

RESUME

ASSAF SCHUSTER

Born: 6 July, 1958, Kibutz Givat Brenner.

Academic Degrees

Sep 87 – Aug 91: Ph.D., Computer Science, Hebrew University.

Sep 86 – Jul 87: Graduate student (No-fee No-degree program), Computer Science, UC Berkeley.

Jul 86: M.Sc. (Cum Laude), Computer Science, Hebrew University.

Aug 84: B.Sc. (Cum Laude), Computer Science and Mathematics, Hebrew University.

Academic Appointments

Aug 07 – present: Professor, Computer Science, Technion.

Summer 07, 09, 10, 11, 12, 13, 15, 16: Visiting Scientist, Microsoft Research, Redmond, WA.

Feb 00 – Jul 07: Associate Professor, Computer Science, Technion.

Summers 06, 05, 04, 03: Visiting Professor, Computer Science, Madison, WI.

Mar 99: Tenure, Computer Science, Technion.

Feb 96 – Jan 00: Senior Lecturer, Computer Science, Technion.

Sep 91 – Jan 96: Lecturer, Computer Science, Technion.

Oct 87 – May 91: Teaching Assistant, Computer Science, Hebrew University.

Jan 87 – May 87: Teaching Assistant, Computer Science, UC Berkeley.

Sep 83 – Aug 86: Teaching Assistant, Computer Science, Hebrew University.

Research Interests

Distributed and Scalable Data Mining. Monitoring Distributed Data Streams. Big Data Technologies and Analytics. Privacy Preserving. Security and System Vulnerabilities. Cloud Management and Resource as a Service (RaaS). Local Algorithms for Very Large-Scale (peer-to-peer) Distributed Networks. Grid Software and Opportunistic Computing. Data-Race Detection. Multilevel Caching and Selfish Collaborative Caching Schemes. Shared Memory Models and Software Distributed Shared Memory.

Teaching Experience

Computer Architecture – graduate level.

Parallel and Distributed Computation – graduate level.

Parallel Architectures – graduate level.

Parallel Algorithms – graduate level.

Operating Systems – graduate level.

Data Structures – undergraduate level.

Assembly Language – undergraduate level.

Automatic Deduction – undergraduate level.

Pascal, C – undergraduate level.

Public Professional Activities

2018 Member of the IEEE Fellows Evaluation Committee

2015 – current Member of the Steering Committee, Ben Gurion University Center for Cyber Security.

2015 – current Member of the Scientific Committee, Technion Center for Cyber Security.

2014 – current European Commission H2020-ICT Committee.

2014 – current Member of the National Committee for Cyber Security R&D.

2010 – 2014: Established and headed the Technion Computer Engineering Center, aka TCE (EE+CS)
[HTTP://TCE.TECHNION.AC.IL](http://TCE.TECHNION.AC.IL)

1996 – 2012: Established and served as head of the Computer Systems Laboratory (CSL). Essentially all the systems research in the CS department at the Technion is carried in the scope of CSL, where eight faculty members and dozens of graduate students are involved. Over the years, by using resources collected through various grants, industry connections, and by employing grid-based resource allocation technology, CSL grew to be a major center for scalable systems research.

2008 – present: Member of the executive board of the Association for Knowledge Discovery in Distributed and Ubiquitous (KDD&U) Environments.

2005 – 2008: Leading the Ubiquitous Technology workgroup of the KD-Ubiq coordinated action (A European Commission project: *KD-ubiq - a blueprint for ubiquitous knowledge discovery systems*).

2004 – 2008: Associate Editor, IEEE Transactions on Computers (IEEE TC).

2000 – 2009: Subject Area Editor, Journal of Parallel and Distributed Computing (JPDC).

2000 – present: Member of the following IEEE Computer Society's Technical Committees: Computer Architecture (TCCA), Computer Communication (TCCC), Fault-Tolerant Computing (TCFT), and Parallel Processing (TCPP).

2001 – present: Member of the Advisory Committee of the IEEE Technical Committee on Parallel Processing (TCPP).

2004 – 2008: Member of the Steering Committee of the Israeli Academic Grid (IAG).

1999 – 2000 and 2005 – 2009: Member of the Technion committee for Information Technology.

2005 – 2008: Member of MALAG review committee for Hebrew University program in Computer Engineering.

Public Professional Activities – Workshops and Conferences

- PC Chair Industry Track, Conference on Information and Knowledge Management (CIKM), Turin, Italy, 2018.
- Vice Program Chair for Applications area, Intl. Parallel and Distributed Processing Symp. (IPDPS), April 2013, Boston.
- Member of the TCPP Outstanding Service Award Committee, 2007.
- Organizer and Co-Chair (together with Ran Wolff) Workshop on Data Mining and the Grid: 1st DM-Grid (in conjunction with ICDM), Brighton UK, November 2004.
- Vice Program Chair for Algorithms area, Intl. Conf. on High Performance Computing, 7th HiPC, December 2000, Bangalore.
- Member of the steering committee for the Intl. Conf. on High Performance Computing (HIPC), 1998–2005.
- Co-Chair for the Reconfigurable Architectures Workshop, 3rd WAR, April 1996, Hawaii.
- Vice Chair for Jerusalem Symposium on Parallel and Distributed Systems, 1st JPDPS, November 2001, Jerusalem.
- Meeting Chair, 12th Israeli National Systems & Engineering Seminar, December 1997, Tel-Aviv.
- Co-Chair, Workshop on Distributed, High-Performance and Grid Computing in Computational Biology, 1st GCCB, September 2006, Eilat. Werner Dubitzky, Assaf Schuster, Peter M. A. Sloot, Michael Schroeder, Mathilde Romberg: “*Distributed, High-Performance and Grid Computing in Computational Biology*”. International Workshop, GCCB 2006, Eilat, Israel, January 21, 2007. Proceeding Springer 2007.
- Guest Editor, *Parallel Processing Letters*. Special Issue on Dynamically Reconfigurable Architectures. Vol. 5, No. 1, March 1995.

Member of the Program Committee for the following workshops and conferences:

Conference on Management of Data

SIGMOD, July 2020, Amsterdam.

World Wide Web Conference

26th WWW, April 2017, Perth, Australia.

ACM Conference on Distributed and Event-Based Systems:

10th ACM DEBS, June 2016, Irvine.

11th ACM DEBS, June 2017, Barcelona.

12th ACM DEBS, June 2018, Hamilton, New Zealand.

Conference on Knowledge Discovery and Data Mining:

22nd ACM KDD, August 2016, San Francisco.

23rd ACM KDD, August 2017, Halifax.

25rd ACM KDD, August 2019, Anchorage.

International Conference on Data Engineering:

18th ICDE, May 2016, Helsinki, Finland.

20th ICDE, April 2018, Paris.

Extending Database Technology:

18th EDBT/ICDT, March 2015, Brussels.

19th EDBT/ICDT, March 2016, Bordeaux.

IEEE Conference on Big Data:

1st BigData, October 2013, San Francisco.

5th BigData, December 2017, Boston.

Intl. Workshop on Parallel and Distributed Methods in verification:

6th PDMC, July 2007, Berlin.

IEEE Intl. Symp. on Data Mining and Information Retrieval:

21st DMIR, June 2007, Niagara Falls.

ACM Symposium on Parallelism in Algorithms and Architectures:

20st SPAA, June 2008, Munich.

European Systems Conference:

2nd EuroSys, March 2007, Lisbon.

7th EuroSys, April 2012, Bern

14th EuroSys, March 2019, Dresden.

Workshop on Parallel Data Mining:

PDM, Berlin, September 2006.

High Performance Computing Conference:

1st HPCC, Sorrento (Naples), Italy, September 2005.

2nd HPCC, Munich, September 2006.

3rd HPCC, Houston, September 2007.

IEEE International Conference on Data Mining:

5th ICDM, Houston, Texas, November 2005.

6th ICDM, Hong Kong, December 2006.

7th ICDM, Omaha NE, October 2007.

8th ICDM Piza, December 2008.

SIAM International Conference on Data Mining:

5th SDM, Newport Beach, CA, April 2005.

8th SDM, Atlanta, Georgia, April 2008.

Workshop on High-Performance and Distributed Data Mining:

8th HPDM (in conjunction with SDM), April 2005.

Workshop on Data Mining and the Grid:

1st DM-Grid, November 2004.

Workshop on Operating Systems, Programming Environments and Management Tools for High-Performance Computing:

1st COSET, June 2004, St Malo.

2nd COSET, June 2005, Cambridge.

Workshop on Architectural Support for Security and Anti-Virus:

1st WASSA, October 2004, Boston.

Symposium on High-Performance Distributed Computing:

13th HPDC, June 2004, Honolulu.

Workshop on the Grid and Web Intelligence:

1st GRaWI, June 2004, Cracow.

ACM International Conference on Supercomputing:

18th ICS, July 2004, St. Malo.

22nd ICS, June 2008, Iland of Kos, Greece.

Workshop on Parallel and Distributed Systems - Testing and Debugging:

1st PADTAD, April 2003, Nice.

2nd PADTAD, April 2004, Santa Fe.

3rd PADTAD, November 2005, Haifa.

4th PADTAD, July 2006, Portland.

Annual International Systems and Storage Conference:

1st SYSTOR, October 2007, Haifa.

4th SYSTOR, May 2010, Haifa.

IBM Haifa Research Labs Verification Conference:

1st Verification Conference, November 2005, Haifa.

2nd Verification Conference, November 2006, Haifa.

Workshop on Languages, Compilers, and Run-Time Systems for Scalable Computers: 6th LCR,

March 2002, Washington DC.

Workshop on Java for High-Performance Computing:

2nd Workshop, May 2000, Santa Fe.

Workshop on Software Distributed Shared Memory:

2nd WSDSM, May 2000, Santa Fe.

Intl. Symposium on Distributed Computing:

14th DISC, September 2000, Toledo.

Intl. Parallel Processing Symposium:

7th IPPS, April 1993, Los Angeles.

9th IPPS, April 1995, Santa Barbara.

10th IPPS, April 1996, Hawaii.

11th IPPS, April 1997, Geneva.

13th IPPS/SPDP, April 1999, San Juan.

Intl. Conf. on Parallel Processing:

27th ICPP, August 1998, Minneapolis.

31st ICPP, August 2002, Vancouver .

36th ICPP, September 2007, XiAn, China.

Intl. Conf. on Computing and Information:

8th ICCL, June 1996, Waterloo.

9th ICCL, 1998, Winnipeg.

Intl. Conf. on Parallel and Distributed Computing Systems (ISCA):

10th PDCS, September 1997, New Orleans.

17th PDCS, September 2004, San Francisco.

Intl. Conf. on High Performance Computing:

4th HiPC, December 1997, Bangalore,

5th HiPC, December 1998, Madras,

6th HiPC, December 2001, Hyderabad.

Reconfigurable Architectures Workshop:

2nd WAR, April 1995, Santa Barbara.

3rd WAR, April 1996, Hawaii.

Intl. Symp. on Automotive Technology and Automation:

29th ISATA, June 1996, Florence.

Workshop on Optical Interconnections for High Speed Communications:

1st WOC, April 1997, Geneva.

Intl. Conf. on Parallel and Distributed Computing and Systems:

9th PDCS, October 1997, Washington D.C.

10th PDCS, October 1998, Las Vegas.

11th PDCS, October 1999, Boston.

Intl. Conf. on Parallel and Distributed Computing and Networks:

22nd PDCN, February 2004, Innsbruck, Austria.

23rd PDCN, February 2005, Innsbruck, Austria.

24rd PDCN, February 2006, Innsbruck, Austria.

25rd PDCN, February 2007, Innsbruck, Austria.

Myrinet User Group Conference:

1st meeting, September 2000, Lyon.

Workshop on Biologically Inspired Solutions to Parallel Processing Problems:

1st BioSP3, April 1998, Orlando.

2nd BioSP3, April 1999, San Juan.

3rd BioSP3, April 2000, Cancun,

4th BioSP3, April 2001, San Francisco.

Workshop on Distributed Shared Memory:

1st DSM, May 2001, Brisbane.

2nd DSM, May 2002, Berlin.

3rd DSM, May 2003, Tokyo.

4th DSM, May 2004, Chicago.

5th DSM, May 2005, Cardiff.

6th DSM, May 2006, Singapore.

Workshop on Distributed Data Mining in Life Science:

1st DDMLS, September 2005, Konstanz.

International Symposium on Parallel Architectures, Algorithms, and Networks:

7th I-SPAN, December 2005, Las-Vegas.

International Conference Applied Computing:

3rd AC, February 2006, San-Sebastian.

Algorithmic Techniques for Data Mining:

2nd ATDM, June 2006, Beer sheva.

Distributed, High-Performance and Grid Computing in Computational Biology:

1st GCCB, September 2006, Eilat.

IEEE Symposium Series on Computational Intelligence:

1st SSCI, April 2007, Hawaii.

Entrepreneurship

March 2016 – November 2018: Co-Founder and CTO, Cy-oT (Cyber of Things). Sold to FOUNDERS Group.

2012 Co-Founder CLEARSKY (ML for Cyber Security). Sold to VERINT.

Professional Experience

Feb 2019 – present Consultant, SigmaDots.

Dec 2018 – present Consultant, IAI.

Oct 2013 – Sep 2016: Advisory Board, ExShake.

Feb 2007 – Oct 2012: Consultant, PineApp, Haifa.

Jan 2012 – Aug 2013: Consultant, Microsoft, Haifa.

Aug 2011 – Jan 2013: Consultant, Verint, Herzlia.

Sep 2000 – Sep 2012: Advisory Board, GigaSpaces, Herzlia.

Sep 2001 – Sep 2005: Advisory Board, Qlusters, Tel-Aviv.

Mar 2006 – Jun 2006: Consultant, Qumranet, Netania.

Apr 2004 – Dec 2005: Advisory board, Netillion, Palo Alto.

Oct 2003 – Mar 2006: Consultant, Lenslet, Herzlia.

Jul 2001 – Dec 2003: Consultant, HP Research Labs, Technion.

Jun 2002 – Jul 2002: Consultant, Mercury, Yahoo.

Aug 2000 – Jun 2001: Parallel Program Manager, BellMind, Haifa.

May 1998 – Jul 2000: Consultant, IBM Haifa Research Lab, Haifa.

Jul 1984 – Feb 1986: System Programmer, Fritz Haber Institute, Hebrew University.

Jun 1980 – Sep 1981: Software Engineer, “Gavish” Software team, Kibutz Givat-Brenner.

Honors

2019: Hershel Rich Technion Innovation Award. *“Lazy Complex Event Processing”*.

2019: AMiner Most influential Scholar Award *“in recognition of outstanding and vibrant contributions in the field of computational Economics 2007–2017”*.

2017: IEEE Fellow. *“For Contributions to Cloud Computing”*.

2016: *“Taking the Blame Game out of Data Centers Operations with NetPoirot.”* Presented at SIGCOMM 2016. Chosen as highlight paper of the 9th ACM International Systems and Storage Conference (SYSTOR). Behnaz Arzani, Selim Ciraci, Boon Thau Loo, Assaf Schuster, Geoff Outhred.

