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Curriculum Vitae

AVISHAI (AVI) MANDELBAUM

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Personal

I.D. No.: 050508324
Born on January 14, 1951 in Tel-Aviv, Israel.
Married to Dorit Mandelbaum, with three children: Orr, Gil, and Ron; and one grandson: Daniel.

Academic Degrees

B.Sc.	-	Mathematics and Computer Science (summa cum laude, GPA 96.13/100), Tel-Aviv University, 1974.
M.A.	-	Statistics (summa cum laude, GPA 98.58/100), Tel-Aviv University, 1977.
M.Sc.	-	Operations Research, Cornell University, 1981.
Ph.D.	-	Major in Probability and Statistics; Minors in Operations Research and Mathematics, Cornell University, 1983.

Academic Appointments

10/2019–	:	Professor Emeritus (compulsory in Israel, at the age of 68)
9/2011, 2/2012, 1–7/2013	:	Stern School, New York University, New York, Senior Research Scholar
1–5/2013	:	Wharton School, University of Pennsylvania, Philadelphia, Senior Research Scholar
8–12/2012	:	SAMSI NSF and STOR UNC (Statistics and Operations Research), University of North Carolina at Chapel Hill, Senior Research Scholar
2008–2011	:	Director of the Technion OCR program (Open Collaboration Research with IBM Haifa Research Lab and the Rambam Hospital)

2007–	:	Academic Director of the SEE (Service Enterprise Engineering) Laboratory, IE&M, Technion
1999–	:	The Benjamin and Florence Free Chair in Industrial Engineering and Management, Faculty of Industrial Engineering and Management, Technion—Israel Institute of Technology
1995–	:	Professor, IE&M, Technion
1988–1994	:	Associate Professor, IE&M, Technion
1987–1991	:	Associate Professor of Decision Sciences, The Graduate School of Business, Stanford University
1987–1988	:	Senior Lecturer, IE&M, Technion
1983–1986	:	Assistant Professor, The Graduate School of Business, Stanford University
1975–1978	:	System Programmer (Tenured), Tel-Aviv University Computation Center
1973–1974	:	Programming Consultant, Tel-Aviv University Computation Center

Teaching

General: Probability, Stochastic Processes, Operations Research, Operations Management, Service Engineering and Management, Healthcare Operations, Statistics, Control;

Undergraduate: Probability, Stochastic Processes, Statistics, Service Operations, Queueing Theory and Practice; Service Engineering and Management;

PhD: Probability and Stochastic Processes - foundations, modelling, stochastic calculus; Dynamic Programming, Stochastic Control; Queueing, Fluid and Diffusion Networks; Linear Complementarity; Service Networks;

MBA: MIS/DSS, Computer Implementations of Mathematical Models, Linear and Integer Programming, Simulation, Production and Operations Management - cases and theory.

Service Engineering: Developed and taught a unique course to a wide audience (undergraduates, graduates), applying up-to-date research tools and real-world data.
Course material available in http://ie.technion.ac.il/serveng.
Course description: (pdf)

TAU course: "Introduction to Data-Driven Service Networks"; invited to teach this course within the Israeli Statistics National Program, 1st semester, 2018–2019. (pdf)

Research Interests

Stochastic Networks: Fluid, Diffusion and Strong Approximations; Time and State-dependent Models; Stability, Harris Recurrence and Ergodicity; Service Engineering, Manufacturing, Project-management and Product-development Networks.

Probability and Stochastic Processes: Multi-parameter Processes; Diffusion Processes,

Stochastic Calculus; Weak Convergence.

Statistics: Symmetric Statistics; Statistical Decision Theory; Survival Analysis; Inference for Stochastic Processes, and specifically Stochastic Networks; Data Analysis of Large Service Systems.

Mathematical Programming: Complementarity Theory, Linear Models.

Control Theory: Multiarmed Bandits; Optimal Stopping; Control of Queueing Systems.

Service Systems, in particular Tele-Services: Modeling, Design, Management, Measurements, Inference; Call/Contact Centers; Hospitals and Healthcare in general.

Honors

Lifetime-Achievement Award, ORSIS (OR Society of Israel), 2024.

MSOM Distinguished Fellow, 2019.

Master Forum, The Chinese University of Hong Kong, Shenzhen, May 2019: "Theompirical" Research of Service Systems (A Case Study of Hospitals and Call Centers)

2018 MSOM Service Management SIG Best Paper Award: "Control of Patient Flow in Emergency Departments, or Multiclass Queues with Deadlines and Feedback," with Junfei Huang and Boaz Carmeli, *Operations Research*, 2015.

2014 Naor Memorial Lecture, Plenary, ORSIS (OR Society of Israel).

2014 Uri Rothblum prize for best publication, ORSIS (OR Society of Israel): "Excursion-Based Universal Approximations for the Erlang-A Queue in Steady-State," with Itay Gurvich and Junfei Huang, *Operations Research*, 2014.

Eindhoven Data Science Center, Opening Ceremony, Keynote lecture December 2, 2013.

Kellogg's Operations Conference, Plenary tutorial, Chicago, September 2012.

INFORMS Beijing, Plenary lecture, June 2012.

MOSTLY Beijing, Plenary tutorial, June 2012.

INFORMS Fellow, 2011.

Yanai Award for Excellence in Academic Education (inaugural), Technion, 2011.

Taub Prize for Academic Excellence, Technion, 2011.

SENG Distinguished Visiting Fellow, Hong Kong University of Science and Technology (HKUST), 2011.

ISyE Distinguished Lecturer, Georgia Tech, 2011.

LOIS Lecture, University of Eindhoven, 2010.

Technion Excellence in Teaching, 2009.

Inaugural Service Research Innovation Award for the best collaborative practice between

industry, academia and government, Santa Clara, 2009: Director of project (jointly with IBM Research Israel, Rambam Hospital Haifa, Technion IE&M).

Best publication prize, ORSIS (OR Society of Israel) 2009 (with Sergey Zeltyn)

Inaugural Markov Lecture in Applied Probability, Plenary Lecture: "QED Q's", INFORMS 2005, San Francisco.

Meir Rosenblatt Prize for Teaching, IE&M, Technion, 2004.

Mitchner Prize for Quality Sciences and Quality Management, Technion, 2003.

Yosef Levy Prize, ORSIS (OR Society of Israel) 2001 (with Sem Borst and Martin I. Reiman), to promote scientific work in the fields of Operations Research and Managerial Economics: "Dimensioning Large Call Centers", Operations Research, 52(1), pp. 17-34, 2004.

Senior Fellow of the Wharton Financial Institutions Center (Call Centers Forum), 2000–.

Technion Excellence in Teaching, 2000, for the course "Service Engineering".

Technion Salomon Simon Mani Award for Excellence in Teaching, 1999.

Marcel F. Neuts Best Paper Award, 1998: "Fluid and Diffusion Limits for Queues in Slowly Changing Random Environments," Stochastic Models, 1998. (with Gagan L. Choudhury, Martin I. Reiman and Ward Whitt), 1998.

Japan Society for the Promotion of Science (JSPS): Visiting Fellowship, July 1995.

Fellow of the Stanford Business School Trust Fund, 1989–1990.

Fellow of the Bat-Sheva de Rothchild Foundation, 1987–1988.

Alon Israeli Young Scientist, 1987–1990.

Milton and Lilian Edwards Technion Academic Lectureship, 1987–1988.

Cornell University Fellowships: First Year Graduate Fellowship, 1978–1979; Allen Seymour Olmstead Fellowship, 1979–1980; Sage Graduate Fellowship, 1980–1982.

Tel-Aviv University Graduate Scholarships, 1976–1977.

Grants

The Israel Science Foundation (ISF): "Planning and Scheduling Appointments to Large-Scale Service-Systems: Starting with Many Homogeneous Resources that are Quality & Efficiency Driven (QED), and then some", 4-year grant, 1/10/2022–30/9/2026, $60,000 per year.

