

Jason M. Eisner

Curriculum Vitae

CONTACT	Department of Computer Science Johns Hopkins University 3400 N. Charles St., Hackerman 324C Baltimore, MD 21218-2691 U.S.A.	Phone: (410) 516-8438 Fax: (410) 516-5050 jason@cs.jhu.edu http://cs.jhu.edu/~jason
EDUCATION AND HONORS	<p><i>Ph.D. in Computer Science</i> 2001 University of Pennsylvania Graduate Teaching Award Thesis: <i>Smoothing a Probabilistic Lexicon via Syntactic Transformations</i> Advisor: Mitch Marcus</p> <p><i>B.A./M.A. in Mathematics</i> 1993 University of Cambridge First-class honours Note: Second undergraduate degree.</p> <p><i>A.B. in Psychology, Cognitive Science track</i> 1990 Harvard University Summa cum laude Junior-year election to Phi Beta Kappa GPA: 3.9/4.0; GRE: 800/800/800 Thesis: <i>Dynamical-Systems Behavior in Recurrent and Non-Recurrent Connectionist Nets</i></p>	
PROFESSIONAL EXPERIENCE	<p>Microsoft Corporation Sep. 2019– Partner Principal Researcher Director of Research at Semantic Machines (as dual appointment with academic job below)</p> <p>Johns Hopkins University July 2014– Professor of Computer Science Joint appointment in Cognitive Science (2003–) Member of the Center for Language and Speech Processing (2000–) Member of the Mathematical Institute for Data Science (2017–) Affiliate of the Human Language Technology Center of Excellence (2007–)</p> <p>Johns Hopkins University July 2007–June 2014 Associate Professor of Computer Science</p>	

Johns Hopkins University Assistant Professor of Computer Science	July 2000–June 2007
University of Rochester Assistant Professor of Computer Science Secondary appointment in Linguistics	Jan. 2000–June 2001
iReactor Inc., Philadelphia, PA Consultant	1994–2004
AT&T Bell Labs, Murray Hill, NJ Artificial Intelligence Research Department	summers 1989–1992
Microsoft Corporation, Seattle, WA Programmer	summer 1988
IBM Research Center, Yorktown Heights, NY Consultant	1987–1988

PROFESSIONAL
ACTIVITIES

Journals

- Associate editor, *Journal of Artificial Intelligence Research* (2012–2018).
- Action editor, *Transactions of the Association for Computational Linguistics* (2012–2018).
- Organizing committee, Jelinek Summer Workshop on Speech and Language Technology (JSALT)—an 8-week annual event (2001–)
- Editorial board member, *Linguistic Issues in Language Technology* (2014–).
- Editorial board member, *Research in Language and Computation* (2006–2011).
- Guest editorial board member (special issue), *Journal of Natural Language Engineering* (2011).
- Special issue editor, *Cognitive Science* (2002).
- Journal reviewer, *J. Applied Logic* (2016), *IEEE Trans. on Pattern Matching and Machine Intelligence* (2014, 2012), *J. Machine Learning Research* (2012), *IEEE Signal Processing Letters* (2012), *Foundations and Trends* (2012), *J. Logic and Computation* (2012, 2011), *Computational Linguistics* (2011, 2010, 2007, 2005, 2004, 2002, 2001, 2000), *Phonology* (2010, 2008), *Research on Language and Computation* (2008, 2007), *ACM Trans. on Speech and Language Processing* (2007, 2005), *IEEE Transactions on Audio, Speech, and Language Processing* (2007), *Cognition* (2002), *J. Algorithms* (1997), *Language and Speech* (1999).

Conferences

- Diversity & Inclusion co-chair, NAACL (2019).
- Program area chair or co-chair for ACL (2017, morphology/phonology; 2014, machine learning; 2013, morphology/phonology), COLING (2014,

machine learning); NAACL-HLT (2012, morphology/phonology; 2006, syntax/grammar/morphology), EMNLP (2009, phonology/morphology/tagging/chunking/segmentation; 2006, machine learning), EACL (2006, phonology/morphology/finite-state/tagging/segmentation). Guest editor for PNAS (2018).

- Chair of Best Paper Award committee, EMNLP (2010). Member of Best Short Paper Award committee, NAACL (2012).
- Program chair, [EMNLP-CoNLL](#) (2007).
- Program chair, [SIGMORPHON Workshop](#) (2008, with Jeff Heinz); SIGPHON Workshop on Finite-State Phonology (2000).
- Organizer, NSF-funded international workshop on [Probabilistic Representations of Linguistic Meaning](#) (2014).
- Publications chair, ACL (2005).
- Co-chair for HLT/NAACL Tutorial and Workshop Programs (2003).
- Organizing committee, ACL Workshop on Deep Learning and Formal Languages (2019).
- Program committee member / reviewer for ACL (2020, 2017, 2016, 2014, 2013, 2012, 2011, 2010, 2009, 2007, 2005, 2004, 2003, 2002), AISTATS (2010), COLING (2014, 2012, 2008), EAAI (2013), EACL (2012, 2006, 2003, 1999), EMNLP (2018, 2017, 2016, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, 2003, 2002—“best reviewer” awards in 2018, 2010), FSMNLP (2005, 2001), ICGI (2012), ICFP (2008), ICLR (2017), ICML (2019, 2016, 2004), IJCAI (2007), IWPT (2009), MITWPL (1999), NAACL (2016, 2015, 2013, 2012, 2010, 2009, 2006), NIPS (2019, 2018, 2017, 2016, 2014, 2013, 2011, 2010, 2007), NLP-LING (2010), SCiL (2020, 2018), SIGMORPHON (2019, 2018, 2014, 2012, 2010, 2008, 2006, 2004, 2002, 2000, 1998), WinNLP—Widening NLP Workshop (2019, 2018, 2017), ACL Workshop on Statistical NLP and Weighted Automata (StatFSM) (2016), ACL Workshop on Relevance of Linguistic Structure in Neural Architectures for NLP (RELNLP) (2018), ACL Workshop on Unsupervised Learning (2011), ACL Workshops on Teaching NLP and CL (2013, 2008, 2005, 2002), CVPR Workshop on Structured Prediction (2013), ICML Workshop on Prediction with Sequential Models (2013), International Conference on Dependency Linguistics (2011), Workshop on Formal Approaches to Slavic Linguistics 8 (1999).

