Roni Rosenfeld
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Education:

Carnegie Mellon University	Computer Science	Ph.D. 1994
Carnegie Mellon University	Computer Science	M.Sc. 1991
Tel-Aviv University, Israel	Mathematics and Physics	B.Sc. 1985

Professional Positions and Honors:

2018-	Head, Machine Learning Department, School of Computer Science, Carnegie Mellon University, Pittsburgh, PA
2005-	Professor of Language Technologies, Machine Learning, Computer Science and Computational Biology, School of Computer Science, Carnegie Mellon University
2010-	Visiting Adjunct Professor of Computational and Systems Biology, School of Medicine, University of Pittsburgh
2017-	Professor by courtesy, Heinz College, Carnegie Mellon University
2017	Interim Director, Machine Learning Minor undergraduate degree program
2017	Interim Co-Director (computer science), M.S. in Machine Learning program
2017	Joel and Ruth Spira Teaching Award
2001-2005	Tenured Associate Professor, School of Computer Science, Carnegie Mellon University
2001-2003	Co-Director (computer science), Graduate Program in Computational and Statistical Learning, School of Computer Science, Carnegie Mellon University
2003	Visiting Associate Professor, Computer Science Department, Hong-Kong University
1999-2001	Associate Professor, School of Computer Science, Carnegie Mellon University
1997-1999	Co-Director (computer science), inter-collegiate Computational Finance graduate program, Carnegie Mellon University
1997-1999	Assistant Professor, School of Computer Science, Carnegie Mellon University
1994-1997	Research Computer Scientist, Computer Science Department, Carnegie Mellon University
1992	Allen Newell Medal for Research Excellence

Professional Society Positions:

2013	ICTD Senior Program Committee
2010-	ACM DEV Program Committee (2012, 2013, 2014, 2015, 2016)
2006-	Editorial Board, *Dialog & Discourse*, an International Journal
2002-2004	Editorial Board, *Journal of Computational Linguistics*
1999-2002	Associate Editor, *IEEE Transactions on Speech and Audio Processing*

Current Interests:

- Forecasting Epidemics
    - National advocate for the science and technology of epidemic forecasting
    - Top scoring group in forecasting challenges organized by U.S. Government
    - Named "*Most Accurate Forecaster*" by CDC in 2016; Won competition again in 2017.
- Spoken Dialog Technologies to Aid Socioeconomic Development
    - Deployed multilingual information systems in Pakistan, India and Guinea
    - Content provided by Punjab government (Pakistan), private jobs agency (India), and World Health Organization (Guinea, Ebola)
    - Systems spread virally and reached over 180,000 users
    - CHI *Best Paper* award; Covered widely in the popular press
- Machine Learning for Social Good
- Machine Learning Pedagogy
    - Improving data numeracy in all segments of society

Selected Recent Collaborators Outside CMU:

- Donald S. Burke, MD, Dean, Graduate School of Public Health, University of Pittsburgh
- Matt Biggerstaff, ScD, Centers for Disease Control and Prevention (CDC), Influenza branch
- Umar Saif, PhD, Chair, Punjab IT Board and Vice-Chancellor, Information Technology University (ITU), Lahore, Pakistan

Teaching:

- Created the "Language and Statistics" course and grew it from a 10 student LTI-only PhD course in 2001 to a 78 student course in 2016, attended by students from all over the School of Computer Science and outside it. In a survey of LTI graduates a few years ago, "Language and Statistics" was voted the most impactful course on their post-CMU career.
- Have been teaching a Masters-level "Machine Learning" course for over 20 years, most recently to a roster of 346 students.
- FCEs (student evaluations) consistently and significantly exceed university, school and departments' norms.