The Israel Science Foundation (ISF): "Appointment-Driven Research Networks (ARNets): Data-Based Modeling, Analysis and Design, with Applications to Healthcare and Judicial Services", 4-year grant, 2018–2021, $50,000 per year.

The Binational Science Foundation (BSF): "Data-Based Models of Resource-Driven Activity Networks", jointly with M. Armony (NYU) and P. Momčilović (University of

Florida), 4-year grant, 2016–2019, $22,000 per year.

The Israel Science Foundation (ISF): "Announcing Delays in Queueing Networks, for example Hospitals: Theory, Impact, and Applications", 3-year grant, jointly with G. Yom-Tov, 2016–2018, about $40,000 per year.

Dana Farber Cancer Institute, Boston, USA: $30,000 for 2015, $35,000 for 2016, to support joint data-based research.

SEE (Service Enterprise Engineering) Center: Continuing donation by Harold & Inge Marcus, $145,000, 2011–2012; $200,000, 2014–2015; Technion President Fund, $60,000, 2016.

The Gordon Center for Systems Engineering: "Development of a Data-Based System for Simulating Call Centers, with Further Applications to Emergency Departments", $21,000, 2009–10.

The Israel Science Foundation (ISF): "Data-Based Analysis of Queueing Systems in the Halfin-Whitt (QED) Regime", 4-year grant, 2008–2012, over 200,000 IS per year.

IBM OCR (Open Collaborative Research) grant: with D. Gopher and A. Shtub, jointly with IBM Research (Oded Cohen) and Rambam Hospital (Rafi Beyar), 2008–2010, $200,000; 2010, $50,000; grant director 2009–11.

The Binational Science Foundation (BSF): "Analysis and Control of Many-Server Queueing Systems", jointly with M. Armory (NYU), L. Brown (Wharton), H. Kaspi (Technion), K. Ramanan (Carnegie Mellon), N. Shimkin (Technion) and W. Whitt (Columbia), 4-year grant 2007–2010, approximately $22,000 per year.

SEE (Service Enterprise Engineering) Center: $1 million donation to IE&M, Technion (by Harold & Inge Marcus), 2007–2010, Founding Director.

IBM Faculty Fellow: "Data-Repository for Call/Contact Centers", jointly with Paul Feigin, 2006, 70,000 IS; extended 2007, 45,000 IS.

The Israel Science Foundation (ISF): "Statistical Models for Customer Behavior in Tele-Services: Telephone Call Centers and Contact Centers", Cooperating Investigator to P. Feigin (PI); 3-year grant 2004–2007, approximately 120,000 IS per year.

The Binational Science Foundation (BSF): "Large-Scale Tele-Queues", jointly with N. Shimkin (Technion), M. Armory (NYU), L. Brown (Wharton) and W. Whitt (Columbia), 4-year grant 2003–2006, approximately $22,000 per year.

The National Science Foundation (NSF), U.S.A.: "Telephone Call Centers—Performance, Design and Control of Time-Varying Queues", a consultant for a funded proposal by W.A. Massey, Department of Operations Research and Financial Engineering, Princeton University, 2002–2004, $300,000.

The Israel Science Foundation (ISF): "Control of Many-Server Queues in Heavy Traffic", jointly with Rami Atar, Technion EE; 4-year grant 2003–2006; average yearly budget $60,000.

Lower Saxony Ministry of Education and Science: "Service Engineering and Management

of Call/Contact Centers", jointly with Stefan Helber, Technical University of Clausthal, Germany; 1-year grant, 2003, 100,000 Euros.

The National Science Foundation (NSF), U.S.A.: "Service Engineering of Human Tele-Queues: Empirically-Based Stochastic Analysis of Telephone Call Centers", a consultant for a funded proposal by L. Brown, N. Gans and L. Zhao, the Wharton Business School, NSF Initiative on Engineering the Service Enterprise, 2002–2003, $150,000.

The Davidson Applied Research Fund: "Exploring Queueing Systems with Impatient Customers: Empirically-Based Analysis of Telephone Call Centers", jointly with S. Zeltyn, April 2002, $6,000.

Technion Research Grant, $20,000 to support "Data Analysis of Contact Centers", 2000–2001.

The Israel Science Foundation (ISF): "Tele-Services: Performance Analysis of Stochastic Service Networks with Rational Customers", jointly with Nahum Shimkin, Technion EE; 3-year grant 1999–2002; average yearly budget 195,000 IS.

Technion Research Grants, 1987–1989, 1992– , Principal Investigator.

Stanford Institute for Manufacturing and Automation (SIMA), Grant 1ACC638, Stanford University, 1989–1991: "From Project to Process Management: Empirically-Based Models of Engineering Product Development". Principal Investigator, jointly with Paul Adler - Stanford IE. Participating: Vien Nguyen - MIT Sloan and Liz Schwerer - Stanford (GSB).

Postdoctoral Fellow, National Science Foundation (NSF), Grant ECS-8603857, Stanford University, 1986–1987: "Stochastic Networks." Principal Investigator: J.M. Harrison.

Semi-Conductor Research Corporation (SRC), Contract 83-01-046, Stanford University, 1986–1987: "Computer-Integrated Manufacturing Science for Ultra Large Scale Integration Systems (Factory Modelling Project)." Principal Investigator: J.D. Meindle; Project Leader: J.M. Harrison.

Editorial and Professional Activities

Operations Research (OR): Co-Editor of OR's Special Issue on "Behavioral Queueing Science," jointly with Armann Ingolfsson, Kenneth Schultz and Galit Yom-Tov; *Operations Research*, **71** (3), May-June 2023.

Israel Council for Higher Education—Advisory Committee on Data Science, 2018–2019.

INFORMS von Neumann Theory Prize, 2015–2017; heading the committee in 2017.

Organizer of the HKUST-Technion 2nd Workshop, jointly with Ron Lavie, Technion, September 2016.

Organizer of the HKUST-Technion 1st Workshop, Technion, May 2014.

Program Leader, SAMSI 2012–13 Program on Data-Driven Decisions in Healthcare; NSF, Duke, NCSU, UNC, NISS.

Co-leader of a SAMSI Working Group on "Data-based Research on Patient Flow", Fall 2012.

Advisor to Israeli Council for Higher Education (Malag), 2012.

ISF Panel Reviews, 2011.

APS 2011, Stockholm, Sweden, Program Committee, Invited Tutorial.

OCR Technion Director, 2008–2011.

ORSIS (OR Society of Israel) Mehrez Prize Committee, 2010.

MSOM Conference, Technion: Organized 2 sessions (6 lectures), SEE-sponsored, on Empirically-based Research in Call-Centers and Hospitals, June 2010.

BSF Panel Reviews, 2009.

INFORMS Lancaster Prize Committee, 2006–2008.

Gruenblat Prize coordinator, Technion IE&M, 2005–2014.

Associate Editor, *Queueing Systems: Theory and Applications (QUESTA)*, 1994–2008.

Associate Editor, *Management Science*, 1997–2008.

Senior Associate Editor, *Manufacturing and Service Operations Management (M&SOM)*, 2003–2006.

Associate Editor, *Mathematics of Operations Research (MOR)*, 1990–1999.

INFORMS Lanchester Prize Committee, 2006–2008.

APS (Applied Probability Society) Awards Committee, 2006–2008 (Chair, 2007).

International Advisory Committee: The 2005 IEEE International Conference on Service Operations, Logistics and Informatics, Beijing, August 2005.

Program Committee: 13th INFORMS Applied Probability Conference, Ottawa, July 2005.

Organizing Committee: Call Center Workshop, CRM (Center for Mathematical Research), Montreal, July 2004.

Program Committee: 12th INFORMS Applied Probability Conference, Beijing, June 2003.

Yosef Levy ORSIS (OR Society of Israel) Prize Committee, 2003.

Program Committee: The 14th International Symposium on Transportation and Traffic Theory, Jerusalem, 1998.

Program Committee: The Eleventh International Conference of the Israel Society for Quality, Jerusalem, November 1996.

Session Organization: Stochastic Networks, 3rd World Congress of the Bernoulli Society

and 57th Annual Meeting of the IMS, June 1994.

