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RESUME

Full name: **Nir Ailon**

Web site: <http://www.cs.technion.ac.il/~nailon>

ACADEMIC DEGREES

- 2006 Department of Computer Science
Princeton University, Princeton NJ
Thesis: Studies in Algorithms: (i) Lower bounds in computational geometry
(ii) Fast approximation algorithms for aggregation of ranking and clustering of data (iii)
Efficient algorithms for dimension reduction of high dimensional data
- 2001 Department of Mathematics
Tel Aviv University, Tel Aviv, Israel
M.Sc. Summa Cum Laude
Thesis: Primitive powers of matrices and related problems
- 1999 Department of Computer Science
Tel Aviv University, Tel Aviv, Israel
B.Sc. Summa Cum Laude

ACADEMIC APPOINTMENTS

- 2010- Senior Lecturer
date Faculty of Computer
Science
Technion, Haifa, Israel
- 2006- Postdoctoral Member
2007 Institute for Advanced
Study
Princeton, NJ

PROFESSIONAL EXPERIENCE

- 2008- Senior Research
2010 Scientist
Google Research
New York, NY

RESEARCH INTERESTS

Learning and optimization, active learning, dimensionality reduction, ranking, clustering, probability in high dimensional spaces and its uses in algorithm design.

HONORS

- 2013 Invited **plenary speaker** at ALT (Algorithmic Learning Theory) and DS (Data Science) in Singapore
- 2012 Paper published in SICOMP (2009) “*The fast Johnson–Lindenstrauss transform and approximate nearest neighbors*” (with B. Chazelle) selected as **SIAM outstanding paper**
- 2012 **Best student paper award** for “*A new active learning scheme with applications to learning to rank from pairwise preferences*” (with advised student R. Begleiter and E. Ezra) in COLT 2012.
- 2011 **Best paper award** for “Almost optimal unrestricted fast Johnson-Lindenstrauss Transform” (with E. Liberty) in SODA 2011.
- 2006 Charlotte Elizabeth Procter Honorific Fellowship, Princeton University
- 2001 Best achievement award in M.Sc. studies, Tel Aviv University
- 1998 Rector's prize (top 3 in B.Sc. studies), Tel Aviv University

DEPARTMENTAL ACTIVITIES

- 2013- Advisor for student exchange
date
- 2010- Organizer of open day for undergraduate
date students
- 2013 Secretary of the faculty council

Professional Activities

- 2016 PC member for Algorithmic Learning Theory (ALT), to take place
- 2015 PC member for Symposium on Discrete Algorithms (SODA)
- 2014 Reviewer for International Conference on Machine Learning (ICML)
- 2014 PC Member for Algorithmic Learning Theory (ALT)
- 2013 Reviewer for National Science Foundation (NSF)
- 2013 Reviewer for International Conference on Machine Learning (ICML)
- 2013 Reviewer for Neural Information Processing Systems (NIPS)
- 2012 Reviewer for International Conference on Machine Learning (ICML)
- 2012 Reviewer for Neural Information Processing Systems (NIPS)
- 2012 Reviewer for Conference on Learning Theory (COLT)
- 2011 Reviewer for Neural Information Processing Systems (NIPS)

- 2011 PC member for Web Search and Data Mining (WSDM)
 2011 PC member for Foundations of Computer Science (FOCS)
 2011 PC member for Association for Advancement of Artificial Intelligence (AAAI)
 2008 PC member for RANDOM-APPROX

Ph.D Students

- 2011- Ron Begleiter (**Graduated**) as primary advisor, co-advised with Prof. Ran El-Yaniv
 2013 *Research topic: Active Learning*
 2010- Kira Radinsky (**Graduated**) as secondary advisor, co-advised with Prof. Shaul
 2013 Markovitch
 2014- *Research topic: Knowledge extraction and prediction from the web*
 date Elad Hoffer
Research topic: Deep Network Architectures Theory and Practice
 2016- Ivo David
 date *Learning and optimizing from pairwise preference data*

M.Sc. Students

- 2013- Amit Wolfenfeld (**Graduated**).
 date *Research topic: Dueling bandit strategies*
 2011- David Wajc (**Graduated**) as primary advisor, co-advised with Prof. Seffi
 2014 Naor
Research topic: Parametrized complexity

RESEARCH GRANTS

- 2015 ERC Consolidator Grant (1.4 Million Euro)
 2014 ISF-UGC (University Grant Commission – India) joint research (> 100,000 USD, exact sum TBD)
 2013 ISF (180,000 USD)
 2012 Technion-Cornell Institute of Innovation (TCII) (60,000 USD)
 2011 German Israel Foundation (GIF) (16,000 Euro)
 2010 FP7 Reintegration Grant (IRG) (100,000 Euro)
 2010 Yahoo! Faculty Research and Engagement Program (10,000 USD)

