# Rivka Levitan

Department of Computer Science
450 Computer Science Building
1214 Amsterdam Avenue
New York, NY 10027-7003 USA

Office: (212) 939-7122
Mobile: (347) 770-0891
rlevitan@cs.columbia.edu
www.cs.columbia.edu/~rlevitan

---

## Objective

A tenure-track faculty position in Computer Science at a leading university, or a research position at a top research facility.

## Education

**Columbia University, New York, NY**
Member of PhD program since August 2009. Advisor: Dr. Julia Hirschberg. Thesis title: Entrainment in Spoken Dialogue Systems: Measurement, Implementation, and Implications. Expected graduation date May 2014.

**Columbia University, New York, NY**
Master of Science in Computer Science, received May 2011. Advisor: Dr. Julia Hirschberg.

**Brooklyn College CUNY, Brooklyn, NY**
Bachelor of Science in Computer and Information Science, *summa cum laude,* received September 2009.

## Employment

Graduate research assistant, Columbia University. September 2009 – present.

Software engineering intern, Google. May – August 2013. Host: David Elson.

Math teacher, sixth grade, Prospect Park Elementary School. Sept. 2008 – June 2009.

Assistant teacher, first grade, Prospect Park Elementary School. Sept. 2007 – June 2008.

## Research Interests and Projects

*Thesis work: Entrainment in spoken dialogue systems*
My thesis, entitled "Entrainment in spoken dialogue systems: measurement, implementation, and implications," presents a comprehensive look at entrainment in human conversations and how entrainment may be incorporated into the design of spoken dialogue systems in order to improve system performance and user satisfaction. The major contributions of the thesis include a comparison of the prevalence of entrainment across an array of prosodic features, multiple definitions of entrainment, and different gender groups; a first look at entrainment in a pragmatic dimension; a method for implementing prosodic entrainment in a spoken dialogue system; and experimental results on how entrainment can be leveraged by a spoken dialogue system to promote trust and improve automatic speech recognition performance.

*Retries in voice search*
When a system fails to correctly recognize a query, the user will frequently retry the query, either by repeating it exactly or rephrasing it in an attempt to adapt to the system's failure. It is desirable to be able to identify queries as retries both offline, as a valuable quality signal, and online, as contextual information that can aid recognition. We developed a method than can identify retries with 83% accuracy using similarity measures between the two queries, system and user signals of recognition accuracy, and features of the queries themselves. The retry rate predicted by this method correlates significantly with a gold standard measure of accuracy, suggesting that it may be useful as an unsupervised predictor of accuracy on unseen transcripts. This work was done with David Elson during a summer internship at Google.

*Cross-Language Prominence Detection*
We explored the ability to perform automatic prosodic analysis in one language using models trained on another, which would make it possible to identify prosodic elements in a language for which little or no prosodically labeled training data is available, using models trained on a language for which such training data exists. Given the laborious nature of manual prosodic annotation, such a process would vastly improve our ability to identify prosodic events in many languages and therefore to make use of such information in downstream processing tasks.

We experimented with prominence detection using material from four languages: American English, Italian, French and German. While we did find that cross-language prominence detection is possible, we also found significant language-dependent differences. We hypothesized that language family might serve as a reliable predictor of cross-language prosodic event detection accuracy, but in our experiments this did not prove to be the case. However, we did find that augmenting American English training data with small amounts of labeled data from the target language led to significant performance improvements. Also, including training material from a variety of source languages can, for some languages, improve performance over that observed using training data from a single language.

**Professional Activities**

Program Committee, 1st ACL Workshop on NLP and Social Dynamics, 2014

Reviewer, NAACL 2013

Reviewer, Frontiers in Cognitive Science, 2012

Student Research Workshop Co-Chair, NAACL 2012

Reviewer, Language and Speech, 2011

Publicity Chair, Women in Computer Science at Columbia, 2009 – 2012

**Honors and Awards**

Computer Science Service Award. 2012, 2013. Awarded by the Computer Science Department at Columbia University for service as board member of Women in Computer Science at Columbia.

Honorable Mention, NSF Graduate Research Fellowship. 2010, 2011.

Computing Research Association Distributed Research Experiences for Undergraduates. Summer 2009.

Frank Wertheimer Award. 2009. Awarded by the Math Department at Brooklyn College for academic excellence.

Jack Wolfe Award. 2009. Awarded by the Computer Science Department at Brooklyn College for academic excellence.

Upsilon Pi Epsilon. 2009. International Honor Society for the Computing and Information Disciplines.

Presidential Scholarship. 2006 – 2009. Awarded by the Computer Science Department at Brooklyn College for academic excellence.

**Publications**

"Entrainment in spoken dialogue systems: Adopting, predicting, and influencing user behavior." R. Levitan. NAACL Student Research Workshop (thesis proposal track). 2013.

"Entrainment in spontaneous speech: the case of filled pauses in Supreme Court hearings." S. Benus, R. Levitan, J. Hirschberg. In Proceedings of the 3rd IEEE Conference on Cognitive Infocommunications, pp. 793-797, 2012. (Best Paper Award)

“Acoustic-prosodic entrainment and social behavior.” R. Levitan, A. Gravano, L. Willson, S. Benus, J. Hirschberg, A. Nenkova. NAACL 2012.

“Cross-Language Prominence Detection.” A. Rosenberg, E. Cooper, R. Levitan, J. Hirschberg. Speech Prosody, 2012.

“Acoustic and prosodic correlates of social behavior.” A. Gravano, R. Levitan, L. Willson, S. Benus, J. Hirschberg, A. Nenkova. In Proceedings of Interspeech, 2011.

“Measuring acoustic and prosodic entrainment with respect to multiple levels and dimensions.” R. Levitan, J. Hirschberg. In Proceedings of Interspeech, 2011.

“Entrainment in speech preceding backchannels.” R. Levitan, A. Gravano, J. Hirschberg. In Proceedings of ACL/HLT, 2011.

*Pending*

“Entrainment as a Communicative Social Signal.” S. Benus, A. Gravano, R. Levitan, S. Levitan, L. Willson, J. Hirschberg. Submitted to Knowledge-Based Systems, CogInfoCom special issue.

“Hope and Despair: Retries in Voice Search.” R. Levitan, D. Elson. In preparation for submission to EACL 2014.

“Prosodic Entrainment in Mandarin Chinese and American English: A Cross-Linguistic Comparison.” X. Zhihua, R. Levitan, J. Hirschberg. In preparation for submission to Prosody 2014.

**Programming Languages and Technologies**

C++, Perl, Objective C, Cocoa, Praat, R, Weka.