- 2016:** The Henry Taub Prize for Academic Excellence.
- 2015:** ACM Fellow. *“For Contributions to Cloud Computing”*.
- 2015:** Phd thesis of Nadav Amit *“Alleviating Virtualization Bottlenecks”*. Honorable Mention for the Denis M. Ritchie SIGOPS Thesis Award.
- 2015:** Google Security Vulnerability Award (for the discovery of more than hundred bugs and six security vulnerabilities in Linux/KVM). *“Virtual CPU Validation.”* Nadav Amit, Dan Tsafir, Assaf Schuster, Ahmad Ayoub, Eran Shlomo. The 25th ACM Symposium on Operating Systems Principles (SOSP).
- 2015:** Best Research Paper Award. *“Lazy Evaluation Methods for Detecting Complex Events”*. Ilya Kolchinsky, Tsachi Sharfman, and Assaf Schuster. The 9th ACM International Conference on Distributed Event-Based Systems (DEBS).
- 2015:** *“Write Once, Get 50% Free: Saving SSD Erase Costs Using WOM.”* Presented at FAST 2015. Chosen as highlight paper of the 8th ACM International Systems and Storage Conference (SYSTOR). Gala Yadgar, Eitan Yaakobi, Assaf Schuster.
- 2014:** Phd thesis of Nadav Amit *“Alleviating Virtualization Bottlenecks”* won 2014 SPEC Distinguished Dissertation Award.
- 2014:** HiPEAC Paper Award. *“VSwapper: a memory swapper for virtualized environments.”* Presented at ASPLOS 2014. Also chosen as highlight paper of the 7th ACM International Systems and Storage Conference (SYSTOR). Nadav Amit, Assaf Schuster, and Dan Tsafir.
- 2014:** Joseph and Sadie Danciger Chair in Engineering.
- 2013:** Phd thesis of Orna Agmon Ben-Yehuda *“Efficient, Non-Cooperative Sharing of Computing Resources”* Thesis won Excellence Award by the Amnon Pazi Fund for 2013.
- 2013:** IBM Research’s 2012 Pat Goldberg Memorial Best Paper Award in Computer Science, Electrical Engineering and Math. *“ELI: Bare-metal Performance for IO Virtualization”* presented at ASPLOS 2012. Abel Gordon, Nadav Amit, Nadav HarEl, Muli Ben-Yehuda, Alex Landau, Assaf Schuster, and Dan Tsafir.
- 2012:** HiPEAC Paper Award. *“ELI: Bare-metal Performance for IO Virtualization”* presented at ASPLOS 2012. Abel Gordon, Nadav Amit, Nadav HarEl, Muli Ben-Yehuda, Alex Landau, Assaf Schuster, and Dan Tsafir.
- 2010:** Second Prize Winner, IEEE International Scalable Computing Challenge (SCALE 2010). IEEE Computer Society Technical Committee on Scalable Computing. *“A System for Efficient Execution of Bags of Tasks in Multiple Grids and Clouds”*. Mark Silberstein, Artyom Sharov, Dan Geiger, and Assaf Schuster.
- 2009:** George Michael Memorial HPC Award Honorable Mention (in conjunction with SC’09). *“A System for Efficient Execution of Bags of Tasks in Multiple Grids and Clouds”*. Mark Silberstein, Artyom Sharov, Dan Geiger, and Assaf Schuster.
- 2008:** Technion Best Graduate Student Paper Award. *A Geometric Approach to Monitoring Threshold Functions Over Distributed Data Streams*. Danny Keren, Tsachi Scharfman, and Assaf Schuster. ACM Transactions on Database Systems (TODS).
- 2006:** PKDD Best Student Paper Award.
- 2006:** SIGMOD Best Paper Award Honorable Mention.
- 2005:** ATVA Best Paper Award.
- 2005:** Kaplan Prize - for the best commercial plan.

2004: Hershel Rich Innovation Award.

2001: IBM Research's 2000 Pat Goldberg Memorial Best Paper Award in Computer Science, Electrical Engineering and Math. Y. Aridor, T. Eilam, M. Factor, A. Schuster and A. Teperman. "*A High Performance Cluster JVM Presenting a Pure Single System Image*". JavaGrande Conference, pp. 168-177, June 2000, San Francisco.

2001: IPDPS Best Paper Award. N. Niv and A. Schuster. "*Transparent Adaptation of Sharing Granularity in MultiView-Based DSM Systems*". Intl. Conf. on Parallel and Distributed Processing Symposium, San Francisco, April 2001.

1999: Ray and Miriam Klein Research Award.

1996: Gutwirth Award.

1988: Wolf Foundation Scholarship.

1986/7: Hebrew University – U. of California exchange program.

1985: I.B.M. Scholarship.

1983: Hebrew University Dean's honors list.

Graduate Students

Completed Theses - PhD

(SP-1) October 1999. Ayal Itzkovitz. "*Distributed Shared Memory - Bridging the Granularity Gap*".

(SP-2) December 2003. Tamir Heyman (O. Grumberg main advisor). "*Distributed Algorithms for Symbolic Model Checking*".

(SP-3) October 2004. Ran Wolff. "*Data Mining in Large Scale Distributed Systems*".

(SP-4) September 2006. **Recommended for Distinction by the School for Graduate Students.** Liran Liss (Tzachi Birk main advisor). "*Realizing the Performance of Contemporary Parallel and Distributed Systems: Theoretical and Systems Perspectives*".

(SP-5) August 2007. Alex Gontmakher. "*An Architecture and Programming Model for Extremely Fine-Grain Parallelism*".

(SP-6) November 2008. Tsachi Sharfman. (Daniel Keren additional advisor). "*Geometric Monitoring of Data Streams*".

(SP-7) February 2009. Konstantin Shagin (Michael Factor additional advisor). "*High-Performance Fault-Tolerant Wide-Area Computing with Java*".

(SP-8) October 2009. Valentin Kravtchov. "*Service-based Resource Brokering for Grid-based Applications*".

(SP-9) March 2010. Avi Yadgar. (Orna Grumberg main advisor). "*New Approaches to Model Checking and to 3-Valued Abstraction and Refinement*".

(SP-10) June 2010. Mark Silberstein. (Dan Geiger main advisor). "*A Distributed System for Genetic Linkage Analysis*". **(His research won Honorable Mention for HPC Award in SC09)**

(SP-11) November 2010. Arik Friedman. (Ran Wolff additional advisor). "*Privacy Preserving Data Mining*".

- (SP-12) June 2012. Gala Yadgar (Golan) (Michael Factor additional advisor). “*Multilevel Cache Management Based on Application Hints*”.
- (SP-13) May 2012. Guy Sagi. (Daniel Keren additional advisor). “*Geometric Distributed Data Mining*.”
- (SP-14) June 2013. Orna Agmon Ben-Yehuda. “*Efficient, Non-Cooperative Sharing of Computing Resources*.” **Excellence Award by the Amnon Pazi Fund for 2013.**
- (SP-15) July 2014. Nadav Amit. “*Alleviating Virtualization Bottlenecks*.” **2014 SPEC Distinguished Dissertation Award. 2015 Honorable Mention for the Denis M. Ritchie SIGOPS Thesis Award.**
- (SP-16) December 2015. Uri Verner. “*Processing Real-time Data Streamson GPU-based System*.”
- (SP-17) July 2017. Mickey (Moshe) Gabel. “*Distributed Monitoring with the Geometric Method*.”
- (SP-18) January 2018. Arnon Lazerson. “*Scalable Monitoring with the Geometric Methos*”.

Theses in Progress - PhD

- (SP-19) Expected 2019. Liran Funaro. “*Memory-Elastic Applications*”.
- (SP-20) Expected 2019. Ilya Kolchinsky. “*Scalability in Distributed CEP Systems*”.
- (SP-21) Expected 2019. Gal Yehuda. “*Monitoring Data Streams*”.
- (SP-22) Expected 2020. Vadim Gliner. “*Monitoring heart arrhythmias*”.
- (SP-23) Expected 2022. Ido Hakimi. “*Distributed training of deep neural networks*”.

Completed Theses - MSc

- (SM-1) 1994. Shai Halevi. Thesis title: “*On Greedy Hot-Potato Routing*”.
- (SM-2) 1995. Galit Shemesh. “*Bounds on parallel computation by reconfigurable networks*”.
- (SM-3) 1995. Ishai Ben-Aroya. “*Algorithms and Bounds for Deflection Routing*”.
- (SM-4) 1996. Maxim Goldin. “*Weak Consistency Distributed Shared Memory System Design*”.
- (SM-5) 1996. Alex Dubrovsky. “*Load-Balancing in Distributed Shared Memory Systems*”.
- (SM-6) 1997. Gadi Pesach. “*Transparent Access to Pointer Parameters and Global Variables in Remote Procedures*”.
- (SM-7) 1997. Amit Reisman (Craig Gotsman main advisor). “*Parallel Adaptive Ray Tracing on IBM’s SP/2*”.
- (SM-8) 1998. Sasha Basonov. “*Parallel DSM Implementation of Binary Decision Diagrams*”.
- (SM-9) 1998. Lea Wolfovitch. “*Load Sharing and Locality in Distributed Shared Memory Systems*”.
- (SM-10) 1999. Dmitry Kogan. “*Garbage Collection in Multithreaded Distributed Shared Memory Systems*”.
- (SM-11) 2000. Nitzann Niv. “*Dynamic Adaptation of Sharing Granularity in Distributed Shared Memory Systems*”.

- (SM-12) 2001. Oren Zeev Ben-Mordechai. “*On-The-Fly Data-Race Detection in Distributed Shared Memory Systems*”.
- (SM-13) 2002. Vladislav Kalinovsky (Roy Friedman additional advisor). “*The Symphony Project - Managing Virtual Servers*”.
- (SM-14) 2002. Vadim Gleizer. “*Optimizing Sharing Patterns and Locality via Thread Migration*”.
- (SM-15) 2002. Emil Cohn-Dan. “*A Transparent Software Distributed Shared Memory System*”.
- (SM-16) 2002. Sergey Polyakov. “*Testability and Non-Operational Characterization of Java Memory Model*”.
- (SM-17) 2003. Eli Poznianski. “*Efficient On-the-Fly Data Race Detection in Multithreaded C++ Programs*”.
- (SM-18) Vadim Iosevitch. “*Software Distributed Shared Memory: to Relax or not to Relax?*”.
- (SM-19) January 2003. Dan Trock. “*Sampling-Based Distributed Mining of Association Rules*”.
- (SM-20) Avi Yadgar (Orna Grumberg main advisor). “*A Memory-Efficient All-SAT Solver.*”.
- (SM-21) May 2004. Yoram Talmor. “*Higher Performance DSMs by Peaking Network Utilization*”.
- (SM-22) July 2004. Amir Baror. “*Hierarchical Decision Tree Induction for Highly Dimensional Data in Large-Scale Distributed Systems*”.
- (SM-23) August 2004. Baruch (Bobi) Gilburd. “*A Privacy Model and Privacy-Preserving Algorithms for Data Mining in Large-Scale Distributed Systems*”.
- (SM-24) January 2005. Ohad Shacham. (Tel Aviv Univ., Mooly Sagiv main advisor). “*Scaling Model Checking of Dataraces Using Dynamic Information.*”
- (SM-25) April 2005. Nili Ifergan (Informal advisor. Orna Grumberg main advisor). “*Asynchronous Scalable Distributed Symbolic Model Checking*”.
- (SM-26) June 2006. Denis Krivitsky. “*A Local Facility Location Algorithm for Large-Scale Distributed Systems*”.
- (SM-27) November 2006. Oren Katzengold (Avi Mendelson additional advisor). “*Fully informed processor execution*”.
- (SM-28) May 2007. Gregory Shklover. “*Compiling sequential code into fine-grain parallel Intrathreads*”.
- (SM-29) June 2007. Noam Palatin. (Arie Leizarovitz main advisor). “*Monitoring Distributed Grid Batch Systems Via Data Mining*”.
- (SM-30) August 2008. Tal zamir. (Michael Factor additional advisor). “*Speculative computing for a Java distributed run-time*”.
- (SM-31) August 2008. Benjamin Yoshpa. (Ariel Orda additional advisor). “*Game Theory Aspects in QoS Grid Computing*”.
- (SM-32) August 2009. Kfir Karmon. “*Quota in Grid Systems.*”
- (SM-33) June 2010. Avishay Livne. “*Monitoring distributed data streams.*”
- (SM-34) June 2012. David Ben-David. “*Violation Recovery in Geometric Distributed Monitoring.*”
- (SM-35) July 2012. Amir Abboud. “*Monitoring General Functions in a Distributed Systems with Minimal Communication.*” **Summa Cum Laude.**

- (SM-36) May 2013. Eyal Posener. *“Dynamic Memory Allocation in Cloud Computers Using Progressive Second Price Auctions”*.
- (SM-37) July 2013. Mickey (Moshe) Gabel. *“Unsupervised Anomaly Detection in Large Data Centers”*.
- (SM-38) March 2017. Ran Bernstein. *“Distributed Monitoring of Machine Models”*.
- (SM-39) June 2017. Matan Liram. *“Enhancing SSDs using Erasure Codes”*. July 2017.
- (SM-40) July 2017. Roman Shor. *“Enhancing SSDs using WOM Codes”*.
- (SM-41) October 2017. Boris Pismenny. *“Auction-based Resource Allocation in the Cloud”*.
- (SM-42) October 2018. Shay Nachum. *“Attack techniques as a new approach to detect malware infection”*.

Theses in Progress - MSc

- (SP-43) Expected 2018. Shunit Agmon. *“Security in RaaS Clouds.”*
- (SP-44) Expected 2019. Hadar Sivan. *“Communication efficient monitoring.”*
- (SP-45) Expected 2019. Yuval Sheratzki. *“Learning to solve intractable computations.”*
- (SP-46) Expected 2019. Dolev Elbaz. *“Scalable Blockchain”*.
- (SP-47) Expected 2020. Saar Eliad. *“Personalization models to predict cow production.”*
- (SP-48) Expected 2020. Saar Barkai. *“Distributed training of deep neural networks.”*
- (SP-49) Expected 2020. Najeeb Nabwani. *“Learning to solve maxclique.”*
- (SP-50) Expected 2020. Qasem Sayah. *“Distributed Detection of Complex Events.”*
- (SP-51) Expected 2020. Koral Chapnik. *“Uncertainty in complex event processing.”*
- (SP-52) Expected 2020. Maor Yankovich. *“Parallel Detection of Complex Events.”*

Research Grants

- 2018–2021** *“Personalization models for cow productivity.”* Innovation Authority (*“Food IOT”* consortium). Budget: \$450K.
- 2018–2020** *“Differentiating the brain and the pacemaker cardiac operating signals.”* Joy Ventures. Budget: \$80K. Group share: \$40K.
- 2018–2022** *“Efficient Detection of Complex Event Patterns in Rapid Data Streams”*. Israeli Science Foundation. Budget: 916K NIS.
- 2018** *“Efficient distribution of training for deep neural networks”*. Google Cloud. Budget: \$12K.
- 2017–2021** *“ODYSSEA - Operating a Network of Integrated Observatory Systems in The Mediteranian Sea”*. Horizon 2020. Group share: 340K Euro.
- 2016–2018**. Mellanox. *“Tools for cloud resource management using game theoretic approach -II.”* Total budget over 2 years: \$100K. Together with Dan Tsafir. Group share: 50K Euro.