Program Committee: INRIA/ORSA/TIMS/SMAI Conference on Applied Probability, Paris, June 1993.

Session Organization: Bandit Processes, INRIA/ORSA/TIMS/SMAI Conference on Applied Probability, Paris, June 1993.

Session Organization: Hierarchical Modelling of Queueing Networks, ORSA/TIMS Conference, Philadelphia, October 1990.

On organization, advisory and prize committees of various conferences.

Reviewer for the Annals Prob., Annals Stat., Math. OR, Mgt. Science, SIAM J. on Control and Optimization, J. of Multivariate Anal., JASA, NSF (Probability, Statistics, Operations Research and Production Systems), and more.

Administration

Technion Research Committee, 2017–2019

Israeli Council for Higher Education/Budget Committee: Advisory Committee on Data Science, 2018–2019

Dean, Faculty of Industrial Engineering and Management, October 2014–December 2017.

Faculty advisor to outstanding students, 1995–2015.

Faculty advisor to foreign students, 2008–2013.

Technion representative in European IE-Cluster meeting, Lisbon, Portugal, May 2009.

SEE (Service Enterprise Engineering) Laboratory, Director, 2007–.

Faculty Undergraduate-Studies Committee IE&M, 2005–2014.

Faculty Development Committee, 2004–2005, 2009–2010.

Area Head, Statistics, 2003–2004, 2008–2014.

Faculty committee for graduate teaching, 2003–2004.

Technion Academic Development Committee, 2000–2002.

Faculty committee for relations with industry, 1995–2000.

Technion Representative to Mil (Israel Center for Management), 1996–2006.

Associate Dean for Research, Faculty of Industrial Engineering, Technion, 1997–2000.

Davidson School steering committee, 1996–1998.

Technion Prize Committee, 1996–1997.

MBA committee, 1995–1997.

Israeli Council for Higher Education: Subcommittee for Evaluating the academic program on Hotel Management and Tourism, at Beer Sheba University, 1994–1997.

Head of Graduate Studies, Faculty of Industrial Engineering, Technion, 1992–1994.

Area Head, Operations Research, 1991–1992.

Consulting Activities

Israeli Health Ministry, 2018– .

Genesys: Consulting and Teaching, 2005–2006.

IBM Research, Consulting, 2004, 2006–.

Foreign Expert on Service Engineering, The IAO Fraunhofer Institute, Stuttgart, Germany, 2000–2003.

Senior Research Associate, Wharton's Call Center Forum, within the Financial Institutions Center, 1999–.

Regular Visiting Scholar and Consultant, Bell Laboratories, Math. Research Center at Murray Hill, USA, 1990–2003.

Projects for and workshops with numerous service organizations, in the public and private sector, including government ministries, local municipalities, national corporations, banks, hospitals and more.

Research advisor for corporations, consulting firms, etc.

Conferences and Lectures

IMS Western Regional Meeting, California Polytechnic State University, San Luis Obispo, CA, June 1985: "Multi-armed Bandits", invited lecture.

ASA-ENAR-WNAR-IMS Joint Statistical Meeting, Las Vegas, August 1985: "Multi-armed Bandits and Multi-parameter Processes", invited IMS lecture.

Workshop on Stochastic Differential Systems, Stochastic Control Applications, The Institute for Mathematics and its Applications, University of Minnesota, June 1986: "Navigating and Stopping Multi-parameter Bandit Processes", **invited resident and speaker**.

Fourth International Symposium on Statistical Decision Theory, Purdue University, June 1986, session-chair invitation.

The 16th Conference on Stochastic Processes and their Applications, Stanford University, Stanford, CA, August 1987: "Stochastic Flow Networks", invited speaker.

The Israeli International Conference of Mathematics, Tel-Aviv University, Israel, March 1988: "Some Solvable Two Dimensional Brownian Control Problems", invited speaker.

The Israeli International Conference of Operations Research, Tel-Aviv University, Israel,

May 1988: "Approximations of Queueing Networks", invited speaker.

The Technion International Conference on Matrices, Haifa, Israel, January 1989: "Dynamic Complementarity Problems", invited speaker.

Workshop on Applied Stochastic Systems, Imperial College, London, April 1989: "Stochastic Leontief Systems", invited speaker.

The Israeli International Conference of Operations Research, Beer-Sheva University, Israel, June 1989: "Stochastic Networks and Linear Complementarity", invited speaker.

IMS-AMS-SIAM Summer Conference on Sequential Search and Selection in Real Time, Amherst, Massachusetts, June 1990: "Bandit Processes", invited speaker.

ORSA/TIMS Conference, Philadelphia, October 1990: invited to organize a session on "Hierarchical Modeling of Queueing Networks"; speaker on "Micro, Meso and Macro Models of Queueing Networks".

ORSA/TIMS Conference, Philadelphia, October 1990: "The Dynamic Complementarity Problem", invited speaker.

ORSA/TIMS Western Regional Conference, Monterey, California, December 1990: "Hierarchical Modeling of Stochastic Networks", invited speaker.

Summer School on Scheduling Theory and its Applications, Chateau de Bonas, France, September 1992: "Bandit Processes", invited speaker.

2nd IMS International Symposium on Probability and its Applications, Bloomington, Indiana, March, 1993: "Weak Convergence of Queueing Networks", invited speaker.

INRIA/ORSA/TIMS/SMAI Conference on Applied Probability, Paris, June 1993: invited to organize a session on "Multiarmed Bandits"; speaker on "Bandit Processes".

Workshop on Applied Probability, Cornell University, Ithaca N.Y., June 1993, in honor of N.U. Prabhu: "Stochastic Networks", **plenary speaker**.

IMA Program for 1993–1994 in Emerging Applications of Probability, Minnesota, February–March, 1994: "Service Networks (Dynamic, Stochastic)", **invited resident and speaker**.

Meeting in honor of E. Dynkin, May 1994, Cornell University, Ithaca, N.Y., "Brownian Bandits", invited speaker.

3rd World Congress of the Bernoulli Society and 57th Annual Meeting of the Institute of Mathematical Statistics, June 1994, The University of North Carolina, Chapel Hill: invited to organize a session on "Stochastic Networks"; speaker on "Hierarchical Modelling".

TIMS XXXIII Conference, Singapore, June 1995: Tutorial on "Service Networks: Modelling, Analysis and Inference".

Numazu International Workshop on Applied Probability, Numazu, Japan, July 1995: invited as a "**Major foreign guest**"; speaker on "State and Time-Dependent Queueing Networks".

Kanagawa University, Japan, July 1995: Tutorials on "Approximations of Queueing Networks and Stochastic Control", **JSPS Fellow**.

Osaka University, Japan, July 1995: "Brownian Mice, Levy Bandits, Ito Excursions, Random Fields and even more...", invited speaker.

Tokyo Institute of Technology, Japan, July 1995: "Queueing-prone Service Operations", invited to **address the Queueing Society of Japan**.

Höllviken, Sweden, May 1997: "Service Measurement and Engineering", Workshop on Telecommunications: Statistical Analysis and Performance Evaluation, ITM (Swedish Institute of Applied Math), invited speaker.

Lunteren, The Netherlands, January 1999: "Service Engineering: Modelling, Analysis and Inference of Stochastic Service Networks", 24th Conference on the Mathematics of Operations Research, organized by CWI and LMMB (Dutch Network on Math. OR), **invited as a "main speaker", delivered a mini-course** (4 lectures).

INSEAD, France, May 1999: "Service Engineering and Management", Ph.D. mini-course.

Stuttgart, Germany, July 1999: "Service Engineering", invited talk at the IAO, Fraunhofer Institute.

10th INFORMS Applied Probability Conference, Ulm, Germany, July 1999: "Designing a Call Center with Impatient Customers", invited talk within a session on Call Centers, organized by W. Massey.

The Wharton School, University of Pennsylvania, U.S.A., February 2000: "Service Engineering and Management", Ph.D. mini-course (Including a Statistics Seminar).

