

# Steven Bethard

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School of Information  
University of Arizona

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<http://scholar.google.com/citations?user=sXM8J5EAAAAJ>

## RESEARCH INTERESTS

Natural language processing and machine learning theory and applications, including modeling the language of time and timelines, normalizing text to medical and geospatial ontologies, and information extraction models for clinical applications.

## CHRONOLOGY OF EDUCATION

2002-08 – 2007-12 Ph.D. Computer Science and Cognitive Science, University of Colorado  
Dissertation: “Finding Event, Temporal and Causal Structure in Text:  
A Machine Learning Approach.” Advisor: James H. Martin  
1998-08 – 2002-05 B.S., B.A. Computer Science, Mathematics, Linguistics, University of Arizona

## CHRONOLOGY OF EMPLOYMENT

|                   |                           |   |
|-------------------|---------------------------|---|
| 2016-08 – 2020-08 | Assistant Professor       | University of Arizona, School of Information  |
|                   | Assistant Professor       | University of Arizona, Cognitive Science GIDP   |
|                   | Courtesy Appointment      | University of Arizona, Linguistics  |
| 2016-08 – 2020-08 | Assistant Professor       | University of Arizona, School of Information  |
|                   | Assistant Professor       | University of Arizona, Cognitive Science GIDP   |
|                   | Courtesy Appointment      | University of Arizona, Linguistics  |
| 2013-08 – 2016-08 | Assistant Professor       | University of Alabama at Birmingham,<br>Department of Computer and Information Sciences |
| 2011-10 – 2015-10 | Visiting Professor        | KU Leuven, Department of Computer Science   |
| 2011-09 – 2013-08 | Research Associate        | University of Colorado, Institute of Cognitive Science                                  |
| 2010-09 – 2011-08 | Postdoctoral Fellow       | KU Leuven, Department of Computer Science   |
| 2009-06 – 2009-08 | Senior Research Scientist | Johns Hopkins University,<br>Human Language Technology Center of Excellence             |
| 2009-01 – 2010-08 | Postdoctoral Scholar      | Stanford University, Department of Computer Science                                     |
| 2008-01 – 2008-12 | Research Associate        | University of Colorado, Institute of Cognitive Science                                  |

## HONORS AND AWARDS

2016-02 Kevin and Jo Ann Reilly Endowed Award (\$1000), University of Alabama at Birmingham  
2009-06 Vannevar Bush Best Paper Award (\$1000), Joint Conference on Digital Libraries  
2008-12 Daniel Henkel Service Award, University of Colorado Office of International Education  
2002-03 NSF Graduate Research Fellowship Honorable Mention  
1998-08 Flinn Scholar  
1998-08 National Merit Scholar

## SERVICE/OUTREACH

### LOCAL/STATE OUTREACH

2015, 2016 Site coordinator, North American Computational Linguistics Olympiad

### NATIONAL/INTERNATIONAL SERVICE: COMMITTEES

2020-2022 Vice-Secretary Elect, Special Interest Group on the Lexicon  
of the Association for Computational Linguistics (SIGLEX)

2016-2020 Board member (representative of the SemEval section), Special Interest Group on the Lexicon  
of the Association for Computational Linguistics (SIGLEX)

### NATIONAL/INTERNATIONAL SERVICE: CONFERENCE ORGANIZATION

2020 Publication Chair, Annual Meeting of the Association for Computational Linguistics (ACL)

2019 Area chair, Annual Meeting of the Association for Computational Linguistics (ACL)

2019 Area chair, North American Chapter of the Association for Computational Linguistics  
(NAACL)

2018 Organizer, Parsing Time Normalizations shared task

2016-2018 Co-Chair, International Workshop on Semantic Evaluation (SemEval)

2016, 2019 Organizer, Clinical Natural Language Processing Workshop (Clinical NLP)

2015-2017 Organizer, Clinical TempEval shared task

2015-2016 Area chair, Annual Meeting of the Association for Computational Linguistics (ACL)

2014 Organizer, Workshop on Computational Approaches to Causality in Language

2013 Publication Chair, Empirical Methods in Natural Language Processing (EMNLP)

2013 Faculty advisor, ACL Student Research Workshop

2012-2013 Organizer, SemEval Spatial Role Labeling Task

2011-2012 Mentor, ACL Student Research Workshop

2011 Organizer, American Medical Informatics Association Virtual Journal Club on Temporal  
Reasoning

### NATIONAL/INTERNATIONAL SERVICE: GRANT REVIEWING

2020 México: Consejo Nacional de Ciencia y Tecnología, Frontier Science

2013, 2015, 2018

US National Science Foundation, Division of Information and Intelligent Systems

2017 Israel Science Foundation (ISF), Individual Research Grants

2017 Netherlands Organization for Scientific Research (NWO), Council for the Humanities

2016 Swiss National Science Foundation, Division of Mathematics, Physical and Engineering  
Sciences

### NATIONAL/INTERNATIONAL SERVICE: JOURNAL REVIEWING

2016-2020 Transactions of the Association for Computational Linguistics

2012-2013, 2015, 2019-2020

Journal of Natural Language Engineering (JNLE)

2019-2020 Transactions on Audio, Speech and Language Processing

2014, 2019 Journal of the American Medical Informatics Association (JAMIA)

2018-2019 Journal of Biomedical Informatics

2018 PLOS ONE

2013, 2015 Cognition  
2014 Computational Linguistics (CL)  
2013–2014 Transactions on Asian Language Information Processing (TALIP)  
2011–2013 Journal of Artificial Intelligence Research (JAIR)  
2013 Journal of Language Modeling (JLM)  
2013 Transactions on Information Forensics & Security (TIFS)  
2010–2011 International Journal on Digital Libraries (IJDL)  
2011 Transactions on Computational Biology and Bioinformatics (TCBB)  
2008 Language Resources and Evaluation (LRE)

#### NATIONAL/INTERNATIONAL SERVICE: CONFERENCE REVIEWING

2009, 2011, 2013–2020  
Empirical Methods in Natural Language Processing (EMNLP)  
2018 Machine Learning for Healthcare (MLHC)  
2009, 2011–2014, 2017–2018  
Annual Meeting of the Association for Computational Linguistics (ACL)  
2010, 2012–2013, 2016, 2018  
North American Chapter of the Association for Computational Linguistics (NAACL)  
2017 International Joint Conference on Natural Language Processing (IJCNLP)  
2012, 2016 International Conference on Computational Linguistics (COLING)  
2016 International Joint Conference on Artificial Intelligence (IJCAI)  
2015–2016 International World Wide Web Conference (WWW)  
2012, 2014 European Chapter of the Association for Computational Linguistics (EACL)  
2013 American Medical Informatics Association Annual Symposium (AMIA)  
2010–2013 Joint Conference on Digital Libraries (JCDL)  
2012–2013 Joint Conference on Lexical and Computational Semantics (\*SEM)  
2011 Conference on Natural Language Learning (CoNLL)  
2010 International Conference on Language Resources and Evaluation (LREC)  
2007–2008 IEEE International Conference on Semantic Computing (ICSC)

#### NATIONAL/INTERNATIONAL SERVICE: WORKSHOP REVIEWING

2012–2018, 2021  
International Workshop on Semantic Evaluation (SemEval)  
2018–2020 International Workshop on Spatial Language Understanding (SpLU)  
2020 Workshop for Natural Language Processing Open Source Software (NLP-OSS)  
2019 Workshop on Natural Language Processing and Computational Social Science  
2019 Combined Workshop on Spatial Language Understanding (SpLU)  
& Grounded Communication for Robotics (RoboNLP)  
2017 Workshop on Ethics in Natural Language Processing (EthNLP)  
2016 Workshop on Cross-Platform Text Mining and Natural Language Processing Interoperability  
2015 Workshop on Replicability and Reusability in Natural Language Processing (RRNLP)  
2014 Workshop on Computational Approaches to Causality in Language (CAtoCL)  
2014 Workshop on Computational Approaches to Code Switching (CodeSwitch)  
2014 Workshop on Open Infrastructures and Analysis Frameworks for HLT (OIAF4HLT)

