

Steven Bethard

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RESEARCH INTERESTS

Natural language processing, machine learning, and information retrieval theory and applications, including constructing timelines from unstructured text, building information extraction models for health informatics, and automating educational feedback for personalized learning.

CHRONOLOGY OF EDUCATION

2011-09 – 2013-08	Postdoc	Institute of Cognitive Science, University of Colorado
2010-09 – 2011-08	Postdoc	Department of Computer Science, KU Leuven
2009-06 – 2009-08	Postdoc	Human Language Technology Center of Excellence, Johns Hopkins
2009-01 – 2010-08	Postdoc	Department of Computer Science, Stanford University
2008-01 – 2008-12	Postdoc	Institute of Cognitive Science, University of Colorado
2002-08 – 2007-12	Ph.D.	Computer Science and Cognitive Science, University of Colorado
1998-08 – 2002-05	B.S., B.A.	Computer Science, Mathematics, Linguistics, University of Arizona

CHRONOLOGY OF EMPLOYMENT

2016-08 – present	Assistant Professor	University of Arizona, School of Information
2013-08 – 2016-08	Assistant Professor	U. Alabama at Birmingham, Computer and Information Sciences
2011-10 – 2015-10	Visiting Professor	KU Leuven Department of Computer 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), ACM/IEEE Joint Conference on Digital Libraries
2008-12 Daniel Henkel Service Award, CU Office of International Education
2002-03 NSF Graduate Research Fellowship Honorable Mention
1998-08 Flinn Scholar (1998–2002)
1998-08 National Merit Scholar

SERVICE/OUTREACH

LOCAL/STATE OUTREACH

Site coordinator, North American Computational Linguistics Olympiad: 2015, 2016

NATIONAL/INTERNATIONAL SERVICE: COMMITTEES

SemEval representative, Special Interest Group on the Lexicon (SIGLEX) board: 2016, 2017, 2018

NATIONAL/INTERNATIONAL SERVICE: CONFERENCE ORGANIZATION

Co-Chair, International Workshop on Semantic Evaluation (SemEval): 2016, 2017, 2018

Organizer, Clinical TempEval shared task: 2015, 2016, 2017
Area chair, Annual Meeting of the Association for Computational Linguistics (ACL): 2015, 2016
Organizer, Workshop on Computational Approaches to Causality in Language: 2014
Publication Chair, Empirical Methods in Natural Language Processing (EMNLP): 2013
Faculty advisor, ACL Student Research Workshop: 2013
Organizer, SemEval Spatial Role Labeling Task: 2012, 2103
Mentor, ACL Student Research Workshop: 2011, 2012
Organizer, American Medical Informatics Association Virtual Journal Club on Temporal Reasoning: 2011

NATIONAL/INTERNATIONAL SERVICE: GRANT REVIEWING

Israel Science Foundation (ISF), Individual Research Grants: 2017
Netherlands Organization for Scientific Research (NWO), Council for the Humanities: 2017
Swiss National Science Foundation, Division of Mathematics, Physical and Engineering Sciences: 2016
US National Science Foundation, Division of Information and Intelligent Systems: 2013, 2015

NATIONAL/INTERNATIONAL SERVICE: JOURNAL REVIEWING

Transactions of the Association for Computational Linguistics: 2016-2018
Cognition: 2013, 2015
Computational Linguistics (CL): 2014
Journal of the American Medical Informatics Association (JAMIA): 2014
Transactions on Asian Language Information Processing (TALIP): 2013, 2014
Journal of Artificial Intelligence Research (JAIR): 2011, 2012, 2013
Journal of Language Modeling (JLM): 2013
Journal of Natural Language Engineering (JNLE): 2012, 2013
Transactions on Information Forensics & Security (TIFS): 2013
International Journal on Digital Libraries (IJDL): 2010, 2011
Transactions on Computational Biology and Bioinformatics (TCBB): 2011
Language Resources and Evaluation (LRE): 2008