- 2015–2018** *"VaVel: Variety, Veracity, VaLue: Handling the Multiplicity of Urban Sensors"*. EC H2020-ICT.16a BigDataResearch RIA. With Ethniko Athinon, TU Dortmund, Fraunhofer, IBM Ireland, AGT GMBH, Orange Polska, Dublin city, Miasto Stoleczne Warszawa, Politechnika Warszawska. EC contribution over 3 years: 3,999,668 Euro. Group share: 100K Euro.
- 2015–2017**. Mellanox. *"Tools for cloud resource management using game theoretic approach - I."* Total budget over 2 years: \$100K. Together with Dan Tsafir. Group share: 50K Euro.
- 2014–2017**. Kibernetik Office Research grant. *"Data leakage prevention from cellular phones."* Total budget over 3 years: 1.8M NIS. Together with Yuval Elovici and Assaf Shabtai from BGU. Group share: 500K NIS.
- 2014–2017** Pazi grant. *"Ginseng: Dynamic resource allocation in the Cloud"*. Together with Orna Agmon Ben-Yehuda. 1M NIS over 4 years.
- 2013–2016** *"FERRARI: Flexible event processing for big data architectures"*. STREP, FP7-ICT-2013-11. With Fraunhofer, IBM, TU Crete, Poslovna Inteligencija, HRVATSKI Telekom. EC contribution over 3 years: 2,954,091 Euro. Group share: 570K Euro.
- 2013–2016** *"SPEEDD: Scalable Proactive Event-Driven Decision making."* STREP, FP7-ICT-2013-11. With Greek National Center for Scientific Research, IBM Israel, EPFL, U Birmingham, Feedzai, and Centre National de la Recherche Scientific France. EC contribution over 3 years: 3,074,505 Euro. Group share: 400K Euro.
- 2013–2014**. *"RaaS: Market Driven Resource Allocation"*. Technion-Microsoft Electronic-Commerce Research Center Grant. Budget: \$20K.
- 2012–2016**. *"Bare metal performance for fully virtualized guests"*. Israeli Science Foundation. Budget over four years: \$250K. With Dan Tsafir. Group share: \$125K.
- 2013–2015**. Kibernetik Office Research grant. *"CYBER-SECURE COMPUTER SYSTEMS: REFACTORING COMPUTER SYSTEMS FOR THE CYBER ERA."* Total budget over 2 years: 2M NIS. Together with Eran Yahav, Yoav Etzion, Dan Tsafir, and Eran Tromer. Group share: 400K NIS.
- 2012–2013**. Mafaat research grant. *"Laboratory for Cyber Security."* Total budget over 2 years: \$230K.
- 2012–2015** European Commission, STREP, FP7-ICT-2011-8. *"INtelligent Synthesis and Real-tIme Response using Massive StreaminG of HeTerogeneous Data"*. With U. of Athens, IBM Ireland, Fraunhofer, U. of Dortmund, Dublin City Council, and BBK Germany. EC contribution over three years: 2,787,720 Euro. Group share: 180K Euro.
- 2012–2017**. Ministry of Industry and Commerce, Metro450 Industry Consortium. *"Checking chips in 450 nanometer technology"*. With Avi Mendelson. Budget over three years: \$600K.
- 2011–2014** European Commission, FET open, FP7-ICT-2009-C. *"DATA SIM: Data Science for Simulating the Era of Electric Vehicles"*. With U. Hasselt, Fraunhofer, CNR (Pisa), BPGE (Hungary), UP Madrid, and Pireus Research Center. EC contribution over three years: 2,368,270 Euro. Group share: 255,600 Euro.
- 2010–2013** European Commission, FET open, FP7-ICT-2009.8.0-C. *"LIFT: Using Local Inference in Massively Distributed Systems"*. With Haifa University, Fraunhofer, CNR (Pisa), and Technical Institute of Crete. EC contribution over three years: 1,891,268 Euro. Group share: 395,200 Euro.
- 2010** Amazon cloud Services. \$ 4,000.
- 2010–2013** European Commission, STREP, FP7-ICT-2009-4. *"ENCORE - ENabling technologies for a programmable many-CORE"*. With Barcelona Supercomputing Center, Technische Universiteit Delft, FORTH Greece, Kungliga Tekniska Hogskolan Sweden, ARM Limited. EC contribution over three years: 3,552,574 Euro. Group share: 408,413 Euro.

- 2009–2013** US–Israel Binational Science Foundation. “*Local Inference in Massively Distributed Systems*”. With Daniel Keren (Haifa U) and Hillol Kargupta (UMBC). Budget over four years: \$76K. Group share: \$44K.
- 2009–present.** Technion Hasso-Plattner-Institut on Scalable Computing - Software and Architecture. Funding for 15 PhD students every year. Together with faculty members from EE and CS departments. Was in charge of compiling and submitting the proposal.
- 2009–2013.** Ministry of Industry and Commerce, HD-Net Consortium. “*Multi-Level Caching for Video Streaming*”. Group share over five years: \$400K.
- 2009.** IBM Innovation Award. Budget: \$20K. “*Monitoring Distributed Data Streams.*”
- 2008.** Intel grant to the Distributed Systems and Data Mining Laboratory (DSL). Budget: \$20K.
- 2008.** SUN donation to student education on parallel programming. A Niagara server worth \$32K.
- 2007–2008.** Google Award. Budget: \$40K. “*Communication-Efficient Map-Reduce.*” With Daniel Keren from Haifa U.
- 2007.** IBM Faculty Award. Budget: \$20K. “*Monitoring Distributed Data Streams.*”
- 2007–2008.** “*European Grid Equipement*”. Israeli Science Foundation Basic Equipement. \$100K. With Technion Physics and CS researchers.
- 2007–2010.** “*Geometric Monitoring of Distributed Data Streams*”. Israeli Science Foundation. Budget over three years: \$150K. With Daniel Keren, Haifa U.
- 2007–2009.** “*Software and system for genetic linkage analysis of SNP data for large families*”. Microsoft TCI grant. Budget over two years: \$500K. Together with Dan Geiger.
- 2007–2009.** “*Algorithms for Wireless Sensor Networks*”. Israeli Ministry of Industry and Commerce. Budget for first year: \$250K (\$50K Technion budget). With Elbit Systems LTD and Haifa University.
- 2012–2013.** Mafaat research grant. “*Communication Minimization in Ad-Hoc Sensor Systems.*”. Total budget over 1 years: \$60K. (Declined).
- 2003–2018.** Mafaat research grants: Big Data Research. “*Data, Analytics, and Privacy in Large-Scale Distributed Systems*”. Aggregate budget: \$650K.
- 2006–2007.** “*A Grid System Personalization Service*”. Intel Grant. Budget: \$21K.
- 2006–2007.** “*Using Explicit Fine-Granularity Parallelization for Power Efficient Computing*”. Intel Grant. Budget: \$20K.
- 2006–2008.** “*EGEE-II - Enabling Grids for E-science II*”, European Commission mega project. Technion budget – 45K Euro.
- 2006–2009.** European Commission, FP6 (Call 5) – IST, Grid Track. “*QosCosGrid: Quasi-Opportunistic Supercomputing for Complex Systems in Grid Environments*”. Budget over 2.5 years: 2,800K Euro (Technion share: 441K Euro). With University of Ulster (UK), University of Queensland (Australia), Cranfield University (UK), Universitat Pompeu Fabra (Spain), Etvos Lorand University (Hungary), Institut National de Recherche en Informatique et Automatique (France), INSTYTUT CHEMII BIOORGANICZNEJ PAN (Poland), Universiteit van Amsterdam (Netherlands), Platform Computing SARL (France).
- 2005.** IBM Faculty Award. Budget: \$7.5K. “*Multi-level Caching for Storage Systems.*”
- 2005.** Intel equipment grant. Budget: \$42K. For the Distributed Systems Laboratory.

- 2005–2006.** EGEE - Enabling Grids for E-science, European Commission mega project. Technion budget – 18K Euro.
- 2005–2007.** Israeli Ministry of Science. “*Energy Saving Protocols in Sensor Networks by Localizing Data Computing and Transmissions*”. With Shai Kuttin, David Peleg, and Boaz Patt-Shamir. Budget for the first two years: \$200K.
- 2005–2007.** Israeli Ministry of Science. “*National computational grid-based center for the analysis of family data of genetic diseases*”. With Dan Geiger, Tzipi Falik, Ohad Birk, and Motti Shochat. Budget: \$500K.
- 2004.** IBM Shared University Relations grant. *Grid Laboratory and a National Grid Node*. Budget: \$250K. With Dan Geiger.
- 2004.** Intel Microcomputers Research grant. *Intrathreads Implementation and Code Generation*. Budget \$10K.
- 2004.** IBM Faculty Award. “*A framework for information sharing between the application and file system layers and the storage system.*” Budget \$20K.
- 2004.** Intel equipment donation, Itanium processors for DSL. Budget \$10K.
- 2004–2006.** European Commission, FP6 – IST. “*Data Mining Tools and Services for Grid Computing Environments*”. Budget over 2 years: 1,883K Euro (Technion share: 400K Euro). With W. Dubitzky (U. Ulster), M. May (Fraunhofer), J. Franke (DaimlerChrysler), and V. Stankovski (U. Ljubljana).
- 2004.** Intel academic research support. “*Data Mining in Very Large-Scale Distributed and Peer-to-Peer Systems*”. Budget: \$20K.
- 2003.** Intel academic education grant. \$4K in software for the new operating systems course.
- 2003.** Voltair academic donation. \$10K in communication equipment.
- 2003.** Intel Microarchitecture Academic Grant. “*Intrathreads – Techniques for Parallelization of Sequential Code*”. Budget for one year: \$10K.
- 2001–2005.** Israel Science Foundation. “*Highly Scalable Model Checking*”. Budget over four years: \$255K. With O. Grumberg.
- 2001–2003.** Intel Microarchitecture Academic Grant. “*Parallel and Distributed Model Checking*”. Budget over two years: \$100K.
- 2000–2004.** Ministry of Industry and Commerce, LSRT Consortium. “*Cheap Scalable Servers for Telephony Services*”. Budget over four years: \$335K.
- 2000–2003.** Microsoft Academic Grants. “*Distributed Active Systems*”. Budget over three years: \$90K.
- 2000.** Software Technology Laboratory. Budget for one year: \$25K. “*Hierarchies of Memory Models*”.
- 2000–2003.** Intel equipment grant. Budget over three years: \$120K. For the Distributed Systems Laboratory.
- 2000–2003.** Ministry of Science – Infrastructure Project. Budget over three years: \$500K. “*Efficient Transmission of Multimedia Over High-Speed Access Network*”. With R. Cohen and R. Friedman (Technion), O. Hadar and S. Greenberg (Ben-Gurion U.).
- 1999 .** Software Technology Laboratory. Budget for one year: \$25K. Implementing a Distributed Java Virtual Machine.

- 1999–2001.** Ministry of Science – Infrastructure Project. Budget over three years: \$970K. “*The Wide Area Cluster Computing (WACC) Project: Infrastructure for National-Scale High-Performance Parallel Computing*”. With A. Barak (Hebrew U.), and N. Fraenkel (Inter-University Computing-Center – Israeli MACHBA).
- 1998.** Arc-En-Ciel project. Travel budget for one year: \$10K. “*LIPTech: Parallel Virtual Machines for High Performance Computing on Commodity Clusters: Programming Environments*”. With L. Bouge (ENS, Lyon).
- 1998–2000 (Project Manager).** Ministry of Science – Infrastructure Project. Budget over three years: \$900K (\$370K to Technion group). “*Virtual Servers - Dynamic Access Infrastructure to Global Information*”. With M. Rodeh, E. Biham, R. Friedman (Technion), D. Feitelson, D. Dolev (Hebrew U.), Y. Ben-Asher (Haifa U.).
- 1997–1998.** French-Israeli Joint Research. Travel budget: \$40K over two years. “*Communication Algorithms in Optical Networks*”. With E. Upfal, D. Peleg, U. Feige (Weizmann Inst.), S. Kutten (Technion), A. Ferreira (ENS Lyon), F. Chavel (IOTA Orsay), P. Berthomé, C. Laforest, D. Barth (LRI Orsay) F. Clerot, F. Tillerot (CNET), J-C. Bermond, S. Perennes, M. Syska, J. Bond (INRIA, Sophia Antipolis).
- 1997–1998.** French-Israeli Joint Research. Travel budget: \$24K over two years. “*Towards Global Computing in the Global Village: Computing in Distributed Environments*”. With N. Nisan (Hebrew U.) and M. Shapiro (Inria, Paris.)
- 1996–1997.** Ministry of Science. Budget over two years: \$66K. “*Parallel Rendering Algorithms for Computer Graphics and Visualization*”. With C. Gotsman (Technion.)
- 1995–1996.** Ministry of Industry and Commerce. Budget: \$39K. “*The Millipede Project*”.
- 1993–1996.** Ministry of Science. Total budget over 3 years: \$70K. “*Routing Models for Fast Optical Communication Networks*”. With I. Newman (Haifa U.)
- 1992–1994.** French-Israeli Joint Research. Budget over two years: \$72K. “*Optical Models for Parallel Computers*”. With A. Ferreira (ENS, Lyon).
- 1995–1997.** Intel Academic Grant. Budget over three years: \$45K. “*Parallel Binary Decision Diagrams on Millipede*”. In addition to Intel Academic Product Grants 1993–5 for the Millipede project: Workstations and Communication.
- 1995–1999** Microsoft R&D Donation. Budget: \$25K. Support for the Millipede project. In addition to Microsoft Product Donation for the *Distributed Systems Laboratory*: full MSDN Subscription, software and books.
- 120-830** Haifa University – Technion, 1994. \$5K, with I. Newman.
- 1996–1998.** Mitchell-Soref Entrepreneurial Program. Budget: \$15K. “*The Millipede Project: Parallel Computing in Distributed Environments*”.
- 1996.** Ministry of Industry and Commerce. Budget: \$23.2K. “*Parallel Information Services on a Cluster of Workstations*”.

Significant Professional Projects

2010 – : Ginseng – resource allocation in cloud servers. Ginseng is an implementation of a negotiation agent using which elastic applications and services will be able to take part in auctions for resources in cloud servers hosting multiple guests. Ginseng uses and implements game theoretic ideas to encourage the guests to bid truthfully, and to make the resulting allocation of resources maximize system utilization and owner’s revenue.

