

# ANDREW ROBERT PLUMMER

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## Research Interests

- ▶ Mathematical and computational modeling of phonetic and phonological acquisition.
- ▶ Developing models and methods for analyzing infants' vocalizations and children's speech.
- ▶ Improving community education in the mathematical and computational sciences.

## Education

- 2014 Ph.D., Linguistics, The Ohio State University.  
Thesis: The acquisition of vowel normalization during early infancy: Theory and computational framework.  
Committee: Mary Beckman, Eric Fosler-Lussier, William Schuler.
- 2007 Graduate Certificate in Linguistics, Florida International University.
- 2006 M.S., Mathematics, Georgia State University.  
Thesis: Characterizations in domination theory.  
Committee: Johannes Hattingh, Guantao Chen, George Davis.
- 2004 B.S., Mathematics, Florida International University.

## Grants and Fellowships

- 2017 Translational Data Analytics (TDA) Seed Grant (one year of support to develop techniques for building articulatory models of the vocalizations of infants and the speech of young children), College of Arts and Sciences, College of Engineering, College of Medicine, The Ohio State University.
- 2015 Targeted Investment in Excellence (TIE) (one semester of support to teach a seminar on speech synthesis), College of Arts and Sciences, The Ohio State University.
- 2010 Targeted Investment in Excellence (TIE) Fellowship (two quarters of support), College of Arts and Sciences, The Ohio State University.

## Grants and Fellowships (continued)

- 2007 Distinguished University Fellowship for Doctoral Studies (first and dissertation years of support), The Ohio State University.
- 2006 Faculty funding for advanced research in graph algorithms (Summer semester), Department of Computer Science, Georgia State University.

## Employment

- 2017–  
present Lecturer/Research Engineer. Department of Computer Science and Engineering, The Ohio State University. (I worked with Eric Fosler-Lussier on the Speech Recognition Virtual Kitchen – [www.speechkitchen.org](http://www.speechkitchen.org) – producing virtual machines, developing articulatory synthesizers for infant vocalizations and child speech, and grant writing. I also taught the courses “Survey of Artificial Intelligence I: Basic Techniques” and “Survey of Artificial Intelligence II: Advanced Techniques.”)
- 2016–  
2017 Postdoctoral Researcher in Linguistics. Anneliese Maier Forschungspreis through the Institut für Phonetik und Sprachverarbeitung, Ludwig-Maximilians-Universität München and the Department of Linguistics, The Ohio State University. (I worked with Mary Beckman on basic research on the emergence of phonological systems at the levels of ontogeny, phylogeny, and cultural transmission.)
- 2014–  
2016 Postdoctoral Researcher. Department of Computer Science and Engineering, The Ohio State University. (I worked with Eric Fosler-Lussier on the Speech Recognition Virtual Kitchen – [www.speechkitchen.org](http://www.speechkitchen.org) – producing virtual machines and web content. I also taught the course “Survey of Artificial Intelligence II: Advanced Techniques” and co-taught a seminar on speech synthesis in the Linguistics Department with Mary E. Beckman.)
- 2013 Graduate Teaching Assistant, Department of Linguistics, The Ohio State University. (I taught the course “Analyzing the Sounds of Language.”)
- 2011 Seed Grant for Interdisciplinary Projects in Cognitive Science (two quarters of support), Center for Cognitive Science, The Ohio State University. (PIs were Mary Beckman, Eric Fosler-Lussier, and Mikhail Belkin. My roles in this grant were that I helped Mary Beckman write the grant application and then worked closely with the PIs to develop the basis model for my dissertation.)
- 2009–  
2010 Graduate Research Associate, Department of Computer Science and Engineering, The Ohio State University. (I worked on National Science Foundation grant no. BCS-0729306, *DHB/Collaborative Research: Using machine learning to model the interplay of production dynamics and perception dynamics in phonological acquisition.*)
- 2008 Graduate Teaching Assistant, Department of Linguistics, The Ohio State University. (I graded and held office hours for the course “Formal Foundations of Linguistics.”)
- 2007 Adjunct Instructor, Mathematics Department, Miami Dade College. (I taught pre-algebra and pre-calculus to matriculated students, and a course on basic math skills to adjudicated minors.)

## Employment (continued)

2005–  
2006 Graduate Research Associate, Department of Mathematics and Statistics, Georgia State University. (I graded for the courses “Advanced Matrix Analysis” and “College Geometry.” I also contributed to research on graph theory, primarily with my advisor Johannes Hattingh.)