Long-Term Committees

- Board member, Women and Underrepresented Minorities in Natural Language Processing (WINLP) (2016–).
- Organizing committee member, [SIGDAT](#) (which runs the EMNLP conference) (2007–).
- Problems committee, North American Computational Linguistics Olympiad (2006–).

- President, ACL SIGMORPHON (Computational Morphology and Phonology) (2001–); executive committee (1998–).

Other

- Judge for “NLP Idol” special event at NAACL (2012). Panel moderator for NeurIPS Workshop on Interpretability and Robustness in Audio, Speech, and Language (2018).
- Mentor for NAACL Student Research Workshop (2013, 2012, 2009).
- NSF proposal reviewer (2019, 2018, 2017, 2014, 2013, 2010, 2009, 2008, 2004, 2003).
- Board of reviewers, *Handbook of Natural Language Processing* (2008–2009).
- Advisor to DARPA seedling in Adaptive Interactive Representations (2008–2009).
- Member, EU/NSF joint working group: “ePhilology: Emerging Language Technologies and the Rediscovery of the Past” (2002).

FELLOWSHIPS AND AWARDS	Fellow of the Association of Computational Linguistics	2018
	Best Paper award (EMNLP-IJCNLP)	2019
	Best Long Paper award (ACL)	2017
	Finalist for 5-year retrospective Best Paper award (SMT Workshop)	2011
	Finalist for Best Paper award (ACL, EMNLP-CoNLL, ACL, EMNLP)	2009, 2007, 2005, 2002
	Quora Top Writer	2016, 2017
	Best Featured Actor in a Musical DC Metro Theater Arts, Best of 2014	2014
	Alumni Association Excellence in Teaching Award Johns Hopkins University, Whiting School of Engineering	2013
	Robert B. Pond, Sr. Excellence in Teaching Award Johns Hopkins University, Whiting School of Engineering	2005
	NSF Graduate Research Fellowship (computer science)	1993–1996
	Herchel Smith Harvard Scholarship (mathematics)	1991–1993
	Fulbright Scholarship (creative writing), South Africa	1990–1991
	Harvard National Scholarship	1986–1990

UNIVERSITY SERVICE	Curriculum committee, Computer Science Department (2016–, as chair 2017–).
	Faculty member, Center for Language and Speech Processing (2000–).

Executive committee, [Mathematical Institute for Data Science](#) (2017–).

Leader of campus-wide [Machine Learning Group](#), (2007–).

Mentor for a few junior faculty members.

Service on tenure and promotion committees.

Search committees: Computer Science lecturer (2019), Bloomberg Distinguished Professorship in Computational Cognitive Science (2014, co-chair), Bloomberg Distinguished Professorship in Computational Healthcare (2014), Director of Admissions (2012), Applied Math and Statistics (2012, 2011), CS machine learning subcommittee (2014, 2013, 2012, 2011, 2010), HLTCOE (2008–).

Chair of education planning committee, Computer Science Department (2013–2014).

Excellence in Teaching awards committee, Whiting School of Engineering (2014).

Director of graduate studies, Computer Science Department (2002–2013).

Onstage presenter for various Homewood events: admissions open houses and parents' weekends (spring 2013, fall 2013, spring 2014, fall 2014, fall 2017, spring 2018, fall 2018), Hopkins Engineering Sampler Seminar (2013), Dissertation Writing Workshop (2013, 2016), QuarkNet (2013), WSE centennial video (2013), TA Training Institute (2005–).

Judge for the HopHacks hackathon (2014, 2013).

PI of two NSF IGERT proposals involving 25+ faculty across campus (2011, 2010).

External review committees for Cognitive Science and PBS departments (2011).

Advisory committee member, Zooniverse project of the Adler Planetarium and JHU Space Telescope Science Institute (2009–?).

Advisory board member, AMS GAANN Fellowship Program (2009–?).

Advisory board member, cogito.org (2005–2016).

CS/CLSP admissions committee (2001–).

See also "Teaching" section.