#### DEPARTMENTAL SERVICE

2018–2021 Academic Advisor for MS INFO students, University of Arizona School of Information  
2017–2021 Curriculum committee, University of Arizona School of Information  
2016–2017, 2018–2021  
Graduate committee, University of Arizona School of Information  
2015–2016 Faculty search committee, U. of Alabama at Birmingham Computer and Info. Sci.  
2014–2016 Undergrad curriculum committee, U. of Alabama at Birmingham Computer and Info. Sci.  
2014–2016 Ph.D. qualifying exam committee, U. of Alabama at Birmingham Computer and Info. Sci.  
2004–2007 Student grants committee, University of Colorado Boulder Institute of Cognitive Science  
2004 Hiring committee, University of Colorado Boulder Department of Linguistics

#### COLLEGE-LEVEL SERVICE

2019–2021 Computational Social Science Advisory Committee,  
University of Arizona College of Social and Behavioral Sciences  
2012–2013 Curriculum design committee, University of Colorado Boulder social media certificate

#### UNIVERSITY-LEVEL SERVICE

2018–2021 Data Science Resources and Training Steering Committee, University of Arizona  
2007–2008 CU International Leader, University of Colorado Boulder  
2005–2007 International Peer Mentor, University of Colorado Boulder

### PUBLICATIONS/CREATIVE ACTIVITY

#### CHAPTERS IN SCHOLARLY BOOKS AND MONOGRAPHS

González López, Samuel, **Steven Bethard**, and Aurelio López-López (June 2014). “[Identifying Weak Sentences in Student Drafts: A Tutoring System](#)”. In: *Methodologies and Intelligent Systems for Technology Enhanced Learning*. Ed. by Tania Di Mascio, Rosella Gennari, Pierpaolo Vitorini, Rosa Vicari, and Fernando de la Prieta. Vol. 292. Advances in Intelligent Systems and Computing, pp. 77–85.  
**Bethard, Steven**, Hong Yu, Ashley Thornton, Vasileios Hatzivassiloglou, and Dan Jurafsky (2005). “[Extracting opinion propositions and opinion holders using syntactic and lexical cues](#)”. In: *Computing Attitude and Affect in Text: Theory and Applications*. Ed. by James G. Shanahan, Yan Qu, and Janyce Wiebe, pp. 125–141.

#### EDITED CONFERENCE PROCEEDINGS

Rumshisky, Anna, Kirk Roberts, **Steven Bethard**, and Tristan Naumann, eds. (Nov. 2020). “[Proceedings of the 3rd Clinical Natural Language Processing Workshop](#)”.  
Rumshisky, Anna, Kirk Roberts, **Steven Bethard**, and Tristan Naumann, eds. (June 2019). “[Proceedings of the 2nd Clinical Natural Language Processing Workshop](#)”.  
Apidianaki, Marianna, Saif M. Mohammad, Jonathan May, Ekaterina Shutova, **Steven Bethard**, and Marine Carpuat, eds. (June 2018). “[Proceedings of The 12th International Workshop on Semantic Evaluation \(SemEval-2018\)](#)”.  
**Bethard, Steven**, Marine Carpuat, Marianna Apidianaki, Saif M. Mohammad, Daniel Cer, and David Jurgens, eds. (Aug. 2017). “[Proceedings of the 11th International Workshop on Semantic Evaluation \(SemEval-2017\)](#)”.  
Rumshisky, Anna, Kirk Roberts, **Steven Bethard**, and Tristan Naumann, eds. (Dec. 2016). “[Proceedings of the Clinical Natural Language Processing Workshop \(ClinicalNLP\)](#)”.  
**Bethard, Steven**, Marine Carpuat, Daniel Cer, David Jurgens, Preslav Nakov, and Torsten Zesch, eds. (June 2016). “[Proceedings of the 10th International Workshop on Semantic Evaluation \(SemEval-2016\)](#)”.

- Kolomiyets, Oleksandr, Marie-Francine Moens, Martha Palmer, James Pustejovsky, and **Steven Bethard**, eds. (Apr. 2014). “[Proceedings of the EACL 2014 Workshop on Computational Approaches to Causality in Language \(CAtoCL\)](#)”.
- Yarowsky, David, Timothy Baldwin, Anna Korhonen, Karen Livescu, and **Steven Bethard**, eds. (Oct. 2013). “[Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing](#)”.
- Dey, Anik, Sebastian Krause, Ivelina Nikolova, Eva Vecchi, **Steven Bethard**, Preslav I. Nakov, and Feiyu Xu, eds. (Aug. 2013). “[51st Annual Meeting of the Association for Computational Linguistics Proceedings of the Student Research Workshop](#)”.

#### REFEREED JOURNAL ARTICLES

- Xu, Dongfang, Manoj Gopale, Jiacheng Zhang, Kris Brown, Edmon Begoli, and **Steven Bethard** (July 2020). “[Unified Medical Language System resources improve sieve-based generation and Bidirectional Encoder Representations from Transformers \(BERT\)–based ranking for concept normalization](#)”. In: *Journal of the American Medical Informatics Association*.
- Laparra, Egoitz, **Steven Bethard**, and Timothy A Miller (Apr. 2020). “[Rethinking domain adaptation for machine learning over clinical language](#)”. In: *JAMIA Open*.
- Lin, Chen, **Steven Bethard**, Dmitriy Dligach, Farig Sadeque, Guergana Savova, and Timothy A Miller (Feb. 2020). “[Does BERT need domain adaptation for clinical negation detection?](#)” In: *Journal of the American Medical Informatics Association* 27.4, pp. 584–591.
- Laparra, Egoitz, Dongfang Xu, and **Steven Bethard** (May 2018). “[From Characters to Time Intervals: New Paradigms for Evaluation and Neural Parsing of Time Normalizations](#)”. In: *Transactions of the Association for Computational Linguistics* 6, pp. 343–356.
- Osborne, John D., Matthew B. Neu, Maria I. Danila, Tamar Solorio, and **Steven J. Bethard** (Jan. 2018). “[CUILESS2016: a clinical corpus applying compositional normalization of text mentions](#)”. In: *Journal of Biomedical Semantics* 9.1, p. 2.
- Miller, Timothy, Dmitriy Dligach, **Steven Bethard**, Chen Lin, and Guergana Savova (2017). “[Towards generalizable entity-centric clinical coreference resolution](#)”. In: *Journal of Biomedical Informatics* 69, pp. 251–258.
- Lin, Chen, Dmitriy Dligach, Timothy A Miller, **Steven Bethard**, and Guergana K Savova (Mar. 2016). “[Multilayered temporal modeling for the clinical domain](#)”. In: *Journal of the American Medical Informatics Association* 23.2, pp. 387–395.
- Osborne, John D, Matthew Wyatt, Andrew O Westfall, James Willig, **Steven Bethard**, and Geoff Gordon (Mar. 2016). “[Efficient identification of nationally mandated reportable cancer cases using natural language processing and machine learning](#)”. In: *Journal of the American Medical Informatics Association*.
- Mulder, Wim De, **Steven Bethard**, and Marie-Francine Moens (Mar. 2015). “[A survey on the application of recurrent neural networks to statistical language modeling](#)”. In: *Computer Speech & Language* 30.1, pp. 61–98.
- Chambers, Nathanael, Taylor Cassidy, Bill McDowell, and **Steven Bethard** (Oct. 2014). “[Dense Event Ordering with a Multi-Pass Architecture](#)”. In: *Transactions of the Association for Computational Linguistics* 2, pp. 273–284.
- Sultan, Md. Arafat, **Steven Bethard**, and Tamara Sumner (May 2014). “[Back to Basics for Monolingual Alignment: Exploiting Word Similarity and Contextual Evidence](#)”. In: *Transactions of the Association for Computational Linguistics* 2, pp. 219–230.
- Styler IV, William F., **Steven Bethard**, Sean Finan, Martha Palmer, Sameer Pradhan, Piet C. de Groen, Brad Erickson, Timothy Miller, Chen Lin, Guergana Savova, and James Pustejovsky (Apr. 2014). “[Temporal](#)”.