The Graduate School of Business, Stanford University, U.S.A., May 2000: "Service Engineering and Management", Ph.D. mini-course (Including OIT Seminar).

The Wharton School, University of Pennsylvania, U.S.A., June 2000: "Service Engineering of Call Centers", **Plenary speaker at The Call Center Forum**, Financial Institutions Center.

Milano, Italy, November 2000: "Service Engineering of Call Centers", invited talk at the Mediolanum Bank.

Karlsruhe, Germany, November 2000: "Service Engineering—A Subjective Survey", **plenary talk at the Conference "Service Engineering 2000"**, organized by WBK (Lehrstuhl und Institut für Werkzeugmaschinen und Betriebstechnik) of the University of Karlsruhe, jointly with IAO Fraunhofer and VDLI.

Zichron Yaakov, May 2001: "OR Applications in Services", **plenary speaker at the ORSIS Conference** (OR Society of Israel).

Zichron Yaakov, May 2001: "Dimensioning Large Call Centers", **Yosef Levy Biannual ORSIS Prize lecture, ORSIS Conference (OR Society of Israel)**.

Munich, Germany, May 2001: "Service Engineering", invited talk at Siemens Research Headquarters.

The Wharton School, University of Pennsylvania, USA, May 2001: "Staffing Large Call Centers", invited speaker at The Call Center Forum, Financial Institution Center.

CWI and The Free University, The Netherlands, June 2001: "Staffing Large Queueing Systems for both Service Quality and Efficiency", invited to the Dutch Yearly Queueing Colloquium.

The Wharton School, University of Pennsylvania, U.S.A., April 2002: "Service Engineering and Management", Ph.D. mini-course (Including a Statistics Seminar).

Columbia Business School, U.S.A., April 2002: "Service Engineering and Management", Ph.D. mini-course (Including a Business School Seminar). (Mini-Course)

The Wharton School, University of Pennsylvania, USA, May 2002: "A Personal Tool for Workforce Management", invited speaker at The Call Center Forum, Financial Institution Center. (pdf)

Madrid, Spain, July 2002: "Call Centers: Queueing Theory, Science, and Practice", invited talk, First Madrid Conference on Queueing Theory (MCQT '02).

IBM, T.J. Wharton Research Center, U.S.A., August 2002: "Service Engineering of Call/Contact Centers", invited lecture.

Stuttgart, Germany, November 2002: "Telephone Services: Science, Engineering, Management and Teaching", invited speaker at the First International Symposium on Service Engineering and Management. (pdf)

Istanbul, Turkey, December 2002: "Service Engineering of Call Centers", invited to Koç University.

The Wharton School, University of Pennsylvania, USA, May 2003: "Skills-Based Routing and its Operational Complexities", invited speaker at The Call Center Forum, Financial Institution Center. (pdf - Short Lecture delivered). (pdf - Full version)

Eurandom, The Netherlands, September 2003: "QED Q's", **plenary seminar**.

CRM (Center for Mathematical Research), Montreal, Canada, July 2004: "QED Q's", invited speaker at the Stochastic Networks Conference, jointly with a Call-Center Workshop. (pdf)

Tilburg University, The Netherlands, September 2004: "Service Engineering of Call/Contact Centers", **semi-plenary speaker** at the Annual International Conference of the German Operations Research Society (GOR), jointly organized with The Netherlands Society for Operations Research (NGB).

San Francisco, U.S.A., November 2005, INFORMS: **"QED Q's", invited to give the Inaugural Markov Lecture of the Applied Probability Society (APS)**. (pdf - Lecture) (pdf - Printout) (pdf - APS link)

Genesys Headquarters, Daly City, California, USA, November 2005: "State-of-the-Art Research of Call/Contact Centers", invited to deliver two lectures and supervise a workshop.

Shfayim, Israel, May 2006: "QED Q's", invited speaker to Uri Yechiali's Retirement Workshop.

IBM Research, Haifa, Israel, May 2006: "Service-Engineering of Call Centers", invited speaker to IBM Business Optimization & Operations Research Workshop.

The Wharton School, University of Pennsylvania, USA, September 2006: "Service Engineering & Science: Data-Based Research, Teaching, Practice", invited speaker and panelist at the Empirical OM Conference. Lecture: (pdf - Lecture) (pdf - Printout)

IBM SSME Conference (Service Sciences, Management, Engineering), Palisade, NY, USA, October 2006: "Service Engineering & Science: Simple Models at the Service of Complex Realities", invited speaker (with Sergey Zeltyn).
(pdf)

Graduate School of Business, Stanford University, USA, October 2006: "Service Engineering: Data-Based Research and Teaching in Support of Service Management", Ph.D. mini-course (Including OIT Seminar). (pdf - Lecture) (pdf - Printout)

Technion Statistics Seminar, November 2006: "Service Engineering: Data-Based Science and Teaching in Support of Service Management".

Technion Operations Research Seminar, January 2007: "Empirically-Based Staffing in Call Centers: Simple Models at the Service of Complex Realities".

Shfayim, Israel, May 2007: "Service Engineering", invited workshop of the ISA Conference (Israeli Statistical Association).

Technion-Penn State joint workshop on Service Engineering, Technion, June 2007: "SEE at the Technion".

The 32nd Conference on Stochastic Processes and Their Applications, University of Illinois at Urbana-Champaign, IL, August 2007: "QED Queues", invited speaker. (pdf - Lecture) (pdf - printout) (pdf - SPA link)

Carnegie-Mellon University, Mathematics, August 2007: "QED Q's: Quality- and Efficiency-Driven Call Centers", invited speaker to the Colloquium of Probability in Industry.

Executive MBA für Technologiemanager, RWTH Aachen and the University of St. Gallen, Stuttgart, Germany, October 2007: "Service Engineering", invited lecturer.

The Berlin Colloquium on Probability Theory, October 2007: "Many-Server Queues".

NYU Stern Business School, New York, December 2007: "Service Science & Engineering (of QED Q's and Call Centers)", OM Seminar.

Technion Reunion, Class of 1967, December 2007: "Service Science & Engineering (of Call/Contact Centers)". (pdf)

Istanbul, Turkey, June 2008: "Service Engineering & Science: Data-Based Research, Teaching, Practice", **keynote speaker, 2008 Euro Working Group on Stochastic Modeling**, Koc University. (pdf)

Columbia Business School, U.S.A., September 2008: "Service Engineering and Management", Ph.D. mini-course (Including a Business School Seminar). (pdf)

IBM, T.J. Wharton Research Center, U.S.A., September 2008: "Service Engineering and Science", invited lecture.

Athens, Greece, September 2008: "Service Engineering & Science: Data-Based Research, Teaching, Practice", invited speaker, ENBIS 2008 (European Network for Business and Industrial Statistics), within ISBIS (ISI Section of the International Society for Business and Industrial Statistics). (pdf)

Athens, Greece, October 2008: "QED Q's: Quality & Efficiency-Driven Call Centers", **plenary speaker, Valuetools 2008**.

Chinese National Academy of Sciences, Beijing, China, October 2008: "Service Science", Ph.D. mini-course, at the Mathematics Department.

Tsinghua University, Beijing, China, October 2008: "Service Management, Engineering and Science", invited talk at the Business School. (pdf)

Fudan University, Shanghai, China, November 2008: "Service Management and Engineering", invited talk at the Business School. (pdf)

Hamil, Tel-Aviv, Israel, 3-hour lecture on "Service Engineering of Call Centers", December 2008.

Santa Clara, U.S.A., May 2009: "Service Science in Hospitals: A Research-Based Partnership for Innovating and Transforming Patient Care". **Winner of the Inaugural (2009) Service Science Innovation Partnership Award (Rambam, IBM, Technion)**.

Shfayim, Israel, May 2009: "Staffing Many-Server Queues with Impatient Customers: Constraint Satisfaction in Call Centers". Delivered by S. Zeltyn. **Winner of the 2009 ORSIS (OR Society of Israel) Best Publication Award**. (pdf)

Istanbul, Turkey, September 2009: "Empirical Adventures in Call Centers and Hospitals", invited to lecture and organize a session (jointly with Z. Aksin) on Service Operations, The First (2009) Workshop of the Turkish and Israeli Operations Research Societies, Bogazici University.