## Professional Activities

### *Service*

- ▶ Conference Organization:  
Interspeech 2016 Special Session on “Sharing research and education resources for understanding speech processing.”  
Graduate Coordinator for the Semantics Workshop of the American Midwest and Prairies (SWAMP), Fall Quarter, 2011.  
Graduate Coordinator for Semantics and Linguistic Theory (SALT) 19, Winter Quarter, 2009.
- ▶ Committee Work:  
Graduate Curriculum Review Committee, Department of Linguistics, The Ohio State University, 2009–2010.  
Speakers Committee, Student Linguistics Association, The Ohio State University, 2007–2009.
- ▶ Reviewing:  
Article referee for *Journal of Phonetics*, *Computer Speech and Language*, *Speech Communication*, *Discrete Mathematics*, and *Discrete Applied Mathematics*.

### *Affiliations*

- ▶ Speech Sciences and Linguistics:  
The Acoustical Society of America (ASA)  
The International Speech Communication Association (ISCA)  
The North American Association for the History of the Language Sciences (NAAHoLS)
- ▶ Mathematics and Computer Science:  
The American Mathematical Society (AMS)  
The Association for Computing Machinery (ACM)  
Society for Applied and Industrial Mathematics (SIAM)

## Professional Skills

### *Computer Programming*

Mainstream Languages: R, MATLAB, Python, Haskell, Prolog, C.  
Computational and Statistical Modeling: R, MATLAB.  
Instructional Software Development: R, MATLAB, Python, Haskell, Prolog.  
Mark-up and Scripting Languages: HTML, L<sup>A</sup>T<sub>E</sub>X, Python.

### *Natural Languages*

English (native), Spanish (basic conversation and reading).

## Peer-reviewed Publications

### *Journal Articles*

- sub. Plummer, A. R. & Reidy, P. F. Computing low-dimensional representations of speech from socio-auditory structures for phonetic analyses. *Journal of Phonetics*, **xx**, xx-xx.
- 2017 Beckman, M. E., Plummer, A. R., Munson, B. & Reidy, P. F. Methods for eliciting, annotating, and analyzing databases for child speech development. *Computer Speech and Language*, **45**, 278-299.
- 2015 Plummer, A. R. & Beckman, M. E. Framing a socio-indexical basis for the emergence and transmission of phonological systems. *Journal of Phonetics*, **53**, 66-78.
- 2010 Hattingh, J. H., Jonck, E., Joubert, E. J., & Plummer, A. R. Total restrained domination in unicyclic graphs. *Utilitas Mathematica*, **82**, 81-95.
- Hattingh, J. H., & Plummer, A. R. A note on restrained domination in trees. *Ars Combinatoria*, **94**, 477-483.
- 2009 Hattingh, J. H., Joubert, E. J., Loizeaux, M., Plummer, A. R., & van der Merwe, L. Restrained domination in unicyclic graphs. *Discussiones Mathematicae Graph Theory*, **29**, 71-86.
- 2008 Hattingh, J. H., Jonck, E., Joubert, E. J., & Plummer, A. R. Nordhaus-Gaddum results for restrained domination and total restrained domination in graphs. *Discrete Mathematics*, **308**, 1080-1087.
- Hattingh, J. H. & Plummer, A. R. Restrained bondage in graphs. *Discrete Mathematics*, **308**, 5446-5453.
- Xing, H.-M., Hattingh, J. H., & Plummer, A. R. On the domination number of Hamiltonian graphs with minimum degree six. *Applied Mathematics Letters*, **21**, 1037-1040.
- 2007 Hattingh, J. H., Jonck, E., Joubert, E. J., & Plummer, A. R. Total restrained domination in trees. *Discrete Mathematics*, **307**, 1643-1650.

## Peer-reviewed Publications (continued)

Plummer, A. R. S4 enriched multimodal categorial grammars are context-free. *Theoretical Computer Science*, **388**, 173-180. Corrigendum. (2008). *Theoretical Computer Science*, **403**, 406-408.

