

Tomer Hertz

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Citizenship: Israeli

Education

B.Sc. Computer Science and an Interdisciplinary Program in the Humanities, The Hebrew University of Jerusalem, Israel, 1999.

Ph.D. Computational Neuroscience, The Hebrew University of Jerusalem, Israel, 2007.
Title: *Learning Distance Functions: Algorithms and Applications*.
Advisor: Prof. Daphna Weinshall.

Postgraduate training

Postdoctoral researcher 2006 - 2009
Microsoft Research, eScience group (formerly the Machine Learning and Applied Statistics group) Seattle, Washington

Development of computational tools for immunology research, with specific focus on applications for HIV rational vaccine design. Projects: (1) Evolution of the MHC system - a study based on computational binding prediction models. (2) Classification of MHC alleles into supertypes.

Faculty Positions

Staff Scientist 2009 - present
Vaccine and Infectious Disease Division, Seattle, Washington
Fred Hutchinson Cancer Research Center

- ◇ Host-pathogen co-evolution - Studying the co-evolution of the MHC system and the pathogens it faces using computational modeling tools.
- ◇ T-cell and B-cell immunodominance and the effects of immunological history - Developing computational and experimental approaches to understand the effects of previous exposure of pathogens on the immune response to a new pathogen or following vaccination.
- ◇ Computational immunology with specific focus on HLA binding prediction and its applications in vaccine design, HLA-viral interactions and immunodominance

Honors and Awards

2010 UW Virology Division Innovative Pilot Award

2009 NIH Mentored Quantitative Research Development Award (K25)

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2008 IBM Research Pat Goldberg Memorial Best Paper Award in Computer Science, Electrical Engineering and Math

2008 Best paper award, 6th USENIX Conference on File and Storage Technologies

1999-2006 Ph.D. fellowship, Interdisciplinary Center for Neural Computation, The Hebrew University of Jerusalem

1996-1999 B.Sc. fellowship, The Amirim Interdisciplinary program for outstanding students, The Hebrew university of Jerusalem

Teaching Responsibilities

Lecturer, Introduction to Object Oriented Programming (Computer Science), The Hebrew University of Jerusalem, Spring 2006

Teaching Assistant, Introduction to Computer Science (Computer Science), The Hebrew University of Jerusalem, Fall 2001-2005

Teaching Assistant, Introduction to Logic (B.Sc. Amirim program), The Hebrew University of Jerusalem, Spring 2005

Teaching Assistant, Languages of Art (B.Sc. Amirim program), The Hebrew University of Jerusalem, 2005

Teaching Assistant, Game Theory (B.Sc. Amirim program), The Hebrew University of Jerusalem, Fall 2003

Teaching Assistant, History and Philosophy of Science (B.Sc. Amirim program), The Hebrew University of Jerusalem, Fall 2002

Instructor and Consultant, Programming languages, John Bryce, 1999-2001.

Instructor, Programming languages, I.B.M, 1999-2000

Teacher, Leyada High School, Computer Science, and Home Room teacher in the 12th grade. Social coordinator of student school, 1999-2001 council.

Teacher, Mevaseret Zion Junior High school - Social counselor and teacher, 1995-1999

Editorial responsibilities

Vaccine, PLoS Computational Biology, Virology, Journal of Machine Learning Research (JMLR), Immunogenetics, Bioinformatics, Machine Learning, Annual Conference on Intelligent Systems for Molecular Biology (ISMB), ACM Transactions on Knowledge Discovery from Data, Journal of Chemical Information and Modeling, ACM Transactions on Knowledge and Discovery of Data, IEEE/ACM Transactions on Computational Biology, Transactions on Neural Networks, Neural Information processing Systems (NIPS) and International Conference on Machine Learning (ICML).

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Research Funding

Mentored Quantitative Research Development Award (K25) 9/20010-9/2015
NIH

PI: T. Hertz

Computational Approaches to Studying Immunodominance The goal of this project is to develop computational methods to predict immunodominant T-cell responses.

Virology Division Innovative Pilot Award 1/2011-1/2012

University of Washington, Virology Division, Department of Laboratory Medicine

PI: T. Hertz and D. Koelle

Capturing Immunological History using Antigen Microarrays The goal of this project is to develop an antigen microarray to measure immunological history, defined as previous exposure to a large set of common human pathogens.

38744 Vaccine Immunology Statistical Center (VISC) 7/2006-7/2011

Bill and Melinda Gates Foundation

PI: M.J. McElrath

The VISC will provide 1) statistical and study design support for pre-clinical vaccine performance trials, 2) centralized data management services for the standardized evaluation of vaccine candidates, 3) development of new statistical methods for cross-species correlates-of-protection analysis.

41185 Immune Correlates of Protection Against HIV and SIV Infection 06/07 05/12

Bill and Melinda Gates Foundation

PI: M.J. McElrath

Objective 2: Biostatistical Analyses The goal of the project is to discover the correlates of protection against SIV infection in rhesus macaques and their relevance to humans.