Consulting, Legal Expert Testimony, and Technical Board Positions:

- *DNS Capital*
- *Google, Inc.*
- *Acusis LLC*
- *Irell & Manella LLP*
- *Precision Therapeutics, Inc*.
- *Ignite Venture Partners*
- *Lendable Inc.*
- *Vocollect Inc.*
- *iConverse*
- *Novauris / Aurilab LLC*

Current Students: (* co-advised)

- Amanda Coston* (MLD and Heinz PhD student, Machine Learning and Public Policy)
- Logan Brooks (CSD PhD student, Epi-forecasting)
- Aaron Rumack (MLD PhD student, Epi-forecasting)
- Nuoyu Li (MLD MS student, Epi-forecasting)

Graduated PhD and MS Students and Post-Docs: (* co-advised)

- David C. Farrow, "Modeling the Past, Present, and Future of Influenza", PhD Thesis (2016), Dept. of Computational Biology, School of Computer Science, Carnegie Mellon University.
- Lisheng Gao, Masters in Machine Learning (2017), School of Computer Science, CMU
- June Li, Masters in Machine Learning (2017), School of Computer Science, CMU
- Juneki Hong, Masters in Language Technologies (2016), School of Computer Science, CMU
- Agha Ali Raza, "Viral Entertainment as a Vehicle for Disseminating Core Development Services", PhD Thesis (2014), Language Technologies Institute, School of Computer Science, Carnegie Mellon University.
- Chuang Wu, "Phenotype Inference from Genotype in RNA Viruses", PhD Thesis (2014), Dept. of Computational Biology, School of Computer Science, Carnegie Mellon University.
- Peter Schulam, Masters in Language Technologies (2013), School of Computer Science, CMU
- ?Anuroop Sriram, Masters in Language Technologies (2012), School of Computer Science, CMU
- Jahanzeb Sherwani*, "Speech Interfaces for Information Access by Low Literate Users", PhD Thesis (2009), Computer Science Department, School of Computer Science, Carnegie Mellon University.
- Yong Lu*, "A Computational Framework for the Analysis of Multi-Species Microarray Data", PhD Thesis (2008), Computer Science Department, School of Computer Science, Carnegie Mellon University.
- Dan Bohus*, "Error Awareness and Recovery in Conversational Spoken Language Interfaces", PhD Thesis (2007), Computer Science Department, School of Computer Science, Carnegie Mellon University.
- Stefanie Tomko, "Improving User Interaction with Spoken Dialog Systems via Shaping", PhD Thesis (2006), Language Technologies Institute, School of Computer Science, Carnegie Mellon University.
- Xiaojin (Jerry) Zhu*, "Semi-Supervised Learning with Graphs", PhD Thesis (2005), Language Technologies Institute, School of Computer Science, Carnegie Mellon University.
- Thomas Harris, "The Speech Graffiti Personal Universal Controller: A Speech Interface for Appliances", Masters Thesis (2004), Language Technologies Institute, School of Computer Science, Carnegie Mellon University
- Arthur Toth, Masters in Language Technologies (200?), School of Computer Science, CMU
- Rob Malkin, Masters in Language Technologies (200?), School of Computer Science, CMU
- Lin Chase, ""Error-responsive Feedback Mechanisms for Speech Recognizers", PhD Thesis (1997), Robotics Institute, School of Computer Science, Carnegie Mellon University.
- Andy Walsh, post-doctoral fellow, computational virology, 2005—2008
- Xiaojun Wang, post-doctoral fellow, machine learning, 2000
- Stanley F. Chen, post-doctoral fellow, statistical language modeling, 1997-2000

- Pierre DuPont, post-doctoral fellow, statistical language modeling, 1996-1997

CMU Thesis Committees since 2010:

- George Montanez, CMU MLD, 2017
- Neil Shah, CMU MLD, 2017
- Ming Sun, CMU LTI, 2016
- Dana Movshovitz-Atias, CMU CSD, 2015
- Danai Koutra, CMU CSD, 2015
- Hai-Son Le, CMU MLD, 2013
- Kenton Murray, CMU LTI (MLT), 2013
- Shan Zhong, CMU CompBio, 2013
- Guy Zinman, CMU CompBio, 2012
- Aditya Prakash, CMU CSD, 2011
- Rachel Brower-Sinning, Joint CompBio with U. Pitt, 2011
- Anne Yust, CMU Math, 2010

Major University Service:

- Faculty Senate Budget and Financial Affairs Committee, 2009—2013.
- SCS committee to design an undergraduate Artificial Intelligence major, 2007—2008.
- University Promotion and Reappointment committee, 2000's.

Research Trajectory:

My initial scientific training was in Mathematics, Physics, Statistics and Computer Science.