### *Conference Proceedings*

- 2016 Andrew R. Plummer & Mary E. Beckman. Sharing speech synthesis software for research and education within low-tech and low-resource communities. *Proc. of the 17th Annual Conference of the International Speech Communication Association (INTERSPEECH 2016)*.
- 2015 Bagchi, Deblin, Michael I. Mandel, Zhongqiu Wang, Yanzhang He, Andrew R. Plummer, & Eric Fosler-Lussier. Combining spectral feature mapping and multi-channel model-based source separation for noise-robust automatic speech recognition. *Proc. of the 2015 IEEE Automatic Speech Recognition and Understanding Workshop (ASRU 2015)*.
- Metze, Florian, Eric Riebling, Eric Fosler-Lussier, Andrew R. Plummer, & Rebecca Bates. The Speech Recognition Virtual Kitchen Turns One. *Proc. of the 16th Annual Conference of the International Speech Communication Association (INTERSPEECH 2015)*.
- 2014 Plummer, Andrew R., Eric Riebling, Anuj Kumar, Florian Metze, Eric Fosler-Lussier, & Rebecca Bates. The Speech Recognition Virtual Kitchen: Launch Party. *Proc. of the 15th Annual Conference of the International Speech Communication Association (INTERSPEECH 2014)*.
- 2013 Plummer, Andrew R., Lucie Ménard, Benjamin Munson, & Mary E. Beckman. Comparing vowel category response surfaces over age-varying maximal vowel spaces within and across language communities. *Proc. of the 14th Annual Conference of the International Speech Communication Association (INTERSPEECH 2013)*.
- 2012 Plummer, Andrew R. Aligning manifolds to model the earliest phonological abstraction in infant-caretaker vocal imitation. *Proc. of the 13th Annual Conference of the International Speech Communication Association (INTERSPEECH 2012)*.
- Plummer, Andrew R. & Carl J. Pollard. Agnostic possible worlds semantics. *Proc. of the seventh edition of the international conference on Logical Aspects of Computational Linguistics (LACL 2012)*.
- 2010 Plummer, Andrew R., Mary E. Beckman, Mikhail Belkin, Eric Fosler-Lussier, & Benjamin Munson. Learning speaker normalization using semisupervised manifold alignment. *Proc. of the 11th Annual Conference of the International Speech Communication Association (INTERSPEECH 2010)*.

## Presentations

### *Invited Talks*

- 2018 “The challenges of developing articulatory synthesis models of early vocal production in humans.” *175th Meeting of the Acoustical Society of America*, Minneapolis Minnesota, May, xx, 2018.
- 2017 “Designing developmental stage-specific articulation-based speech processing systems for child speech.” Dept. of Otolaryngology - Head and Neck Surgery, The Ohio State University. Columbus, OH, Jun. 26, 2017.
- 2016 “Characterizing the emergence of commensuration mappings in phonological acquisition.” Simon Fraser University, Barnaby, BC, Canada, Oct. 21, 2016.
- “Designing computational models of the emergence of the earliest phonological abstractions during infancy.” University of British Columbia, Vancouver, BC, Canada, Oct. 20, 2016.
- “Formulating the earliest dynamic aspects of phonological acquisition.” *Workshop on Speech dynamics, social meaning, and phonological categories at The 15th Conference on Laboratory Phonology (LabPhon 2016)*, Ithaca, New York, Jul. 13, 2016.
- 2015 “The Speech Recognition Virtual Kitchen: Infrastructure for the exchange and preservation of speech research and education technology.” Institute of Phonetics and Speech Processing at the Ludwig-Maximilians-Universität München, Munich, Germany, Oct. 15, 2015.
- “Building individual age-varying models of vowel categorization across language communities.” Institute of Phonetics and Speech Processing at the Ludwig-Maximilians-Universität München, Munich, Germany, Oct. 14, 2015.
- 2014 “Modeling gestural coordination in infant-caregiver dyads in the earliest stages of phonological acquisition.” *Workshop on gestural coordination within and between speakers in first language phonological acquisition at The 14th Conference on Laboratory Phonology (LabPhon 2014)*, Tokyo, Japan, Jul. 28, 2014.
- “Investigating the relationship between age, gender, and vowel categorization within and across languages: A comparison of Cantonese, English, and Japanese.” *The 2nd Workshop on Innovations in Cantonese Linguistics (WICL 2)*, Chicago, IL, Mar. 7, 2014. (with Benjamin Munson)
- 2013 “Prerequisites for computational models of the early emergence of phonological categories.” Graduate Institute of Linguistics, National Chung Cheng University, Chia-Yi, Taiwan, Mar. 15, 2013. (with Mary E. Beckman)

### *Papers with published abstracts*

- 2018 Plummer, Andrew R. The challenges of developing articulatory synthesis models of early vocal production in humans. *The Journal of the Acoustical Society of America*, **143**, xx.