NATIONAL/INTERNATIONAL SERVICE: CONFERENCE REVIEWING

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

NATIONAL/INTERNATIONAL SERVICE: WORKSHOP REVIEWING

International Workshop on Semantic Evaluation (SemEval): 2012-2017
Workshop on Ethics in Natural Language Processing (EthNLP): 2017
Workshop on Cross-Platform Text Mining and Natural Language Processing Interop. (INTEROP): 2016
Workshop on Replicability and Reusability in Natural Language Processing (RRNLP): 2015
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): 2014

DEPARTMENTAL COMMITTEES

Curriculum committee, University of Arizona School of Information, 2017
Graduate committee, University of Arizona School of Information, 2016-2017
Faculty search committee, U. of Alabama at Birmingham Computer and Information Sciences, 2015-2016
Undergrad curriculum committee, U. of Alabama at Birmingham Computer and Information Sci., 2014-2016
Ph.D. qualifying exam committee, U. of Alabama at Birmingham Computer and Information Sci., 2014-2016
Curriculum design committee, University of Colorado Boulder social media certificate, 2012-2013
Student grants committee, University of Colorado Institute of Cognitive Science, 2004–2007
Hiring committee, University of Colorado Department of Linguistics, 2004
CU International Leader, University of Colorado, 2007–2008
International Peer Mentor, University of Colorado, 2005–2007

PUBLICATIONS/CREATIVE ACTIVITY

CHAPTERS IN SCHOLARLY BOOKS AND MONOGRAPHS

Samuel González López, 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.

Steven Bethard, 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.

CONFERENCE PROCEEDINGS

Steven Bethard, Marine Carpuat, Marianna Apidianaki, Saif M. Mohammad, Daniel Cer, and David Jurgens, eds. (Aug. 2017). “[Proceedings of the 11th International Workshop on Semantic Evaluation \(SemEval-2017\)](#)”.

Anna Rumshisky, Kirk Roberts, Steven Bethard, and Tristan Naumann, eds. (Dec. 2016). “[Proceedings of the Clinical Natural Language Processing Workshop \(ClinicalNLP\)](#)”.

Steven Bethard, Marine Carpuat, Daniel Cer, David Jurgens, Preslav Nakov, and Torsten Zesch, eds. (June 2016). “[Proceedings of the 10th International Workshop on Semantic Evaluation \(SemEval-2016\)](#)”.

Oleksandr Kolomiyets, 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 \(CAtoCL\)](#)”.

David Yarowsky, Timothy Baldwin, Anna Korhonen, Karen Livescu, and Steven Bethard, eds. (Oct. 2013). “[Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing](#)”.

Anik Dey, 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

Timothy Miller, 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.

Chen Lin, 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.

John D Osborne, 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*.

Wim De Mulder, 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.

Nathanael Chambers, 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.

Md. Arafat Sultan, Steven Bethard, and Tamara Sumner (May 2014b). “[Back to Basics for Monolingual Alignment: Exploiting Word Similarity and Contextual Evidence](#)”. In: *Transactions of the Association for Computational Linguistics* 2, pp. 219–230.

William F. Styler IV, 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.

Jyotishman Pathak, 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.

Dmitriy Dligach, 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*.

Philipp Wetzler, 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.

Michael Levin, 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.

Steven Bethard, Zhiyong Lu, James H. Martin, and Lawrence Hunter (June 2008). “[Semantic Role Labeling for Protein Transport Predicates](#)”. In: *BMC Bioinformatics* 9.1, p. 277.

Steven Bethard, James H. Martin, and Sara Klingsstein (Dec. 2007a). “[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

Quynh Ngoc Thi Do, 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.

Ligaj Pradhan, 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.

Dmitriy Dligach, 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.

Natalia Viani, 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.

Quynh Ngoc Thi Do, Steven Bethard, and Marie-Francine Moens (Dec. 2016a). “[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.

Upendra Sapkota, Tamar 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.

Steven Bethard 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%].

Prasha Shrestha, 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%].

Quynh Ngoc Thi Do, 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.

