Christo N. Kirov

CONTACT INFORMATION

The Center for Language and Speech Processing
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PRIMARY INTEREST AREAS

- Natural language processing and computational linguistics.
  - Multi-lingual NLP.
  - NLP for low-resource languages.
  - Computational morphology.
- Machine learning, especially deep learning and neural networks.
  - Interpreting network behavior in light of linguistics and cognitive science.

CURRENT EMPLOYMENT

The Center for Language and Speech Processing - Johns Hopkins University

Postdoctoral Fellow (Supervisor: David Yarowsky) **September 2014 - Present**

- Senior team member on multi-lingual computational morphology project (UniMorph). Responsibilities include developing annotation standards, algorithms, tools, and resources for morphological analysis of low-resource languages in service of machine translation, information extraction, and other downstream NLP tasks. Also responsible for managing small groups of undergraduate and graduate student research assistants. (Funding: DARPA LORELEI Initiative, Websites: www.unimorph.org, www.unimorph.github.io)

Georgetown University

Research Computational Linguist (Supervisor: Lisa Singh) **September 2014 - Present**

- Developing analysis techniques for English and Arabic Twitter content in order to predict and track humanitarian crises in the Middle East. Tracking topics and opinions in social media. (Funding: Georgetown University Massive Data Institute Seed Grant, Websites: electiondynamics.org/)

EDUCATION

Johns Hopkins University, Baltimore, MD USA

Ph.D., Cognitive Science, October, 2013

- Thesis: A Bayesian Approach to Speech Production
- Advisor: Colin Wilson

Johns Hopkins University, Baltimore, MD USA

M.A., Cognitive Science, May, 2009

New York University, New York, NY USA

B.A., Computer Science (honors), May, 2007
B.A., Linguistics (honors), May, 2007

- Thesis: Dynamic Phonetic Detail in Lexical Representations
- Advisor: Adamantios Gafos

JOURNAL AND CHAPTER PUBLICATIONS

Christo Kirov and Ryan Cotterell. 2018. Recurrent Neural Networks in Linguistic Theory: Revisiting Pinker and Prince (1988) and the Past Tense Debate. TACL. (to appear)

Ryan Cotterell, Christo Kirov, Mans Hulden, and Jason Eisner. 2017. On the Complexity and Typology of Inflectional Morphological Systems. TACL.

Christo Kirov and Bob Frank. 2011. Processing of Nested and Cross-Serial Dependencies: an Automaton Perspective on SRN Behavior. Connection Science. Volume 24. Issue 1. pp. 1-24.

Christo Kirov and Adamantios Gafos. 2010. Assembling Phonological Representations. Phonological and Complex Adaptive Systems: Phonology and Complexity. Ioana Chitoran, Christophe Coupe, Egidio Marsico, and Francois Pellegrino (eds.), Mouton de Gruyter, Berlin/New York.

Refereed Conference Proceedings

Ryan Cotterell, Christo Kirov, Mans Hulden, and Jason Eisner. 2018. On the Diachronic Stability of Irregularity in Inflectional Morphology. NAACL. New Orleans, Louisiana.

Ryan Cotterell, Christo Kirov, Sebastian J. Mielke, and Jason Eisner. 2018. Unsupervised Disambiguation of Syncretism in Inflected Lexicons. NAACL. New Orleans, Louisiana.

Steven Shearing, Christo Kirov, Huda Khayrallah, and David Yarowsky. 2018. Improving Low Resource Machine Translation with Morphological Glosses. AMTA. Boston, Massachusetts.

Christo Kirov, Ryan Cotterell, John Sylak-Glassman, Géraldine Walther, Ekaterina Vylomova, Patrick Xia, Manaal Faruqui, Sandra Kübler, David Yarowsky, Jason Eisner, and Mans Hulden. 2018. UniMorph 2.0: Universal Morphology. LREC. Miyazaki, Japan.

Robert Churchill, Lisa Singh, and Christo Kirov. 2018. A Temporal Topic Model for Noisy Mediums. PAKDD. Melbourne, Australia.

Ryan Cotterell, Ekaterina Vylomova, Huda Khayrallah, Christo Kirov, and David Yarowsky. 2017. Paradigm Completion for Derivational Morphology. EMNLP. Copenhagen, Denmark.

Ryan Cotterell, Christo Kirov, John Sylak-Glassman, Géraldine Walther, Ekaterina Vylomova, Patrick Xia, Manaal Faruqui, Sandra Kübler, David Yarowsky, Jason Eisner, and Mans Hulden. 2017. CoNLL-SIGMORPHON 2017 Shared Task: Universal Morphological Reinflection in 52 Languages. CoNLL. Vancouver, Canada.

Christo Kirov, John Sylak-Glassman, Ryan Cotterell, Rebecca Knowles, and Matt Post. 2017. A Rich Morphological Tagger for English: Exploring the Cross-Linguistic Tradeoff Between Morphology and Syntax. EACL. Valencia, Spain.