GRANTS	Amazon Research Award: Continuous-Time Reinforcement Learning For Personalization (PI, \$99K)	2018
	NSF RI-Small: Linguistic Structure in Neural Sequence Models (PI, \$395K)	2017–2020
	Google Faculty Research Award: Neural Modeling of String-to-String Transductions (PI, \$79K)	2017

NVIDIA Corporation GPU Grant	2016
XPS:FULL:Collaborative Research: Parallel and Distributed Circuit Programming for Structured Prediction (PI, \$825K)	2016–2019
Facebook Faculty Gift (PI, \$50K)	2016
NSF RI-Small: CompCog: Modeling Latent Discrete Knowledge Across Utterances (PI, \$500K)	2014–2017
Science of Learning: Innovative Technology for Personalized Foreign Language Education (co-PI, \$200K)	2014–2016
NSF RI-Medium: Learned Dynamic Prioritization (PI, \$900K)	2010–2014
NSF PIRE: Investigation of Meaning Representations in Language Understanding for Machine Translation Systems (co-PI, \$2.5M)	2005–2014
JHU Framework for the Future: Initiative in Computational Learning (PI, \$50K, leading a group of 30+ faculty)	2009–
NSF: Computing Innovation Fellows Program (postdoc mentor, \$140K)	2009–2011
NSF RI: Cross-Cutting Research Workshops in Intelligent Information Systems (co-PI, \$647K plus substantial additional funding from other agencies and corporations)	2007–2012
JHU WSE-APL Partnership Fund: Learning with Less (PI, \$68K)	2006–2007
NSF CAREER: Finite-State Machine Learning on Strings and Sequences (PI, \$500K)	2004–2010
NSF ITR: Weighted Dynamic Programming for Statistical Natural Language Processing (PI, \$425K)	2003–2007
ONR MURI: Improving Statistical Translation Models Via Text Analyzers Trained From Parallel Corpora (co-PI, \$4.3M)	2001–2006
NSF ITR/IM+PE+SY: Summer Workshops on Human Language Technology (co-PI, \$2.35M)	2001–2006

PUBLICATIONS AND PRESENTATIONS

Work may be browsed by topic at <http://cs.jhu.edu/~jason/papers>.

Invited talks

What are natural languages optimized for? NeurIPS Workshop on Emergent Communication (invited talk), December 2019.

Sequential structure meets hierarchical structure. Carnegie Mellon University, November 2019.

Improving cross-linguistic robustness by training on synthetic languages. ACL Workshop on Typology for Polyglot NLP (invited talk), August 2019.

Modeling event streams. NAACL Workshop on Structured Prediction for NLP (invited talk), June 2019.

[Discrete latent variables in NLP: good, bad, and indifferent](#). ACL Workshop on Relevance of Linguistic Structure in Neural Architectures for NLP (invited talk), August 2018.

[Recovering syntactic structure from surface features](#). Pennsylvania State University, January 2018. Similar talks at Saarland University, January 2019; Georgetown University (Distinguished Lecture Series), April 2019.

[Probabilistically modeling surface patterns using latent structure](#). Symposium on Perceptrons and Syntactic Structures at 60: Computational Modeling of Language (invited talk), at Society for Computation in Linguistics (SCiL), January 2018.

Strategies for discovering underlying linguistic structure. 8th International Joint Conference on Natural Language Processing (IJCNLP), November 2017. ([invited talk](#))

Probabilistic modeling of natural language. Data Science Seminar, Johns Hopkins University, March 2017.

Tractable deep models of sequential structure. LTI Colloquium, Carnegie Mellon University, March 2017. Similar talk at NeurIPS Workshop on Interpretability and Robustness in Audio, Speech, and Language (invited talk), December 2018.

Methods to discover underlying linguistic structure. NLP and Text-as-Data Speaker Series, New York University, March 2017. Similar invited talk at Duke University, October 2018.

Probabilistic models of related strings. ACL Workshop on Statistical NLP and Weighted Automata (StatFSM) (keynote talk), August 2016.

[Gradually learning to read a foreign language: Adaptive partial machine translation](#). Science of Learning Symposium at Johns Hopkins University ([keynote talk](#)), January 2016. Similar talks at Mount St. Mary's College, April 2016; ACL Workshop on Cognitive Modeling for Language Learning (keynote talk), August 2016; Duolingo, November 2019.

[Graphical models over string-valued random variables](#). IEEE ASRU ([keynote talk](#)), December 2015.

Probabilistic inference on strings. [Triangle Computer Science Distinguished Lecture Series](#) (UNC+Duke+NCSU), November 2015. Similar talks at Hebrew University of Jerusalem, April 2015; Bar-Ilan University, April 2015; Microsoft Research, May 2015; University of Illinois at Urbana-Champaign, June 2015; Georgetown University, November 2015.

A non-probabilistic language for probabilistic AI. [Dagstuhl Workshop on Challenges and Trends in Probabilistic Programming](#), April 2015.

Weighted deduction for analyzing natural language and other data. AAAI Fall Symposium: Natural Language Access to Big Data ([invited talk](#)), November 2014.

Learning phonology from surface data: Reconstructing the inputs. ACL Joint Workshop on Morphology/Phonology/Phonetics and Finite-State Methods ([keynote talk](#)), June 2014.

Open problems in computational phonology and morphology. ACL Joint Workshop on Morphology/Phonology/Phonetics and Finite-State Methods (invited panelist), June 2014.

[Deep learning of recursive structure: Grammar induction](#). 1st International Conference on Learning Representations ([keynote talk](#)), May 2013.

Grammar induction: Beyond local search. International Conference on Grammatical Inference ([keynote talk](#)), September 2012.

[Learning approximate inference policies for fast prediction](#). ICML Workshop on Inferning: Interactions between Inference and Learning ([keynote talk](#)), July 2012.

Dyna: A language for propagating and combining information. Workshop on Architectures for Uncertainty in Knowledge at Scale (AUKS), February 2012.