Technion, Excellence Program, January 2010: "Service Science and Engineering".

Technion, Statistics Seminar, January 2010: "Empirical Adventures in Call Centers and Hospitals".

Eurandom, The Netherlands, February 2010: "On Service Science and Engineering in Hospitals", Healthcare Workshop, Eindhoven, invited lecture. (pdf)

Tel Aviv, Israel, March 2010: "Service Engineering", **Plenary lecture for the 16th Industrial Engineering and Management Conference** (also session organizer on Healthcare Engineering).

Technion, MSOM Conference, June 2010, Special Interest Group (SIG) on Services: Lecture plus Workshop on "SEEStat: Real-Time Analysis of Event-based Data from Service

Operations (Call Centers, Hospitals, Internet Sites)".

Technion, MSOM Conference, June 2010, Penn-Technion session: "Service Engineering at the Technion".

Technion, MSOM Conference, June 2010, 2 sessions (6 lectures) on SEELab-supported research: Lectured by Armony, M., Marmor, Y., Zeltyn, S., Gurvich, I., Tseytlin, Y., Khudyakov, P. (pdf)

National University of Singapore (NUS), August 2010: "A Data-Based Science for Service Engineering and Management", invited seminars (Decision Sciences, Statistics).

INSEAD Singapore, August 2010: "Empirical Adventures in Call Centers and Hospitals", invited seminar.

Eindhoven University, October 2010: "Service Science, Engineering and Management", The **Yearly LOIS Speaker** (LOIS = Logistics, Operations and Information Systems).

The Wharton School, University of Pennsylvania, USA, December 2010: "Skills-based Routing: Exploratory Analysis and Research Prospects", invited speaker to Larry Brown's 70's birthday fest.

Atlanta, U.S.A., February 2011: "Service Engineering and Science in Support of Service Management or, Empirical Adventures in Call Centers and Hospitals", **2011 Distinguished Lecture**, ISyE, Georgia Tech. (pdf - final)

Tel-Aviv, Israel, March 2011: "Service Engineering of Call Centers", invited lecture, The Israeli Call-Centers Forum.

Stockholm, Sweden, July 2011, Applied Probability Society Conference, **Invited Tutorial on Service Engineering and Science**. Lecture: (pdf - Part 1-Final)
(pdf - Related material)

Hong Kong University of Science and Technology, September 2011: **SENG Distinguished Professorship**, Service-Engineering: Mini-course and Seminar. (pdf - Mini)
(pdf - Final)

NYU Stern Business School, New York, February 2012: "Research in Service Science, Engineering and Management: Open Problems, New Directions and Uncharted Territories".

Technion and Monash University, Dedication Ceremony of Tele-Teaching Facility, March 2012: "Research in Service Engineering and Science".

Technion, 1972 Alumni, April 2012: "Research in Service Engineering and Science".

Technion, ATF (French Friends of the Technion), May 2012: "Service Science and Engineering at the Technion".

Beijing, China, June 2012, INFORMS International, **Plenary Speaker**.

Beijing, China, June 2012, MOSTLY Workshop, **Plenary Tutorial**.

SAMSI (NSF Statistics and Applied Mathematical Sciences Institute), August 2012: Program on "Data-Driven Decisions in Healthcare": **Plenary Tutorial** in Opening Work-

shop, Research Triangle Park, NC.

Kellogg Business School, September 2012: "Data-Based Service Networks", **Plenary Tutorial**, Operations Workshop.

Cornell ORIE Seminar, October 2012: "Data-Based Service Networks".

INFORMS Annual Meeting, October 2012, Phoenix, USA: "On Data-Based (Operations) Research", Discussant of the APS Markov Lecture by Jim Dai.

Stanford University, Statistics Seminar, October 2012: "Data-Based Service Networks".

UNC, STOR Seminar, November 2012: "Data-Based Service Networks".

The Wharton School, University of Pennsylvania, January 2013: "A Research Framework for Asymptotic Inference, Analysis and Control of Service Systems".

SAMSI Undergraduate Workshop, February 2013: "Data-Based Service Networks".

Hong Kong University of Science and Technology, September 2013: **SENG Distinguished Professorship**, Service-Engineering: Mini-course and Seminar.

SUTD (Singapore University of Technology and Design), October 2013: "Data-Based Service Networks".

Technion, T2med Conference, December 2013: "On Measuring, Modeling and Analyzing Healthcare Systems in Real-Time".

Eindhoven University, Holland, December 2013: "Data-Based Processing Networks: Inference, Design & Control of Service Systems". Data Science Center (DSC/e) Launch Symposium, **Plenary Speaker**.

Technion, Ph.D. Seminar, March 2014: "On Measuring, Modeling and Analyzing (Healthcare) Systems in Real-Time".

Technion, Israeli Science Day, March 26, 2014: "Analysis and Control of Service Systems in Real-Time" (YNET).

ORSIS (OR Society of Israel), April 2014: "Excursion-Based Universal Approximations for the Erlang-A Queue in Steady-State", **Uri Rothblum Best Paper Prize**.

ORSIS (OR Society of Israel), April 2014: "Data-Based Service Networks: A Framework for Online (Asymptotic) Inference, Design, Control; or From Small-Measurements Through Big-Data to Analytics", **Plenary, Naor Memorial Lecture**.

HKUST-Technion 1st Workshop on Data-Science, May 2014: "Data-Based Service Networks: A Framework for Online (Asymptotic) Inference, Design, Control; or: From Small-Measurements Through Big-Data To Analytics".

Erasmus University, Holland, July 2014: "Data-Based Science for Service Engineering and Management; or: Empirical Adventures in Call-Centers and Hospitals".

Eindhoven University, Holland, September 2014: "On Measuring, Modelling and Analyzing Healthcare Systems in Real-Time: From Small Measurements through Big Data to

Analytics". International Workshop on Process-Oriented Information Systems in Healthcare (ProHealth'14), **Keynote Speaker**.

HKUST-Technion 2nd Workshop on Data-Science, December 2014: "Intrapreneurship in Academia: History of the Faculty of Industrial Engineering & Management at the Technion".

ORSIS (OR Society of Israel), May 2015: "Modeling and Analyzing IVR Systems, as a Special Case of Self-Services". Lecture delivered by Nitzan Carmeli (jointly with Haya Kaspi).

Workshop in Honor of Robert Adler and Haya Kaspi's 35th year at the Technion, July 2015: "The Story of Haya Kaspi: Friend, Colleague, Teacher, Scholar", jointly with Micha Rubinovitch.

Shiva Hospital, June 2015; Beilinson Hospital, November 2015; Nahariya Hospital, November 2015: "Analysis and Control of Service Systems in Real-Time: From Small/Big Data to Analytics" or "Empirical Adventures in Service Systems: Hospitals, Telephone Call Centers,...; from Small Measurements Through Big Data to Analytics, in Real Time".

Shantou University, China, December 2015: "Engineering, then Management, now Data Science: 3 (4?) Stories of Intrapreneurship at the Faculty of IE&M, Technion", Technion-Shantou joint conference on Entrepreneurship.

Tel-Aviv University, February 2016, the 7th Israeli Conference of Research in Industrial Engineering. Panel on "Industrial Engineering in the Era of Information Technologies". **Invited Panelist**.

Tel-Aviv University, May 2016; Yearly Conference of the Israeli Statistical Association (ISA). Panel on "Statistics and Data Science". **Invited Panelist**.

City University of Hong Kong, September 2016: "Theompirical Research in OR/IE/OM: A Theory-and Data-Based Journey through Service Systems". **IAS Distinguished Lecture**.

Columbia University, NYC, April 2017: Applied Probability Day 2017, in honor of Ward Whitt turning 75; invited speaker. "Theompirical Research in OR/IE/OM: A Theory-and Data-Based Journey through Service Systems".