Ryan Cotterell, Christo Kirov, and John Sylak-Glassman. 2017. Neural Graphical Models over Strings for Principal Parts Morphological Paradigm Completion. EACL. Valencia, Spain. (***Outstanding Paper Award***)

Ryan Cotterell, Christo Kirov, John Sylak-Glassman, David Yarowsky, Jason Eisner, and Mans Hulden. 2016. The SIGMORPHON 2016 Shared Task — Morphological Reinflection. Proceedings of the 2016 Meeting of SIGMORPHON. ACL. Linguistics. Berlin, Germany.

Christo Kirov, John Sylak-Glassman, Roger Que, and David Yarowsky. 2016. Very-large Scale Parsing and Normalization of Wiktionary Morphological Paradigms. LREC. Portoroz, Slovenia.

John Sylak-Glassman, Christo Kirov, and David Yarowsky. 2016. Remote Elicitation of Inflectional Paradigms to Seed Morphological Analysis in Low-Resource Languages. LREC. Portoroz, Slovenia.

John Sylak-Glassman, Christo Kirov, David Yarowsky, and Roger Que. 2015. A Language-Independent Feature Schema for Inflectional Morphology. ACL. Beijing, China.

John Sylak-Glassman, Christo Kirov, David Yarowsky, and Roger Que. 2015. A Universal Schema for Rich Morphological Annotation. SFCM. Stuttgart, Germany.

Christo Kirov and Colin Wilson. 2013. Bayesian Speech Production: Evidence from Latency and Hyperarticulation. COGSCI. Berlin, Germany.

Christo Kirov and Colin Wilson. 2012. The Specificity of Online Variation in Speech Production. COGSCI. Sapporo, Japan.

Christo Kirov and Adamantios Gafos. 2007. Dynamic Phonetic Detail in Lexical Representations. ICPHS. Saarbrucken, Germany. pp. 637-640.

Conference Presentations

Ryan Cotterell, Christo Kirov, Mans Hulden, and Jason Eisner. 2018. The Pareto Complexity of Inflectional Systems. SCIL. Salt Lake City, Utah.

John Sylak-Glassman, Christo Kirov, David Yarowsky, and Roger Que. 2015. Typology Enriching NLP: A Universal Schema for Inflectional Morphology. ALT. New Mexico.

Christo Kirov and Colin Wilson. 2013. Modeling the Relationship Between Competition, Latency, and Articulation. LSA. Boston, MA.

Christo Kirov and Colin Wilson. 2012. Modeling Speech Production with Bayesian Inference: Competition, Latency, and Articulation. APCAM. Minneapolis, MN.

Christo Kirov and Colin Wilson. 2012. Specificity of Online Variation in Speech Production. LSA, Portland, Oregon.

Christo Kirov. 2011. Explaining Online Hyperarticulation in Speech Production. NECPHON, Yale University, New Haven, Connecticut.

Posters

Christo Kirov. 2017. Recurrent Neural Networks as a Strong Baseline for Morphophonological Learning. LSA. Austin, TX.

Christo Kirov. 2014. Grammatical Influences in a Bayesian Speech Production Framework. COGSCI. Quebec City, Quebec.

Christo Kirov and Colin Wilson. 2012. How Phonological Context Affects Phonetic Realization. LABPHON. Stuttgart, Germany.

Christo Kirov. 2008. Forward and Reverse Recall in Simple Recurrent Networks. COGSCI, Washington, D.C.

Invited Talks

Christo Kirov. 2018. Computational Morphology with UniMorph. Army Research Laboratories

Christo Kirov. 2018. Computational Morphophonology — Bridging NLP and Linguistics. University of Chicago.

Christo Kirov. 2017. Morphological Modeling for Multi-lingual NLP. GUCL. Georgetown University.

Christo Kirov. 2016. Building Strong Inductive Baselines for Computational Morphophonology. New York University.

Christo Kirov. 2016. UniMorph — Universal Morphology at JHU. Center For Language and Speech

Processing Seminar Series. Johns Hopkins University. Video:
http://www.clsp.jhu.edu/seminars/seminar-videos/

Christo Kirov. 2015. The Consequences of Bayesian Decision-Making in Speech Production. Common Ground Speaker Series. University of Pennsylvania.

Teaching Experience

Georgetown University

Student Advising

- Independent Study, Shuo Zhang, 2013
- Dissertation Proposal Committee Member, Stephen Kunath, Georgetown, October 2013
- Dissertation Committee Member, Tracy Canfield, Georgetown, November 2015
- Masters Thesis Committee Member, Robert Churchill, Georgetown, May 2017

Adjunct Professor **Fall 2014**

- Developed and taught an introductory full-semester combined graduate and undergraduate course in Natural Language Processing.