- [Annotation in the Clinical Domain](#)". In: *Transactions of the Association for Computational Linguistics* 2, pp. 143–154.
- Pathak, Jyotishman, Kent R Bailey, Calvin E Beebe, **Steven Bethard**, David S Carrell, Pei J Chen, Dmitriy Dligach, Cory M Endle, Lacey A Hart, Peter J Haug, Stanley M Huff, Vinod C Kaggal, Dingcheng Li, Hongfang Liu, Kyle Marchant, James Masanz, Timothy Miller, Thomas A Oniki, Martha Palmer, Kevin J Peterson, Susan Rea, Guergana K Savova, Craig R Stancl, Sunghwan Sohn, Harold R Solbrig, Dale B Suesse, Cui Tao, David P Taylor, Les Westberg, Stephen Wu, Ning Zhuo, and Christopher G Chute (Nov. 2013). "[Normalization and standardization of electronic health records for high-throughput phenotyping: the SHARPN consortium](#)". In: *Journal of the American Medical Informatics Association* 20.e2, e341–e348.
- Dligach, Dmitriy, **Steven Bethard**, Lee Becker, Timothy Miller, and Guergana K. Savova (Oct. 2013). "[Discovering body site and severity modifiers in clinical texts](#)". In: *Journal of the American Medical Informatics Association*.
- Wetzler, Philipp, **Steven Bethard**, Heather Leary, Kirsten Butcher, Soheil Danesh Bahreini, Jin Zhao, James H. Martin, and Tamara Sumner (Oct. 2013). "[Characterizing and Predicting the Multifaceted Nature of Quality in Educational Web Resources](#)". In: *ACM Transactions on Interactive Intelligent Systems* 3.3, 15:1–15:25.
- Levin, Michael, Stefan Krawczyk, **Steven Bethard**, and Dan Jurafsky (May 2012). "[Citation-based bootstrapping for large-scale author disambiguation](#)". In: *Journal of the American Society for Information Science and Technology* 63.5, pp. 1030–1047.
- Bethard, Steven**, Zhiyong Lu, James H. Martin, and Lawrence Hunter (June 2008). "[Semantic Role Labeling for Protein Transport Predicates](#)". In: *BMC Bioinformatics* 9.1, p. 277.
- Bethard, Steven**, James H. Martin, and Sara Klingenstein (Dec. 2007). "[Finding Temporal Structure in Text: Machine Learning of Syntactic Temporal Relations](#)". In: *International Journal of Semantic Computing (IJSC)* 1.4, pp. 441–458.

#### REFEREED CONFERENCE ARTICLES

- Laparra, Egoitz and **Steven Bethard** (Dec. 2020). "[A Dataset and Evaluation Framework for Complex Geographical Description Parsing](#)". In: *Proceedings of the 28th International Conference on Computational Linguistics*. [Acceptance rate 35%], pp. 936–948.
- Xu, Dongfang, Zeyu Zhang, and **Steven Bethard** (July 2020). "[A Generate-and-Rank Framework with Semantic Type Regularization for Biomedical Concept Normalization](#)". In: *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*. [Acceptance rate 23%], pp. 8452–8464.
- Yadav, Vikas, **Steven Bethard**, and Mihai Surdeanu (July 2020). "[Having Your Cake and Eating It Too: Training Neural Retrieval for Language Inference without Losing Lexical Match](#)". In: *Proceedings of the 43rd International ACM SIGIR Conference on Research and Development in Information Retrieval*. SIGIR '20. [Acceptance rate 26%], pp. 1625–1628.
- Yadav, Vikas, **Steven Bethard**, and Mihai Surdeanu (July 2020). "[Unsupervised Alignment-based Iterative Evidence Retrieval for Multi-hop Question Answering](#)". In: *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*. [Acceptance rate 23%], pp. 4514–4525.
- Zhao, Yiyun and **Steven Bethard** (July 2020). "[How does BERT's attention change when you fine-tune? An analysis methodology and a case study in negation scope](#)". In: *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*. [Acceptance rate 23%], pp. 4729–4747.
- Yadav, Vikas, **Steven Bethard**, and Mihai Surdeanu (Nov. 2019). "[Quick and \(not so\) Dirty: Unsupervised Selection of Justification Sentences for Multi-hop Question Answering](#)". In: *Proceedings of the 2019*

- Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP)*. [Acceptance rate 23%], pp. 2578–2589. Sadeque, Farig, Stephen Rains, Yotam Shmargad, Kate Kenski, Kevin Coe, and **Steven Bethard** (June 2019). “[Incivility Detection in Online Comments](#)”. In: *Proceedings of the Eighth Joint Conference on Lexical and Computational Semantics (\*SEM 2019)*. [Acceptance rate 33%], pp. 283–291.
- Xu, Dongfang, Egoitz Laparra, and **Steven Bethard** (June 2019). “[Pre-trained Contextualized Character Embeddings Lead to Major Improvements in Time Normalization: a Detailed Analysis](#)”. In: *Proceedings of the Eighth Joint Conference on Lexical and Computational Semantics (\*SEM 2019)*. [Acceptance rate 33%], pp. 68–74.
- Yadav, Vikas, **Steven Bethard**, and Mihai Surdeanu (June 2019). “[Alignment over Heterogeneous Embeddings for Question Answering](#)”. In: *Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers)*. [Acceptance rate 26%], pp. 2681–2691.
- Yadav, Vikas and **Steven Bethard** (Aug. 2018). “[A Survey on Recent Advances in Named Entity Recognition from Deep Learning models](#)”. In: *Proceedings of the 27th International Conference on Computational Linguistics*. [Acceptance rate 37%], pp. 2145–2158.
- Yadav, Vikas, Rebecca Sharp, and **Steven Bethard** (June 2018). “[Deep Affix Features Improve Neural Named Entity Recognizers](#)”. In: *Proceedings of the Seventh Joint Conference on Lexical and Computational Semantics*. [Acceptance rate 29%], pp. 167–172.
- Pradhan, Ligaj, Chengcui Zhang, **Steven Bethard**, and Xin Chen (Apr. 2018). “[Embedding User Behavioral Aspect in TF-IDF Like Representation](#)”. In: *2018 IEEE Conference on Multimedia Information Processing and Retrieval (MIPR)*. [Acceptance rate 20%], pp. 262–267.
- Sadeque, Farig, Dongfang Xu, and **Steven Bethard** (Feb. 2018). “[Measuring the Latency of Depression Detection in Social Media](#)”. In: *Proceedings of the Eleventh ACM International Conference on Web Search and Data Mining*. WSDM ’18. [Acceptance rate 16%], pp. 495–503.
- Do, Quynh Ngoc Thi, **Steven Bethard**, and Marie-Francine Moens (Nov. 2017). “[Improving Implicit Semantic Role Labeling by Predicting Semantic Frame Arguments](#)”. In: *Proceedings of the Eighth International Joint Conference on Natural Language Processing (Volume 1: Long Papers)*. [Acceptance rate 31%], pp. 90–99.
- Pradhan, Ligaj, Chengcui Zhang, and **Steven Bethard** (Aug. 2017). “[Infusing Latent User-Concerns from User Reviews into Collaborative Filtering](#)”. In: *2017 IEEE International Conference on Information Reuse and Integration (IRI)*. [Acceptance rate 29%], pp. 471–477.
- Dligach, Dmitriy, Timothy Miller, Chen Lin, **Steven Bethard**, and Guergana Savova (Apr. 2017). “[Neural Temporal Relation Extraction](#)”. In: *Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 2, Short Papers*. [Acceptance rate 24%], pp. 746–751.
- Viani, Natalia, Timothy A. Miller, Dmitriy Dligach, **Steven Bethard**, Carlo Napolitano, Silvia G. Priori, Riccardo Bellazzi, Lucia Sacchi, and Guergana K. Savova (2017). “[Recurrent Neural Network Architectures for Event Extraction from Italian Medical Reports](#)”. In: *Artificial Intelligence in Medicine: 16th Conference on Artificial Intelligence in Medicine, AIME 2017, Vienna, Austria, June 21-24, 2017, Proceedings*. Ed. by Annette ten Teije, Christian Popow, John H. Holmes, and Lucia Sacchi. [Acceptance rate 39%], pp. 198–202.
- Do, Quynh Ngoc Thi, **Steven Bethard**, and Marie-Francine Moens (Dec. 2016). “[Facing the most difficult case of Semantic Role Labeling: A collaboration of word embeddings and co-training](#)”. In: *Proceedings of COLING 2016, the 26th International Conference on Computational Linguistics: Technical Papers*. [Acceptance rate 32%], pp. 1275–1284.
- Sapkota, Upendra, Thamar Solorio, Manuel Montes, and **Steven Bethard** (Aug. 2016). “[Domain Adaptation for Authorship Attribution: Improved Structural Correspondence Learning](#)”. In: *Proceedings of the 54th*

- Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*. [Acceptance rate 28%], pp. 2226–2235.
- Pradhan, Ligaj, Chengcui Zhang, and **Steven Bethard** (July 2016). “[Towards Extracting Coherent User Concerns and Their Hierarchical Organization from User Reviews](#)”. In: *2016 IEEE 17th International Conference on Information Reuse and Integration (IRI)*. [Acceptance rate 26%], pp. 582–590.
- Bethard, Steven** and Jonathan Parker (May 2016). “[A Semantically Compositional Annotation Scheme for Time Normalization](#)”. In: *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC 2016)*. Ed. by Nicoletta Calzolari (Conference Chair), Khalid Choukri, Thierry Declerck, Marko Grobelnik, Bente Maegaard, Joseph Mariani, Asuncion Moreno, Jan Odijk, and Stelios Piperidis. [Acceptance rate 60%].
- Shrestha, Prasha, Nicolas Rey-Villamizar, Farig Sadeque, Ted Pedersen, **Steven Bethard**, and Tamar Solorio (May 2016). “[Age and Gender Prediction on Health Forum Data](#)”. In: *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC 2016)*. Ed. by Nicoletta Calzolari (Conference Chair), Khalid Choukri, Thierry Declerck, Marko Grobelnik, Bente Maegaard, Joseph Mariani, Asuncion Moreno, Jan Odijk, and Stelios Piperidis. [Acceptance rate 60%].
- Do, Quynh Ngoc Thi, **Steven Bethard**, and Marie-Francine Moens (Sept. 2015). “[Adapting Coreference Resolution for Narrative Processing](#)”. In: *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing*. [Acceptance rate 24%], pp. 2262–2267.
- Sultan, Md Arafat, **Steven Bethard**, and Tamara Sumner (Sept. 2015). “[Feature-Rich Two-Stage Logistic Regression for Monolingual Alignment](#)”. In: *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing*. [Acceptance rate 24%], pp. 949–959.
- Sapkota, Upendra, **Steven Bethard**, Manuel Montes, and Tamar Solorio (June 2015). “[Not All Character N-grams Are Created Equal: A Study in Authorship Attribution](#)”. In: *Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*. [Acceptance rate 26%], pp. 93–102.
- Sultan, Md. Arafat, **Steven Bethard**, and Tamara Sumner (Sept. 2014). “[Towards automatic identification of core concepts in educational resources](#)”. In: *2014 IEEE/ACM Joint Conference on Digital Libraries (JCDL)*. [Acceptance rate 29%], pp. 379–388.
- Sapkota, Upendra, Tamar Solorio, Manuel Montes, **Steven Bethard**, and Paolo Rosso (Aug. 2014). “[Cross-Topic Authorship Attribution: Will Out-Of-Topic Data Help?](#)” In: *Proceedings of COLING 2014, the 25th International Conference on Computational Linguistics: Technical Papers*. [Acceptance rate 32%], pp. 1228–1237.
- Cassidy, Taylor, Bill McDowell, Nathanael Chambers, and **Steven Bethard** (June 2014). “[An Annotation Framework for Dense Event Ordering](#)”. In: *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers)*. [Acceptance rate 25%], pp. 501–506.
- Lin, Chen, Timothy Miller, Alvin Kho, **Steven Bethard**, Dmitriy Dligach, Sameer Pradhan, and Guergana Savova (June 2014). “[Descending-Path Convolution Kernel for Syntactic Structures](#)”. In: *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers)*. [Acceptance rate 25%], pp. 81–86.
- Bethard, Steven**, Philip Ogren, and Lee Becker (May 2014). “[ClearTK 2.0: Design Patterns for Machine Learning in UIMA](#)”. In: *Proceedings of the Ninth International Conference on Language Resources and Evaluation (LREC’14)*. [Acceptance rate 61%], pp. 3289–3293.
- Bursztein, Elie, Angelique Moscicki, Celine Fabry, **Steven Bethard**, John C. Mitchell, and Dan Jurafsky (Apr. 2014). “[Easy Does It: More Usable CAPTCHAs](#)”. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. CHI ’14. [Acceptance rate 23%], pp. 2637–2646.



- Bethard, Steven** (Oct. 2013). “A Synchronous Context Free Grammar for Time Normalization”. In: *Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing*. [Acceptance rate 24%], pp. 821–826.
- Okoye, Ifeyinwa, Tamara Sumner, and **Steven Bethard** (July 2013). “Automatic extraction of core learning goals and generation of pedagogical sequences through a collection of digital library resources”. In: *Proceedings of the 13th ACM/IEEE-CS joint conference on Digital libraries*. JCDL '13. [Acceptance rate 29%], pp. 67–76.
- Kolomiyets, Oleksandr, **Steven Bethard**, and Marie-Francine Moens (July 2012). “Extracting Narrative Timelines as Temporal Dependency Structures”. In: *Proceedings of the 50th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*. [Acceptance rate 19%], pp. 88–97.
- Bethard, Steven**, Oleksandr Kolomiyets, and Marie-Francine Moens (May 2012). “Annotating Story Timelines as Temporal Dependency Structures”. In: *Proceedings of the Eight International Conference on Language Resources and Evaluation (LREC'12)*. [Acceptance rate 70%], pp. 2721–2726.
- Jans, Bram, **Steven Bethard**, Ivan Vulić, and Marie-Francine Moens (Apr. 2012). “Skip N-grams and Ranking Functions for Predicting Script Events”. In: *Proceedings of the 13th Conference of the European Chapter of the Association for Computational Linguistics*. [Acceptance rate 27%], pp. 336–344.
- Kolomiyets, Oleksandr, **Steven Bethard**, and Marie-Francine Moens (June 2011). “Model-Portability Experiments for Textual Temporal Analysis”. In: *Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies*. [Acceptance rate 26%], pp. 271–276.
- Gusev, Andrey, Nathanael Chambers, Divye Raj Khilnani, Pranav Khaitan, **Steven Bethard**, and Dan Jurafsky (Jan. 2011). “Using Query Patterns to Learn the Duration of Events”. In: *International Conference on Computational Semantics*. [Acceptance rate 42%], pp. 145–154.
- Bethard, Steven** and Dan Jurafsky (Oct. 2010). “Who Should I Cite? Learning Literature Search Models from Citation Behavior”. In: *ACM Conference on Information and Knowledge Management*. [Acceptance rate 13%], pp. 609–618.
- Bursztein, Elie, **Steven Bethard**, John C. Mitchell, Dan Jurafsky, and Celine Fabry (May 2010). “How Good are Humans at Solving CAPTCHAs? A Large Scale Evaluation”. In: *IEEE Symposium on Security and Privacy*. [Acceptance rate 10%], pp. 399–413.
- Savova, Guergana, **Steven Bethard**, Will Styler, James H. Martin, Martha Palmer, James Masanz, and Wayne Ward (Nov. 2009). “Towards Temporal Relation Discovery from the Clinical Narrative”. In: *American Medical Informatics Association Annual Symposium*. [Acceptance rate 47%], pp. 568–572.
- Bethard, Steven**, Soumya Ghosh, James H. Martin, and Tamara Sumner (June 2009). “Topic model methods for automatically identifying out-of-scope resources”. In: *JCDL '09: Proceedings of the 9th ACM/IEEE-CS Joint Conference on Digital Libraries*. [Acceptance rate 28%], pp. 19–28.
- Bethard, Steven**, Philipp Wetzler, Kirsten Butcher, James H. Martin, and Tamara Sumner (June 2009). “Automatically characterizing resource quality for educational digital libraries”. In: *JCDL '09: Proceedings of the 9th ACM/IEEE-CS Joint Conference on Digital Libraries*. [Acceptance rate 28%] [Best paper award], pp. 221–230.
- Bethard, Steven** and James H. Martin (June 2008). “Learning Semantic Links from a Corpus of Parallel Temporal and Causal Relations”. In: *Proceedings of 46th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies, Short Papers*. [Acceptance rate 23%], pp. 177–180.
- Bethard, Steven**, William Corvey, Sara Klingenstein, and James H. Martin (May 2008). “Building a Corpus of Temporal-Causal Structure”. In: *Language Resources and Evaluation Conference (LREC)*. [Acceptance rate 70%], pp. 908–915.

