation in Semi-Markov models," June 1990.

Rachel Levi: "A theory of approachability and throughput-delay tradeoff in a queue with impatient customers," June 1994.

Ofir Sahar: (temporary: permanent advisor: Ofer Zeitouni), June 1994–1995.

Mathew Jacobson: "Two time scale Markov Decision processes." M.Sc., October 1994–February 1999. (Co-advisor, together with Nahum Shimkin.) Ph.D. Electrical Engineering, University of Michigan, 2006, now in the Biotechnology industry.

Remi Menneson: (additional advisor: Prof. Moshe Sidi. Previous advisor: Prof. Ofer Zeitouni), November 1997-

Alexander Zadorojniy: "Constrained Markov decision processes with applications to wireless communications". 2003–June 2004. A Ph.D. student, Electrical Engineering, Tel Aviv University.

Maxim Ioresh: "Large deviations for a polling system with exhaustive service." October 2003–September 2005. Currently at Intel.

Michal Asory-Cohen: "Optimal Control of queues in the Moderate deviations regime." 2013-March 2016.

National Activities

Member, ISF grant committee for Electrical Engineering, 1997/8

Chairman, ISF grant committee for Electrical Engineering (date witheld).

Technion major activities

Assistant to the EE dean for undergraduate studies 1994–1996.
Chair, committee on "Computer for every student," (appointed by the senior vice president), May–July 1995.
Chair, committee on "Infrastructure for computer-assisted learning," (appointed by the senior vice president), September 1995–March 1996.
Ad-hoc committee on basic courses, November 1997–July 1998.
Senate committee for undergraduate and graduate studies, January 1998–December 2000.
November 1998–September 2000: Assistant (for "computerization") to the Vice Provost for Undergraduate Studies.
Chair, Technion Internet Site committee, November 1998–November 2000.
August 1999–2000 Presidents committee on advanced technologies for teaching and distance learning.

October 2000–June 2002: vice dean of undergraduate studies, for information technologies.

November 2000–2009: In charge of the Technion New Information Systems project—Matmon (deciding, choosing and implementing a Technion ERP system).

January 2002–2009: vice "Manmap" (vice president for administration and finance) for information systems (Since October 2005: deputy vice president for Information Systems.)

In charge of the Matmon (Technion ERP) project, in charge of the Information Systems department at the Technion. November 2002–2004 Steering Committee for the Technion New Information Systems.

2009–2011: co-founder and co-chair—Technion Computer Engineering Center.

2009–2013: Dean, Faculty and Electrical Engineering, Technion.

2011–2012: Technion ad-hoc committee - Technion-Cornell NYC initiative.

2011–present: Steering committee, MORTech - Israel Teachers Center for Technology and Science disciplines.

2011–2012: Steering committee, The 4th Israel conference on communication of science.

2012–2013: Member, Board of Directors - Jacobs Technion-Cornell Innovation Institute.

2013–2015: Member, Advisory Board, Intel CRI-CI (Intel-Technion-Hebrew U. research center).

2014-2016: Director - Jacobs Technion-Cornell Institute.

2017–2019: Chair, Board of Directors, Jacobs Technion-Cornell Institute.

2016–2019: Senior Executive Vice President, Technion. Ex-Officio member of the board of Madatech, Neeman Institute.

2018–2019 Chair, Rector forum, VERA (Israel Association of Heads of Universities). Member of the board, Inter-University Computation Center (MACHBA).

2019– : member, Board of Directors, Jacobs Technion-Cornell Institute.

EXTERNAL GRANTS

United-States Israel Binational Science Foundation grant no. 85-00306, with Prof. A. M. Makowski: "Adaptive Control of Markov Chains: Explicit Strategies and Approximations".
September 1 1986—August 30 1989

Israeli Science Foundation grant no. 295-94-1 "Stochastic Control of Markov Systems with Multiple Discounts."
October 1994—September 1996.

United-States Israel Binational Science Foundation grant, with Dr. Rami Atar, Dr. Alan Weiss and Prof. Paul Dupuis, "Performance and control of stochastic networks: asymptotic methods."
October 2000—September 2004.

INTAS Project 265: "Mathematics of stochastic networks," funded by the European community. A joint project between teams from several countries including Western and Eastern Europe, and Israel. Israeli team includes Offer Kella and Adam Shwartz. 2001–2003. Project budget - 90000 EU.

United-States Israel Binational Science Foundation grant , with Prof. Rami Atar and Prof. Amarjit Budhiraja, "Blind control of stochastic networks and heavy traffic."
September 2009—August 2013.