A non-parametric Bayesian approach to inflectional morphology. JHU Applied Math & Statistics Dept., December 2011; University of Maryland, November 2011; ICML/ACL/ICSA Symposium on Machine Learning in Speech and Language Processing, June 2011; Workshop on Machine Translation and Morphologically-Rich Languages, January 2011.

Invited panelist, ACL Workshop on Multiword Expressions, June 2011.

Toward unsupervised web scraping. DIRE Meeting, May 2011.

A weighted deductive language for declaratively specifying (some) algorithms. University of Bielefeld, July 2010.

Using dynamic programming to help search for reorderings. University of Bielefeld, July 2010.

Variational inference over structured variables for linguistic modeling. University of Edinburgh, May 2010.

A weighted deductive language for declaratively specifying (some) algorithms. University of Edinburgh, May 2010.

Constraint interaction, probabilistic models, and approximate inference. Chicago Linguistic Society Annual Conference, April 2010.

Extending logic programming to support modern statistical AI. Datalog 2.0 Workshop, March 2010.

[Weighted deduction as an abstraction level for AI](#). Joint conference on Statistical Relational Learning + Inductive Logic Programming + Mining and Learning with Graphs ([keynote talk](#)), July 2009.

[Joint models with missing data for semi-supervised learning](#). NAACL Workshop on Semi-Supervised Learning for Natural Language Processing ([keynote talk](#)), June 2009.

Dependency parsing by belief propagation. Boulder Workshop on Dependency Parsing, June 2009; Temple University, November 2008.

Shuffling non-constituents. ACL Workshop on Syntax and Structure in Statistical Translation (keynote talk), June 2008.

The Dyna language. CMU and Google, May 2008; MIT, November 2006; IBM Yorktown Heights, May 2006; Microsoft Research, August 2005; University of Washington, August 2005.

Searching for optimal permutations with very large-scale neighborhoods. JHU Applied Math & Statistics Dept., November 2007.

Discovering syntactic deep structure via Bayesian statistics. U. of Maryland, May 2007.

Bootstrapping without the boot. MITRE Corporation, August 2006; IPAM Document Space Workshop, January 2006.

Parameterized finite-state machines and their training. U. of Saarland, Germany, March 2004; AT&T Research, October 2002.

Inferring transformations. Mathematics of Language Conference (MoL8), Bloomington, June 2003.

Learning natural-language grammars using a Bayesian prior. Rochester Institute of Technology, May 2000; Johns Hopkins University, February 2000; UCLA Linguistics Department, June 1999; Stanford, 1999; U. of Texas at Austin, 1999; U. of Toronto, 1999; U. of Rochester, 1999; U. of Chicago, 1999.

[Doing OT in a straitjacket](#). Johns Hopkins Cognitive Science Dept., 2002; U. of Rochester Linguistics Dept., 2000; UCLA Linguistics Dept., 1999; Stanford Linguistics Dept., 1999; MIT Linguistics Dept., 1997.

Journal Articles

Xiang Lisa Li, Dingquan Wang, and Jason Eisner. [A generative model for punctuation in dependency trees](#). *Transactions of the Association for Computational Linguistics (TACL)*, 7:357–373, March 2019.

Ryan Cotterell, Christo Kirov, Mans Hulden, and Jason Eisner. [On the complexity and typology of inflectional morphological systems](#). *Transactions of the Association for Computational Linguistics (TACL)*, 7:327–342, March 2019.

Dingquan Wang and Jason Eisner. [Surface statistics of an unknown language indicate how to parse it](#). *Transactions of the Association for Computational Linguistics (TACL)*, 6:667–685, December 2018.

Dingquan Wang and Jason Eisner. [Fine-grained prediction of syntactic typology: Discovering latent structure with supervised learning](#). *Transactions of the Association for Computational Linguistics (TACL)*, 5:147–161, June 2017.

Tim Vieira and Jason Eisner. [Learning to prune: Exploring the frontier of fast and accurate parsing](#). *Transactions of the Association for Computational Linguistics (TACL)*, 5:263–278, August 2017.

- Dingquan Wang and Jason Eisner. [The Galactic Dependencies treebanks: Getting more data by synthesizing new languages](#). *Transactions of the Association for Computational Linguistics (TACL)*, 4:491–505, September 2016.
- Matthew R. Gormley, Mark Dredze, and Jason Eisner. [Approximation-aware dependency parsing by belief propagation](#). *Transactions of the Association for Computational Linguistics (TACL)*, 3:489–501, August 2015.
- Ryan Cotterell, Nanyun Peng, and Jason Eisner. [Modeling word forms using latent underlying morphs and phonology](#). *Transactions of the Association for Computational Linguistics (TACL)*, 3:433–447, August 2015.
- Francisco Sánchez-Vega, Jason Eisner, Laurent Younes, and Donald Geman. [Learning multivariate distributions by competitive assembly of marginals](#). *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 99, April 2012. 14 pages plus 32-page supplement.
- John Eng and Jason M. Eisner. [Radiology report entry with automatic phrase completion driven by language modeling](#). *Radiographics*, 24(5):1493–1501, 2004.
- Jason Eisner. [Discovering syntactic deep structure via Bayesian statistics](#). *Cognitive Science*, 26(3):255–268, May-June 2002.
- Jason Eisner. [Introduction to the special section on linguistically apt statistical methods](#). *Cognitive Science*, 26(3):235–237, May-June 2002.