Peer-reviewed Publications

1. N. Shental, **T. Hertz**, D. Weinshall and M. Pavel. Adjustment learning and relevant component analysis, *European Conf. on Computer Vision (ECCV)*, 2002. ([115 citations](#))
2. N. Shental, A. Zomet, **T. Hertz** and Y. Weiss. Learning and inferring image segmentations using the GBP Typical Cut, *International Conference on Computer Vision (ICCV)*, 1243–1250, 2003. ([34 citations](#))
3. Aharon Bar-Hillel, **Tomer Hertz**, Noam Shental and Daphna Weinshall. Learning distance functions using equivalence relations, *International Conference on Machine Learning (ICML)*, 11–18, 2003. ([235 citations](#))
4. **T. Hertz**, N. Shental, A. Bar-Hillel and D. Weinshall. Enhancing image and video retrieval: learning via equivalence constraints, *Conf. on Computer Vision and Pattern Recognition (CVPR)*, 668–674, 2003. ([46 citations](#))

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5. N. Shental, A. Bar-Hillel, **T. Hertz** and D. Weinshall. Computing Gaussian mixture models with EM using equivalence constraints, *Advances in Neural Information Processing Systems (NIPS)*, 465–472, 2004. ([116 citations](#))
6. N. Shental, A. Zomet, **T. Hertz** and Y. Weiss. Pairwise clustering and graphical models, *Advances in Neural Information Processing Systems (NIPS)*, 185–192, 2004. ([22 citations](#))
7. **Tomer Hertz**, Aharon Bar-Hillel and Daphna Weinshall. Learning Distance Functions for Image Retrieval, *Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2004. ([79 citations](#))
8. **Tomer Hertz**, Aharon Bar-Hillel and Daphna Weinshall. Boosting Margin Based Distance Functions for Clustering, *International Conference on Machine Learning (ICML)*, 2004. ([54 citations](#))
9. R. Hammer, **T. Hertz**, S. Hochstein and D. Weinshall. Category Learning from Equivalence Constraints, *XXVII Annual Meeting of the Cognitive Science Society, Stresa Italy*, 2005. ([11 citations](#))
10. A. Bar-Hillel, **T. Hertz** and D. Weinshall. Efficient learning of relational object class models, *International Conference on Computer Vision (ICCV)*, 2005. ([51 citations](#))
11. Aharon Bar-Hillel, **Tomer Hertz**, Noam Shental and Daphna Weinshall. Learning a Mahalanobis Metric from Equivalence Constraints, *Journal of Machine Learning Research*, 6, 937–965, 2005. ([211 citations](#))
12. A. Bar-Hillel, **T. Hertz** and D. Weinshall. Object Class Recognition by Boosting a Part-Based Model, *Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2005. ([29 citations](#))
13. Chen Yanover and **Tomer Hertz**. Predicting Protein-Peptide Binding Affinity by Learning Peptide-Peptide Distance Functions, *The Ninth Annual Conference on Research in Computational Biology (RECOMB)*, 2005. ([13 citations](#))
14. Inna Weiner, **Tomer Hertz**, Israel Nelken and Daphna Weinshall. Analyzing Auditory Neurons by Learning Distance Functions, *Advances in Neural Information Processing Systems (NIPS)*, 2005. ([1 citation](#))
15. **Tomer Hertz** and Chen Yanover. PepDist: A New Framework for Protein-Peptide Binding Prediction based on Learning Peptide Distance Functions, *BMC Bioinformatics*, 7(Suppl 1):S3, 2006. ([34 citations](#))
16. **Tomer Hertz**, Aharon Bar Hillel and Daphna Weinshall. Learning a kernel function for classification with small training samples, *International Conference on Machine Learning (ICML)*, 2006. ([49 citations](#))
17. **Tomer Hertz** and Chen Yanover. Identifying HLA Supertypes by Learning Distance Functions, *European Conference on Computational Biology (ECCB)*, 2006. ([18 citations](#))
18. Rubi Hammer, **Tomer Hertz**, Shaul Hochstein and Daphna Weinshall. Classification with Positive and Negative Equivalence onstraints: Theory, Computation and Human Experiments, *BVAI*, 264-276, 2007. ([6 citations](#))