American Control Conference (ACC), May 24–26, 2017, Seattle, WA, USA: Panel on "Big Data". **Invited Panelist**.

21st IFORS Conference (IFORS 2017), Quebec City, July 17–21, 2017 (www.ifors2017.ca). **Plenary tutorial**: "Data-based Modeling, Analysis, Design and Control of Service Networks".

Israeli IDF, April 2018: "Industrial Engineering & Management at Technion, 1958 (68)–2018". Society of IE&M, Israel, April 2018: "Industrial Engineering & Management in the 21st Century".

Israeli National Statistics Program, October 2018–January 2019. "Empirical Adventures in Service Systems: From Small Data Through Big Data to Analytics".

Workshop on Service Engineering: From Theory to Practice, January 7–8, 2019, Technion. "On 'Theompirical' (Operations) Research, or Data-Based Network-Models of Call-Centers, Hospitals, Courts". (pdf)

Shenzhen Research Institute of Big Data, Shenzhen, China, May 2019: "Data-Based Service-Networks: A Framework for (Asymptotic) Inference, Design & Control of Service Systems (e.g., Hospitals, Contact Centers) in Real-Time".

Chinese University of Hong-Kong-Shenzhen, Shenzhen, China, May 2019, **MASTER FORUM**: " 'Theompirical' Research of Service Systems, Specifically OR = I E + OM + DS of Congested Systems, or My Empirical Adventures in Hospitals, Contact Centers, Banks,...".

Luohu Hospital Chain, Shenzhen, China, May 2019: "Data-Based Theory of Service Networks: From Small Measurements through Big Data to Analytics".

Cornell-Tech, NYC, June 2019: "Data Science for Processing Networks (on NSF Proposal 5/7/29)".

INFORMS Healthcare 2019, Boston, July 2019: "(How) Will RTLS Transform Healthcare Delivery (research)? Strength & Limitations"; invited lecture, within the session on "Applications of Real-Time Locating Systems in Ambulatory Oncology (Panel)", organized by Nikolaos Trichakis. (Abstracts) (Full version)

Israeli Ministry of Health, Quality Forum, Jerusalem, November 2019: "Data-Based Service-Engineering of Healthcare/Service Systems".

Tal Campus (Women Engineering & Technology College), Lev Academic Center, Jerusalem, November 2019: "Service Engineering: History, Present and a (subjective) View of its Future".

Stanford, Operations Research Colloquium, February 12, 2020. "On 'Theompirical' Research of Service Systems; or Data-Based Network-Models of Hospitals, Call-Centers, Courts,... in support of their Inference, Modeling, Analysis, Design, Control, Prediction,...; or From Small-Data through Big-Data to Analytics (OR). (pdf)

17th Annual Meir Rosenblatt Memorial Lecture, Boeing Center, Olin Business School, Washington University in St. Louis, March 10, 2021. "Theompirical (Theoretical + Empirical) Research in the Sciences, Engineering & Management of Service Systems", **Invited lecture**. (pdf)

Stanford Graduate School of Business, OIT Seminar, June 9, 2021. "Resource-Driven Activity Networks (RANs) arising from Empirical Excursions at Technion SEELab". (pdf)

Webinar on Data-Driven Queueing Challenges (DDQC), September 22, 2021. "Resource-Driven Activity Networks (RANs) arising from "Theompirical" Research at Technion SEELab". (pdf), **Invited lecture**.

Tel-Aviv University, March 6, 2022. "Resource-Driven Activity Networks (RANs): Data, Theory and Applications (e.g. to Appointment-driven QED Service Systems)".

Bob Vanderbei's Retirement Conference, Princeton Department of Operations Research

and Financial Engineering, October 6, 2023. "Resource-Driven Activity Networks (RANs): Linear/Conic Functional Models of Large Service Operations". **Invited lecture**.

ORSIS (OR Society of Israel), May 2024, **Lifetime-Achievement Award**:
Title 1 (Talking *about* Research):"Data-based Research Adventures in the Science, Engineering & Management of Service Systems; for example Hospitals, Call-Centers, Banks, Courts, ...";
Title 2 (Talking Research): "From Erlang-A (feature-lean) to RANs (rich): Models arising from "Theompirical" Research @ SEESLab (DDS, Technion)".

AAAI-25 Bridge, February 2025: AI+ORMS – Combining AI and OR/MS for Better Trustworthy Decision Making; 39th Annual AAAI Conference on Artificial Intelligence: "From PM/QM through AI/ML to OR/QR: "Theompirical" Adventures in Service Systems, Leading to a Vision / Plan for OR-informed X (here X = NNets, ML, RL or AI)", **Keynote speaker**.

AAAI-25 Bridge, February 2025: AI+ORMS – Combining AI and OR/MS for Better Trustworthy Decision Making; 39th Annual AAAI Conference on Artificial Intelligence: Joint panel with the Constraint Programming and Machine Learning Bridge, on AI+ORMS, **Invited panelist**.

Graduate Students

Chen, Hong: Stochastic flow networks: bottleneck analysis, fluid approximations and diffusion limits. Ph.D., Stanford, 1987.

Pats, Genady: State-dependent queueing networks: approximations and applications. Ph.D., Technion, January, 1995.

Zeltyn, Sergey: Estimating characteristics of queueing networks using partial information. M.Sc., Technion, March, 1996. **Awarded the Poter Prize for the best dissertation in the general area of Statistics, by the Israeli Statistics Association**.

Baron, Yonit: Performance analysis of stochastic dynamic PERT networks. M.Sc., Technion, April, 1997.

Zeltyn, Sergey: Approximation of queueing networks based on transactional data. Ph.D., Technion, Qualifying Exam August, 1997. Changed subject to: Queues with impatient customers: Theory and inference combined into science, June 2004.

Garnett, Ofer: Designing a telephone call center with impatient customers. M.Sc., Technion, April, 1998. **Awarded the Students Mitchner Prize for "Quality Sciences and Quality Management", Technion, 1999**.

Izhar, Ety (jointly with N. Shimkin): Rational abandonments from invisible queues. M.Sc., Technion, December 2000.

Kestelman, Ran (jointly with M. Tennenholtz): Optimal organizational structures for information processing and problem solving. M.Sc., Technion, December 2000.

Isaeev, Eva (jointly with E. Greenshtein): Fitting phase-type distributions to call-center

data. M.Sc., Technion, June 2003.

Nakibli, Efrat: Predicting delays in telephone queues. M.Sc., Technion, February 1998–June 2003. **Awarded the Students Mitchner Prize for "Quality Sciences and Quality Management", Technion, 2002**.

Khudyakova, Polina: Designing a call center with an IVR (Interactive Voice Response). M.Sc., Technion, June 2006.

Shaikhet, Gennady (main advisor: R. Atar): Skills-based routing in the QED regime. Ph.D., Technion, April 2003.

Gurvich, Itay: Design and control of the M/M/N queue with multi-type customers and many servers. M.Sc., Technion, August 2004.

Aldor, Sivan (main advisor: P. Feigin): Statistical inference of call center data. M.Sc., Technion, June 2006.

Rosenschmidt, Luba: On queues with impatient customers: Theory, approximation and simulation. M.Sc., Technion, 2006–2008.

Feldman, Zohar: Optimal staffing of systems with skills-based-routing. M.Sc., Technion, 2005–2009 (Summa Cum Laude).

Luzon, Yossi (main advisor: M. Penn): Appointment systems. M.Sc., Technion. 2006–2009.

Yom-Tov, Galit: Performance analysis of health-care systems. Ph.D., Technion, October 2006–2010. **Research Fellowship, Israel National Institute for Health Policy (NIHP)**.

Maman, Shimrit (jointly with S. Zeltyn): Uncertainty in the demand for service: The case of call centers and emergency departments. M.Sc. in Statistics, May 2007–2009. **Winner of the 2009 ORSIS Mechraz Prize for Best Graduate Thesis in Operations Research**.

Tseytlin, Yulia: Queueing systems with heterogeneous servers: On fair routing of patients in emergency departments. M.Sc., Technion, October 2007–2009. **Research Fellowship, Israel National Institute for Health Policy (NIHP)**.