Md Arafat Sultan, Steven Bethard, and Tamara Sumner (Sept. 2015a). “[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.

Upendra Sapkota, 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.
- Md. Arafat Sultan, Steven Bethard, and Tamara Sumner (Sept. 2014a). “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.
- Uendra Sapkota, 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.
- Taylor Cassidy, 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.
- Chen Lin, 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.
- Steven Bethard, 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.
- Elie Bursztein, Angeliqne 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.
- Steven Bethard (Oct. 2013a). “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.
- Ifeyinwa Okoye, 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.
- Oleksandr Kolomiyets, 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.
- Steven Bethard, 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.
- Bram Jans, 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.
- Oleksandr Kolomiyets, 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.
- Andrey Gusev, 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.

- Steven Bethard 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.
- Elie Bursztein, 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.
- Guergana Savova, 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.
- Steven Bethard, 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.
- Steven Bethard, 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.
- Steven Bethard 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.
- Steven Bethard, 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.
- Steven Bethard, James H. Martin, and Sara Klingenstein (Sept. 2007b). “[Timelines from Text: Identification of Syntactic Temporal Relations](#)”. In: *International Conference on Semantic Computing (ICSC)*, pp. 11–18.
- Steven Bethard 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

- Chen Lin, 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.
- Timothy Miller, Steven Bethard, Hadi Amiri, and Guergana Savova (Aug. 2017). “[Unsupervised Domain Adaptation for Clinical Negation Detection](#)”. In: *BioNLP 2017*, pp. 165–170.
- Quynh Ngoc Thi Do, Steven Bethard, and Marie-Francine Moens (Nov. 2016b). “[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.
- Nicolas Rey-Villamizar, Prasha Shrestha, Farig Sadeque, Steven Bethard, Ted Pedersen, Arjun Mukherjee, and Thamar 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.
- Farig Sadeque, Ted Pedersen, Thamar 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.
- Chen Lin, 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.

- Nicolas Rey-Villamizar, 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.
- Md Arafat Sultan, 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.
- Farig Sadeque, 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.
- Timothy Miller, 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.
- Suraj Maharjan, 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.
- Quynh Ngoc Thi Do, 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*.
- Timothy Miller, 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.
- Steven Bethard, 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.
- Robert Munro, 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.
- Philip V. Ogren, 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*.
- Elie Bursztein and Steven Bethard (Aug. 2009). “[Decaptcha: Breaking 75% of eBay Audio CAPTCHAs](#)”. In: *3rd USENIX Workshop on Offensive Technologies*, p. 8.
- Steven Bethard, 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.
- Philip Ogren 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.
- Philipp G Wetzler, 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.
- Philip V. Ogren, 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)*.

- Steven Bethard, 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*.
- Steven Bethard, 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*.
- Sameer S. Pradhan, 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

- Farig Sadeque, 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*.
- Steven Bethard, 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.
- Steven Bethard, 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.
- Steven Bethard, 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.
- James Gung, 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.
- Md Arafat Sultan, Steven Bethard, and Tamara Sumner (June 2015b). “[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.
- Tamar Solorio, 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.
- Md Arafat Sultan, 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.
- Steven Bethard (June 2013b). “[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.
- Oleksandr Kolomiyets, 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.
- Ifeyinwa Okoye, 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.

Md. Arafat Sultan, 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.

Parisa Kordjamshidi, 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.