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19. Dan Tsafir, **Tomer Hertz**, David Wagner and Dilma Da Silva. Portably Solving File TOCTTOU Races with Hardness Amplification, *6th USENIX Conference on File and Storage Technologies*, 2008. ([19 citations](#))
20. Vladimir Jovic, **Tomer Hertz** and Nebojsa Jovic. Population Sequencing Using Short Reads: HIV as a Case Study, *Pacific Symposium on Biocomputing (PSB)*, 2008. ([7 citations](#))
21. R. Hammer, A. Bar-Hillel, **T. Hertz**, D. Weinshall and S. Hochstein. Comparison Processes in Category Learning: From Theory to Behavior, *Brain Research*, 2008. ([5 citations](#))
22. Dan Tsafir, **Tomer Hertz**, Dilma Da Silva and David Wagner. Portably solving file races with hardness amplification, *ACM Transactions on Storage (TOS)*, 4, 2008.
23. Rubi Hammer, **Tomer Hertz**, Shaul Hochstein and Daphna Weinshall. Category Learning from Equivalence Constraints., *Cognitive Processing*, 10, 211-232, 2009. ([11 citations](#))
24. Tomer Hertz, David Nolan, Ian James, Mina John, Silvana Gaudieri, Elizabeth Phillips, Jim C. Huang, Gonzalo Riadi, Simon Mallal and Nebojsa Jovic. Mapping the landscape of host-pathogen co-evolution: HLA class I binding and its relationship with evolutionary conservation in human and viral proteins., *J. Virol.*, 85(3) , 1310-1321, 2011. ([2 citations](#))
25. Daphna Meroz, Sun-Woo Yoon, Mariette F. Ducatez, Thomas F. Fabrizio, Richard J. Webby, **Tomer Hertz*** and Nir Ben-Tal*, Putative amino acid determinants of the emergence of the 2009 influenza A (H1N1) virus in the human population., *PNAS*, 108(33), 13522-13527, 2011. [*corresponding author]

Submitted/In-preparation publications

(*) indicates corresponding author

1. **Tomer Hertz***, Christine Oshansky-Weilna, Paul Thomas, Betz Halloran and Larry Corey. Antigenic variability of human HLA types to the novel swine-origin influenza A (H1N1) virus - A computational analysis, *in preparation*, 2011.
2. Daphna Meroz, Richard Webby, Nir Ben-Tal and **Tomer Hertz***. "In Silico Identification of Amino Acids Comprising the Avian-to-Human Barrier of Influenza A H5N1 viruses", *in preparation* , 2011.

Book Chapters

1. Noam Shental, Aharon Bar-Hillel, **Tomer Hertz** and Daphna Weinshall. Gaussian Mixture Models with Equivalence Constraints. in *Constrained Clustering: Advances in Algorithms, Theory, and Applications*, edited by S. Basu, I. Davidson, and K.L. Wagstaff, Chapman & Hall/CRC Data Mining Series, 2008.

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Invited Talks

HIV Vaccine Trial Network (HVTN) Conference, Washington DC, June 2011, *Vaccine Induced Epitope Hotspots*.

Workshop on T-lymphocyte dynamics in acute and chronic viral infection, Wellcome Trust conference centre, London, UK, 2011, *HIV vaccine induced T-cell epitope immunodominance in the Step and HVTN 054 vaccine trials*.

Center for Computational Biology, University of California Los Angeles (UCLA), 2010, *A computational approach to identifying signature sites in influenza A viruses*

IDS/Virology Annual conference, Seattle WA, 2010 *Mapping the landscape of host-pathogen co-evolution: HLA class I-peptide interactions correlate with conservation in human and viral proteins* .

Seattle Biomed, Seattle, WA, 2009 *Mapping the landscape of host-pathogen co-evolution: HLA class I-peptide interactions correlate with conservation in human and viral proteins* .

Department of Immunology, Weizmann Institute, Rehovot, Israel, 2009, *Mapping the landscape of host-pathogen co-evolution: HLA class I-peptide interactions correlate with conservation in human and viral proteins*.

Bioinformatics Unit, Hadassah School of Medicine, The Hebrew University of Jerusalem, Israel, 2009, *Mapping the landscape of host-pathogen co-evolution: HLA class I-peptide interactions correlate with conservation in human and viral proteins*.

Departments of Biochemistry and Immunology, Tel Aviv University, Israel, 2009, *Mapping the landscape of host-pathogen co-evolution: HLA class I-peptide interactions correlate with conservation in human and viral proteins*.

Center for Computational Biology, University of California Los Angeles (UCLA), 2008, *Evolutionary optimization of MHC class I allele repertoire for the recognition of functionally important, evolutionarily conserved elements*.

La Jolla Institute for Allergy and Immunology, San Diego CA, 2008, *Evolutionary optimization of MHC class I allele repertoire for the recognition of functionally important, evolutionarily conserved elements*

La Jolla Institute for Allergy and Immunology, San Diego CA, 2007, *Identifying HLA Supertypes by Learning Distance Functions*.

Microsoft Research, Redmond WA, 2006, *Immunoinformatics and Distance Learning*.

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Center for Neural Computation (ICNC) The Hebrew University of Jerusalem, Israel, 2006, *Analyzing Auditory Neurons by Learning Distance Functions*.

La Jolla Institute for Allergy and Immunology, San Diego CA, 2005, *Predicting Protein-Peptide Binding Affinity by Learning Peptide-Peptide Distance Functions*.

Oregon Graduate Institute, 2004, *Learning a Gaussian Mixture Model from Equivalence Constraints*.

Scientific Software

Relevant Component Analysis (RCA) [[matlab code](#)] - An algorithm for learning Mahalanobis distance functions from equivalence constraints.

DistBoost [[matlab code](#)] - An algorithm for learning non-linear distance functions from equivalence constraints.

Programming Languages

Matlab, Java, C++, Perl