Starting in the 1990s, I have worked for two decades on **statistical-computational models of speech and natural language**, with direct application to language technologies such as automatic speech recognition and machine translation. Statistical models of natural language are at the heart of virtually all language technologies, such as speech recognition, machine translation, and information retrieval. In my 1994 Computer Science PhD thesis I showed how to integrate diverse linguistic and statistical knowledge sources into a single consistent Maximum Entropy framework, thereby achieving breakthrough improvements in the predictive quality of the models. Five years later, this work won the "most influential paper in past 5 years" award. Maximum Entropy-based language models are now very commonly used throughout industry and academia.

- Rosenfeld R. A Maximum Entropy Approach to Adaptive Statistical Language Modeling. *Computer, Speech and Language* **10**, 187--228, 1996 (*2001 CSL award for "Most Influential Paper in the Last 5 Years"*).

While still a graduate student, I developed and source-released a **statistical language modeling toolkit** – the first of its kind – to allow anyone to create statistical language models from their own corpora and experiment with and extend the toolkit's capabilities. This toolkit has been used by more than 100 NLP laboratories in more than 20 countries. Based on user requests, I subsequently redesigned and supervised a revision of the toolkit by a summer student. This work won a Best Student Paper prize.

More than twenty years later, I continue to receive inquiries, suggestions and thanks from users throughout the world. The toolkit is also in active use by several language technology courses.

- Ronald Rosenfeld. The CMU Statistical Language Modeling Toolkit, and its use in the 1994 ARPA CSR Evaluation. In *Proc. ARPA Spoken Language Technology Workshop,* Austin, TX, January 1995.
- Clarkson P, Rosenfeld R. Statistical Language Modeling using the CMU-Cambridge toolkit. In *Proc. Eurospeech '97*, September 1997 *(ELRA Best Student Paper Prize).*

In the early 2000's, in addition to my statistically-flavored work, I became interested in the **human aspects of speech interfaces**, and initiated and led the design of a universal language for human-machine speech communication. This was a controversial approach which resulted in significant scientific debate and several prominent publications, but which did not win many adherents.

- Roni Rosenfeld, Dan Olsen and Alexander Rudnicky. Universal Speech Interfaces. Interactions, VIII(6), 2001, pp.34--44.
- Stefanie Tomko, Thomas K. Harris, Arthur Toth, James Sanders, Alexander Rudnicky, Roni Rosenfeld. Towards Efficient Human Machine Speech Communication: The Speech Graffiti Project. *ACM Transactions on Speech and Language Processing,* **2**(1), February 2005.

In the mid 2000's, I started experimenting with using telephone-based automated dialog systems to help **bridge the digital divide** for illiterate and low-literate people **in developing countries**. Our first project, *HealthLine*, developed a telephone-based automated dialog system for access to healthcare information by low-literate community health workers in Pakistan. Our current project, *Polly*, uses telephone-based viral entertainment to reach low-literate people in Pakistan, India and Africa, and introduce them to development-related services. In eight months in 2012, Polly spread to over 165,000 users all over Pakistan and fielded over 2.5 million phone calls. In 2013 we launched Polly in Bangalore, India, eventually spreading virally to West Bengal, New Delhi and other areas of India. In March 2015 we deployed Polly in Guinea, for person-to-person spreading of WHO-approved anti-Ebola messages in 12 local languages, in collaboration with the US embassy in Conakry. In 2016 we launched two new services in Pakistan: *Baang*, a voice-based Reddit, and *Sawaal*, a voice-based quiz game. Our work won the prestigious CHI *Best Paper* award, and was covered widely in the popular press, including a story on NPR's *Morning Edition*.

- Agha Ali Raza, Farhan Ul Haq, Zain Tariq, Mansoor Pervaiz, Samia Razaq, Umar Saif and Roni Rosenfeld, Job Opportunities through Entertainment: Virally Spread Speech-Based Services for Low-Literate Users, Proc. ACM SIGCHI Conference on Human Factors in Computing Systems, 2013 (*CHI Best Paper Award*).
- http://www.npr.org/sections/goatsandsoda/2015/06/01/410026531/how-a-drunken-chipmunk-voice-helps-send-a-public-service-message.