Postdoctoral Assistant Professor **September 2013 - May 2014**

- Developed and taught a full-semester graduate course on processing and statistical analysis of large linguistically-annotated corpora using tools such as Python and the Unix shell.
- Developed and taught a full-semester graduate seminar on advances in Computational Phonology.
- Lead a weekly reading circle focusing on Bayesian Inference, including developing and presenting several tutorial lectures.

Johns Hopkins University

Adjunct Professor **Spring 2014**

- Developed and taught an introductory full-semester undergraduate course in Phonology/Phonetics.

Teaching Assistant **September 2007 - May 2013**

Standard responsibilities included creating and grading assignments and exams, as well as holding regular office hours and review sessions prior to each exam. Additional experience is listed along with each course.

- Cognition, Robert Frank, Spring 2008
  - Taught guest lecture on Bayesian statistics.
- Formal Methods: Language, Kyle Rawlins, Fall 2008
- Cognitive Neuropsychology of Visual Perception, Michael McCloskey, Spring 2009
- Formal Methods: Neural Networks, Paul Smolensky, Fall 2009
  - Held weekly review sessions covering material from class along with extensions, as well as helping students work through homework assignments.
  - Developed and delivered special lectures on R programming to graduate students.
- Foundations of Cognitive Science, Paul Smolensky, Spring 2010
  - Led classroom discussions of classic papers in cognitive science.
- Introduction to Cognitive Neuropsychology, Michael McCloskey, Fall 2010
- Cognitive Neuropsychology of Visual Perception, Michael McCloskey, Spring 2011

Professional Experience

Haskins Laboratories

Research Assistant (Supervisor: Adamantios Gafos) **Summer 2006**

- As part of larger project analyzing syllabification in Arabic, extended and documented mview software for visualization and analysis of electromagnetometer (EMMA) data of speech articula-

tor movement.

New York University

Undergraduate Research Assistant (Advisor: I. Dan Melamed) **September 2002 - May 2007**

- Contributed graphics, layout, and UI code to MTV (MultiTree Viewer), a visualization tool for the GenPar machine translation toolkit (http://nlp.cs.nyu.edu/GenPar/mtv.html), along with some debugging of the core GenPar distribution.
- Co-developed PLAD plagiarism detection system (http://nlp.cs.nyu.edu/pubs/index.shtml, Technical Report 06-012).

Bell Labs/Lucent Technologies (currently Nokia)

Summer Internship **Summer 2004**

- Evaluated static code analysis software for automatic enforcement of coding standards via the creation of a custom testbed of evaluation code.
- Compiled manual of code security best practices for use by internal development teams.

Professional Activities and Service

- Student volunteer at the NAACL HLT meeting, June 2006
- Student volunteer at the LSA Annual Meeting, January 2010
- Member of the Linguistic Society of America, 2009-present
- Member of the Cognitive Science Society, 2009-present
- Member of the Association for Computational Linguistics, 2014-present
- Organizer, SIGMORPHON 2016 Shared Task
- Member of the Program Committee, SIGMORPHON 2017 Workshop
- Organizer, CONLL 2017 Shared Task
- Organizer, CONLL 2018 Shared Task (https://sigmorphon.github.io/sharedtasks/2018/)
- Member of the Program Committee, SIGMORPHON 2018 Workshop

Relevant Graduate-Level Coursework

At JHU:

- Research Seminar in Formal Approaches to Cognitive Science (Smolensky, Frank, Wilson)
- Research Seminar in Phonetics/Phonology (Wilson)
- Information Theory (Jelinek)
- Graphical Models (Younes)
- Computer Vision (Hager)
- Parallel Programming (Burns)
- Foundations of Cognitive Science (Smolensky)
- Philosophy of Language (Gross)
- Learning Theory (Smolensky, Mathis)
- Cognitive Neuroscience (Rapp)
- Cognitive Neuropsychology of Visual Perception (McCloskey)
- Advanced Statistic Methods (Yantis)
- Advanced Research Design and Analysis (Shelton)

At NYU:

- Phonology (Gouskova)
- Research Seminar in Articulatory Phonology (Gafos, Davidson)
- Syntax (Baltin)
- Natural Language Processing (Grishman)
- Research Seminar in Machine Translation (Melamed)
- Machine Learning and Pattern Recognition (LeCun)
- Foundations of Machine Learning (Mohri)

PROFESSIONAL SKILLS

- Experience with many inference and machine learning algorithms including log-linear models, SVMs, deep/recurrent neural networks, graphical models including HMMs, and MCMC sampling
- Statistical modeling and analysis in Python, R, Matlab, BUGS/JAGS, and SPSS, including data management via SQL
- Programming in Python, R, Matlab, Java, C, C++, and Unix shell scripting
- Prosodic/acoustic analysis in Praat
- Experiment design and implementation in Python (using pygame, pyglet, pscychopy) and the Matlab psycholinguistics toolbox

LANGUAGES

Fluent in English and Bulgarian. Reading competence in Spanish, and French, and Portuguese. Rudimentary German and Japanese (Japanese Language Proficiency Test Level 3 certification).