- Bethard, Steven**, James H. Martin, and Sara Klingenstein (Sept. 2007). “[Timelines from Text: Identification of Syntactic Temporal Relations](#)”. In: *International Conference on Semantic Computing (ICSC)*, pp. 11–18.
- Bethard, Steven** and James H. Martin (July 2006). “[Identification of Event Mentions and their Semantic Class](#)”. In: *Empirical Methods in Natural Language Processing (EMNLP)*. [Acceptance rate 31%], pp. 146–154.

#### REFEREED WORKSHOP ARTICLES

- Ozler, Kadir Bulut, Kate Kenski, Steve Rains, Yotam Shmargad, Kevin Coe, and **Steven Bethard** (Nov. 2020). “[Fine-tuning for multi-domain and multi-label uncivil language detection](#)”. In: *Proceedings of the Fourth Workshop on Online Abuse and Harms*, pp. 28–33.
- Wright-Bettner, Kristin, Chen Lin, Timothy Miller, **Steven Bethard**, Dmitriy Dligach, Martha Palmer, James H. Martin, and Guergana Savova (Nov. 2020). “[Defining and Learning Refined Temporal Relations in the Clinical Narrative](#)”. In: *Proceedings of the 11th International Workshop on Health Text Mining and Information Analysis*, pp. 104–114.
- González-López, Samuel, **Steven Bethard**, and Aurelio Lopez-Lopez (July 2020). “[Assisting Undergraduate Students in Writing Spanish Methodology Sections](#)”. In: *Proceedings of the Fifteenth Workshop on Innovative Use of NLP for Building Educational Applications*, pp. 115–123.
- Lin, Chen, Timothy Miller, Dmitriy Dligach, Farig Sadeque, **Steven Bethard**, and Guergana Savova (July 2020). “[A BERT-based One-Pass Multi-Task Model for Clinical Temporal Relation Extraction](#)”. In: *Proceedings of the 19th SIGBioMed Workshop on Biomedical Language Processing*, pp. 70–75.
- Bethard, Steven**, Egoitz Laparra, Sophia Wang, Yiyun Zhao, Ragheb Al-Ghezi, Aaron Lien, and Laura López-Hoffman (June 2019). “[Inferring missing metadata from environmental policy texts](#)”. In: *Proceedings of the 3rd Joint SIGHUM Workshop on Computational Linguistics for Cultural Heritage, Social Sciences, Humanities and Literature*, pp. 46–51.
- Lin, Chen, Timothy Miller, Dmitriy Dligach, **Steven Bethard**, and Guergana Savova (June 2019). “[A BERT-based Universal Model for Both Within- and Cross-sentence Clinical Temporal Relation Extraction](#)”. In: *Proceedings of the 2nd Clinical Natural Language Processing Workshop*, pp. 65–71.
- Lin, Chen, Timothy Miller, Dmitriy Dligach, Hadi Amiri, **Steven Bethard**, and Guergana Savova (Oct. 2018). “[Self-training improves Recurrent Neural Networks performance for Temporal Relation Extraction](#)”. In: *Proceedings of the Ninth International Workshop on Health Text Mining and Information Analysis*, pp. 165–176.
- Lin, Chen, Timothy Miller, Dmitriy Dligach, **Steven Bethard**, and Guergana Savova (Aug. 2017). “[Representations of Time Expressions for Temporal Relation Extraction with Convolutional Neural Networks](#)”. In: *BioNLP 2017*, pp. 322–327.
- Miller, Timothy, **Steven Bethard**, Hadi Amiri, and Guergana Savova (Aug. 2017). “[Unsupervised Domain Adaptation for Clinical Negation Detection](#)”. In: *BioNLP 2017*, pp. 165–170.
- Do, Quynh Ngoc Thi, **Steven Bethard**, and Marie-Francine Moens (Nov. 2016). “[Visualizing the Content of a Children’s Story in a Virtual World: Lessons Learned](#)”. In: *Proceedings of the Workshop on Uphill Battles in Language Processing: Scaling Early Achievements to Robust Methods*, pp. 39–42.
- Rey-Villamizar, Nicolas, Prasha Shrestha, Farig Sadeque, **Steven Bethard**, Ted Pedersen, Arjun Mukherjee, and Tamar Solorio (Nov. 2016). “[Analysis of Anxious Word Usage on Online Health Forums](#)”. In: *Proceedings of the Seventh International Workshop on Health Text Mining and Information Analysis*, pp. 37–42.

- Sadeque, Farig, Ted Pedersen, Tamar Solorio, Prasha Shrestha, Nicolas Rey-Villamizar, and **Steven Bethard** (Nov. 2016). “[Why Do They Leave: Modeling Participation in Online Depression Forums](#)”. In: *Proceedings of The Fourth International Workshop on Natural Language Processing for Social Media*, pp. 14–19.
- Lin, Chen, Timothy Miller, Dmitriy Dligach, **Steven Bethard**, and Guergana Savova (Aug. 2016). “[Improving Temporal Relation Extraction with Training Instance Augmentation](#)”. In: *Proceedings of the 15th Workshop on Biomedical Natural Language Processing*, pp. 108–113.
- Rey-Villamizar, Nicolas, Prasha Shrestha, Tamar Solorio, Farig Sadeque, **Steven Bethard**, and Ted Pedersen (June 2016). “[Semi-supervised CLPsych 2016 Shared Task System Submission](#)”. In: *Proceedings of the Third Workshop on Computational Linguistics and Clinical Psychology*, pp. 171–175.
- Sultan, Md Arafat, **Steven Bethard**, and Tamara Sumner (June 2016). “[DLS@CU at SemEval-2016 Task 1: Supervised Models of Sentence Similarity](#)”. In: *Proceedings of the 10th International Workshop on Semantic Evaluation (SemEval-2016)*, pp. 650–655.
- Sadeque, Farig, Tamar Solorio, Ted Pedersen, Prasha Shrestha, and **Steven Bethard** (Sept. 2015). “[Predicting Continued Participation in Online Health Forums](#)”. In: *Proceedings of the Sixth International Workshop on Health Text Mining and Information Analysis*, pp. 12–20.
- Miller, Timothy, **Steven Bethard**, Dmitriy Dligach, Chen Lin, and Guergana Savova (July 2015). “[Extracting Time Expressions from Clinical Text](#)”. In: *Proceedings of BioNLP 15*, pp. 81–91.
- Maharjan, Suraj, Elizabeth Blair, **Steven Bethard**, and Tamar Solorio (June 2015). “[Developing Language-tagged Corpora for Code-switching Tweets](#)”. In: *Proceedings of The 9th Linguistic Annotation Workshop*, pp. 72–84.
- Do, Quynh Ngoc Thi, **Steven Bethard**, and Marie-Francine Moens (Sept. 2014). “[Text Mining for Open Domain Semi-Supervised Semantic Role Labeling](#)”. In: *Proceedings of the 1st International Workshop on Interactions between Data Mining and Natural Language Processing*.
- Miller, Timothy, **Steven Bethard**, Dmitriy Dligach, Sameer Pradhan, Chen Lin, and Guergana Savova (Aug. 2013). “[Discovering Temporal Narrative Containers in Clinical Text](#)”. In: *Proceedings of the 2013 Workshop on Biomedical Natural Language Processing*, pp. 18–26.
- Bethard, Steven**, Ifeyinwa Okoye, Md. Arafat Sultan, Haojie Hang, James H. Martin, and Tamara Sumner (June 2012). “[Identifying science concepts and student misconceptions in an interactive essay writing tutor](#)”. In: *Proceedings of the Seventh Workshop on Building Educational Applications Using NLP*, pp. 12–21.
- Munro, Robert, **Steven Bethard**, Victor Kuperman, Vicky Tzuyin Lai, Robin Melnick, Christopher Potts, Tyler Schnoebelen, and Harry Tily (June 2010). “[Crowdsourcing and language studies: the new generation of linguistic data](#)”. In: *NAACL Workshop on Creating Speech and Language Data With Amazon’s Mechanical Turk*, pp. 122–130.
- Ogren, Philip V., Philipp G. Wetzler, and **Steven J. Bethard** (Sept. 2009). “ClearTK: A Framework for Statistical Natural Language Processing”. In: *Unstructured Information Management Architecture Workshop at the Conference of the German Society for Computational Linguistics and Language Technology*.
- Bursztein, Elie and **Steven Bethard** (Aug. 2009). “[Decaptcha: Breaking 75% of eBay Audio CAPTCHAs](#)”. In: *3rd USENIX Workshop on Offensive Technologies*, p. 8.
- Bethard, Steven**, Vicky Tzuyin Lai, and James H. Martin (June 2009). “[Topic Model Analysis of Metaphor Frequency for Psycholinguistic Stimuli](#)”. In: *Proceedings of the Workshop on Computational Approaches to Linguistic Creativity*, pp. 9–16.
- Ogren, Philip and **Steven Bethard** (June 2009). “[Building Test Suites for UIMA Components](#)”. In: *Proceedings of the Workshop on Software Engineering, Testing, and Quality Assurance for Natural Language Processing (SETQA-NLP 2009)*, pp. 1–4.