PUBLICATIONS

Theses

1. M.Sc. Thesis: Torsion points on curves and common divisors of a^k-1 and b^k-1 , *Tel-Aviv University School of Mathematics*
2. Ph.D Thesis: Studies in Algorithms (i) Lower bounds in computational geometry, (ii) Fast approximation algorithms for aggregating inconsistent

data, (iii) Efficient algorithms for dimension reduction, *Princeton University Department of Computer Science*

Refereed papers in professional journals

- J1.** Nir Ailon and Zeev Rudnick. Torsion points on curves and common divisors of $a^k - 1$ and $b^k - 1$. *Acta Arithmetica*, (113):31-38, 2004.
- J2.** Nir Ailon and Bernard Chazelle. Lower bounds for linear degeneracy testing. *Journal of the ACM*, 52(2):157-171, 2005. [See C3]
- J3.** Nir Ailon and Bernard Chazelle. Information theory in property testing and monotonicity testing in higher dimension. *Inf. Comput.*, 204(11):1704-1717, 2006. [See C6]
- J4.** Nir Ailon and Noga Alon. **Hardness of fully dense problems**. *Inf. Comput.*, 205(8):1117-1129, 2007.
- J5.** Nir Ailon, Bernard Chazelle, Seshadhri Comandur, and Ding Liu. Estimating the distance to a monotone function. *Random Struct. Algorithms*, 31(3):371-383, 2007. [See C2]
- J6.** Nir Ailon, Bernard Chazelle, Seshadhri Comandur, and Ding Liu. Property preserving data reconstruction. *Algorithmica*, 51(2):160-182, 2008. [See C1]
- J7.** Nir Ailon, Moses Charikar, and Alantha Newman. Aggregating inconsistent information: Ranking and clustering. *J. ACM*, 55(5), 27 pages, 2008. [See C4]
- J8.** Nir Ailon and Bernard Chazelle. The fast Johnson–Lindenstrauss transform and approximate nearest neighbors. *SIAM J. Comput.*, 39(1):302-322, 2009. [See C9].
- J9.** Nir Ailon and Edo Liberty. Fast dimension reduction using Rademacher series on dual BCH codes. *Discrete & Computational Geometry*, 42(4):615-630, 2009. [See C14]
- J10.** Nir Ailon. Aggregation of partial rankings, p-ratings and top-k lists. *Algorithmica*, 57(2):284-300, 2010. [See C10]
- J11.** Nir Ailon and Bernard Chazelle. Faster dimension reduction. *CACM Highlights (by invitation)*, 53(2):97-104, 2010.
- J12.** Nir Ailon, Bernard Chazelle, Kenneth L. Clarkson, Ding Liu, Wolfgang Mulzer, and C. Seshadhri. Self-improving algorithms. *Siam Journal on Computing*, 49(2):350-375, 2011, 2011. [See C8]
- J13.** Nir Ailon and Mehryar Mohri. Preference based learning to rank. *Journal of Machine Learning*, 80(2-3), 189-211, 2011. [See C13]
- J14.** Nir Ailon, Edo Liberty, and Amit Singer. Dense fast random projections and the lean Walsh transform. *Discrete & Computational Geometry*, 45(1), 34-44, 2011. [See C12]
- J15.** Nir Ailon and Moses Charikar. Fitting tree metrics: Hierarchical clustering and phylogeny. *Siam J. Comp.*, 40(5), 1275-1291, 2011. [See C5]
- J16.** Nir Ailon. An active learning algorithm for ranking from pairwise preferences with an almost optimal query complexity. *JMLR*, 13(Jan):137-164, 2012. [See C21]
- J17.** Nir Ailon and Noa Elgrabli and Edo Liberty and Anke van Zuylen. Improved approximation algorithms for bipartite correlation clustering. *Siam J. Comp.*, 41(5), 1110-1121, 2012. [See C20]
- J18.** Nir Ailon and Edo Liberty. An almost optimal unrestricted fast Johnson-Lindenstrauss Transform. *Transactions of Algorithms, ACM Trans. On Alg. (SODA 2011 Special Issue)*, 9(3), 21 pages, 2013. [See C19]