Steven Bethard 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

Christopher Manning, 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

Kathy Baker, 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

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

SCHOLARLY PRESENTATIONS

COLLOQUIA

22 Apr 2016 University of Arizona: “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

- 5 Nov 2016 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

2017-12 – 2021-11	\$4,676,602	Co-Investigator	Defense Advanced Research Projects Agency GRASP: Global Reading and Assembly for Semantic, Probabilistic World Models
2016-01 – 2019-12	\$3,300,000	Co-Investigator	US National Institutes of Health, BD2K R01 Extended Methods and Software Development for Health NLP
2015-09 – 2018-09	\$2,007,965	Co-Investigator	US National Institutes of Health, NLM, R01 Temporal Relation Discovery for Clinical Text
2013-03 – 2014-01	\$19,000	Principal Investigator	US National Science Foundation, CISE, IIS ACL 2013 Student Research Workshop
2012-09 – 2015-11	€1,993,326	Co-Investigator	EU FP7 ICT FET-Open Machine Understanding for Interactive Storytelling
2007-09 – 2008-09	\$138,213	Senior Personnel	US National Science Foundation, CISE, IIS SGER: Relevance Models for Digital Repository Management
2006-08 – 2006-12	\$10,000	Principal Investigator	US Department of Homeland Security <i>Dissertation Grant Award</i>
2003-08 – 2006-08	\$82,800 plus tuition		US Department of Homeland Security <i>Graduate Fellowship</i>

INSTITUTIONAL

2015-11 – 2017-11	\$132,557	Co-Investigator	Univ. of Alabama Health Services Foundation Natural Language Processing to Identify COPD Exacerbations in Real Time
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LIST OF COLLABORATORS AND THEIR ORGANIZATIONAL AFFILIATIONS

COLLABORATORS ON GRANTS

Dmitriy Dligach, Loyola University Chicago
Noemie Elhadad, Columbia University
James H. Martin, University of Colorado Boulder
Timothy Miller, Boston Children's Hospital / Harvard Medical School
Martha Palmer, University of Colorado Boulder
Ted Pedersen, University of Minnesota Duluth
James Pustejovsky, Brandeis University
Guergana Savova, Boston Children's Hospital / Harvard Medical School
Thamar Solorio, University of Houston

GRADUATE THESIS ADVISOR

James H. Martin, University of Colorado Boulder

POSTDOCTORAL SPONSORS

Dan Jurafsky, Stanford University
Marie-Francine Moens, KU Leuven
Martha Palmer, University of Colorado Boulder
Tamara Sumner, University of Colorado Boulder

MENTORING

POSTDOCTORAL ADVISOR

Cynthia M Kroeger, NIH F32 “Research-reporting fidelity within dietary weight-loss supplement literature”

THESIS ADVISOR

Vikas Yadav, Ph.D., Information, University of Arizona, expected 2022

Dongfang Xu, Ph.D., Information, University of Arizona, expected 2021

Farig Sadeque, Ph.D., Information, University of Arizona, expected 2019

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

2017-Sp Instructor [ISTA 116: Statistical Foundations for the Info. Age](#) 64 undergrad

2016-Fa Instructor [ISTA 116: Statistical Foundations for the Info. Age](#) 59 undergrad

2016-Sp	Instructor	CS 460/660/760: Artificial Intelligence	12 undergrad	9 grad
2015-Fa	Instructor	CS 201: Introduction to Programming	48 undergrad	
2015-Fa	Instructor	CS 499: Senior Capstone	25 undergrad	
2015-Sp	Instructor	CS 460/660/760: Artificial Intelligence	9 undergrad	19 grad
2014-Fa	Instructor	CS 201: Introduction to Programming	63 undergrad	
2014-Fa	Instructor	CS 499: Senior Capstone	16 undergrad	
2014-Sp	Instructor	CS 460/660/760: Artificial Intelligence	4 undergrad	24 grad
2013-Fa	Instructor	CS 499: Senior Capstone	5 undergrad	
2008-Fa	Instructor	CSCI 3202: Introduction to Artificial Intelligence	57 undergrad	
2002-Sp	Section Leader	CSC 345: Analysis of Discrete Structures	20 undergrad	
2001-Fa	Section Leader	CSC 245: Introduction to Discrete Structures	20 undergrad	
2001-Sp	Section Leader	CSC 335: Object-Oriented Programming and Design	20 undergrad	
2000-Fa	Section Leader	CSC 227: Program Design and Development	20 undergrad	
2000-Sp	Section Leader	CSC 127a: Introduction to Computer Science	20 undergrad	