Reich, Michael (jointly with Y. Ritov): The workload process: Modelling, analysis and inference. M.Sc., Technion, 2008–2011.

Zviran, Asaf: On fork-join (split-match) networks (jointly with R. Atar). M.Sc., Technion, 2008–2011.

Zaied, Itamar (jointly with H. Kaspi): The offered load of fork-join networks, with applications to health care. M.Sc. Technion, 2009–2012.

Marmor, Yariv (started Ph.D. under the guidance of the late Dr. David Sinreich): Simulation support of service engineering—design, staffing and real-time control of emergency departments. Ph.D., 2006–2010. **Research Fellowship, Israel National Institute for Health Policy (NIHP)**.

Senderovich, Arik: Call centers with skills-based-routing: Simulation-based state-inference and dynamic-staffing. M.Sc., January 2010–August 2012.

Carmeli, Boaz: Real-time optimization of patient-flow in emergency departments. M.Sc., January 2010–August 2012.

Zychlinski, Noa (jointly with I. Cohen): Models in support of Mass-Casualty-Events. M.Sc., Winter 2011–December 2012.

Ghebali, Rony (jointly with M. Gorfine): Impatience over the phone: Inference and control. M.Sc., Winter 2011–January 2013.

Yuviler, Nitzan (jointly with H. Kaspi): Modeling and Analyzing IVR Systems, as a Special Case of Self-Services. M.Sc., 2011–2014.

Koren, Abir (jointly with Y. Ritov): Modelling and analyzing scoring attempts in soccer. M.Sc., Winter 2012–2015.

Senderovich, Arik (jointly with A. Gal): Service analysis and simulation in process mining. Ph.D., Winter 2012–2017.

Moldavsky, Max: Multi-channel service systems, M.E. project, Spring 2014–2015.

Liberman, Pablo (main advisor: Isaco Meilijson, Tel-Aviv University): Protocol inference, M.Sc., 2013–2017.

Zychlinski, Noa (jointly with I. Cohen and P. Momčilović): Analysis of hospital networks via time-varying fluid models with blocking. Ph.D., 2013–2018.

Carmeli (Yuviler), Nitzan (jointly with Galit Yom-Tov; Mor Armony, Petar Momčilović): Predicting delays in queueing networks; Closed processing networks. Ph.D., 2015–2020.

Undergraduate Projects

Birger Itai and Rosenthal Alon: From project to process management: power stations planning — the Israeli Electric Company, 1 year, August 1993, IE&M.

Batito Ran and Reis David: Mailbox location and mail collection — the Israeli Post Office (Ilan Gonen), 1 year, October 1994, IE&M.

Bokai Keren, Gochberg Hagit and Marko Rami: The Production of Justice (Management of pre-trial delay) — the Labor Court of Law, Haifa (Doron Meiblum), 1 year, September 1995, IE&M.

Erhard Ran and Markin Ina: Inventory management of storage boxes — Rav-Bariach, Israel, $\frac{1}{2}$ year, April 1995, IE&M.

Horn Gad, Itman Tami, Mazuz Fabian and Neria Uri: Analysis of operating rooms — Carmel Hospital, Haifa (1 year), September 1995, IE&M.

Arnon Moti, Baram Eran, Ilan Zohar, Shalski Noam: Queues of ships - Haifa Port, Israel, 1 year, April 1996, IE&M.

Margalit Ido, Segev Tal, Shmilovitch Michael: From project to process management in

software development — Telrad (Eitan Polak), 1 year, September 1996, IE&M.

Livne Tali, Shtraus Nir, Zilberman Alex: The Production of Justice, Part II (Designing a decision support system) — the Labor Court of Law, Haifa (Doron Meiblum), 1 year, August 1997, IE&M.

Ben-Nun Eitan, Dar Dan, Hochberg Yael, Shparber Elisheva: Tele-Nets - Telephone call centers — Bezek 144, Pelephone Tikshoret, Tel-Aviv Police 100, Hulon Municipality, Missing Link, Beeper,. . ., 1 year, June 1997, IE&M.

Baron Ofer, Gat Yohai, Peleg Yuval: Help Desks, 1 year, Bank Leumi - Keshev (Hanania Kafri), February 1998, IE&M.

Nov Yuval, Newman Igal (jointly with M. Pollatschek): Simulation and analysis to support Skills-Based Routing, 1 year, 1998–9, honors project, IE&M.

Gutman Rakefet, Katmor Inbal, Rotem Efrat, Etzion Hila (jointly with Ido Erev): Shift assignments: Operations and psychology — Netvision Haifa (Shuki Lapid, Ruth Alon), 1 year, February 1999, IE&M.

Guslitser Elana, Yahalom Tomer: Skills-based routing, 1 year, 1999–2000, IE&M.

Schwartz Roy: Empirical and Theoretical Analysis of Many-Server Queues, 1 year, 2001, honors project, IE&M.

Gurevich Itay, Harary Guy, Omer Dan: Telephone-based pizza delivery, 1 year, 2001–2002, IE&M.

Arigor Menachem, Gazit Alon, Rize Daniel (jointly with B. Golany): Bug management in Intel, 1 year, 2002–2003. **Awarded the Gruenblat Prize, Technion, 2003**, IE&M.

Asulin Yehuda, Terroni Gustavo Martin, Fertzenko Vladimir (Veba): Staffing a Technical-Support Call Center—Netvision, Haifa, 1 year, 2002–2003, IE&M.

Aldor Sivan, Arzi Yair: Security Checking in Ben Gurion Airport - Israeli Airport Authority (Alon Ziberstein, Eran Bushari), 1 year, **Best Project Prize**, 2003–2004, IE&M.

Averhamy Meirav, Hickry Yechiel, Luzon Yossef: Skills-based routing at Bank Hapoalim (Gideon Makleff), 1 year, 2003–2004, IE&M.

Feldman Zohar: Staffing of time-varying queues to achieve time-stable performance, 1 year, July 2004, honors project, IE&M.

Kramer Taly, Meretzky Orly, Vinter Zahi, Pisarevski Micky: Reservation queues in Maccabi physiotheray (Ilana Ariel), 1 year, 2004–2005, IE&M.

Reich Michael, Lieber Rita, Shaviv Jenny: Specialized call centers—Nurses in Clalit; Workers' Support in Intel, 1 year, 2005–2006, IE&M.

Halamish Geva, Hauber Yoni, Harel Johnny: Workforce management at Cellcom cellular (Sharon Tamir), 1 year, 2006–2007, IE&M.

Kimhi Rafi, Shmerler Kobi, Katzir Duddi: Project management at the Israeli Air Force (Izik Cohen), 1 year, 2006–2007, IE&M.

Elkin Kosta, Rosenberg Noga, Levy Sharon, Yiftah Shiri: Patients' Flow from the Emergency Department to the Internal Wards at the Rambam Hospital (Yaron Barel, Mira Shiloah), 1 year, September 2007 (Supplement: A Business Plan for RFID in the ED), IE&M.

Kagan Yulia, Katz Odaya, Moses Lital; Khudiakov Polyna (Ph.D. advisor): Mortgage tele-services at Bank Hapoalim (Gidi Maklef, Zeev Hugi, Eli Aviad), 1 year, 2007–2008, IE&M.

Babajani Nir, Hod Alon, Liberman Pablo: SBR at Pelephone (Shiri Yiftah, Ater Efrat), 1 year, 2008, IE&M.

Kubi Yael, Shimon Sarit, Yuviler Nitzan; Luzon Yossi (Ph.D. advisor): Analysis of the Pre-Operative Process at the Rambam Hospital (Dudu Levy), 1 year, 2008, IE&M.

Badran Kamal, Haas Inbal, Huli Rasha; Marmor Yariv (Ph.D. advisor): Operational Aspects of the Transition to a *Temporary* ED at Rambam Hospital (Dr. Fuad Basis), 1 year, 2008, IE&M.