## Presentations (continued)

- Wilson, Michael L., Lisa R. O'Bryan, Mary E. Beckman, Andrew R. Plummer, & Benjamin Munson. Tracking chimpanzee pant-hoot changes across time and space. *The Journal of the Acoustical Society of America*, **143**, xx.
- 2015 Plummer, Andrew R. Using the Speech Recognition Virtual Kitchen infrastructure for reproducible cross-disciplinary speech research exchange. *The Journal of the Acoustical Society of America*, **137**, 2303.
- 2014 Plummer, Andrew R. A virtual environment for modeling the acquisition of vowel normalization. *The Journal of the Acoustical Society of America*, **135**, 2357.
- 2013 Plummer, Andrew R. Graph alignment and cross-modal learning during early infancy. *The Journal of the Acoustical Society of America*, **134**, 4236.
- Plummer, Andrew R., Benjamin Munson, Lucie Ménard, & Mary E. Beckman. Examining the relationship between the interpretation of age and gender across languages. *The Journal of the Acoustical Society of America*, **133**, 3339.

### *Other workshop and conference papers*

- 2016 Plummer, Andrew R. Investigating the cultural and biological evolution of phonological systems using socio-indexical models of early phonological acquisition. *Workshop on Linking social effects in language processing to social effects in language evolution*, The Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands, Sep. 16, 2016.
- Plummer, Andrew R. Higher-order structure for vowel variation is specific to the culture and individual listener. *Workshop on higher-order structure in speech variability at The 15th Conference on Laboratory Phonology (LabPhon 2016)*, Ithaca, NY, Jul. 17, 2016.
- Plummer, Andrew R. Conceptual foundations for modeling the evolution of vowel systems in phylogeny, ontogeny, and language speciation. *Workshop on how words emerge and dissolve: evidence from speech production, speech perception, acquisition and disorders*, Institute of Phonetics and Speech Processing at the Ludwig-Maximilians-Universität München, Munich, Germany, Japan, May 17, 2016.
- Plummer, Andrew R. Modeling the evolution of vowel systems in phylogeny, ontogeny, and language speciation. *The 13th Annual Martin Luther King Day Linguistics Symposium: Mathematical/Computational Modeling and Tools in and for Historical Linguistics (MLK Symposium 2016)*, Columbus, OH, Jan. 16, 2016. (with Mary E. Beckman)
- 2014 Plummer, Andrew R. Modeling the emergence of cognitive structures for the acquisition of vowel dynamics during early infancy using manifold alignment. *Workshop on gestural coordination within and between speakers in first language phonological acquisition at The 14th Conference on Laboratory Phonology (LabPhon 2014)*, Tokyo, Japan, Jul. 28, 2014.
- Plummer, Andrew R. Modeling the acquisition of vowel normalization as cognitive manifold alignment. *The 14th Conference on Laboratory Phonology (LabPhon 2014)*, Tokyo, Japan, Jul. 25, 2014.

## Presentations (continued)

- 2013 Plummer, Andrew R. Aspects of modeling the learning of vowel normalization. *Workshop on Current Issues and Methods in Speaker Adaptation (CIMSAs)*, Columbus, OH, Apr. 7, 2013.
- Plummer, Andrew R. & Carl J. Pollard. Bolzano-Lewis possible worlds semantics: An improvement over its successors. *The North American Association for the History of the Language Sciences at the Annual Meeting of the Linguistic Society of America (NAAHoLS at LSA 2013)*, Boston, MA, Jan. 4.
- 2012 Plummer, Andrew R. Manifold alignment, vocal imitation, and the perceptual magnet effect. *The Annual International Child Phonology Conference (ICPC 2012)*, Minneapolis, MN, June 5.
- Plummer, Andrew R. Galen's critique of rationalism and empiricism, and its relevance for modern linguistics. *The North American Association for the History of the Language Sciences at the Annual Meeting of the Linguistic Society of America (NAAHoLS at LSA 2012)*, Portland, OR, Jan. 8.
- 2006 Plummer, Andrew R. Nordhaus-Gaddum Results for Restrained Domination and Total Restrained Domination in Graphs. *The 19th Cumberland Conference on Combinatorics, Graph Theory, and Computing*, Johnson City, TN, May 20. (with Johannes H. Hattingh, Elizabeth Jonck, & Ernst J. Joubert)
- Plummer, Andrew R. Total Restrained Domination in Trees. *The 37th Southeastern International Conference on Combinatorics, Graph Theory, and Computing*, Boca Raton, FL, March 8. (with Johannes H. Hattingh, Elizabeth Jonck, & Ernst J. Joubert)