- Wetzler, Philipp G, **Steven Bethard**, Kirsten Butcher, James H Martin, and Tamara Sumner (Apr. 2009). “Automatically assessing resource quality for educational digital libraries”. In: *WICOW '09: Proceedings of the 3rd workshop on Information credibility on the web*, pp. 3–10.
- Ogren, Philip V., Philipp G. Wetzler, and **Steven J. Bethard** (May 2008). “ClearTK: A UIMA Toolkit for Statistical Natural Language Processing”. In: *UIMA for NLP workshop at Language Resources and Evaluation Conference (LREC)*.
- Bethard, Steven**, Rodney Nielsen, James H. Martin, Wayne Ward, and Martha Palmer (Mar. 2007). “Semantic integration in learning from text”. In: *AAAI Spring Symposium on Machine Reading*.
- Bethard, Steven**, Hong Yu, Ashley Thornton, Vasileios Hatzivassiloglou, and Dan Jurafsky (Mar. 2004). “Automatic extraction of opinion propositions and their holders”. In: *AAAI Spring Symposium on Exploring Attitude and Affect in Text: Theories and Applications*.
- Pradhan, Sameer S., Gabriel Illouz, Sasha J. Blair-Goldensohn, Andrew Hazen Schlaikjer, Valerie Krugler, Elena Filatova, Pablo A. Duboue, Hong Yu, Rebecca J. Passonneau, **Steven Bethard**, Vasileios Hatzivassiloglou, Wayne Ward, Dan Jurafsky, Kathleen R. McKeown, and James H. Martin (2002). “Building a foundation system for producing short answers to factual questions”. In: *Text REtrieval Conference (TREC)*.

#### REFEREED SHARED TASK ARTICLES

- Kim, Moonsung and **Steven Bethard** (Dec. 2020). “TTUI at SemEval-2020 Task 11: Propaganda Detection with Transfer Learning and Ensembles”. In: *Proceedings of the Fourteenth Workshop on Semantic Evaluation*, pp. 1829–1834.
- Yadav, Vikas, Egoitz Laparra, Ti-Tai Wang, Mihai Surdeanu, and **Steven Bethard** (June 2019). “University of Arizona at SemEval-2019 Task 12: Deep-Affix Named Entity Recognition of Geolocation Entities”. In: *Proceedings of the 13th International Workshop on Semantic Evaluation*, pp. 1319–1323.
- Laparra, Egoitz, Dongfang Xu, Ahmed Elsayed, **Steven Bethard**, and Martha Palmer (June 2018). “SemEval 2018 Task 6: Parsing Time Normalizations”. In: *Proceedings of The 12th International Workshop on Semantic Evaluation*, pp. 88–96.
- Xu, Dongfang, Vikas Yadav, and **Steven Bethard** (May 2018). “UARizona at the MADE1.0 NLP Challenge”. In: *Proceedings of the 1st International Workshop on Medication and Adverse Drug Event Detection*. Ed. by Feifan Liu, Abhyuday Jagannatha, and Hong Yu. Vol. 90. Proceedings of Machine Learning Research, pp. 57–65.
- Sadeque, Farig, Dongfang Xu, and **Steven Bethard** (Sept. 2017). “UARizona at the CLEF eRisk 2017 Pilot Task: Linear and Recurrent Models for Early Depression Detection”. In: *CEUR workshop proceedings: Working Notes of CLEF 2017 - Conference and Labs of the Evaluation Forum*.
- Bethard, Steven**, Guergana Savova, Martha Palmer, and James Pustejovsky (Aug. 2017). “SemEval-2017 Task 12: Clinical TempEval”. In: *Proceedings of the 11th International Workshop on Semantic Evaluation (SemEval-2017)*, pp. 565–572.
- Bethard, Steven**, Guergana Savova, Wei-Te Chen, Leon Derczynski, James Pustejovsky, and Marc Verhagen (June 2016). “SemEval-2016 Task 12: Clinical TempEval”. In: *Proceedings of the 10th International Workshop on Semantic Evaluation (SemEval-2016)*, pp. 1052–1062.
- Bethard, Steven**, Leon Derczynski, Guergana Savova, James Pustejovsky, and Marc Verhagen (June 2015). “SemEval-2015 Task 6: Clinical TempEval”. In: *Proceedings of the 9th International Workshop on Semantic Evaluation (SemEval 2015)*, pp. 806–814.
- Gung, James, John Osborne, and **Steven Bethard** (June 2015). “CUAB: Supervised Learning of Disorders and their Attributes using Relations”. In: *Proceedings of the 9th International Workshop on Semantic Evaluation (SemEval 2015)*, pp. 417–421.

- Sultan, Md Arafat, **Steven Bethard**, and Tamara Sumner (June 2015). “[DLS@CU: Sentence Similarity from Word Alignment and Semantic Vector Composition](#)”. In: *Proceedings of the 9th International Workshop on Semantic Evaluation (SemEval 2015)*. [Winner of the English shared task], pp. 148–153.
- Solorio, Thamar, Elizabeth Blair, Suraj Maharjan, **Steven Bethard**, Mona Diab, Mahmoud Ghoneim, Abdelati Hawwari, Fahad AlGhamdi, Julia Hirschberg, Alison Chang, and Pascale Fung (Oct. 2014). “[Overview for the First Shared Task on Language Identification in Code-Switched Data](#)”. In: *Proceedings of the First Workshop on Computational Approaches to Code Switching*, pp. 62–72.
- Sultan, Md Arafat, **Steven Bethard**, and Tamara Sumner (Aug. 2014). “[DLS@CU: Sentence Similarity from Word Alignment](#)”. In: *Proceedings of the 8th International Workshop on Semantic Evaluation (SemEval 2014)*. [Winner of the shared task], pp. 241–246.
- Bethard, Steven** (June 2013). “[ClearTK-TimeML: A minimalist approach to TempEval 2013](#)”. In: *Second Joint Conference on Lexical and Computational Semantics (\*SEM), Volume 2: Proceedings of the Seventh International Workshop on Semantic Evaluation (SemEval 2013)*. [Winner of the shared task], pp. 10–14.
- Kolomiyets, Oleksandr, Parisa Kordjamshidi, Marie-Francine Moens, and **Steven Bethard** (June 2013). “[SemEval-2013 Task 3: Spatial Role Labeling](#)”. In: *Second Joint Conference on Lexical and Computational Semantics (\*SEM), Volume 2: Proceedings of the Seventh International Workshop on Semantic Evaluation (SemEval 2013)*, pp. 255–262.
- Okoye, Ifeyinwa, **Steven Bethard**, and Tamara Sumner (June 2013). “[CU: Computational Assessment of Short Free Text Answers - A Tool for Evaluating Students’ Understanding](#)”. In: *Second Joint Conference on Lexical and Computational Semantics (\*SEM), Volume 2: Proceedings of the Seventh International Workshop on Semantic Evaluation (SemEval 2013)*, pp. 603–607.
- Sultan, Md. Arafat, **Steven Bethard**, and Tamara Sumner (June 2013). “[DLS@CU-CORE: A Simple Machine Learning Model of Semantic Textual Similarity](#)”. In: *Second Joint Conference on Lexical and Computational Semantics (\*SEM), Volume 1: Proceedings of the Main Conference and the Shared Task: Semantic Textual Similarity*, pp. 176–180.
- Kordjamshidi, Parisa, **Steven Bethard**, and Marie-Francine Moens (June 2012). “[SemEval-2012 Task 3: Spatial Role Labeling](#)”. In: *\*SEM 2012: The First Joint Conference on Lexical and Computational Semantics – Proceedings of the Sixth International Workshop on Semantic Evaluation (SemEval 2012)*, pp. 365–373.
- Bethard, Steven** and James H. Martin (June 2007). “[CU-TMP: Temporal Relation Classification Using Syntactic and Semantic Features](#)”. In: *Proceedings of the Fourth International Workshop on Semantic Evaluations (SemEval-2007)*, pp. 129–132.