Also in the 2000's, I trained myself in molecular biology, molecular evolution, virology, immunology and epidemiology, and joined the NIH-funded MIDAS research network to work on understanding RNA **virus evolution** in general and Influenza evolution in particular. I developed machine learning approaches for solving open problems in molecular virology, such as genotype-phenotype mapping in RNA viruses, and active learning algorithms for minimizing the amount of bench work needed to zero in on the set of residues that affect a particular phenotype. The algorithm was later found also useful for predicting mortality in a clinical setting.

- Chuang Wu, Andrew S. Walsh, and Roni Rosenfeld. Genotype Phenotype Mapping In RNA Viruses – Disjunctive Normal Form Learning, *Proc. PSB, Pacific Symposium on Biocomputing*, Jan 2011. DOI No: 10.1142/9789814335058_0007.

- Chuang Wu, Roni Rosenfeld, Gilles Clermont. (2014) Using Data-Driven Rules to Predict Mortality in Severe Community Acquired Pneumonia. *PLoS One*; 9(4): e89053. doi: 10.1371/journal.pone.0089053. PMCID: PMC3974677.

During the 2010's, except for my work in the developing world, I have been focusing my attention on **epidemiological forecasting**. I have made the case for a national initiative in this area, including by circulating white papers calling for standardized evaluations. In parallel, I created and am leading (with Prof. Ryan Tibshirani) the Delphi research group at Carnegie Mellon (delphi.midas.cs.cmu.edu). We developed multiple novel methods for epidemiological forecasting and nowcasting, and have fielded them in real-time, operational systems. We are the only group to have participated (and done very well) in all epidemiological forecasting challenges organized by the U.S. government to date: Influenza 2013—2014 (CDC), Chikungunya 2015 (DARPA), Influenza 2014—2015 (CDC), Dengue 2009—2014 (White House Office of Science and Technology Policy, OSTP). The three distinct forecasting systems we developed won the top 3 places in the most recent CDC flu prediction challenge (out of 14 submissions). In December 2016, the CDC has named our group "Most Accurate Forecaster" for 2015-2016.

- Standardized Evaluation of Epidemiological Models white paper (Last Revised: 09 November 2012)
- Predicting The Predictable presentation
- Brooks LC, Farrow DC, Hyun S, Tibshirani RJ, Rosenfeld R. (2105) Flexible Modeling of Epidemics with an Empirical Bayes Framework, *PLoS Computational Biology*, August 28, 2015. DOI: 10.1371/journal.pcbi.1004382
- Willem G. van Panhuis, Sangwon Hyun, Kayleigh Blaney, Ernesto T. A. Marques, Jr, Giovanini E. Coelho, João Bosco Siqueira, Jr, Ryan Tibshirani, Jarbas B. da Silva, Jr, Roni Rosenfeld. (2014) Risk of Dengue for Tourists and Teams during the World Cup 2014 in Brazil. *PLoS Negl Trop Dis.* July; 8(7): e3063. doi: 10.1371/journal.pntd.0003063. PMCID: PMC4120682.
- David C. Farrow, Logan C. Brooks, Sangwon Hyun, Ryan J. Tibshirani, Donald S. Burke, Roni Rosenfeld (2017) A Human Judgment Approach to Epidemiological Forecasting, *PLoS Computational Biology*, March 10, 2017. DOI: 10.1371/journal.pcbi.1005248

Full List of Publications: Because I have worked in diverse areas, no single public bibliographic database contains all or even most of my work.

- For biomedically-related work see http://www.ncbi.nlm.nih.gov/pubmed/?term=Rosenfeld+Roni%5Bauthor%5D
- For computer science related work, see http://dblp.uni-trier.de/pers/hd/r/Rosenfeld:Ronald
- For Google Scholar, see https://scholar.google.com/citations?user=ct3WjtoAAAAJ&hl=en&oi=ao
- For my own list (with links to most papers), see http://www.cs.cmu.edu/~roni/publication_list.html

Publications (taken from http://www.cs.cmu.edu/~roni/publication_list.html on 7/2018)**:**

Computational Biology & Epidemiology:

- Brooks LC, Farrow DC, Hyun S, Tibshirani RJ, Rosenfeld R (2018) Nonmechanistic forecasts of seasonal influenza with iterative one-week-ahead distributions. *PLoS Computational Biology* 14(6): e1006134. doi: 10.1371/journal.pcbi.1006134.
- Matthew Biggerstaff, Michael Johansson, David Alper, Logan C. Brooks, Prithwish Chakraborty, David C. Farrow, Sangwon Hyung, Sasikiran Kandulah, Craig McGowana, Naren Ramakrishnane, Roni Rosenfeld, Jeffrey Shamanh, Rob Tibshirani, Ryan J. Tibshirani, Alessandro Vespignanil, Wan Yangh, Qian Zhangl, Carrie Reed (2018) Results from the second

year of a collaborative effort to forecast influenza seasons in the United States, *Elsevier Epidemics*, February 24, 2018. DOI: 10.1016/j.epidem.2018.02.003.
- David C. Farrow, Logan C. Brooks, Sangwon Hyun, Ryan J. Tibshirani, Donald S. Burke, Roni Rosenfeld (2017) A Human Judgment Approach to Epidemiological Forecasting, *PLoS Computational Biology*, March 10, 2017. DOI: 10.1371/journal.pcbi.1005248
- Matthew Biggerstaff, David Alper, Mark Dredze, Spencer Fox, Isaac Chun-Hai Fung, Kyle S. Hickmann, Bryan Lewis, Roni Rosenfeld, Jeffrey Shaman, Ming-Hsiang Tsou, Paola Velardi, Alessandro Vespignani, Lyn Finelli and for the Influenza Forecasting Contest Working Group (2016). Results from the centers for disease control and prevention's predict the 2013–2014 Influenza Season Challenge. *BMC Infectious Diseases,* 16:357. DOI: 10.1186/s12879-016-1669-x.
- Brooks LC, Farrow DC, Hyun S, Tibshirani RJ, Rosenfeld R. (2015) Flexible Modeling of Epidemics with an Empirical Bayes Framework, *PLoS Computational Biology*, August 28, 2015. DOI: 10.1371/journal.pcbi.1004382 .
- Farrow DC, Burke DS, Rosenfeld R (2015) Computational Characterization of Transient Strain-Transcending Immunity against Influenza A. *PLoS One* 10(5): e0125047. doi:10.1371/journal.pone.0125047.
- Willem G. van Panhuis, Sangwon Hyun, Kayleigh Blaney, Ernesto T. A. Marques, Jr, Giovanini E. Coelho, João Bosco Siqueira, Jr, Ryan Tibshirani, Jarbas B. da Silva, Jr, Roni Rosenfeld. (2014) Risk of Dengue for Tourists and Teams during the World Cup 2014 in Brazil. *PLoS Negl Trop Dis.* July; 8(7): e3063. doi: 10.1371/journal.pntd.0003063. PMCID: PMC4120682.
- Sarah Lukens, Jay DePasse, Roni Rosenfeld, Elodie Ghedin, Ericka Mochan, Shawn T Brown, John Grefenstette, Donald S Burke, David Swigon, Gilles Clermont. (2014) A large-scale immuno-epidemiological simulation of influenza A epidemics. *BMC Public Health*; 14: 1019. doi: 10.1186/1471-2458-14-1019. PMCID: PMC4194421.
- Chuang Wu, Roni Rosenfeld, Gilles Clermont. (2014) Using Data-Driven Rules to Predict Mortality in Severe Community Acquired Pneumonia. *PLoS One*; 9(4): e89053. doi: 10.1371/journal.pone.0089053. PMCID: PMC3974677.
- Grefenstette J John, Brown T Shawn, Rosenfeld Roni, DePasse Jay, Stone TB Nathan, Cooley C Phillip, Wheaton D William, Fyshe Alona, Galloway D David, Sriram Anuroop, Guclu Hasan, Abraham Thomas, Burke S Donald. FRED (A Framework for Reconstructing Epidemic Dynamics): an open-source software system for modeling infectious diseases and control strategies using census-based population. *BMC Public Health*, 2013, 13:940. DOI: 10.1186/1471-2458-13-940.
- Roni Rosenfeld, John Grefenstette, Donald Burke (2012) A Proposal for Standardized Evaluation of Epidemiological Models. Whitepaper, November 9, 2012.
- Alex Beutel, B. Aditya Prakash, Roni Rosenfeld and Christos Faloutsos. Interacting Viruses on a Network: Can both survive? Proc. SIGKDD 2012, Beijing.
- B. Aditya Prakash, Alex Beutel, Roni Rosenfeld and Christos Faloutsos. Winner Takes All: Competing Viruses or Ideas on fair-play Networks, Proc. *WWW2012.*
- Daniel Percival, Kathryn Roeder, Roni Rosenfeld and Larry Wasserman. Structured Sparse Regression with Application to HIV Drug Resistance, *The Annals of Applied Statistics*, 2011, Vol. 5, No. 2A, 628–644, DOI: 10.1214/10-AOAS428, or arXiv.
- Chuang Wu, Andrew S. Walsh, and Roni Rosenfeld. Genotype Phenotype Mapping In RNA Viruses – Disjunctive Normal Form Learning, *Proc. PSB, Pacific Symposium on Biocomputing*, Jan 2011. DOI No: 10.1142/9789814335058_0007.
- Lee BY, Brown ST, Cooley P, Grefenstette JJ, Zimmerman RK, Zimmer SM, Potter MA, Rosenfeld R, Wheaton WD, Wiringa AE, Bacon KM, Burke DS. Vaccination Deep into a Pandemic Wave: Potential Mechanisms for a 'Third Wave' and the Impact of Vaccination, *Am J Prev Med.* 2010 Nov;39(5):e21-9.
- Chuang Wu, Andrew S. Walsh, Roni Rosenfeld: Identification of Viral Protein Genotypic Determinants Using Combinatorial Filtering and Active Learning. BIBE 2010: 162-167.
- Y. Lu, R. Rosenfeld, G.J. Nau and Z. Bar-Joseph, Cross species expression analysis of innate immune response. *Journal of Computational Biology*, 17(3):253-68, 2010. Earlier version published in Proceedings of *RECOMB2009* [conference website | proceedings.]