2003 – 2008: Gozal – realizing dependable grids. Gozal is a collaboration with the Condor team from Madison, Wisconsin. Condor is one of the most popular grid batch systems in use today, with a worldwide installation base of thousands resource pools. The Gozal team has developed a high availability (HA) library for mission-critical grid services, and for Condor’s matchmaker and submission queues in particular.

The special characteristics of the grid environment make the building of highly available services unusually difficult. The Gozal approach is unique in providing HA functionality itself as a set of configurable services, which can be used by transparently decorating, but not changing, the original services.

Gozal HA is used by the Condor matchmaker without changing even a single line of Condor software code. Effective as of version 6.8, the Gozal software is incorporated into the standard Condor distribution, which is used by thousands large-scale high-throughput Condor installations worldwide.

2000 – 2008: cJVM and JavaSplit – transparent distributed run-time for Java. The cJVM project was originally carried out at IBM’s Haifa Research Laboratory, with the goal of transparently executing multithreaded programs in parallel on distributed clusters. The cJVM project won several best paper awards.

A follow-up project, called JavaSplit, was initiated at the Technion in collaboration with IBM. JavaSplit goals go beyond those of cJVM while exploiting a different set of technologies. In addition to cJVM’s transparency, JavaSplit also achieves portability by using bytecode-level instrumentation and distributed shared memory. Various optimization techniques are implemented for improved performance. However, JavaSplit’s most unique property is high availability (HA), which is efficiently obtained through novel replication protocols that extend the underlying memory model. Furthermore, JavaSplit employs a novel speculation mechanism which is based on the HA rollback capabilities. This mechanism boosts overall system performance, effectively nullifying the overhead of the HA protocols.

2005 – 2008: GridLogMiner – mining to improve large distributed systems. The GridLogMiner project uses distributed data mining to improve large-scale grid batch systems. Mining job execution logs for thousands of resources can improve user experience with the system, better match jobs to resources, and help identify sources of malfunctions of all kinds. Moreover, resource misbehaviors such as black and white holes can be pinpointed, while job misbehaviors such as attacks on resources and DDOS attacks can also be detected and avoided.

In GridLogMiner, the execution logs at every resource are collected into local databases and transformed into a system-independent representation using a specialized batch system ontology. The data is then mined using a centralized control, whereas the queries to the local databases are piggybacked on the underlying batch system mechanism itself. The GridLogMiner implementation can be downloaded as an add-on to the Condor batch system.

The GridLogMiner ideas were taken up by Intel, resulting in an Intel-internal \$3M project to collect and mine the logs of NetBatch, Intel’s global batch system.

2004 – 2007: DataMiningGrid – data mining in grid environments. This EC funded project develops tools and services for deploying highly demanding data mining tasks on grid environments. The DataMiningGrid architecture employs a high-level workflow editor that utilizes Web services for mining functionality and utilizes grid services for resource allocation and data movement. At the same time, this architecture places a special emphasis on maintaining data privacy. To demonstrate the

developed technology, the DataMiningGrid project implements a range of demonstrator applications in e-science and e-business, including parallel and scalable mining of large, distributed datasets.

2006 – 2009: QosCosGrid – quasi-opportunistic supercomputing. The goal of this EC funded project, is to develop core grid infrastructure capable of providing quasi-opportunistic supercomputing (QOS) grid services and technology. It will enable users to develop applications with supercomputing requirements without having to actually purchase and deploy supercomputers. The technology will be validated in the areas of stellar dynamics and evolution, biochemistry, ecological evolution, gene regulation networks, and business supply chains.

1996 – 2004: Millipede – fine-grain software distributed shared memory. The goal in the original Millipede project was to develop a single system image environment for parallel programming on top of non-dedicated distributed networks of Windows workstations. An early version of Millipede provided a virtual parallel machine with a high-level interface, including software distributed shared memory (the first ever SDSM using Windows). It presented novel optimization techniques such as multi-protocol weak-consistency for shared variables. This work was the first to discuss, implement, and use page and thread migration for adaptive load-sharing, dynamic avoidance of false-sharing, and ping-pong situations. The system analyzed the communication pattern during run-time and – via dynamic page and thread migration – remapped the work accordingly. An article on Millipede was published in *BYTE Magazine*.

A later version of Millipede presented a high-performance software distributed shared memory (OSDI 1999). By employing special memory mappings it was able to demonstrate the first fine-grain page-based SDSM. Millipede avoided false sharing by adapting the sharing granularity to the native object granularity as declared by the application. The sharing granularity was dynamically adapted on-the-fly according to an autonomic run-time optimization mechanism, the only one of its kind (best paper award, IPDPS 2001). A recent version of Millipede uses Infiniband interconnections and in-kernel processing to reach high-performance with Linux OS (Hot Interconnects 2003). Another version of Millipede is fully transparent at the binary level, using Windows OS.

2004 – 2011: SuperLink Online. Online System for Faster Multipoint Linkage Analysis via Parallel Execution on Thousands of Personal Computers (in collaboration with Mark Silberstein, Danny Geiger and Miron Livny). Computation of LOD scores is a valuable tool for mapping disease-susceptibility genes in the study of Mendelian and other complex diseases. SuperLink Online is a distributed system for the computation of multipoint LOD scores of large inbred pedigrees—a task which is often beyond the capabilities of a single computer when there is extensive missing data. The system achieves high performance via efficient parallelization, a state-of-the-art serial program, and the use of the idle cycles of thousands of personal computers. The main algorithmic challenge has been to efficiently split a large task for distributed execution in a highly dynamic, nondedicated, hierarchical running environment. The system is available online, facilitating the performance of computationally intensive analyses without the need to install software or maintain a complicated distributed environment. The system is now used extensively by hundreds of collaborating medical centers around the world. Access to the system’s main computational power—tens of thousands of PCs— is in collaboration with the Condor team in Madison, WI, the European Commission EGEE-II (Enabling Grids for E-science), OSG (Open Science Grid), and a home-grown community grid comprising 100K registered home PCs (20K active ones).

A note on SuperLink Online was published in the Science Magazine (under NetWatch Best of the Web in science. Science 19 May 2006: 977). Several magazine articles were published during 2008-9.

2003 – 2008: MultiRace – data race detection in multithreaded code. MultiRace employs a combination of the vector clocks paradigm, special memory mapping configurations, and transparent instrumentation in order to detect data races on-the-fly. MultiRace imposes negligible overhead on most programs and can thus be switched on even in production mode.

MultiRace is unique in its matching of the detection granularity to the native object granularity of the tested program. Automatic granularity refinement takes place whenever an alarm is generated. If the

alarm is determined false, automatic aggregation reduces the overhead. MultiRace uses the same logging mechanism for the implementation of improved versions of two different detection algorithms, thus improving coverage with no false positives. MultiRace can be used to detect races on any reasonable memory model.

The MultiRace vector clocks algorithm was implemented in Intel's ThreadChecker, which is one of the most important debugging tools for multithreaded programs.

1986: The Batch System. A distributed cycle stealing system in the UNIX BSD domain (together with Gil Schwed, Checkpoint CEO and President, and Michael Berman, CEO BioMediCom).

Publications

Theses

- (T-1) “*The Construction and Analysis of a new Communication Network, based on Properties of the Projective Space*”, M.Sc. Thesis, Computer Science Department, Hebrew University, Israel, July 1986. Thesis advisor: Prof. E. Shamir.
- (T-2) “*Dynamic Reconfiguring Networks for Parallel Computation: Algorithms and Complexity Bounds*”, Ph.D. Thesis, Computer Science Department, Hebrew University, Israel, December 1991. Thesis advisor: Prof. E. Shamir.

Journals

- (J-1) E. Shamir and A. Schuster, “*Communication Aspects of Networks Based on Geometric Incidence Relations*”, *Theoretical Computer Science*, Vol. 64 No. 1, pp. 83–96, April 1989.
- (J-2) Y. Aumann and A. Schuster, “*Improved Memory Utilization in Deterministic PRAM Simulation*”, *Journal of Parallel and Distributed Computing*. Special issue on Shared-Memory Multiprocessors, Vol. 12, pp. 146–151, 1991.
- (J-3) Y. Ben-Asher, D. Peleg, R. Ramaswami and A. Schuster, “*The Power of Reconfiguration*”, *Journal of Parallel and Distributed Computing*, Special issue on Massively Parallel Computation, Vol. 13, pp. 139–153, 1991.
- (J-4) Y. Ben-Asher and A. Schuster, “*Ranking on Reconfigurable Networks*”, *Parallel Processing Letters*, Vol. 1, no. 2, pp. 149–156, December 1991.
- (J-5) Y. Ben-Asher, D. Egosi and A. Schuster, “*2-D SIMD Algorithms for Perfect Shuffle Networks*”, *Journal of Parallel and Distributed Computation*, Vol. 16, pp. 250–257, 1992.
- (J-6) Y. Ben-Asher and A. Schuster, “*The Complexity of Data-Reduction on the Reconfigurable Linear Array*”, *Journal of Algorithms*. Vol. 18, pp. 322–357, 1995.
- (J-7) Y. Ben-Asher, A. Schuster and J.F. Sibeyn, “*Load Balancing: A Programmer's Approach or The Impact of Task-Length Parameters on the Performance of the Random Load-Balancing Algorithm*”, *International Journal of High Speed Computing*, pp. 303–325, Vol. 7, No. 2, 1995.
- (J-8) I. Ben-Aroya, T. Eilam and A. Schuster, “*Greedy Hot-Potato Routing on the Two-Dimensional Mesh*”, *Distributed Computing*, pp. 3–19, Vol. 9, No. 1, 1995.
- (J-9) Y. Ben-Asher, K.-J. Lange, D. Peleg and A. Schuster, “*The Complexity of Reconfiguring Network Models*”, *Information and Computation*, Vol. 121, No. 1, pp. 41–58, August 1995.

- (J-10) I. Newman and A. Schuster, “*Hot-Potato Worm Routing via Store-and-Forward Packet Routing*”, *Journal of Parallel and Distributed Computing*, Vol. 30, pp. 76–84, 1995.
- (J-11) Y. Ben-Asher, D. Gordon and A. Schuster, “*Efficient Self Simulation Algorithms in Reconfigurable Arrays*”, *Journal of Parallel and Distributed Computing*, Vol. 30, pp. 1–22, 1995.
- (J-12) Y. Ben-Asher, G. Rünger, A. Schuster and R. Wilhelm, “*2DT-FP: An FP Based Programming Language for Efficient Parallel Programming of Multiprocessor Networks*”, *Intl. Journal of Parallel Programming*, Vol. 23, No. 5, October 1995, pp. 389–422.
- (J-13) I. Newman and A. Schuster, “*Hot-Potato Algorithms for Permutation Routing*”, *IEEE Trans. on Parallel and Distributed Systems*, Vol. 6, No. 11, November 1995, pp. 1168–1176.
- (J-14) Y. Matias and A. Schuster, “*Fast, Efficient Mutual and Self Simulations for Shared Memory and Reconfigurable Mesh*”, *Parallel Algorithms and Architectures*, Vol. 8, pp. 195–221, 1996. Special issue on Enhanced Mesh Architectures, S. Olariu Ed.
- (J-15) Y. Ben-Asher and A. Schuster, “*Low Crosstalk Address Encodings for Optical Message Switching Systems*”, *Parallel Processing Letters*, Vol. 6, No. 1, Feb. 1996, pp. 87–100.
- (J-16) Y. Ben-Asher and A. Schuster, “*Time – Size Tradeoffs for Reconfigurable Meshes*”, *Parallel Processing Letters*, Vol. 6, No. 2, pp. 231–245, June 1996.
- (J-17) I. Ben-Aroya, I. Newman and A. Schuster, “*Randomized Single-Target Hot-Potato Routing*”, *Journal of Algorithms*, Vol. 23, pp. 101–120, 1997.
- (J-18) R. Friedman, M. Goldin, A. Itzkovitz and A. Schuster, “*Millipede: Easy Parallel Programming in Available Distributed Environments*”, *Software: Practice & Experience*, Vol. 27, No. 8, pp. 929–965, August 1997.
- (J-19) A. Itzkovitz, A. Schuster, and L. Wolfovich, “*Thread Migration and its Applications in Distributed Shared Memory Systems*”, *The Journal of Systems and Software*. vol. 42, No. 1, pp. 71–87, 1998.
- (J-20) A. Ben-Dor, S. Halevi and A. Schuster, “*Potential Function Analysis of Greedy Hot-Potato Routing*”. *Theory of Computing Systems*, Vol. 31, pp. 41–62, 1998.
- (J-21) A. Dubrovsky, R. Friedman and A. Schuster, “*Load Balancing in Distributed Shared Memory Systems*”. *International Journal of Applied Software Technology*, Vol. 3, March 1998, pp. 167–202.
- (J-22) I. Ben-Aroya, D. Chinn and A. Schuster, “*A Lower Bound for Nearly Minimal Adaptive and Hot Potato Algorithms*”, *Algorithmica*. Vol. 21, pp. 347–376, 1998.
- (J-23) Y. Ben-Asher and A. Schuster, “*Single Step Undirected Reconfigurable Networks*”. *VLSI Design*, Vol. 9, No. 1, pp. 17–28, 1999. Special issue on High Performance Bus-Based Architectures, S. Olariu Ed.
- (J-24) M. Golin and A. Schuster, “*Optimal Point-to-Point Broadcast Algorithms via Lopsided Trees*”, *Discrete Applied Mathematics*. Vol. 93, pp. 233–263, August 1999.
- (J-25) P. Berthomé, T. Hagerup, I. Newman and A. Schuster, “*Self-Simulation for the Passive Optical Star*”. *Journal of Algorithms*, Vol. 34, pp. 128–147, January 2000.
- (J-26) A. Itzkovitz, A. Schuster and O. Zeev Ben-Mordechai. “*Towards Integration of Data-Race Detection in DSM Systems*”. *Journal of Parallel and Distributed Computing*. Special issue on software support for distributed computing. I. Ahmad and F. Lau Ed’s.
- (J-27) A. Gontmakher and A. Schuster. “*Java Consistency: Non-Operational Characterizations for Java Memory Behavior*”. *ACM Transactions on Computer Systems*. vol. 18, No. 4, Nov. 2000, pp. 333–386.