Badran Kamal, Haas Inbal, Huli Rasha; Marmor Yariv (Ph.D. advisor): Operational Aspects of the Transition to a *Permanent* ED at Rambam Hospital (Dr. Fuad Basis, Dr. Moshe Michelson), 1/2 year, 2008, IE&M.

Gigi Liat, Koshman Keren, Rath Nitzan, Saks Yoav; Khudiakov Polyna (Ph.D. advisor): Retail Services at Bank Hapoalim (Tal Shlasky, Etty Sol), 1 year, 2008–9, IE&M.

Natur Tawheed, Valin Viki; Marmov Yariv (Ph.D. advisor): Architectures of Emergency Departments—Comparative Analysis via DEA, 1 year, 2008, IE&M.

Oppenheim Yael, Raanan Navit, Ston Barak, Yaara; Marmor Yariv (Ph.D. advisor): Designing an RFID System in an Emergency Department, Rambam Hospital (Dr. Tali Freed, Dr. Dagan Schwartz), 1 year, 2009, IE&M.

Paldi Ravid, Hecht Arnon, Israeli Avraham, Solo Maayan; Kutsyy Katerina (SEE Advisor): On Fusing Financial and Operational Data, Mizrahi Bank (Amitai Cohen), 1 year, 2010. Honors Multi-disciplinary project, jointly with E. Gerstner, IE&M.

Plonski Ori, David Noa, Dourban Alon, Gologorsky Michal; Zaied Itamar (M.Sc. Advisor), Efrat Dorit (Ph.D. Advisor): Fairness in the Allocation of Work among a Hospital's Maternity Wards, Rambam Hospital (Michal Kranzler, Sara Tzafrir), 2010. Honors Multi-disciplinary project, jointly with A. Rafaeli, IE&M.

Koren Abir, Yungelson Avi, Shvefed Tal, Stiro Zohar; Marmor Yariv (Ph.D. Advisor), Zychlinski Noa (M.Sc. Advisor): RFID-Based Control of a Mass-Casualty-Event (Dr. Shlomi Israelit), 1 year, 2010. Honors Multi-disciplinary project, jointly with S. Wasserkrug, **Best Project Prize**, IE& M.

Other Projects

Hochberg Yael: Eshkol grant for research in Applied Mathematics, on "Models of telephone call-centers with abandonments", Israeli Ministry of Science, 1996–1997.

Istzhaki Meirav, Katzav Eli, Naor Itzhak (Executive Education, Hebrew University, Jerusalem), "Direct Banking—Survey and Assessments", 1 year, August 1998.

Yahalom Tomer: Eshkol grant for research in Applied Mathematics, on "Models of direct services: skills-based routing", Israeli Ministry of Science, 2000–2001.

Schwartz Roy, Technion Excellent Students program: "Simulation experiments with many-server queues in the QED regime (QED = Quality *and* Efficiency Driven)", 2002–2003.

Reichelstein Efrat, Stern Shimrit: "Reservation queues", 2004–2005, with M. Penn.

Tseytlin Yulia, Zviran Asaf: "Simulation of patients routing from an emergency department to internal wards in Rambam Hospital", 2008.

Plonsky Ori: "Validating models of call centers", supervised jointly with S. Zeltyn, 2010.

Koren Abir: "On workload and offered-load programming", 2010.

Gilman Kurt, Periera Matthew, Pietropaolo Americo, Schiffler Susan, Sharma Amit; Christos Zacharias (Ph.D. Advisor): Optimizing the ED Triaging Process: Developing an Analytic Approach to Assign Patients to Work Groups in an Emergency Department, MS in Business Analytics (MSBA), Capstone Project, Stern-NYU, jointly with Mor Armony, 1-year project, 2014.

PUBLICATIONS

Theses

M.A. Thesis, 1977: "Optimization in the M/GI/1 Queue", Tel-Aviv University.
(Thesis Committee: U. Yechiali, I. Meilijson, M. Smorodinsky)

Ph.D. Thesis, 1983: "Linear Estimators of the Mean of a Gaussian Distribution on a Hilbert Space", Cornell University.
(Thesis Committee: E.B. Dynkin, L.D. Brown, D. Heath, L. Billera)

Original Papers in Refereed Professional Journals or Conference Proceedings

1. Mandelbaum, A. and Vanderbei, R.J. "Optimal Stopping and Supermartingales over Partially Ordered Sets", *Z. Wahrscheinlichkeitstheorie verw. Geb.,* **57**, 253–264, 1981.

2. Mandelbaum, A. and Yechiali, U. "Optimal Entering Rules for a Customer with Wait Option at an M/G/1 Queue", *Management Science,* **29**, 174–187, 1983.

3. Dynkin, E.B. and Mandelbaum, A. "Symmetric Statistics, Poisson Point Processes and Multiple Wiener Integrals", *The Annals of Statistics,* **11**, 739–745, 1983.

4. Mandelbaum, A. and Taqqu, M. "Invariance Principle for Symmetric Statistics", *The Annals of Statistics,* **12**, 483–496, 1984.

5. Mandelbaum, A. "Linear Estimators and Measurable Linear Transformations on a Hilbert Space", *Z. Wahrscheinlichkeitstheorie verw. Geb.,* **65**, 385–397, 1984.

6. Mandelbaum, A. "All Admissible Estimators of the Mean of Gaussian Distribution on a Hilbert Space", *The Annals of Statistics,* **12**, 1448–1466, 1984.

7. Mandelbaum, A. "Discrete Multi-armed Bandits and Multi-parameter Processes", *Probability Theory and Related Fields,* **71**, 129–147, 1986.

8. Mandelbaum, A. and Shepp, L.A. "Admissibility as a Touchstone", *The Annals of Statistics,* **15**, 252–268, 1987.

9. Mandelbaum, A. and Rüschendorf, L. "Complete and Symmetrically Complete Families of Distributions", *The Annals of Statistics,* **15**, 1229–1244, 1987.

10. Mandelbaum, A. "Continuous Multi-armed Bandits and Multi-parameter Processes", *The Annals of Probabilty,* **15**, 1527–1556, 1987.

11. Chen, H., Harrison, J.M., Mandelbaum, A., van Ackere, A. and Wein, L. "Empirical Evaluation of a Queueing Network Model for Semiconductor Wafer Fabrication", *Operations Research*, special issue in Manufacturing, **36**, 202–216, 1988.

12. Mandelbaum, A., Shepp, L.A. and Vanderbei, R.J. "Optimal Switching Between a Pair of Brownian Motions", *The Annals of Probability,* **18**, 1010–1033, 1990.

13. Chen, H. and Mandelbaum, A. "Discrete Flow Networks: Bottleneck Analysis and Fluid Approximations", *Math. of Operations Research,* **16**, 408–446, 1991.

14. Chen, H. and Mandelbaum, A. "Stochastic Discrete Flow Networks: Diffusion Approximations and Bottlenecks", *The Annals of Probability*, **19**, 1463–1519, 1991.

15. Kaspi, H. and Mandelbaum, A. "Regenerative Closed Queueing Networks", *Stochastics and Stochastics Reports,* **39**, 239–258, 1992.

16. Vladimirov, A.A., Kozyakin, V.S., Kuznetsov, N.A. and Mandelbaum, A. "An Investigation of the Dynamic Complementarity Problem By Methods of the Theory of Desynchronized Systems", *Russian Acad. Sci. Dokl. Math.*, **47**, 169–173, 1993.

17. Kaspi, H. and Mandelbaum, A. "On Harris Recurrence in Continuous Time", *Math. of Operations Research,* **19**, 211–222, 1994.

18. Mandelbaum, A. and Massey, W. "Strong Approximations for Time-dependent Queues", *Math. of Operations Research*, **20**, 33–64, 1995.

19. Adler, P., Mandelbaum, A., Nguyen, V. and Schwerer, E. "From Project to Process Management: An Empirically-Based Framework for Analyzing Product Development Time", *Management Science*, **41**, 458–484, 1995.

20. Kaspi, H. and Mandelbaum, A. "Levy Bandits", *Annals of Applied Probability*, **5**, 541–565, 1995.

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