Book Chapters

- Jason Eisner and Nathaniel W. Filardo. [Dyna: Extending Datalog for modern AI](#). In Oege de Moor, Georg Gottlob, Tim Furche, and Andrew Sellers, editors, *Datalog Reloaded*, volume 6702 of *Lecture Notes in Computer Science*, pages 181–220. Springer, 2011. Longer version available as tech report.
- Antti-Veikko Rosti, Eugene Matusov, Jason Smith, Necip Ayan, Jason Eisner, Damianos Karakos, Sanjeev Khudanpur, Gregor Leusch, Zhifei Li, Spyros Matsoukas, Hermann Ney, Richard Schwartz, B. Zhang, and J. Zheng. [Confusion network decoding for MT system combination](#). In *Handbook of Natural Language Processing and Machine Translation*, pages 333–361. Springer, 2011.
- Jason Eisner and Noah A. Smith. [Favor short dependencies: Parsing with soft and hard constraints on dependency length](#). In Harry Bunt, Paola Merlo, and Joakim Nivre, editors, *Trends in Parsing Technology: Dependency Parsing, Domain Adaptation, and Deep Parsing*, chapter 8, pages 121–150. Springer, 2010.
- Jason Eisner. [Bilexical grammars and their cubic-time parsing algorithms](#). In Harry Bunt and Anton Nijholt, editors, *Advances in Probabilistic and Other Parsing Technologies*, pages 29–62. Kluwer Academic Publishers, October 2000.

Book Reviews

- Jason Eisner. [Review of *Optimality Theory* by René Kager](#). *Computational Linguistics*, 26(2):286–290, June 2000.

Ph.D. Thesis

Jason Eisner. *Smoothing a Probabilistic Lexicon via Syntactic Transformations*. PhD thesis, University of Pennsylvania, July 2001. 318 pages.

Refereed Conference and Workshop Proceedings

Xiang Lisa Li and Jason Eisner. [Specializing word embeddings \(for parsing\) by information bottleneck](#). In *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and 9th International Joint Conference on Natural Language Processing*, pages 2744–2754, Hong Kong, November 2019. Best Paper Award.

Ryan Cotterell and Jason Eisner. [A functionalist account of vowel system typology](#). In *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and 9th International Joint Conference on Natural Language Processing*, Hong Kong, November 2019.

Adithya Renduchintala, Philipp Koehn, and Jason Eisner. [Spelling-aware construction of macaronic texts for teaching foreign-language vocabulary](#). In *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and 9th International Joint Conference on Natural Language Processing*, pages 6439–6444, Hong Kong, November 2019.

Adithya Renduchintala, Philipp Koehn, and Jason Eisner. [Simple construction of mixed-language texts for vocabulary learning](#). In *Proceedings of the 14th Workshop on Innovative Use of NLP for Building Educational Applications (BEA)*, pages 369–379, Florence, August 2019.

Sebastian J. Mielke, Ryan Cotterell, Kyle Gorman, Brian Roark, and Jason Eisner. [What kind of language is hard to language-model?](#) In *Proceedings of the 2019 Conference of the Association for Computational Linguistics (ACL)*, pages 4975–4989, Florence, July 2019.

Hongyuan Mei, Guanghui Qin, and Jason Eisner. [Imputing missing events in continuous-time event streams](#). In *Proceedings of the 36th International Conference on Machine Learning*, Long Beach, California, June 2019.

Chu-Cheng Lin, Hao Zhu, Matthew Gormley, and Jason Eisner. [Neural finite-state transducers: Beyond rational relations](#). In *Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 272–283, Minneapolis, June 2019.

Ekaterina Vylomova, Ryan Cotterell, Tim Baldwin, Trevor Cohn, and Jason Eisner. [Contextualization of morphological inflection](#). In *Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 2018–2024, Minneapolis, June 2019.

Sebastian J. Mielke and Jason Eisner. [Spell once, summon anywhere: A two-level open-vocabulary language model](#). In *Proceedings of the 33rd AAAI Conference on Artificial Intelligence*, pages 6843–6850, Honolulu, January 2019.

- Dingquan Wang and Jason Eisner. [Synthetic data made to order: The case of parsing](#). In *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*, pages 1325–1337, Brussels, November 2018.
- Ryan Cotterell, Christo Kirov, Sebastian J. Mielke, and Jason Eisner. [Unsupervised disambiguation of syncretism in inflected lexicons](#). In *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 548–553, New Orleans, June 2018.
- Ryan Cotterell, Sebastian J. Mielke, Jason Eisner, and Brian Roark. [Are all languages equally hard to language-model?](#) In *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 536–541, New Orleans, June 2018.
- Chu-Cheng Lin and Jason Eisner. [Neural particle smoothing for sampling from conditional sequence models](#). In *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 929–941, New Orleans, June 2018.
- Ryan Cotterell and Jason Eisner. [A deep generative model of vowel formant typology](#). In *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 37–46, New Orleans, June 2018.
- Christo Kirov, Ryan Cotterell, John Sylak-Glassman, Géraldine Walther, Ekaterina Vylomova, Patrick Xia, Manaal Faruqui, Sebastian J. Mielke, Arya D. McCarthy, Sandra Kübler, David Yarowsky, Jason Eisner, and Mans Hulden. [UniMorph 2.0: Universal morphology](#). In *Proceedings of the Eleventh International Conference on Language Resources and Evaluation (LREC 2018)*, Miyazaki, Japan, May 2018.
- Hongyuan Mei and Jason Eisner. [The neural Hawkes process: A neurally self-modulating multivariate point process](#). In *Advances in Neural Information Processing Systems (NeurIPS)*, pages 6754–6764, Long Beach, CA, December 2017. First version December 2016 as [arXiv:1612.09328v1](#).
- Adithya Renduchintala, Philipp Koehn, and Jason Eisner. [Knowledge tracing in sequential learning of inflected vocabulary](#). In *Proceedings of the Conference on Natural Language Learning (CoNLL)*, pages 238–247, Vancouver, August 2017.
- Tim Vieira, Matthew Francis-Landau, Nathaniel Wesley Filardo, Farzad Khorasani, and Jason Eisner. [Dyna: Toward a self-optimizing declarative language for machine learning applications](#). In *Proceedings of the First ACM SIGPLAN Workshop on Machine Learning and Programming Languages (MAPL)*, pages 8–17, Barcelona, June 2017. ACM.
- Ryan Cotterell and Jason Eisner. [Probabilistic typology: Deep generative models of vowel inventories](#). In *Proceedings of the Association for Computational Linguistics (ACL)*, pages 1182–1192, Vancouver, August 2017. Best Long Paper Award.
- Nicholas Andrews, Mark Dredze, Benjamin Van Durme, and Jason Eisner. [Bayesian modeling of lexical resources for low-resource settings](#). In *Proceedings of the Association for Computational Linguistics (ACL)*, pages 1029–1039, Vancouver, August 2017.