- (J-28) A. Itzkovitz, N. Niv and A. Schuster. “*Dynamic Adaptation of Sharing Granularity in DSM Systems*”. *The Journal of Systems and Software*. Vol. 55, pp. 19–32, 2000. ((C-37)).
- (J-29) C. Gotsman, A. Reisman, and A. Schuster. “*Parallel Progressive Rendering of Animation Sequences at Interactive Rates on Distributed-Memory Machines*”. ((C-28)). *Journal of Parallel and Distributed Computing*. Volume 60, pp. 1074–1102, 2000.
- (J-30) Dmitry Kogan and Assaf Schuster. “*Remote Reference Counting: Distributed Garbage Collection with Low Communication and Computation Overhead*”. ((C-27)). *Journal of Parallel and Distributed Computing*. Special Issue – Java on Clusters (E. Dekel Ed.). Vol. 60, No. 10, pp. 1260–1292, October 2000.
- (J-31) Y. Aridor, T. Eilam, M. Factor, A. Schuster and A. Teperman. “*Transparently Obtaining Scalability for a Cluster Java Virtual Machine*”. *Journal of Parallel and Distributed Computing*. Special Issue – Java on Clusters (E. Dekel Ed.). Vol. 60, No. 10, pp. 1159–1193, October 2000. (C-41). **IBM Pat Goldberg memorial award for best computer science paper published in 2000.**
- (J-32) R. Friedman, E. Biham, A. Itzkovitz and A. Schuster. “*Symphony: An Infrastructure for Managing Virtual Servers*”. ((C-36)). *Cluster Computing*, Vol. 4, pp. 221–233, 2001.
- (J-33) N. Niv and A. Schuster. “*Transparent Adaptation of Sharing Granularity in Multiview-Based DSM Systems*”. *Software: Practice & Experience*. ((C-44)). Vol. 31, pp. 1439 – 1459, October 2001.
- (J-34) T. Heyman, D. Geist, O. Grumberg, and A. Schuster. “*A Scalable Parallel Algorithm for Reachability Analysis of Very Large Circuits*”. ((C-42)). *Formal Methods in Systems Design*. Vol. 21, pp. 317–338, 2002.
- (J-35) S. Ben-David, T. Heyman, O. Grumberg, and A. Schuster. “*Scalable Distributed On-The-Fly Symbolic Model Checking*”. ((C-43)). *Software Tools for Technology Transfer*. Vol. 4, No. 4, pp. 496–504, November 2003.
- (J-36) A. Schuster and Ran Wolff. “*Communication-Efficient Distributed Mining of Association Rules*”. *Data Mining and Knowledge Discovery*. No. 8, pp. 171–196, 2004.
- (J-37) A. Gontmakher, S. Polyakov, and A. Schuster. “*Complexity of Verifying Java Shared Memory Execution*”. *Parallel Processing Letters*. Vol. 13, No. 4, pp. 721–733, December 2003.
- (J-38) A. Schuster and R. Wolff. “*Association Rule Mining in Peer-to-Peer Systems*”. Special Issue on Distributed and Mobile Data Mining, *IEEE Transactions on System, Man, and Cybernetics (Part B: Cybernetics)*. Pp. 2426–2438, Vol. 34, No. 6, December 2004.
- (J-39) T. Heyman, O. Grumberg and A. Schuster. “*Distributed Model Checking for μ -Calculus*”. ((C-46)). *Formal Methods in Systems Design*. Vol. 26, No. 2, pp. 197–219, March 2005.
- (J-40) A. Bar-Or, D. Keren, A. Schuster, and R. Wolff. *Hierarchical Decision Tree Induction in Distributed Genomic Databases.* *IEEE Transactions on Knowledge and Data Engineering*. pp. 1138–1151, Vol. 18, No. 8, August 2005. **Invited (but refereed) paper.**
- (J-41) A. Schuster, D. Trock and R. Wolff. “*A High-Performance Distributed Algorithm for Mining Association Rules*”. *Knowledge and Information Systems*. Vol. 7, No. 4, pp. 458–475, 2005.
- (J-42) V. Iosevitch and A. Schuster. “*Software Distributed Shared Memory: a VIA-based implementation and comparison of sequential consistency with home-based lazy release consistency*”. *Software, Practice and Experience*. Volume 35, Issue 8, pp. 755–786, July 2005.
- (J-43) T. Birk, L. Liss and A. Schuster. “*Efficient Exploitation of Kernel Access to Infiniband: a Software DSM Example*”. *IEEE Trans. on Parallel and Distributed Systems*, vol. 16 (9), pp. 830–840, Sep. 2005.

- (J-44) Silberstein M., Tzemach A., Dovgolevsky N., Fishelson M., Schuster A., Geiger D. “*On-line System for Faster Linkage Analysis via Parallel Execution on Thousands of Personal Computers*”. *The American Journal of Human Genetics*. Vol. 78, pp. 922–935, June 2006.
- (J-45) M. Factor, A. Schuster and K. Shagin. “*A Platform-Independent Distributed Runtime for Standard Multithreaded Java*”. *International Journal of Parallel Programming*. Special issue on Systems and Storage. Vol. 34, No. 2, pp. 113–142, May 2006.
- (J-46) T. Heyman, O. Grumberg and A. Schuster. “*A Work-Efficient Distributed Algorithm for Reachability Analysis*”. *Formal Methods in System Design*. Special Issue on Parallel and Distributed Methods in Verification. Volume 29, Number 2, September 2006, pages 157-176.
- (J-47) L. Fix, O. Grumberg, T. Heiman, A. Schuster. “*Verifying Very Large Industrial Circuits Using 100 Processes and Beyond*.” *International International Journal of Foundations of Computer Science (IJFCS)*. Special Issue for ATVA05. Volume 18, No. 1, February 2007, pp. 45–62.
- (J-48) E. Pozniansky and A. Schuster. “*MultiRace: efficient on-the-fly data race detection in multithreaded C++ programs*”. *Concurrency and Computation: Practice and Experience*. Volume 19, pp. 327–340, 2007.
- (JS-49) M. Sagiv, A. Schuster, and O. Shacham. “*Scaling Model Checking of Dataraces Using Dynamic Information*.” *Journal of Parallel and Distributed Computing (JPDC)*. Volume 67, pp. 537–550, 2007.
- (J-50) Denis Krivitski, Assaf Schuster, Ran Wolff: “*A Local Facility Location Algorithm for Large-scale Distributed Systems*”. *J. Grid Comput.* 5(4) 361-378, 2007.
- (J-51) Arik Friedman, Ran Wolff, Assaf Schuster: “*Providing k-anonymity in data mining*”. *VLDB J.* 17(4): 789-804, 2008.
- (J-52) Izchak Sharfman, Assaf Schuster, Daniel Keren: “*A geometric approach to monitoring threshold functions over distributed data streams*”. *ACM Transactions on Database Systems*. 32(4), 2007. **Invited refereed paper. Technion Best Graduate Student Paper Award for 2008.**
- (J-53) Kfir Karmon, Liran Liss, Assaf Schuster: “*GWiq-P: an efficient decentralized grid-wide quota enforcement protocol*”. *Operating Systems Review* 42(1): 111-118, 2008.
- (J-54) Vlado Stankovski, Martin Swain, Valentin Kravtsov, Thomas Niessen, Dennis Wegener, M. Rohm, Jernej Trnkoczy, Michael May, Jürgen Franke, Assaf Schuster, Werner Dubitzky: “*Digging Deep into the Data Mine with DataMiningGrid*”. *IEEE Internet Computing*. 12(6): 69-76, 2008.
- (J-55) Avi Yadgar, Orna Grumberg, Assaf Schuster. “*Hybrid BDD and All-SAT Method for Model Checking*”. *Languages: From Formal to Natural*. 2009, pages 228-244.
- (J-56) Pavel Bar, David Carmeli, Valentin Kravtsov, Martin Swain, Assaf Schuster. “*A scheduling framework for large-scale, parallel, and topology-aware applications*.” *Journal of Parallel and Distributed Computing*. 70(9): 983-992, 2010.
- (J-57) Guy Sagy, Daniel Keren, Izhak Sharfman, Assaf Schuster. “*Distributed Threshold Querying of General Functions by a Difference of Monotonic Representation*.” *Proceedings of the VLDB Endowment (PVLDB)*. Vol. 4, No. 2, November 2010.
- (J-58) Guy Sagy, Daniel Keren, Izhak Sharfman, Assaf Schuster. “*Top-k Aggregation Queries in a Distributed Environment*.” *Journal of Parallel and Distributed Computing (JPDC)*. 71(2): 302-315, 2011.
- (J-59) Gala Yadgar, Michael Factor, Kai Li and Assaf Schuster. “*Management of Multilevel, Multi-Client Cache Hierarchies with Application Hints*”. *ACM Transactions on Computer Systems (TOCS)*. Vol 29, Issue 2, May 2011.
- (J-60) Daniel Keren, Tsachi Sharfman, Assaf Schuster, and Avishay Livne. *Shape Sensitive Geometric Monitoring*. *Transactions on Knowledge and Data Engineering (TKDE)*. Vol 24, No 8, August 2012.

- (J-61) Orna Agmon Ben-Yehuda, Muli Ben-Yehuda, Assaf Schuster, and Dan Tsafir. “*Deconstructing Amazon EC2 Spot Instance Pricing*”. ACM Transactions on Economics and Computation. 2013.
- (J-62) Luk Knapen, Ansar Yasar, Sungjin Cho, Daniel Keren, Abed Abu Dbai, Tom Bellemans, Davy Janssens, Geert Wets, Assaf Schuster, Izchak Sharfman, Kanishka Bhaduri. “*Exploiting Graph-theoretic Tools for Matching in Carpooling Applications*”. Journal of Ambient Intelligence and Humanized Computing. 2013.
- (J-63) Orna Agmon Ben-Yehuda, Muli Ben-Yehuda, Assaf Schuster, Dan Tsafir. “*The rise of RaaS: the Resource as a Service Cloud*.” Communication of the ACM. 2014.
- (J-64) Daniel Keren and Guy Sagy and Amir Abboud and David Ben-David and Assaf Schuster and Ischak Sharfman and Antonis Deligiannakis. “*Geometric Monitoring of Heterogeneous Streams*”. IEEE Transactions on Knowledge and Data Engineering (TKDE), 2014.
- (J-65) Nikos Giatrakos, Antonios Deligiannakis, Minos Garofalakis, Izchak Sharfman, Assaf Schuster. “*Distributed Geometric Query Monitoring using Prediction Models*.” ACM Transactions on Database Systems (TODS). Vol. 39, Issue 2, May 2014.
- (J-66) “*Monitoring Distributed Streams using Convex Decompositions*.” Arnon Lazerson, Izchak Sharfman, Daniel Keren, Assaf Schuster, Minos Garofalakis and Vasilis Samoladas. Proceedings of the VLDB Endowment (PVLDB). Vol 9. August 2015.
- (J-67) “*ELI: Bare-Metal Performance for I/O Virtualization*.” Abel Gordon, Nadav Amit, Nadav HarEl, Muli Ben-Yehuda, Alex Landau, Assaf Schuster, Dan Tsafir ”Research Highlights” (RH) section of the CACM. **Invited paper**. December 2015.
- (J-68) Uri Verner, Avi Mendelson, Assaf Schuster: “*Extending Amdahl’s Law for Multicores with Turbo Boost*.” Computer Architecture Letters 16(1): 30-33, 2017.
- (J-69) “*Experience from Two Years of Visualizing Flash with SSDPlayer*”. Gala Yadgar, Roman Shor, Eitan Yaakobi, Assaf Schuster. ACM Transactions on Storage. 2017.
- (J-70) “*An Analysis of Flash Page Reuse with WOM Codes*”. Gala Yadgar, Eitan Yaakobi, Fabio Margaglia, Yue Li, Alexander Yucovich, Nachum Budak, Lior Gilon, Nir Yakovi, Andre Brinkmann, Assaf Schuster. ACM Transactions on Storage (TOS). Special Issue on NVM and Storage. Volume 14, issue 1. February 2018.
- (J-71) “*Lightweight Monitoring of Distributed Streams*”. Arnon Lazerson, Danny Keren, Assaf Schuster. Transactions of Database Systems (TODS). May 2018.
- (J-72) “*LDA classifier monitoring in distributed streaming systems*”. Ran Bernstein, Margarita Osadchy, Daniel Keren, Assaf Schuster. Journal of Parallel and Distributed Computing. October 2018.

Magazines

- (M-1) “*The Millipede Runtime*.” BYTE Magazine (International Bits), May 1998, pp. 3–4.
- (M-2) A. Gontmakher, A. Mendelson, and A. Schuster. “*Inthreads - a Low Granularity Parallelization Model*”. ACM SIGARCH Computer Architecture News newsletter, Vol. 34, No. 1, pp. 77–80, 2006.
- (M-3) “*There Goes the (Genetic) Neighborhood*.” NetWatch Best of the Web in science. Science 19 May 2006: 977.
- (M-4) “*The rise of RaaS: the Resource as a Service Cloud*.” Orna Agmon Ben-Yehuda, Muli Ben-Yehuda, Assaf Schuster, Dan Tsafir. Communication of the ACM. July 2014.

- (M-5) “*Scalable Proactive Event-Driven Decision-Making.*” Alexander Artikis, Chris Baber, Pedro Bizarro, Carlos Canudas-de-Wit, Opher Etzion, Fabiana Fournier, Paul Goulart, Andrew Howes, John Lygeros, Georgios Paliouras, Izchak Sharfman, and Assaf Schuster. The IEEE Technology and Society Magazine. 2014.
- (M-6) “*The rise of RaaS: the Resource as a Service Cloud.*” Orna Agmon Ben-Yehuda, Muli Ben-Yehuda, Assaf Schuster. Haaretz Cloud Magazine (in Hebrew). August 2014.

Electronic Publications

- (E-1) Idit Keidar and Assaf Schuster. “*Want Scalable Computing? Speculate!*” SIGACT News Distributed Computing Column. Volume 37, Number 3, (Whole Number 140), September 2006.

Books and Book Chapters

- (B-1) A. Schuster. “*Bounds and Analysis Techniques for Greedy Hot-Potato Routing.*” Chapter 11 in “*Optical Interconnections and Parallel Processing: Trends at the Interface.*”, pp. 283–354. Kluwer Academic Publishers. ISBN 0-7923-4817-6 P. Berthomé and A. Ferreira Ed’s. November 1997.
- (B-2) A. Cohen, Y. Rabinovich, A. Schuster, and H. Shachnai. “*Optimal Bounds on Tail Probabilities - A Simplified Approach.*” Chapter 1 in “*Combinatorial Optimization: Advances in Randomized Parallel Computing.*”, pp. 1–24. Kluwer Academic Publishers. ISBN 0-7923-5714-0 P. Pardalos and S. Rajasekaran Ed’s. April 1999.
- (B-3) Alex Gontmakher, avi Mendelson, and Assaf Schuster. “*A Programming Model and Architectural Extensions for Fine-Grain Parallelism.*” Parallel Computing: Models, Algorithms, and Applications. CRC Press, 2006. John Reif and Sanguthevar Rajasekaran Ed’s. Computer and Information Science Series, Sartaj Sahni chief-editor.
- (B-4) Michael Factor, Kfir Karmon, Assaf Schuster, Konstantin Shagin, and Tal Zamir. “*A Transparent Distributed Runtime for Java.*” Parallel Computing: Models, Algorithms, and Applications. CRC Press, 2006. John Reif and Sanguthevar Rajasekaran Ed’s. Computer and Information Science Series, Sartaj Sahni chief-editor.
- (B-5) N. Palatin, A. Schuster, and R. Wolff. “*Mining for Misconfigured Machines in Grid Systems.*” In: Data Mining in Grid Computing Environments. Werner Dubitzky Ed. Wiley, November 2008.
- (B-6) A. Schuster and R. Wolff. “*Ubiquitous Technologies.*” pages 19–39. Ubiquitous knowledge discovery: challenges, techniques, applications. Editors: M. May and L. Saitta. Springer, 2010.
- (B-7) Izchak Sharfman, Assaf Schuster and Daniel Keren. “*A Geometric Approach to Monitoring Threshold Functions over Distributed Data Streams.*” pages 163–186. Ubiquitous knowledge discovery: challenges, techniques, applications. Editors: M. May and L. Saitta. Springer, 2010.
- (B-8) Mark Silberstein, Assaf Schuster, and John D. Owens. “*Applying Software-Managed Caching and CPU/GPU Task Scheduling for Accelerating Dynamic Workloads.*” GPU Computing Gems Jade Edition. Morgan Kaufman (Wen-mei W. Hwu Eds.) Chapter 36. pp. 501–517. 2012.
- (B-9) Arik Friedman, Ran Wolff, and Assaf Schuster. “*Embedding Privacy in Data Mining.*” LAMBERT Academic Publishing. 2012.