#### REFEREED DEMONSTRATION ARTICLES

- Sharp, Rebecca, Adarsh Pyarelal, Benjamin Gyori, Keith Alcock, Egoitz Laparra, Marco A. Valenzuela-Escárcega, Ajay Nagesh, Vikas Yadav, John Bachman, Zheng Tang, Heather Lent, Fan Luo, Mithun Paul, **Steven Bethard**, Kobus Barnard, Clayton Morrison, and Mihai Surdeanu (June 2019). “[Eidos, INDRA, & Delphi: From Free Text to Executable Causal Models](#)”. In: *Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics (Demonstrations)*, pp. 42–47.
- Manning, Christopher, Mihai Surdeanu, John Bauer, Jenny Finkel, **Steven Bethard**, and David McClosky (June 2014). “[The Stanford CoreNLP Natural Language Processing Toolkit](#)”. In: *Proceedings of 52nd Annual Meeting of the Association for Computational Linguistics: System Demonstrations*, pp. 55–60.

#### TECHNICAL REPORTS

- Baker, Kathy, **Steven Bethard**, Michael Bloodgood, Ralf Brown, Chris Callison-Burch, Glen Coppersmith, Bonnie Dorr, Wes Filardo, Kendall Giles, Anni Irvine, Mike Kayser, Lori Levin, Justin Martineau, Jim

Mayfield, Scott Miller, Aaron Phillips, Andrew Philpot, Christine Piatko, Lane Schwartz, and David Zajic (Jan. 2010). *Semantically Informed Machine Translation (SIMT)*. Tech. rep. Johns Hopkins University Human Language Technology Center of Excellence.

## THESIS

**Bethard, Steven** (Dec. 2007). “[Finding Event, Temporal and Causal Structure in Text: A Machine Learning Approach](#)”. PhD thesis. University of Colorado at Boulder.

## SCHOLARLY PRESENTATIONS

### COLLOQUIA

- 6 Apr 2018 University of Arizona (CogSci): “Teaching Computers the Language of Time”
- 16 Mar 2018 University of Arizona (MIS): “Parsing the Language of Time”
- 22 Apr 2016 University of Arizona (iSchool): “Parsing the Language of Time”
- 28 Mar 2016 University of Southern Mississippi: “Parsing the Language of Time”
- 3 Mar 2016 University of South Alabama: “Parsing the Language of Time”
- 9 Feb 2016 University of Colorado Boulder: “Parsing the Language of Time”
- 21 Jan 2016 University of California Davis: “Parsing the Language of Time”
- 18 Mar 2015 Northeastern University: “Extracting Timelines from Unstructured Text”
- 20 Feb 2015 Tufts University: “Extracting Timelines from Unstructured Text”
- 9 Jul 2014 i2b2 Academic Users’ Group Annual Meeting: “State of the Art in Timeline Extraction”
- 18 Jun 2012 University of Arizona: “Extracting Timelines from Unstructured Text”
- 7 Mar 2012 Radboud University Nijmegen: “Extracting Timelines from Unstructured Text”
- 3 Feb 2012 University of Chicago: “Extracting Timelines from Unstructured Text”
- 27 Jan 2012 Indiana University: “Extracting Timelines from Unstructured Text”
- 14 Jan 2011 University of Arizona: “Exploring ERP effects of metaphor via crowdsourcing”
- 15 Jul 2008 Johns Hopkins University: “Extracting event structure: building models and corpora”
- 12 Jun 2008 University of Pittsburgh: “Building corpora to support the semantic analysis of text”
- 9 Feb 2007 Western State College: “Meaning from Text: Teaching Computers to Read”
- 26 Feb 2007 University of Texas at Dallas: “Timelines from Text: Research and Resources”
- 6 Apr 2010 Xerox-PARC: “Learning the Temporal Ordering of Textual Events”
- 1 Jun 2010 NSF workshop on Chinese temporal and discourse annotation: “Mechanical Turk and Web Counts: Collecting and Using Distributional Information about Event Durations”

### CONFERENCES

- 16 Feb 2019 2019 Annual Meeting of the American Association for the Advancement of Science (AAAS-2019), Machine Learning and Human Language scientific session: “Human Annotation and Machine Learning in Understanding the Language of Time”
- 5 Nov 2016 2016 Conference on Empirical Methods in Natural Language Processing (EMNLP-2016) Workshop on Uphill Battles in Language Processing: “Visualizing the Content of a Children’s Story in a Virtual World: Lessons Learned”
- 16 Jun 2016 10th International Workshop on Semantic Evaluation (SemEval-2016): “SemEval-2016 Task 12: Clinical TempEval”
- 5 Jun 2015 9th International Workshop on Semantic Evaluation (SemEval-2015): “SemEval-2015 Task 6: Clinical TempEval”

- 4 Jun 2015 9th International Workshop on Semantic Evaluation (SemEval-2015): “CUAB: Supervised Learning of Disorders and their Attributes using Relations”
- 29 May 2014 Ninth International Conference on Language Resources and Evaluation (LREC 2014): “ClearTK 2.0: Design Patterns for Machine Learning in UIMA”
- 19 Oct 2013 Conference on Empirical Methods in Natural Language Processing (EMNLP 2013): “A Synchronous Context Free Grammar for Time Normalization”
- 14 Jun 2013 7th International Workshop on Semantic Evaluation (SemEval-2013): “ClearTK-TimeML: A minimalist approach to TempEval 2013”
- 24 May 2012 Eighth International Conference on Language Resources and Evaluation (LREC 2012): “Annotating Story Timelines as Temporal Dependency Structures”
- 6 Jun 2012 NAACL 2010 Workshop on Creating Speech and Language Data with Amazon’s Mechanical Turk: “Crowdsourcing and language studies: the new generation of linguistic data”
- 17 Jun 2009 Joint Conference on Digital Libraries (JCDL 2009): “Automatically characterizing resource quality for educational digital libraries”
- 16 Jun 2009 Joint Conference on Digital Libraries (JCDL 2009): “Topic Model Methods for Automatically Identifying Out-of-Scope Resources”
- 4 Jun 2009 NAACL-HLT 2009 Workshop on Computational Approaches to Linguistic Creativity (CALC-09): “Topic Model Analysis of Metaphor Frequency for Psycholinguistic Stimuli”
- 17 Jun 2008 46th Annual Meeting of the Association for Computational Linguistics: “Learning Semantic Links from a Corpus of Parallel Temporal and Causal Relations”
- 28 May 2008 Sixth International Conference on Language Resources and Evaluation (LREC 2008): “Building a Corpus of Temporal-Causal Structure”
- 17 Sep 2007 First IEEE International Conference on Semantic Computing (ICSC 2007) “Timelines from Text: Identification of Syntactic Temporal Relations”
- 24 Jun 2007 Fourth International Workshop on Semantic Evaluations (SemEval-2007): “CU-TMP: Temporal Relation Classification Using Syntactic and Semantic Features”
- 26 Mar 2007 AAAI Spring Symposium on Machine Reading: “Semantic integration in learning from text”
- 22 Jul 2006 Empirical Methods in Natural Language Processing (EMNLP 2006): “Identification of Event Mentions and their Semantic Class”
- 22 Mar 2004 AAAI Spring Symposium on Exploring Attitude and Affect in Text: “Automatic extraction of opinion propositions and their holders”