- Ryan Cotterell, Adam Poliak, Benjamin Van Durme, and Jason Eisner. [Explaining and generalizing skip-gram through exponential family principal component analysis](#). In *Proceedings of the Conference of the European Chapter of the Association for Computational Linguistics: Human Language Technologies (EACL)*, pages 175–181, Valencia, Spain, April 2017.
- Matthew Francis-Landau, Bing Xue, Jason Eisner, and Vivek Sarkar. [Fine-grained parallelism in probabilistic parsing with Habanero Java](#). In *Proceedings of the Sixth Workshop on Irregular Applications: Architectures and Algorithms (IA³)*, pages 78–81, Salt Lake City, November 2016. IEEE Press.
- Jason Eisner. [Inside-outside and forward-backward algorithms are just backprop](#). In *Proceedings of the EMNLP Workshop on Structured Prediction for NLP*, pages 1–17, Austin, TX, November 2016.
- Tim Vieira, Ryan Cotterell, and Jason Eisner. [Speed-accuracy tradeoffs in tagging with variable-order CRFs and structured sparsity](#). In *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*, pages 1973–1978, Austin, TX, November 2016.
- Rebecca Knowles, Adithya Renduchintala, Philipp Koehn, and Jason Eisner. [Analyzing learner understanding of novel L2 vocabulary](#). In *Proceedings of the 20th SIGNLL Conference on Computational Natural Language Learning (CoNLL)*, pages 126–135, Berlin, August 2016.
- Adithya Renduchintala, Rebecca Knowles, Philipp Koehn, and Jason Eisner. [Creating interactive macaronic interfaces for language learning](#). In *Proceedings of ACL-2016 System Demonstrations*, pages 133–138, Berlin, August 2016.
- Adithya Renduchintala, Rebecca Knowles, Philipp Koehn, and Jason Eisner. [User modeling in language learning with macaronic texts](#). In *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics (ACL)*, pages 1859–1869, Berlin, August 2016.
- Ryan Cotterell, Hinrich Schütze, and Jason Eisner. [Morphological smoothing and extrapolation of word embeddings](#). In *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics (ACL)*, pages 1651–1660, Berlin, August 2016. Supplementary material (4 pages) also available.
- Nathaniel Wesley Filardo and Jason Eisner. [Rigid tree automata with isolation](#). In *Proceedings of the Fourth International Workshop on Trends in Tree Automata and Tree Transducers (TTATT)*, Seoul, August 2016. 7 pages.
- Pushpendre Rastogi, Ryan Cotterell, and Jason Eisner. [Weighting finite-state transductions with neural context](#). In *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, pages 623–633, San Diego, June 2016. 11 pages. Supplementary material (1 page) also available.
- Nanyun Peng, Ryan Cotterell, and Jason Eisner. [Dual decomposition inference for graphical models over strings](#). In *Proceedings of the Conference on Empirical Methods in Natural*

- Language Processing (EMNLP)*, pages 917–927, Lisbon, September 2015.
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- Matthew R. Gormley. *Graphical Models with Structured Factors, Neural Factors, and Approximation-Aware Training*. PhD thesis, Johns Hopkins University, October 2015.
- Markus Dreyer. *A Non-Parametric Model for the Discovery of Inflectional Paradigms from Plain Text Using Graphical Models over Strings*. PhD thesis, Johns Hopkins University, Baltimore, MD, April 2011.
- David A. Smith. *Efficient Inference for Trees and Alignments: Modeling Monolingual and Bilingual Syntax with Hard and Soft Constraints and Latent Variables*. PhD thesis, Johns Hopkins University, Baltimore, MD, October 2010.
- Zhifei Li. *Discriminative Training and Variational Decoding in Machine Translation Via Novel Algorithms for Weighted Hypergraphs*. PhD thesis, Johns Hopkins University, Baltimore, MD, April 2010.
- Roy Tromble. *Search and Learning for the Linear Ordering Problem with an Application to Machine Translation*. PhD thesis, Johns Hopkins University, Baltimore, MD, April 2009.
- Noah A. Smith. *Novel Estimation Methods for Unsupervised Discovery of Latent Structure in Natural Language Text*. PhD thesis, Johns Hopkins University, Baltimore, MD, October 2006.