Patents

- (PT-1) **Sold to Sanborn Research, March 2007.** A. Itzkovitz and A. Schuster. “*Memory for Accomplishing Lowered Granularity of a Distributed Shared Memory*”. US patent No. 6/263,414. Filed Sep. 28, 1998. Issued July 17, 2001. Expires 2018.
- (PT-2) **Sold to Sanborn Research, March 2007.** A. Schuster and A. Itzkovitz. “*Distributed Shared Memory with Variable Granularity*”. US patent No. 6/591,355. Filed 2001, issued 8 July 2003. Expires 2020.
- (PT-3) **IBM Patent.** Y. Aridor, T. Eilam, M. Factor, A. Schuster and A. Teperman. “*Speculative Caching of Individual Fields in a Distributed Object System*”. US patent No. 6/618,737. Submitted December 1999. Issued 9/9/03.
- (PT-4) A. Schuster and R. Wolff. “*Distributed Mining of Association Rules*”. US patent No. 6,952,693. Issued October 4, 2005.
- (PT-5) A. Schuster and R. Wolff. “*Association Rule Mining in Peer-to-Peer Systems*”. US patent No. 7,680,757 B2 issued March 16, 2010.
- (PT-6) D. Keren, T. Scharfmann and A. Schuster. “*Monitoring Multi-variate Threshold Functions over Distributed Data Streams.*” PCT Patent Application, March 2007. US patent No. 8,332,458 issued December 11, 2012.
- (PT-7) Daniel Keren, Guy Sagy, Assaf Schuster. “*Method and system of managing and/or monitoring distributed computing based on geometric constraints.*” Patent Application US20100325265 A1, December 2010.
- (PT-8) **Microsoft patent.** N. Bjorner, R. Gilad-Bachrach, M. Gabel, A. Schuster. “*Early Detection Of Failing Computers.*” Patent Application, November 2010. Docket No. 331170.01.
- (PT-9) Gala Yadgar, Eitan Yaakobi, Assaf Schuster. “*Improving SSDs using Polar WOM codes.*” Patent Application. December 2014.
- (PT-10) Nadav Amit, Dan Tsafir, Assaf Schuster. Memory swapper for virtualized environments. US patent no 9,811,268. November 2017.
- (PT-11) Arnon Lazerson, Izchak Sharfman, Daniel Keren, Assaf Schuster. “*Monitoring Distributed Streams using Convex Decompositions.*” Patent Application. 2015.
- (PT-12) Daniel Moscovici, Natan Bandler, Assaf Schuster. “*DISTRIBUTED TECHNIQUES FOR DETECTING ATYPICAL OR MALICIOUS WIRELESS COMMUNICATIONS ACTIVITY*”. US Patent Application No.: 15407,886. Filed: January 17, 2017.
- (PT-13) Ilya Kolchinsky and Assaf Schuster. “*Complex Event Processing via Join Plan Generation*”. May 2018.
- (PT-14) Ilya Kolchinsky and Assaf Schuster. “*Adaptive Complex Event Processing*”. May 2018.
- (PT-15) Ido Hakimi, Moshe (Mickey) Gabel, Saar Barkai and Assaf Schuster. “*A method for distributed momentum in training deep neural networks*”. August 2018.
- (PT-16) Ilya Kolchinsky and Assaf Schuster. “*Real-Time Multi-Pattern Detection over Event Streams*”. Jan 2019.

Invited Talks, Keynotes

- (I-1) “*Greedy Hot-Potato Routing*”. ALTEC IV Workshop, Prague, March 1995.
- (I-2) “*Optical Communication - A call for Algorithmic and Theoretical Study*”. Workshop on Optics and Computer Science, Metz, December 1995.
- (I-3) “*Millipede: A Happy Hour for Parallel Computing*”, 9th Seminar Artzi on Computer Systems and Computer Engineering, Tel-Aviv, July 1996.
- (I-4) “*Optimal Bounds on Tail Probabilities - A Simplified Approach*”, 3rd Workshop on Randomized Parallel Computing (WRPC 98), April 1998, Orlando.
- (I-5) “*Shared Memory Models: Java, DSMs, Spaces, and beyond*”. Keynote. 6th Intl. Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS), April 2001, San Francisco.
- (I-6) “*Software Distributed Shared Memory: Will It Ever Prevail?*”. 1st Jerusalem Symposium on Parallel and Distributed Systems. November 2001, Jerusalem.
- (I-7) “*Experiences and Directions in Scalable Distributed Model Checking*”. Learning and Formal Verification: A Workshop in Honor of Eli Shamir. May 2002, Jerusalem.
- (I-8) “*MultiRace – Efficient on-the-fly data-race detection in C++ programs*”. IBM annual seminar on Software Testing, December 2002, Haifa Research Lab.
- (I-9) “*Intrathreads – Techniques for Parallelization of Sequential Code*”. IBM annual seminar on Compilers and Computer Architecture. December 2002, Haifa Research Lab.
- (I-10) “*Efficient On-The-Fly Detection of Data-Races.*” Keynote. Workshop on Parallel and Distributed Systems: Testing and Debugging (PADTAD), In conjunction with IPDPS. April 2003, Nice.
- (I-11) “*Scalable Distributed Model Checking: Experiences, Lessons, and Expectations*”. Workshop on Parallel and Distributed Model Checking (in conjunction with CAV). Keynote. July 2003, Kolorado. Electr. Notes Theor. Comput. Sci. 89(1).
- (I-12) “*Comparing Apples and Bananas: Relaxed vs. Strict Models for Distributed Shared Memory.*” Seminar on Hardware and Software Consistency Models: Programability and Performance. October 2003, Dagstuhl.
- (I-13) “*Efficient on-the-fly data-race detection*”. Seminar on Hardware and Software Consistency Models: Programability and Performance. October 2003, Dagstuhl.
- (I-14) “*JavaSplit - A Runtime for Transparent Distributed Execution of Multithreaded Java Code*”. IBM annual seminar on Compilers and Architecture, November 2003, Haifa Research Lab.
- (I-15) “*Data-Mining in Large-Scale Distributed Systems*”. IBM annual seminar on Storage and Systems, December 2003, Haifa Research Lab.
- (I-16) “*Data-Mining in Peer-to-Peer Systems*”. 3rd Jerusalem Symposium on Parallel and Distributed Systems. Tel-Aviv, December 2003.
- (I-17) “*Single System Image: the MultiView approach*”. First International Workshop on Operating Systems, Programming Environments and Management Tools for High-Performance Computing on Clusters (COSET-1). June 2004, St. Malo, France.
- (I-18) “*Multilevel Cache Management Based on Application Hints*”. IBM annual seminar on Storage and Systems, December 2004, Haifa Research Lab.
- (I-19) “*Large-Scale Distributed Data Mining.*” Conference on Information Management, May 2005, Tel Aviv.

- (I-20) “*Challenges and Issues in Ubiquitous and Large-Scale Distributed Data Mining*”. KD-Ubiq Kickoff meeting. Bonn, November 2005.
- (I-21) “*Software for MultiCore Chips.*” Intel Multicore conference. Portland, December 2005.
- (I-22) “*Managing Data in Large-Scale Distributed Environments*”. The Israeli Association of Grid Technologies Annual Event. December 2005, Tel Aviv.
- (I-23) “*Monitoring Distributed Streams*”. Israel Innovation Summit. April 2006, Haifa.
- (I-24) “*Data Mining in Large-Scale Distributed Systems*”. Keynote. Italian conference on Data Bases. June 2006, Ancona, Italy.
- (I-25) “*Ubiquitous and Distributed Data Mining.*” International Conference on 21st Century: Robotics and Artificial Intelligence. December 2006, Athens, Greece.
- (I-26) “*Monitoring Threshold Functions in Distributed Streams.*” Keynote. ECML-PKDD Workshop on Parallel Data Mining. September 2006, Berlin.
- (I-27) “*Efficient Distributed Collaboration via Geometric Constraints*”. Large-Scale Distributed Systems and Middleware (LADIS). March 2007, IBM-HRL, Haifa.
- (I-28) “*Towards a Quiescent World: Local Inference in Complex Systems.*” September 2008, Intel DTTC conference, Haifa.
- (I-29) “*Superlink-Online: Large-Scale Distributed Genetic Linkage Analysis*”. Keynote. BIT’s 3rd Annual World Congress of BioSoft. March 2011, Beijing.
- (I-30) Invited talk. “*Monitoring Data Streams.*” Conference on Embedded and Microprocessors by New-Tech Magazine. Tel Aviv. September 2012.
- (I-31) “*Scalable Data Stream Processing*”. Keynote. Second International Conference on Parallel, Distributed and Grid Computing (PDGC). December 2012. JUIT Campus, Solan, Himachal Pradesh, INDIA.
- (I-32) “*The Geometric Method for Distributed Monitoring of Threshold Functions*”. NII Shonan meeting on Large Scale Distributed Computation. January 2012, Japan. Invited talk.
- (I-33) “*On-the-Fly Processing of Big, Distributed, Streaming Data*”. SWSTE Symposium, June 2012, Herzlia. Plenary talk.
- (I-34) “*Big Data*”. Invited talk, Israel Machine Vision Conference (IMVC). Tel Aviv, February 2013.
- (I-35) “*Huge data collection and fast decision*”. METRO450 conference. Technion, January 2014. Plenary talk.
- (I-36) “*On-the-Fly Processing of Big, Distributed, Streaming Data*”. International Conference on Applied Algorithms. January 2014. Kolkata, India. Keynote.
- (I-37) Plenary Keynote. “*Monitoring Distributed Streaming Data*”. 14th International Conference on Runtime Verification. September 2014. Toronto, Canada.
- (I-38) Invited talk. “*Discovering Weaknesses in Virtual Systems.*” The 4th Annual International Cybersecurity Conference. Tel Aviv. September 2014.
- (I-39) Plenary Keynote and Invited Talk. “*Monitoring Big, Distributed, Streaming Data*”. XIV International conference on High-performance Parallel Calculations on Cluster Systems (PNRPU). Perm, Russia. November 2014.
- (I-40) Invited talk. “*Economic Tools for Cloud Resource Management*”. International Conference on Data, Digital Business Models, Cloud Computing and Organizational Design. Paris. November 2014.

- (I-41) Invited talk. *“Monitoring Distributed Data Streams”*. International Conference on “Cloud Computing. Education. Research. Development”. December 2014, Moscow.
- (I-42) Invited talk. *“RaaS and Ginseng: The Resource as a Service Cloud”*. Moscow Technical University, High School of Economics. December 2014, Moscow.
- (I-43) Keynote. *“RaaS and Ginseng: The Resource as a Service Cloud”*. 12th International Conference on Distributed Computing and Internet Technology (ICDCIT), January 2016. KIIT University, Bhubaneswar, Odisha, India.
- (I-44) Invited talk. *“Monitoring Big, Distributed, Streaming Data”*. Data Mining and Business Intelligence (DMBI). May 2016. Beer Sheba.
- (I-45) Invited talk. *“Lazy Evaluation of Data Streams.”* Workshop on Distributed Monitoring and Big Data. June 2016, Munchen, Germany.
- (I-46) Keynote. *“Monitoring Big, Distributed, Streaming Data”*. 7th International Conference on MOBILE Wireless MiddleWARE, Operating Systems, and Applications (MOBILWARE). December 2016. Naples, Italy.
- (I-47) Invited series of talks. *“Handling Big, Streaming Data”*. Data Mining Workshop organized by the University of Buenos Aires (UBA). October 2016, Buenos Aires, Argentina.
- (I-48) Invited series of talks. *“Handling Big, Streaming Data”*. Institute of advances in Cloud Computing (the GIAN project). December 2017, Allahabad, India.
- (I-49) Invited talk. *“Efficient Processing of Big, Streaming Data”*. 3rd International Conference on Computational Models, Cyber Security & Computational Intelligence (ICC3). December 2017, Coimbatore, India.
- (I-50) Invited talk. *“Recent advances in Complex Event Processing”*. Hasso Plattner Institute Symposium on future trends in Service Oriented Computing. April 2018, Potsdam, Germany.
- (I-51) Keynote. *“Recent advances in Complex Event Processing”*. Big Data workshop. May 2018, Montevideo, Uruguay.
- (I-52) Invited talk. *“Recent advances in Complex Event Processing”*. ILTAM and BGU Big Data conference. July 2018, Beer-Sheba.
- (I-53) Invited talk. *“Learning for Healthcare and Medicine”*. Frontiers in Biomedical Research. October 2018, University of Michigan.

Contributed Talks

- (L-1) *“SIMD Algorithms for 2-D Arrays in the Perfect Shuffle Network”*. 16th Symp. on Computer Architecture, Jerusalem, May 1989.
- (L-2) *“Algorithms and Optic Implementation for Reconfigurable Networks”*. 5th Jerusalem Conf. on Information Technology, Jerusalem, October 1990.
- (L-3) *“The Power of Reconfiguration”*. 18th International Colloquium on Automata, Languages, and Programming, Madrid, July 1991.
- (L-4) *“The Complexity of Reconfiguring Network Models”*. 1st Israeli Symp. on Theory of Computing and Systems, Haifa, May 1992.