- J19.** Nir Ailon. A lower bound for Fourier transform computation in a linear model over 2×2 unitary gates using matrix entropy. **Chicago J. of Theoretical CS**, 5 pages, 2013
- J20.** Nir Ailon and Ron Begleiter and Esther Ezra. Active learning using smooth relative regret approximations with applications. **JMLR**, 15(Mar):885-920, 2014. [See C22]
- J21.** Nir Ailon and Holger Rauhut. Fast and RIP-optimal Transforms. **Discrete and Comp. Geom.** (pending minor revision). 22 pages, 2014
- J22.** Nir Ailon and Yudong Chen and Huan Xu. Iterative and active graph clustering using trace norm minimization without cluster size constraints. **Journal of Machine Learning Research (JMLR)**. 33 pages, 2014. [See C24]
- J23.** Nir Ailon and Kohei Hatano and Eiji Takimoto. Bandit online optimization over the permutahedron. To appear by invitation, *Theo. Comp. Sci.* [see C28]
- J24.** Nir Ailon. An $\Omega((n \log n)/R)$ Lower Bound for Fourier Transform Computation in the R-Well Conditioned Model. In press, *Trans. On Comp. Theo.*
- J25.** Nir Ailon and Anup Bhattacharta and Ragesh Jaiswal, Tight lower bound instances for k-means++ in two dimensions. **Theor. Comp. Sci.** 634:55-66 (2016). [See C25]

Refereed papers in conference proceedings

- C1.** Nir Ailon, Bernard Chazelle, Seshadhri Comandur, and Ding Liu. Property preserving data reconstruction. In **International Symposium on Algorithms and Computation (ISAAC)**, 16–27, 2004, Hong Kong.
- C2.** Nir Ailon, Bernard Chazelle, Seshadhri Comandur, and Ding Liu. Estimating the distance to a monotone function. In **APPROX-RANDOM**, 229–236, 2004, Barcelona, Spain.
- C3.** Nir Ailon and Bernard Chazelle. Lower bounds for linear degeneracy testing. In **ACM Symposium on Theory of Computing (STOC)**, 554–560, 2004, Chicago, IL.
- C4.** Nir Ailon, Moses Charikar, and Alantha Newman. Aggregating inconsistent information: ranking and clustering. In **ACM Symposium on Theory of Computing (STOC)**, 684–693, 2005, Baltimore, MD.
- C5.** Nir Ailon and Moses Charikar. Fitting tree metrics: Hierarchical clustering and phylogeny. In **IEEE Symposium on Foundations of Computer Science (FOCS)**, 73–82, 2005, Pittsburgh, PA.
- C6.** Nir Ailon and Bernard Chazelle. Information theory in property testing and monotonicity testing in higher dimension. In **Symposium on Theoretical Aspects of Computer Science (STACS)**, 434-447, 2005, Stuttgart, Germany.
- C7.** Nir Ailon, Steve Chien, and Cynthia Dwork. On clusters in Markov chains. In **Latin American Theoretical Informatics Symposium (LATIN)**, 43–55, 2006, Valdivia, Chile.
- C8.** Nir Ailon, Bernard Chazelle, Seshadhri Comandur, and Ding Liu. Self improving algorithms. In **ACM-SIAM Symposium on Discrete Algorithms (SODA)**, 261–270, 2006, Miami, FL.
- C9.** Nir Ailon and Bernard Chazelle. Approximate nearest neighbors and the fast Johnson-Lindenstrauss transform. In **ACM Symposium on Theory of Computing (STOC)**, 557–563, 2006, Seattle, WA.
- C10.** Nir Ailon. Aggregation of partial rankings, p-ratings and top-k lists. In **ACM-SIAM Symposium on Discrete Algorithms (SODA)**, 415–424, 2007, New Orleans, LA.