OTHER SCHOLARLY AND TECHNICAL OUTPUT

In addition to the items below, code and data associated with my papers are available on request. Some of it has been requested often.

My student Matt Gormley in 2014 released [Pacaya](#), a general graphical models package with support for structured factors.

Veselin Stoyanov and I released the [ERMA](#) toolkit in 2012 for robust training of graphical models under approximations.

We have $1\frac{1}{2}$ implementations of the [Dyna programming language](#). My students and I released a Dyna-to-C++ compiler in 2005 for an early, simpler design of Dyna. It was used for both research and teaching. In 2013, we began working hard on a new, more flexible runtime engine for a much more expressive language design. The new system has already been used for teaching. Both versions can be obtained from <http://dyna.org>.

I provide various tutorial materials at <http://cs.jhu.edu/~jason/tutorials>. These include interactive software visualizations for log-linear models (2013), hidden Markov models, and Gaussian mixture models, as well as software for experimenting with probabilistic context-free grammars. They include other writings, slides, and videos as well. My course slides have also been used at a number of other institutions.

Several undergraduates and I released the [Dynasty](#) hypergraph browser in 2006. We are designing a more powerful successor for use with version 2 of Dyna.

Philipp Koehn and I produced the [aclpub](#) publications package that has been used since 2005 for the ACL, NAACL, EMNLP, EACL, COLING, IJCNLP, and CoNLL conferences (among others), as well as their associated workshops.

TEACHING

Department of Computer Science, Johns Hopkins University

Alumni Association Excellence in Teaching Award, Whiting School of Engineering, 2013

Robert B. Pond, Sr. Excellence in Teaching Award, Whiting School of Engineering, 2005

- *Machine Learning: Linguistic and Sequence Modeling* 2018, 2019

A graduate class that teaches formal methods for mathematical modeling of real-world sequence data, including finite-state methods, Bayesian nonparametrics, deep learning, and reinforcement learning. Examples are drawn primarily from natural language processing. Enrollment: 30.

- *Natural Language Processing* 2001–2004, 2006–2014, 2016–

A mixed graduate-undergraduate class that teaches a synthesis of statistical models, formal grammars, and linguistic theory, with associated algorithms. It is reputed to be one of the most challenging classes in the Computer Science department, requiring both rigor and intellectual flexibility.

Faculty at several other universities have asked to use the extensive online course materials.

Enrollment: 60.

- *Declarative Methods* 2005–2014, 2017–
 A new course for juniors, seniors, and graduate students. It surveys computational problems that tend to pop up frequently in different guises (e.g., constraint satisfaction); the specification languages used to describe instances of these problems; general toolkits for solving these instances; and the algorithms run by these toolkits.
 Enrollment: 15–35.
- *Seminar in Natural Language Processing* every semester 2001–
 A weekly reading and discussion group, exploring important current research in natural language processing and potentially relevant material from related fields. Topics are chosen by the group; each lasts 3–4 weeks.
 Enrollment: 10–15.
- *Current Topics in Machine Learning* 2013, 2014
 A weekly reading and discussion group with a participatory format, jointly led by three faculty.
 Enrollment: about 20.
- *Puzzles, Graphs, and NLP* 2008, 2011
 A 3-class unit to expose freshman CS majors to natural language processing. Discusses various contest puzzles and applied NLP problems, and connects many of them to computational questions about directed graphs.
 Enrollment: About 20.
- *Totally Random* 2004, 2005
 A 4-class discussion unit about random numbers and the uses of randomness in computer science. Part of the department’s new freshman experience course.
 Enrollment: 8–10.
- *Data Structures* 2003, 2004
 A sophomore-level class, the third and last in the programming sequence for majors. Covers basic data structures and algorithms, basic analysis of algorithms, and object-oriented programming style. Online “warmups” and highly interactive classes stimulated the students to come up with designs and variations. The challenging weekly assignments often used real-world data.
 Faculty at a dozen other universities have asked to use the course materials.
 Enrollment: about 50.
- *Finite-State Methods in Natural Language Processing* 2000–2001
 A graduate class on semiring-weighted finite-state transducers. Covers theory and practice, including the theory of formal power series, the extended regular expression calculus, and a range of applications to natural language. Rigorous assignments.
 Attendance: about 20.
- *Statistical Language Learning* 2002
 A graduate class about past and present research that has attempted to induce the structure of language from raw data such as text. Lectures are intermixed with reading and discussion of the primary literature.
 Attendance: about 10.

Tutorials at conferences

- [Structured Belief Propagation for Natural Language Processing](#) 2014, 2015
(with Matt Gormley, at ACL 2014 and ACL 2015)

NAACL Professor (named professorship) at the [Linguistic Institute](#) 2013

- [Computational linguistics course](#) at the biennial summer school of the Linguistic Society of America.

Lecturer, 1st [Lisbon Machine Learning School](#) 2011

- Lectures on generative Bayesian modeling.

Lecturer, NAACL Summer School in Human Language Technology summers 2002–2012, 2016

- Lectures on NLP and applied probability.
- [Laboratory exercise](#) in competitive grammar writing.

Speaker, TA Training Institute, Johns Hopkins University 2005–

- Large fall lectures: “Preparing for the first day in sciences and engineering.”
- Small spring workshop (some years): “Starting the semester off right in engineering and sciences.”