- Dreisigmeyer D, Rosenfeld R, DePasse J, Ghedin E, Price I, Clermont G. A multi-reservoir model of influenza evolution. *J Crit Care* 2009; 24(3):e33-e34.
- Y. Lu, R. Rosenfeld, I. Simon, G.J. Nau and Z. Bar-Joseph, A Probabilistic Generative Model for GO Enrichment Analysis, *Nucleic Acids Res*. 36(17):e109, Epub Aug 1 2008. Also Proceedings *RECOMB Satellite Conference on Systems Biology* 2007.[abstract | html | pdf | conference website]
- Y. Lu, S. Mahony, P.V. Benos, R. Rosenfeld, I. Simon, L.L. Breeden and Z. Bar-Joseph, Selecting a threshold for identifying cell cycle genes, *Genome Biology*, 9:403, 2008. [html | pdf] (correspondence -- our response is in the second part).
- Y. Lu, S. Mahony, P.V. Benos, R. Rosenfeld, I., Simon, L.L. Breeden and Z. Bar-Joseph, Combined Analysis Reveals a Core Set of Cycling Genes, *Genome Biology* 2007, 8:R146. [pdf | http | supplements | supporting website] (Ranked 2nd in Hidden Jewels).
- Yong Lu, Roni Rosenfeld and Ziv Bar-Joseph. Identifying Cycling Genes by Combining Sequence Homology and Expression Data, *J. Bioinformatics*, 22(14):e314-322, 2006. Also presented in *The Fourteenth International Conference on Intelligence Systems for Molecular Biology* (ISMB 2006, Aug 7-10, Fortaleza, Brazil) [bib | .pdf | http].
- Henry C.M. Leung, Francis Y.L. Chin, S.M. Yiu, Roni Rosenfeld, W.W. Tsang, Finding Motifs with Insufficient Number of Strong Binding Sites, *Journal of Computational Biology*, ***12(6)***, pp. 686–701, 2005.
- Rose Hoberman, Judith Klein-Seetharaman and Roni Rosenfeld, Inferring Property Selection Pressure from Positional Residue Conservation, *Appl. Bioinformatics.* 2004; 3(2-3): 167-179 (pubmed, pdf). Also Proc. Biological Language Modeling Conference, November 2003. (Best Student Presentation award).
- Ziv Bar-Joseph, Shlomit Farkash, David K. Gifford, Itamar Simon and Roni Rosenfeld, Deconvolving Cell-Cycle Expression Data with Complementary Information, *J. Bioinformatics*,(Proceedings of ISMB), 20 Suppl. 1, pp. I23-I30, 2004.
- Francis Y.L. Chin, Henry C.M. Leung, S.M. Yiu, T.W. Lam, Roni Rosenfeld, W.W. Tsang, David K. Smith, Y.Jiang, Finding Motifs for Insufficient Number of Sequences with Strong Binding to Transcription Factor, *Proceedings of Annual International Conference on Research in Computational Molecular Biology (RECOMB)*, 2004, pages 125 - 132.
- Madhavi Ganapathiraju, Judith Klein-Seetharaman, Roni Rosenfeld, Jaime Carbonell and Raj Reddy, Comparative n-gram analysis of whole-genome sequences. Proc. *HLT'02: Human Language Technologies Conference*, San Diego, March, 2002.
- Madhavi Ganapathiraju, Judith Klein-Seetharaman, Roni Rosenfeld, Jaime Carbonell and Raj Reddy, Rare and frequent amino acid n-grams in whole-genome protein sequences. *RECOMB'02: The Sixth Annual International Conference on Research in Computational Molecular Biology*, Washington DC, USA, April, 2002.
- Judith Klein-Seetharaman, Madhavi Ganapathiraju, Jaime Carbonell, Roni Rosenfeld and Raj Reddy, Differences in usage of local combinations of amino acids in various genomes. *Proc. International Symposium On Crystallography And Bioinformatics in Structural Biology*, Bangalore, India, November, 2001.