## AWARDED GRANTS AND CONTRACTS

### FEDERAL

- 2018-09 – 2021-08 \$1,500,000 PI: López-Hoffman US National Science Foundation, SBE, SMA  
[A Data Science Platform and Mechanisms for Its Sustainability](#)  
Role: Co-PI
- 2018-09 – 2021-07 \$1,250,000 PI: Miller US National Institutes of Health, NLM, R01  
[Automated Domain Adaptation for Clinical Natural Language Processing](#)  
Role: Site PI
- 2017-12 – 2021-11 \$4,676,602 PI: Surdeanu Defense Advanced Research Projects Agency  
[GRASP: Global Reading and Assembly for Semantic, Probabilistic World Models](#)  
Role: Co-PI
- 2016-01 – 2019-12 \$3,300,000 PI: Elhadad US National Institutes of Health, BD2K R01  
[Extended Methods and Software Development for Health NLP](#)

Role: Site PI  
 2015-09 – 2023-05 \$2,007,965 PI: Savova US National Institutes of Health, NLM, R01  
[Temporal Relation Discovery for Clinical Text](#)  
 Role: Site PI  
 2013-03 – 2014-01 \$19,000 PI: Bethard US National Science Foundation, CISE, IIS  
[ACL 2013 Student Research Workshop](#)  
 Role: Principal Investigator  
 2012-09 – 2015-11 €1,993,326 PI: Moens EU FP7 ICT FET-Open  
[Machine Understanding for Interactive Storytelling](#)  
 Role: Co-PI  
 2007-09 – 2008-09 \$138,213 PI: Martin US National Science Foundation, CISE, IIS  
[SGER: Relevance Models for Digital Repository Management](#)  
 Role: Senior Personnel  
 2006-08 – 2006-12 \$10,000 US Department of Homeland Security  
*Dissertation Grant Award*  
 2003-08 – 2006-08 \$82,800 plus tuition US Department of Homeland Security  
*Graduate Fellowship*

#### INSTITUTIONAL

2015-11 – 2017-11 \$132,557 PI: Wells University of Alabama Health Services Foundation  
[Natural Language Processing to Identify COPD Exacerbations in Real Time](#)  
 Role: Co-Investigator

#### MENTORING

##### POSTDOCTORAL ADVISOR

Egoitz Laparra, School of Information, University of Arizona, 2017-2019  
 Cynthia M Kroeger, Nutrition Obesity Research Center, University of Alabama at Birmingham, 2015-2016  
 NIH F32 “Research-reporting fidelity within dietary weight-loss supplement literature”

##### THESIS ADVISOR

Yiyun Zhao, Ph.D., Linguistics, University of Arizona, expected 2022  
 Vikas Yadav, Ph.D., Information, University of Arizona, expected 2020  
 Dongfang Xu, Ph.D., Information, University of Arizona, expected 2020  
 Farig Sadeque, Ph.D., Information, University of Arizona, 2019  
 Thesis: *User behavior in social media: engagement, incivility, and depression*  
 John Osborne, Ph.D., Computer and Information Sciences, U. of Alabama at Birmingham, 2016  
 Thesis: *Machine Learning of Composite Concepts and the Alleviation of The Content Completeness Problem in Text Mention Normalization*  
 Upendra Sapkota, Ph.D., Computer and Information Sciences, U. of Alabama at Birmingham, 2015  
 Thesis: *Domain adaptation for authorship attribution*

##### THESIS CO-ADVISOR

Rongbing Xie, Ph.D., Public Health, University of Alabama at Birmingham, 2017  
 Thesis: *Modeling depression treatment strategies for human immunodeficiency virus (HIV) positive patients*  
 Quynh Thi Ngoc Do, Ph.D., Computer Science, KU Leuven, 2017  
 Thesis: *Domain adaptation in natural language processing for visualizing a children’s story in a virtual*



*world*

Bram Jans, M.S., Computer Science, KU Leuven, 2011

Thesis: *Construction and evaluation of databases of narrative event chains*

Saurabh Shekhar Verma, M.S., Artificial Intelligence, KU Leuven, 2011

Thesis: *Identification and Classification of Temporally Relevant Events in Text*

Carine Yu, M.S., Artificial Intelligence, KU Leuven, 2011

Thesis: *The Bedtime Story Generator*

#### MEMBER OF THESIS COMMITTEE

Md. Arafat Sultan, Ph.D., Computer Science, University of Colorado Boulder, 2016

Thesis: *Short-Text Semantic Similarity: Algorithms and Applications*

Samuel González López, Ph.D., Computer Science, I. N. de Astrofísica, Óptica y Electrónica, Mexico, 2015

Thesis: *Linguistic Analysis of Research Drafts of Undergraduate Students*

Ralph Frank McSweeney IV, M.S., Computer and Information Sciences, U. of Alabama at Birmingham, 2015

Thesis: *Malware Detection through Disassembled Function Analysis*

Ifeyinwa Okoye, Ph.D., Computer Science, University of Colorado Boulder, 2013

Thesis: *Applying the theory of conceptual change to improve students' understanding of science concepts with an educational recommender system*

Oleksandr Kolomiyets, Ph.D., Computer Science, KU Leuven, 2012

Thesis: *Algorithms for Temporal Information Processing of Text and their Applications*

Raquel Mochales Palau, Ph.D., Computer Science, KU Leuven, 2011

Thesis: *Automatic Detection and Classification of Argumentation in a Legal Case*

#### COURSES TAUGHT

|         |                |   |              |         |
|---------|----------------|---|--------------|---------|
| 2019-Fa | Instructor     | <a href="#">ISTA 457 / INFO 557: Neural Networks</a>                      | 9 undergrad  | 47 grad |
| 2019-Sp | Instructor     | <a href="#">LING 439/539: Statistical Natural Language Processing</a>     | 13 undergrad | 31 grad |
| 2018-Fa | Instructor     | <a href="#">ISTA 457 / INFO 557: Neural Networks</a>                      | 10 undergrad | 21 grad |
| 2018-Sp | Instructor     | <a href="#">ISTA 457 / INFO 557: Neural Networks</a>                      | 8 undergrad  | 26 grad |
| 2017-Sp | Instructor     | <a href="#">ISTA 116: Statistical Foundations for the Information Age</a> | 64 undergrad |         |
| 2016-Fa | Instructor     | <a href="#">ISTA 116: Statistical Foundations for the Information Age</a> | 59 undergrad |         |
| 2016-Sp | Instructor     | <a href="#">CS 460/660/760: Artificial Intelligence</a>                   | 12 undergrad | 9 grad  |
| 2015-Fa | Instructor     | <a href="#">CS 201: Introduction to Programming</a>                       | 48 undergrad |         |
| 2015-Fa | Instructor     | <a href="#">CS 499: Senior Capstone</a>                                   | 25 undergrad |         |
| 2015-Sp | Instructor     | <a href="#">CS 460/660/760: Artificial Intelligence</a>                   | 9 undergrad  | 19 grad |
| 2014-Fa | Instructor     | <a href="#">CS 201: Introduction to Programming</a>                       | 63 undergrad |         |
| 2014-Fa | Instructor     | <a href="#">CS 499: Senior Capstone</a>                                   | 16 undergrad |         |
| 2014-Sp | Instructor     | <a href="#">CS 460/660/760: Artificial Intelligence</a>                   | 4 undergrad  | 24 grad |
| 2013-Fa | Instructor     | <a href="#">CS 499: Senior Capstone</a>                                   | 5 undergrad  |         |
| 2008-Fa | Instructor     | <a href="#">CSCI 3202: Introduction to Artificial Intelligence</a>        | 57 undergrad |         |
| 2002-Sp | Section Leader | <a href="#">CSC 345: Analysis of Discrete Structures</a>                  | 20 undergrad |         |
| 2001-Fa | Section Leader | <a href="#">CSC 245: Introduction to Discrete Structures</a>              | 20 undergrad |         |
| 2001-Sp | Section Leader | <a href="#">CSC 335: Object-Oriented Programming and Design</a>           | 20 undergrad |         |
| 2000-Fa | Section Leader | <a href="#">CSC 227: Program Design and Development</a>                   | 20 undergrad |         |
| 2000-Sp | Section Leader | <a href="#">CSC 127a: Introduction to Computer Science</a>                | 20 undergrad |         |