Department of Computer Science, University of Rochester

- *Statistical Learning of Natural Language* 2000
- *Graduate Problem Seminar* 2000

Boot camp for new Ph.D. students. Students learn research skills by teaming up to tackle a series of open-ended engineering problems that touch on research in the department. (I made them build systems for face orientation detection, distributed calendar management, and information retrieval.) Several written and oral presentations are required and receive extensive feedback. The class also includes career advice, familiarization with departmental resources, presentations by other faculty, and a final research project.

Enrollment: 10.

Department of Computer Science, University of Pennsylvania

Graduate Teaching Award, 1995

- TA in *Introduction to Programming* 1994–1995

ADVISING

Postdoctoral fellows

Veselin Stoyanov (*NSF Computational Innovation Fellow;*
now at Facebook) 2009–2011

Ph.D. dissertation students

Sabrina Mielke 2017–
Hongyuan Mei (*Bloomberg Fellow*) 2016–

Matthew Francis-Landau	2016–
Chu-Cheng Lin	2015–
Dingquan Wang (<i>now at Google</i>)	2014–2019
Ryan Cotterell (<i>Fulbright Scholar; NDSEG Fellow, Facebook Fellow; now Asst. Prof., Cambridge Univ.</i>)	2013–
Tim Vieira	2011–
Nathaniel W. Filardo (<i>HLTCOE Fellow; now postdoctoral fellow, Univ. of Cambridge</i>)	2007–2017
Nicholas Andrews (<i>now postdoctoral fellow, JHU HLTCOE</i>)	2009–2016
Matthew Gormley (<i>HLTCOE Fellow; now Asst. Teaching Prof., CMU MLD</i>)	2009–2015
Markus Dreyer (<i>Wolman Fellow; now Sr. Machine Learning Scientist, Amazon</i>)	2003–2011
Zhifei Li (co-adv.) (<i>later at Google; now CEO/founder of Mobvoi</i>)	2008–2010
David A. Smith (<i>NSF Fellow; then Research Prof., U. Mass; now Asst. Prof., Northeastern Univ.</i>)	2002–2010
Roy Tromble (<i>NDSEG Fellow; now at Google</i>)	2002–2009
Noah A. Smith (<i>Hertz Foundation Fellow; then Assoc. Prof., CMU; now at University of Washington</i>)	2001–2006

Other former Ph.D. students (period as primary advisee)

Jacob Buckman	2018–2019
Michael Paul (<i>NSF Fellow; Microsoft Fellow; Dean's Fellow; now Asst. Prof., UC-Boulder</i>)	2010–2015
Adam Teichert (<i>now Asst. Prof., Snow College</i>)	2010–2014
Darcey Riley (<i>Dean's Fellow; now at Google</i>)	2012–2015
Jason R. Smith (<i>switched advisors in 2011; now at Google</i>)	2006–2011
Omar Zaidan (<i>now at Microsoft Research</i>)	2005–2008
John Blatz (<i>now at Google</i>)	2004–2008
Eric Goldlust (<i>Wolman Fellow; Muuss Research Award; Hon. Mention for CRA Outstanding Undergraduate Award</i>)	2004–2005

H.S./B.S./M.S.E. research students

Xiang Lisa Li	2018–
Guanghui Qin (visitor from Peking University, now at JHU)	2018–2019
Hao Zhu (visitor from Tsinghua University, now at CMU)	2018–2019
Shijie Wu	2017–2018
Xiaochen Li	2017
Bo Liu	2016–2017
Yuan Jing (Vincent) Yan	2016–2017
Jiawei Huang	2016–
Akshay Srivatsan	2016–
Mozhi Zhang	2015–

Elan Hourticolon-Retzler	2015
Juneki Hong (<i>Most Valuable Peer Award</i>)	2013–
Sharon Li (<i>Outstanding Senior Award</i>)	2013–2014
Katherine Wu (<i>Pistritto Fellow, Outstanding Senior Award</i>)	2012–2013
Jay Feldman (<i>Pistritto Fellow, Outstanding Senior Award</i>)	2012–2013
Michael Tontchev (<i>High school—Grand Prize Winner, Baltimore Science Fair</i>)	2010–2012
Alex Ropson	2010–2011
Ashish Sharma	2009–2010
Wren Thornton	2008
Ian Nowland	2008–2009
Jay Van Der Wall	2007–2009
Asheesh Laroia	2006–2007
Samuel Huang (<i>Pistritto Fellow</i>)	2006–2007
Constantinos Michael	2005–2006
George Shafer	2005–2006
John Graettinger (<i>Outstanding Research Award</i>)	2005–2006
Michael Kornbluh (<i>Pistritto Fellow, Outstanding Senior Award</i>)	2004–2005
Chalaporn Hathaidharm	2002–2004

Ph.D. dissertation committees (not as advisor)

Benjamin Börschinger (Macquarie U.)	exp. 2015
Yonatan Bisk (UIUC)	2015
Jiarong Jiang (U. of Maryland)	2014
Francisco Sánchez-Vega (JHU Applied Math & Stats Dept.)	2012
Will Headden (Brown University)	2011
Jia Cui	2008
Mark Thober	2007
Gaja Jarosz Snover (JHU Cognitive Science Dept.)	2006
Jonathan Allen	2006
Gideon Mann	2006
Charles Schafer	2006
Myroslava Dzikovska (Univ. of Rochester)	2004
Silviu Cucerzan	2003
Radu “Hans” Florian	2002
Jun Wu	2002
Richard Wicentowski	2002
Grace Ngai	2000

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