- C11.** Nir Ailon. Reconciling real scores with binary comparisons: A new logistic based model for ranking. In **Neural Information Processing Systems (NIPS)**, 25–32, 2008, Vancouver, BC, Canada.
- C12.** Edo Liberty, Nir Ailon, and Amit Singer. Dense fast random projections and lean Walsh transforms. In **APPROX-RANDOM**, 512–522, 2008, Boston, MA.
- C13.** Nir Ailon and Mehryar Mohri. An efficient reduction of ranking to classification. In **Conference on Learning Theory (COLT)**, 87–98, 2008, Helsinki, Finland.
- C14.** Nir Ailon and Edo Liberty. Fast dimension reduction using Rademacher series on dual BCH codes. In **ACM-SIAM Symposium on Discrete Algorithms (SODA)**, 1–9, 2008, San Francisco, CA.
- C15.** Nir Ailon and Claire Monteleoni and Ragesh Jaiswal. Streaming k-means approximation. In **Neural Information Processing Systems (NIPS)**, 10-18, 2009, Vancouver, BC, Canada.
- C16.** Nir Ailon. A simple linear ranking algorithm using query dependent intercept variables. In **European Conference on Information Retrieval (ECIR)**, 685–690, 2009, Toulouse, France.
- C17.** Nir Ailon and Edo Liberty. Correlation clustering revisited: The "true" cost of error minimization problems. In **International Colloquium on Automata, Languages and Programming (ICALP)**, 24–36, 2009, Rhodes, Greece.
- C18.** Nir Ailon and Kira Radinsky. Ranking From Pairs and Triplets: Information Quality, Evaluation Methods and Query Complexity. In **ACM International Conference on Web Search and Data Mining (WSDM)**, 105-114, 2011, Hong Kong.
- C19.** Nir Ailon and Edo Liberty. Almost optimal unrestricted fast Johnson-Lindenstrauss Transform. In **ACM-SIAM Symposium on Discrete Algorithms (SODA)**, with **BEST PAPER AWARD**, 185-191, 2011, San Francisco, CA.
- C20.** Nir Ailon and Noa Elgrabli and Edo Liberty and Anke van Zuylen. Improved approximation algorithms for bipartite correlation clustering. In **European Symposium on Algorithms (ESA)**, 25-36, 2011, Saarbrücken, Germany.
- C21.** Nir Ailon. An active learning algorithm for ranking from pairwise preferences with an almost optimal query complexity. In **Neural Information Processing Systems (NIPS)**, 810-818, 2011, Granada, Spain.
- C22.** Nir Ailon, Ron Begleiter, Esther Ezra. Active learning using smooth relative regret approximations with applications. In **Conference on Learning Theory (COLT)**, with **BEST STUDENT PAPER AWARD**, 19.1-19.20, 2012, Edinburgh, Scotland.
- C23.** Nir Ailon, Zohar Karnin, Edo Liberty, Yoelle Maarek. Threading Machine Generated Email. In **International Conference on Web Search and Data Mining (WSDM)**, 405-414, 2013, Rome, Italy.
- C24.** Nir Ailon and Yudong Chen and Xu Huan. Breaking the small cluster barrier of graph clustering. In **International Conference on Machine Learning (ICML)**, 995-1003, 2013, Atlanta, GA.
- C25.** Anum Bhattacharya and Ragesh Jaiswal and Nir Ailon. A tight lower bound instance for k-means++ in constant dimension. In **Theory and Applications of Models of Computation (TAMC)**, 7-22, 2014, Chennai, India.
- C26.** Nir Ailon. Improved bounds for online learning over the permutahedron and other ranking polytopes. In **Artificial Intelligence and Statistics (AISTATS)**, 29-37, 2014, Reykjavik, Iceland.

- C27.** Nir Ailon and Thorsten Joachims and Zohar Karnin. Reducing dueling bandits to cardinal bandits. In **International Conference on Machine Learning (ICML)**, 9 pages, 2014, Beijing, China.
- C28.** Nir Ailon and Kohei Hatano and Eiji Takimoto. Bandit online optimization over the permutahedron. In **Algorithmic Learning Theory (ALT)**, 15 pages, 2014, Bled, Slovenia.
- C29.** Nir Ailon. Tighter Fourier transform lower bounds. In **International Colloquium on Automata, Languages and Programming (ICALP)**, 12 pages, 2015, Kyoto, Japan.
- C30.** Nir Ailon and Elad Hoffer. Deep metric learning using triplet network. In **International Conference on Learning Representations (ICLR)**, 2015.

Invitations to Lecture at Workshops and Summer Schools

- 03/2014 Preference Learning workshop
Dagstuhl, Germany
- 8/2012 Workshop on Machine Learning
Mysore, India
- 4/2012 Workshop on probability techniques and algorithms
Austin, Texas
- 6/2011 Workshop on sublinear algorithms
Bertinoro, Italy
- 1/2009 Quantitative and computational aspects of metric geometry
UCLA, Los Angeles, CA
- 6/2008 Workshop on algorithms for massive datasets
Stanford, CA
- 5/2007 Summer school on algorithmic data analysis
Helsinki, Finland
- 7/2006 Concentration week on metric geometry & geometric embeddings of discrete metric spaces
Texas A&M University, College Station, TX

Patents

1. Nir Ailon, Edo Liberty, Khalsa Harishabd, Method and System for Clustering Data Points, US publication number 20120254183

Technical Reports

1. Nir Ailon, Zohar Karnin. A note on: No need to choose: How to get both a PTAS and a sublinear query complexity. ArXiv:1204.6588

2. Nir Ailon. Paraunitary Matrices, Entropy, Algebraic Condition Number and Fourier Computation. ArXiv:1609.03278 (2016)
3. Nir Ailon, Gal Yehuda. The complexity of computing a Fourier perturbation. ArXiv: 1604.02557. (2016)