Spoken Language Technologies for Development:

- Agha Ali Raza, Bilal Saleem, Shan Randhawa, Zain Tariq, Awais Athar, Umar Saif, Roni Rosenfeld. Baang: A Viral Speech-based Social Platform for Under-Connected Populations. In *Proceedings of the 2018 ACM SIGCHI Conference on Human Factors in Computing Systems*, April 21-26, Montréal, Canada.
- Agha Ali Raza, Rajat Kulshreshtha, Spandana Gella, Sean Blagsvedt, Maya Chandrasekaran, Bhiksha Raj, Roni Rosenfeld, Viral Spread via Entertainment and Voice Messaging Among Telephone Users in India. In Proceedings of the International Conference on Information and

Communication Technologies and Development (ICTD '16), Jun 03-06, 2016, Ann Arbor, Michigan, USA.

- Aditya Vashistha, Agha Ali Raza, Umar Saif, Roni Rosenfeld, Richard Anderson, Changing Perceptions of Citizens of India and Pakistan. In Development Consortium: HCI Across Borders and Proceedings of the 2016 ACM SIGCHI Conference on Human Factors in Computing Systems. May 07-12, 2016, San Jose, USA.
- Nikolas Wolfe, Juneki Hong, Agha Ali Raza, Bhiksha Raj, Roni Rosenfeld. Combating Ebola Through Voice Messaging: Rapid Development of Public Health Education Systems in Low-Literacy Multilingual Environments. Proc. *SLaTe* (2015).
- Yibin Lin, Agha Ali Raza, Jay-Yoon Lee, Danai Koutra, Roni Rosenfeld and Christos Faloutsos. Influence Propagation: Patterns, Model and a Case Study. *PAKDD2014 (The 18th Pacific-Asia Conference on Knowledge Discovery and Data Mining)*, May 13-16, 2014, Tainan, Taiwan.
- Haohan Wang, Agha Ali Raza, Yibin Lin and Roni Rosenfeld. Behavior Analysis of Low-literate Users of a Viral Speech-based Telephone Service.*ACM DEV-4*, December 6-7, 2013, Cape Town, South Africa.
- Agha Ali Raza, Farhan Ul Haq, Zain Tariq, Mansoor Pervaiz, Samia Razaq, Umar Saif and Roni Rosenfeld, Job Opportunities through Entertainment: Virally Spread Speech-Based Services for Low-Literate Users, in *Proceedings of the 2013 ACM SIGCHI Conference on Human Factors in Computing Systems*. April 27-May 2, 2013, Paris, France. *CHI Best Paper Award*. (Extended Version).