- (L-5) “*Efficient Address Decoding for Fast Packet Switching Systems*”. 7th Intl. Parallel Processing Symp., Newport Beach, LA, April 1993.
- (L-6) “*Hot-Potato Worm Routing is almost as easy as Store-and-Forward Packet Routing*”. 2nd Israeli Symp. on Theory of Computing and Systems, Natanya, June 1993.
- (L-7) “*The Impact of Hardware Restrictions on the Power of the Reconfigurable Mesh*”. 1st Reconfigurable Architecture Workshop, Cancun, April 1994.
- (L-8) “*Greedy Hot-Potato Routing on the Two-Dimensional Mesh*”. 2nd European Symp. on Algorithms, Papendal, September 1994.
- (L-9) “*General Tradeoffs Between Size and Time in Reconfigurable Meshes*”. Reconfigurable Architecture Workshop, Santa Barbara, April 1995.
- (L-10) “*Self-Simulation for the Passive Optical Star Model*”, 3rd European Symp. on Algorithms, Corfu, September 1995.
- (L-11) “*A Lower Bound for Nearly Minimal Adaptive and Hot Potato Algorithms*”, 4th European Symp. on Algorithms, Barcelona, September 1996.
- (L-12) “*Optimal Point-to-Point Broadcast Algorithms via Lopsided Trees*”, 5th Israeli Symp. on the Theory of Computing and Systems, Ramat-Gan, June 1997.
- (L-13) “*Vertex-to-Vertex Parallel Radiosity on a Cluster of PCs*”, 1st Workshop on Algorithm Engineering, Venice, September 1997.
- (L-14) “*Single Step Undirected Reconfigurable Networks*”. 4th Intl. Conf. on High Performance Computing, Bangalore, December 1997.
- (L-15) “*Broadcasting on a Budget in the Multi-Service Communication Model*”. 5th Intl. Conf. on High-Performance Computing, Madras, December 1998.
- (L-16) “*A Distributed Runtime for Java: Yesterday and Today*”. 6th Java for Parallel and Distributed Computing Workshop, Santa Fe, April 2004.
- (L-17) “*Multithreaded Home-based Lazy Release Consistency over VIA*”. Intl. Parallel and Distributed Processing Symp. (IPDPS), April 2004, Santa Fe.
- (L-18) “*A Comparison of Sequential Consistency with Home-Based Lazy Release Consistency for Software Distributed Shared Memory*”. 18th International Conference on Supercomputing (ICS), pp. 306–315. June 2004, St. Malo, France.
- (L-19) “*Large-Scale Distributed Data Mining*”. 5th Haifa Workshop on Interdisciplinary Applications of Graph theory, Combinatorics, and Algorithms. May 2005, Haifa.
- (L-20) “*Monitoring Threshold Functions in Sensor Networks*”. 21st IEEE Parallel & Distributed Processing Symposium (IPDPS). March 2007, Long Beach, CA.

Demonstrations

- (D-1) “*The Millipede System*”. Usenix-NT, Seattle, August 1997.
- (D-2) “*Gait analysis using the Kinect sensor*”. NIPS, Lake Tahoe, December 2012.
- (D-3) “*SSD Player*”. Online at [HTTP://SSDPLAYER.CSWP.CS.TECHNION.AC.IL/](http://SSDPLAYER.CSWP.CS.TECHNION.AC.IL/) In conjunction with C-134.

Posters

- (P-1) “*Execution of Monolithic Java Programs on Large Non-Dedicated Collections of Commodity Workstations*”, Java Grande/ISCOPE, 227. Seattle, November 2002.
- (P-2) Mark Silberstein, Anna Tzemach, Nikolay Dovgolevsky, Maayan Fishelson, Assaf Schuster, Dan Geiger. “*Superlink online: distributed system for linkage analysis of large inbred pedigrees*”, Israel Bioinformatics Symposium, Tel Aviv, May 2005.

Refereed Papers in Conference Proceedings

- (C-1) Y. Aumann and A. Schuster, “*Deterministic PRAM Simulation with Constant Memory Blow-Up and No Time-Stamps*”, 3rd Symp. on the Frontiers of Massively Parallel Computation, October 1990.
- (C-2) Y. Ben-Asher, D. Egosi and A. Schuster, “*SIMD Algorithms for 2-D Arrays in the Perfect Shuffle Network*”, 16th Symp. on Computer Architecture, May 1989.
- (C-3) Y. Ben-Asher and A. Schuster, “*Optical Splitting Graphs: Fast Technology for Massive Parallel Computation*”, 4th Intl. Topical Meeting on Optical Computing, April 1990.
- (C-4) Y. Ben-Asher and A. Schuster, “*Algorithms and Optic Implementation for Reconfigurable Networks*”, 5th Jerusalem Conf. on Information Technology, October 1990.
- (C-5) Y. Ben-Asher, D. Peleg, R. Ramaswami and A. Schuster, “*The Power of Reconfiguration*”, 18th Intl. Colloquium on Automata, Languages, and Programming (ICALP), July 1991.
- (C-6) Y. Ben-Asher, A. Cohen, A. Schuster and J.F. Sibeyn, “*The impact of Task-Length Parameters on the Performance of the Random Load-Balancing Algorithm*”, 6th Intl. Parallel Processing Symp., March 1992.
- (C-7) Y. Ben-Asher and A. Schuster, “*The Bus-Usage Method for the analysis of Reconfiguring Networks Algorithms*” 6th Intl. Parallel Processing Symp., March 1992.
- (C-8) Y. Ben-Asher, D. Peleg and A. Schuster, “*The Complexity of Reconfiguring Network Models*”, Proc. 1st Israeli Symp. on Theory of Computing and Systems, pp. 79–90, May 1992.
- (C-9) Y. Ben-Asher, A. Cohen and A. Schuster, “*Efficient Address Decoding for Fast Packet Switching Systems*”, 7th Intl. Parallel Processing Symp., April 1993.
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- (C-45) A. Schuster and R. Wolff. “*Communication-Efficient Distributed Mining of Association Rules*”. ACM SIGMOD, Santa-Barbara, May 2001.
- (C-46) T. Heyman, O. Grumberg and A. Schuster. “*Distributed Model Checking for μ -Calculus*”. Conference on Computer Aided Verification, Paris, July 2001.
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- (C-58) Bobi Gilburd, Assaf Schuster, and Ran Wolff. “*Privacy-Preserving Data Mining on Data Grids in the Presence of Malicious Participants*”. 13th Symposium on High Performance Distributed Computing (HPDC), pp. 225–234. June 2004, Hawaii.
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- (C-64) Orna Grumberg, Assaf Schuster, and Avi Yadgar. “*Memory Efficient All-Solutions SAT Solver and its Application for Reachability Analysis*”. 5th Intl. Conf. on Formal Methods in Computer-Aided Design (FMCAD). Pp. 275–289, Austin, Texas, November 2004.
- (C-65) Tzachi Birk, Liran Liss, Assaf Schuster, and Ran Wolff. “*A Local Algorithm for Ad Hoc Majority Voting via Charge Fusion*.” 18th International Symposium on Distributed Computing (DISC). Pp. 275–289, Amsterdam, October, 2004.

- (C-66) Amir Bar-Or, Danny Keren, Assaf Schuster, and Ran Wolff. “*Hierarchical Decision Tree Induction in Distributed Genomic Databases.*” 1st workshop on Grid Data Mining (DM-Grid. In conjunction with ICDM). Brighton UK, November, 2004.
- (C-67) Amir Bar-Or, Danny Keren, Assaf Schuster, and Ran Wolff. “*Decision Tree Induction in High Dimensional, Hierarchically Distributed Databases.*” 5th SIAM Intl. Conference on Data Mining (SDM). Newport Beach, April 2005.
- (C-68) Ohad Shacham, Mooly Sagiv and Assaf Schuster. “*Scaling Model Checking of Dataraces Using Dynamic Information.*” ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP). Chicago, June 2005. Pp. 107–118.
- (C-69) Denis Krivitski, Assaf Schuster, and Ran Wolff. “*Local Hill Climbing in Sensor Networks.*” Workshop on Data Mining in Sensor Networks. Newport Beach, April 2005.
- (C-70) Denis Krivitski, Assaf Schuster, and Ran Wolff. “*A Local Facility Location Algorithm for Sensor Networks.*” International Conference on Distributed Computing in Sensor Systems (DCOSS). Marina del Rey, June 2005. Pp. 368–375.
- (C-71) Kfir Karmon, Liran Liss and Assaf Schuster. “*GWiq-P: An Efficient Decentralized Grid-Wide Quota Enforcement Protocol.*” The 14th IEEE Intl Symposium on High Performance Distributed Computing (HPDC). Research Triangle Park, NC, July 2005.
- (C-72) Nili Ifergan, Tamir Heiman, Orna Grumberg, Assaf Schuster. “*Achieving Speedups in Distributed Symbolic Reachability Analysis through Asynchronous Computation.*” The 13th Advanced Research Working Conference on Correct Hardware Design and Verification Methods (CHARME). Saarbrücken (Germany), October 2005. Pp. 129–145.
- (C-73) Limor Fix, Orna Grumberg, Tamir Heiman, Assaf Schuster. “*Verifying Very Large Industrial Circuits Using 100 Processes and Beyond.*” Third International Symposium on Automated Technology for Verification and Analysis (ATVA). Taipei, Taiwan, October 2005. **Best Paper Award.** Pp. 11–25.
- (C-74) Sergey Polyakov and Assaf Schuster. “*Verification of the Java Causality Requirements.*” IBM verification conference (3rd PADTAD track – Parallel and Distributed Systems: Testing and Debugging). November 2005, Haifa. Pp. 224–246.
- (C-75) Alex Gontmakher, Gregory Kovriga, Avi Mendelson, Assaf Schuster. “*Speculative Synchronization and Thread Management for Low Granularity Threads.*” 12th International Symposium on High-Performance Computer Architecture (HPCA), Austin, Texas, February 2006.
- (C-76) Alex Gontmakher, Gregory Kovriga, Avi Mendelson, Assaf Schuster. “*Register Allocation for Lightweight Shared-Context Parallel Architectures.*” The 10th IEEE Annual Workshop on Interaction between Compilers and Computer Architectures (INTERACT). Austin, Texas, February 2006.
- (C-77) Danny Keren, Tsachi Scharfman, and Assaf Schuster. “*A Geometric Approach to Monitoring Threshold Functions Over Distributed Data Streams.*” ACM Intl. Conf. on Management of Data (SIGMOD). Chicago, June 2006. **SIGMOD Best Paper Award Honorable Mention).**
- (C-78) Dan Geiger, Miron Livny, Assaf Schuster, Mark Silberstein. “*Scheduling Mixed Workloads In Multi-grid Environments.*” 15th IEEE International Symposium on High Performance Distributed Computing (HPDC). Paris, June 2006.
- (C-79) Sharov Artyom, Gabi Kliot, Miron Livny, Mark Silberstein, Assaf Schuster. “*Materializing Highly Available Grids.*” 15th IEEE International Symposium on High Performance Distributed Computing (HPDC). Hot Topics. Paris, June 2006.
- (C-80) Valentin Kravtsov, Thomas Niessen, Vlado Stankovski and Assaf Schuster. “*Service-based Resource Brokering for Grid-based Data Mining.*” International Conference on Grid Computing and Applications (GCA). Las Vegas, June 2006.

- (C-81) Tsachi Birk, Idit Keidar, Liran Liss, Assaf Schuster, Ran Wolff. “*Veracity Radius - Capturing the Locality of Distributed Computations.*” Twenty-Fifth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC). Denver, July 2006.
- (C-82) Arie Leizarowitz, Noam Palatin, Assaf Schuster, Ran Wolff. “*Mining for Misconfigured Machines in Grid Systems.*” Twelfth ACM KDD International Conference on Knowledge Discovery and Data Mining (KDD). Philadelphia, August 2006.
- (C-83) Arik Friedman, Assaf Schuster, and Ran Wolff. “*k-Anonymous Decision Tree Induction.*” The 10th European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD). **Best Student Paper Award.** Berlin, September 2006.
- (C-84) Tsachi Birk, Idit Keidar, Liran Liss, Assaf Schuster. “*Efficient Dynamic Aggregation.*” 20th International Symposium on Distributed Computing (DISC). Stockholm, September 2006.
- (C-85) Marc Silberstein, Dan Geiger and Assaf Schuster. “*A Distributed System for Genetic Linkage Analysis.*” Intl. Workshop on Distributed, High-Performance and Grid Computing in Computational Biology (GCCB). Eilat, January 2007.
- (C-86) Alex Gontmakher, Avi Mendelson, and Assaf Schuster. “*Using Fine Grain Multithreading for Energy Efficient Computing.*” ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPOPP). March 2007, San Jose.
- (C-87) Gala Yadgar, Michael Factor, and Assaf Schuster. “*Karma: Know-it-All Replacement for a Multi-level cAche.*” 5th USENIX Conference on File and Storage Technologies (FAST). February 2007, San Jose.
- (C-88) Tsachi Sharfman, Daniel Keren and Assaf Schuster. “*Aggregate Threshold Queries in Sensor Networks.*” 21st IEEE International Parallel & Distributed Processing Symposium (IPDPS). March 2007, Long Beach.
- (C-89) Alex Gontmakher, Gregory Shklover, Vladimir Zdorov, Assaf Schuster, and Avi Mendelson. “*Code Compilation for an Explicitly Parallel Register-Sharing Architecture.*” Intl. Conference on Parallel Processing (ICPP). September 2007, XiAn, China.
- (C-90) Valentin Kravtsov, David Carmeli, Werner Dubitzky, Assaf Schuster, Mark Silberstein, Benny Yoshpa. “*Quasi-Opportunistic Supercomputing in Grids.*” 16th IEEE International Symposium on High Performance Distributed Computing (HPDC). Hot Topics. June 2007, Monterey, CA.
- (C-91) Kfir Karmon, Liran Liss and Assaf Schuster. “*GWiq-P: An Efficient Decentralized Grid-Wide Quota Enforcement Protocol.*” Haifa Systems and Storage Conference (SYSTOR), October 2007, IBM Haifa Research Lab.
- (C-92) Orna Grumberg, Assaf Schuster, Avi Yadgar. “*3-Valued Circuit SAT for STE with Automatic Refinement.*” Fifth International Symposium on Automated Technology for Verification and Analysis (ATVA), 457-473, October 2007, Japan.
- (C-93) Michael Factor, Kai Li, Assaf Schuster and Gala Yadgar. “*MC2: Multiple Clients on a Multilevel Cache.*” The 28th International Conference on Distributed Computing Systems (ICDCS). June 2008, Beijing.
- (C-94) Valentin Kravtsov, Uri Dubin, Werner Dubitzky, Assaf Schuster. “*A Fast and Efficient Algorithm for Topology-Aware Coallocation.*” International Conference on Computational Science (ICCS). May 2008, Reading UK.
- (C-95) Daniel Keren, Assaf Schuster and Tsachi Sharfman. “*Shape Sensitive Geometric Monitoring.*” 27th ACM Symposium on Principles of Database Systems (PODS). June 2008, Vancouver.

- (C-96) Valentin Kravtsov, David Carmeli, Werner Dubitzky, Ariel Orda, Assaf Schuster, Mark Silberstein and Benny Yoshpa. “*Quasi-Opportunistic Supercomputing in Grid Environments.*” Intl. Conference on Algorithms and Architectures (ICA3PP). June 2008, Cyprus.
- (C-97) Mark Silberstein, Assaf Schuster, Dan Geiger, Anjul Patney, John D. Owens. “*Efficient computation of sum-products on GPUs through software-managed cache.*” 22nd ACM International Conference on Supercomputing (ICS). June 2008, Island of Kos - Aegean Sea - Greece.
- (C-98) Valentin Kravtsov, Assaf Schuster, David Carmeli, Krzysztof Kurowski, and Werner Dubitzky. “*Grid-Enabling Complex System Applications with QosCosGrid: An Architectural Perspective.*” International Conference on Grid Computing and Applications (GCA). July 2008, Las-Vegas.
- (C-99) Mark Silberstein, Dan Geiger and Assaf Schuster. “*Harnessing the world’s computers to hunt for disease-provoking genes.*” Microsoft eScience Workshop. December 2008, Indianapolis.
- (C-100) Mark Silberstein, Artyom Sharov, Dan Geiger and Assaf Schuster. “*GridBot: Execution of Bags of Tasks in Multiple Grids.*” SuperComputing. Portland, Oregon, November 2009.
- (C-101) Michael Factor, Assaf Schuster, Konstantin Shagin, Tal Zamir: “*Optimistic concurrency for clusters via speculative locking.*” SYSTOR - The Israeli Experimental Systems Conference, Haifa, May 2009.
- (C-102) Pavel Bar, Camille Coti, Derek Groen, Thomas Hault, Valentin Kravtsov, Martin Swain, Assaf Schuster: “*Running parallel applications with topology-aware grid middleware.*” Fifth IEEE International Conference on e-Science, December 2009, Oxford, UK.
- (C-103) Pavel Bar, David Carmeli, Valentin Kravtsov, Martin Swain, Assaf Schuster: “*A scheduling framework for large-scale, parallel, and topology-aware applications.*” 24th IEEE International Parallel & Distributed Processing Symposium (IPDPS). April 2010, Atlanta, USA.
- (C-104) Arik Friedman and Assaf Schuster: “*Data Mining with Differential Privacy.*” 16th ACM Conference on Knowledge Discovery and Data Mining (KDD). July 2010, Washington DC.
- (C-105) Guy Sagy, Daniel Keren, Izhak Sharfman, Assaf Schuster. “*Distributed Threshold Querying of General Functions by a Difference of Monotonic Representation.*” 37th Conference on Very Large Databases (VLDB), Seattle, August 2011.
- (C-106) Uri Verner, Mark Silberstein, Assaf Schuster. “*Processing data streams with hard real-time constraints on heterogeneous systems.*” International Conference on Supercomputing (ICS), Tucson, May 2011.
- (C-107) Nadav Amit, Muli Ben-Yehuda, Dan Tsafir, and Assaf Schuster. “*vIOMMU: Efficient IOMMU Emulation.*” USENIX Annual Technical Conference (USENIX ATC), Portland 2011.
- (C-108) Orna Ben-Yehuda, Muli Ben-Yehuda, Dan Tsafir, and Assaf Schuster. “*Deconstructing Amazon EC2 Spot Instance Pricing.*” IEEE CloudCom, Athens, November 2011.
- (C-109) Nadav Amit, Muli Ben-Yehuda, Abel Gordon, Nadav HarEl, Alex Landau, Dan Tsafir, Assaf Schuster. “*ELI: Bare-Metal Performance for I/O Virtualization.*” Seventeenth International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS). March 2012, London. **HiPEAC Paper Award** and **IBM Research’s 2012 Pat Goldberg Memorial Best Paper Award in Computer Science, Electrical Engineering and Math.**
- (C-110) Orna Ben-Yehuda, Muli Ben-Yehuda, Alex Iosup, Assaf Schuster, Mark Silberstein, Artiom Sharov, and Dan Tsafir. “*ExPERT: Pareto-Efficient Task Replication on Grids and a Cloud.*” IPDPS, Shanghai, May 2012.
- (C-111) Antonis Deligiannakis, Minos Garofalakis, Tsachi Sharfman, Assaf Schuster. “*Prediction-Based Geometric Monitoring over Distributed Data Streams.*” SIGMOD, Scottsdale, Arizona, May 2012.

- (C-112) Moshe Gabel, Ran Gilad-Bachrach, Nikolaj Bjorner, Assaf Schuster. “*Latent Fault Detection in Large Scale Services*”. Dependable Computing and Communications Symposium, Boston, June 2012.
- (C-113) Uri Verner, Assaf Schuster, Mark Silberstein, Avi Mendelson. “*Processing of real-time data streams on multi-GPU systems*”. Systor, Haifa, June 2012.
- (C-114) Orna Agmon Ben-Yehuda, Muli Ben Yehuda, Assaf Schuster, Dan Tsafirir. “*The Resource-as-a-Service (RaaS) Cloud*”. HotCloud, Boston, June 2012.
- (C-115) Daniel Keren, Ansar-Ul-Haque Yasar, Luk Knapen, Sungjin Cho, Tom Bellemans, Davy Janssens, Geert Wets, Assaf Schuster, Izchak Sharfman. “*Exploiting Graph-theoretic Tools for Matching and Partitioning of Agent Population in an Agent-based Model for Traffic and Transportation Applications*.” *Procedia CS* 10: 833-839 (2012).
- (C-116) Moshe Gabel, Erin Renshaw, Assaf Schuster and Ran Gilad-Bachrach. “*Full Body Gait Analysis with Kinect*”. Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). 2012.
- (C-117) Gala Yadgar, Michael Factor and Assaf Schuster. “*Cooperative Caching with Return on Investment*.”. IEEE Conference on Massive Data Storage (MSST). Los Angeles, May 2013.
- (C-118) Mickey Gabel, Danny Keren, Assaf Schuster. “*Communication-Efficient Outliers for scale-Out Systems*.” BD3 - 1st intl. Workshop on Big Dynamic Distributed Data. August 30th, 2013, Trento, Italy (in conjunction with VLDB 2013).
- (C-119) Daniel Keren, Guy Sagy, Amir Abboud, David Ben-David, Izchak Sharfman, Assaf Schuster. “*Safe-Zones for Monitoring Distributed Streams*.” BD3 - 1st intl. Workshop on Big Dynamic Distributed Data. August 30th, 2013, Trento, Italy (in conjunction with VLDB 2013).
- (C-120) Mario Boley, Michael Kamp, Daniel Keren, Assaf Schuster, Izchak Sharfman. “*Communication-Efficient Distributed Online Prediction using Dynamic Model Synchronizations*.” BD3 - 1st intl. Workshop on Big Dynamic Distributed Data. August 30th, 2013, Trento, Italy (in conjunction with VLDB 2013).
- (C-121) Uri Verner, Avi Mendelson, Assaf Schuster. “*Batch Method for Efficient Resource Sharing in Real-time Multi-GPU Systems*.” ICDCN, January 2014, Coimbatore, India.
- (C-122) Daniel Keren and Guy Sagy and Amir Abboud and David Ben-David and Assaf Schuster and Ischak Sharfman and Antonis Deligiannakis. “*Monitoring Distributed, Heterogeneous Data Streams: the Emergence of Safe Zones*.” International Conference on Applied Algorithms (ICAA). Kolkata, India. January 2014.
- (C-123) Nadav Amit, Dan Tsafirir, Assaf Schuster. “*VSwapper: A Memory Swapper for Virtualized Environments*.” 19th Intl. Conference on Architectural Support for Programing Languages and Operating Systems (ASPLOS). Salt Lake City, March 2014. **HiPEAC Paper Award** Chosen as **highlight paper of the 7th ACM International Systems and Storage Conference (SYSTOR)**. May 2014, Haifa.
- (C-124) Arik Friedman, Izchak Sharfman, Daniel Keren, Assaf Schuster. “*Privacy-Preserving Distributed Stream Monitoring*”, Network and Distributed System Security Symposium (NDSS). San Diego, February 2014.
- (C-125) Mickey (Moshe) Gabel, Danny Keren, Assaf Schuster. “*Communication-efficient Distributed Variance Monitoring and Outlier Detection for Multivariate Time Series*.” 28th IEEE International Parallel and Distributed Processing Symposium (IPDPS). PHOENIX, Arizona, May 2014.
- (C-126) Orna Agmon Ben-Yehuda, Eyal Posener, Muli Ben-Yehuda, Assaf Schuster, Ahuva Mualem. “*Ginseng: Market-Driven Memory Allocation*.” 10th ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments (VEE). Salt Lake City, March 2014.

- (C-127) Uri Verner, Avi Mendelson, Assaf Schuster. “*Scheduling Periodic Real-Time Communication in Multi-GPU Systems.*” The 23rd International Conference on Computer Communications and Networks (ICCCN). Shanghai, August 2014.
- (C-128) “*Communication-Efficient Distributed Online Prediction by Decentralized Variance Monitoring.*” Michael Kamp, Mario Boley, Daniel Keren, Assaf Schuster, and Izchak Sharfman. ECML/PKDD. Nancy, France, September 2014.
- (C-129) “*Adaptive Communication Bounds for Distributed Online Learning.*” Michael Kamp, Mario Boley, Daniel Keren, Assaf Schuster, and Izchak Sharfman. OPT workshop at NIPS, Montreal, December 2014.
- (C-130) “*Monitoring Distributed Streams using Convex Decompositions.*” Arnon Lazerson, Izchak Sharfman, Daniel Keren, Assaf Schuster, Minos Garofalakis and Vasilis Samoladas. 41st Conference on Very Large Data Bases (VLDB). Hawaii, Aug 2015.
- (C-131) “*Write Once, Get 50% Free: Saving SSD Erase Costs Using WOM.*” Gala Yadgar, Eitan Yaakobi, Assaf Schuster. Usenix FAST. Santa Clara, CA. February 2015. Chosen as **highlight paper of the 8th ACM International Systems and Storage Conference (SYSTOR)**. May 2015, Haifa.
- (C-132) Ran Bernstein, Tal Shafir, Rachele Tsachor, Karen Studd, and Assaf Schuster. “*Laban Movement Analysis using Kinect*”. ICACII International Conference on Affective Computing and Intelligent Interaction. May 2015, Paris, France.
- (C-133) Moshe Gabel, Kento Sato, Daniel Keren, Satoshi Matsuoka, Assaf Schuster. “*Latent Fault Detection With Unbalanced Workloads.*” EPForDM - Event Processing, Forecasting and Decision-Making in the Big Data Era. EDBT 2015 Workshop. Brussels, March 2015.
- (C-134) Gala Yadgar, Roman Shor, Eitan Yaakobi, Assaf Schuster. “*It’s Not Where Your Data Is, It’s How It Got There*”. The 7th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage). Santa Clara, July 2015.
- (C-135) “*Lazy Evaluation Methods for Detecting Complex Events*”. Ilya Kolchinsky, Tsachi Sharfman, and Assaf Schuster. The 9th ACM International Conference on Distributed Event-Based Systems (DEBS). Oslo, July 2015. **Best Research Paper Award**.
- (C-136) “*Monitoring Least Squares Models of Distributed Streams.*” Mickey Gabel, Daniel Keren, and Assaf Schuster. 21st ACM Conference on Knowledge Discovery and Data Mining (KDD). August 2015, Sydney.
- (C-137) “*Multitask Learning for LMA*”. Ran Bernstein, Tal Shafir, Rachele Tsachor, Assaf Schuster, Karen Studd. 2nd Intl. Workshop on Moving and Computing (MOCO). August 2015, Vancouver.
- (C-138) “*Virtual CPU Validation.*” Nadav Amit, Dan Tsafir, Assaf Schuster, Ahmad Ayoub, Eran Shlomo. The 25th ACM Symposium on Operating Systems Principles (SOSP). October, 2015, Monterey, California.
- (C-139) “*Attacks in the Resource-as-a-Service (RaaS) Cloud Context.*” Danielle Movsowitz, Orna Agmon Ben-Yehuda and Assaf Schuster. 12th Intl. Conference on Distributed Computing and Internet Technology (ICDCIT). Bhubaneswar, Odisha, India. January 2016.
- (C-140) “*The Devil is in the Details: Implementing Flash Page Reuse with WOM Codes.*” Fabio Margaglia, Gala Yadgar, Eitan Yaakobi, Yue Li, Assaf Schuster, Andre Brinkmann. 14th USENIX Conference on File and Storage Technology (FAST). Santa Clara, February 2016.
- (C-141) “*The Devil is in the Details: Implementing Flash Page Reuse with WOM Codes.*” Fabio Margaglia, Gala Yadgar, Eitan Yaakobi, Yue Li, Assaf Schuster, Andre Brinkmann. Non-Volatile Memories Workshop (NVMW), March 2016.

- (C-142) *“Ginseng: Market-Driven LLC Allocation.”* Liran Funaro, Orna Agmon Ben-Yehuda, Assaf Schuster. Usenix Annual Technical Conference (USENIX ATC), June 2016, Denver.
- (C-143) *“Taking the Blame Game out of Data Centers Operations with NetPoirot.”* Behnaz Arzani, Selim Ciraci, Boon Thau Loo, Assaf Schuster, Geoff Outhred. ACM Conference on Communication and Computer Networks (SIGCOMM), Florianopolis, Brasil. August 2016. Chosen as **highlight paper of the 9th ACM International Systems and Storage Conference (SYSTOR)**. June 2016, Haifa.
- (C-144) *“Lightweight Monitoring of Distributed Streams”.* Arnon leiseron, Daniel Keren and Assaf Schuster. 22nd ACM KDD Conference on Knowledge Discovery and Data Minin (KDD). August 2016, San Francisco.
- (C-145) *“One for All and All for One: Simultaneous Approximation of Multiple Functions over Distributed Streams”.* Arnon Leiseron, Mickey Gabel, Daniel Keren and Assaf Schuster. The 11th ACM International Conference on Distributed and Event-Based Systems (DEBS). June, 2017 Barcelona.
- (C-146) *“Anarchists, Unite: Practical Entropy Approximation for Distributed Streams.”.* Mickey Gabel, Daniel Keren, Assaf Schuster. 23rd ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD). Halifax, Nova Scotia - Canada, August, 2017
- (C-147) *“Detection in the Dark - Exploiting XSS Vulnerability in C&C Panels as a New Technique to Detect Malwares.”.* Shay Nachum, Assaf Schuster, Opher Etzion. 2nd International Symposium on Cyber Security Cryptography and Machine Learning (CSCML). June 2018, Beer Sheba.
- (C-148) *“Efficient Adaptive Detection of Complex Event Patterns”.* Ilya Kolchinsky and Assaf Schuster. 44th Intl Conf. on Very Large Data Bases (VLDB). Rio de Janeiro, August 2018.
- (C-149) *“Join Query Optimization Techniques for Complex Event Processing Applications”.* Ilya Kolchinsky and Assaf Schuster. 44th Intl Conf. on Very Large Data Bases (VLDB). Rio de Janeiro, August 2018.
- (C-150) *“Preventing Collusion in Cloud Computing Auctions”.* Shunit Agmon, Orna Agmon Ben-Yehuda, and Assaf Schuster. The 15th international conference on Economics of Grids, Clouds, Systems, and Services. September 2018, Pisa, Italy.
- (C-151) *“Stochastic Resource Allocation”.* Liran Funaro, Orna Agmon Ben-Yehuda, Assaf Schuster. The 15th ACM Conference on Virtual Execution Environments (VEE). April 2019, Rhode Iland.
- (C-152) *“Real-Time Multi-Pattern Detection over Event Streams.”* Ilya Kolchinsky and Assaf Schuster. ACM SIGMOD/PODS International Conference on Management of Data (SIGMOD). Amsterdam, The Netherlands, June 2019.