- Agha Ali Raza, Farhan Ul Haq, Zain Tariq, Umar Saif and Roni Rosenfeld, Spread and Sustainability: The Geography and Economics of Speech-Based Services. In *ACM DEV 3*, January 11-12, 2013, Bangalore, India (also see the poster).
- Hao Yee Chan and Roni Rosenfeld. Discriminative Pronunciation Learning for Speech Recognition for Resource Scarce Languages. *Proc. ACM DEV 2012, Annual ACM Symposium on Computing for Development*, March 2012, Atlanta, GA.
- Agha Ali Raza, Mansoor Pervaiz, Samia Razaq, Christina Milo, Guy Alster, Jahanzeb Sherwani, Umar Saif, Roni Rosenfeld. Viral Entertainment as a Vehicle for Disseminating Speech-Based Services to Low-Literate Users. Proc. *IEEE/ACM Int'l Conference on Information and Communication Technologies and Development*, (ICTD) Atlanta, GA, March 2012.
- Fang Qiao, Jahanzeb Sherwani, Roni Rosenfeld. Small-Vocabulary Speech Recognition for Resource-Scarce Languages. *Proc. ACM DEV 2010, Annual ACM Symposium on Computing for Development*, December 2010, London, UK.
- Jahanzeb Sherwani, Nosheen Ali, Carolyn Rose, Roni Rosenfeld. Orality-Grounded HCID: Understanding the Oral User. J. *Information Technologies & International Development*, Special Issue on Human Computer Interaction and Development, December 2009.
- Jahanzeb Sherwani, Roni Rosenfeld. Speech vs. Touch-tone: Telephony Interfaces for Information Access by Low Literate Users. Proc. *IEEE/ACM Int'l Conference on Information and Communication Technologies and Development*, Doha, Qatar, April 2009.
- Weber, F., Bali, K., Rosenfeld, R., and Toyama, K. Unexplored Directions in Spoken Language Technology for Development. Proc. *2nd IEEE Workshop on Spoken Language Technology*, December 2008.
- Jahanzeb Sherwani, Roni Rosenfeld. The Case for Speech and Language Technologies for Developing Regions. In *Proc. Human-Computer Interaction for Community and International Development workshop*, Florence, Italy, April 2008.
- Jahanzeb Sherwani, Nosheen Ali, Sarwat Mirza, Anjum Fatma, Yousuf Memon, Mehtab Karim, Rahul Tongia, Roni Rosenfeld. HealthLine: Speech-based Access to Health Information by Low-literate Users. In *Proc. IEEE/ACM Int'l Conference on Information and Communication Technologies and Development*, Bangalore, India, December 2007.

- Jahanzeb Sherwani, Nosheen Ali, Rahul Tongia, Roni Rosenfeld, Yousuf Memon, Mehtab Karim, Gregory Pappas. HealthLine: Towards Speech-based Access to Health Information by Semi-literate Users. In *Proc. Speech in Mobile and Pervasive Environments,* Singapore, September 2007.
- Jahanzeb Sherwani, Rahul Tongia, Roni Rosenfeld, Yousuf Memon, Mehtab Karim, Gregory Pappas. Towards Speech Interfaces for Health Information Access by Semi-literate Users. In *Proc. AI in ICT for Development,*Hyderabad,India, January 2007.

Human-Machine Speech Communication:

- Jahanzeb Sherwani, Stefanie Tomko, and Roni Rosenfeld. Sublime: A Speech- and Language-based Information Management Environment. In *Proc. IEEE Int.l Conference on Acoustics, Speech and Signal Processing,* Toulouse, France, May 2006.
- Stefanie Tomko, Thomas K. Harris, Arthur Toth, James Sanders, Alexander Rudnicky, Roni Rosenfeld. Towards Efficient Human Machine Speech Communication: The Speech Graffiti Project. *ACM Transactions on Speech and Language Processing,* **2**(1), February 2005.
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