

**2013 Conference of the North  
American Chapter of the Association  
for Computational Linguistics:  
Human Language Technologies**

**(NAACL HLT 2013)**

**Atlanta, Georgia, USA  
9-14 June 2013**

**Volume 1 of 2**

**ISBN: 978-1-62748-838-9**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2013) by the Association for Computational Linguistics  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact the Association for Computational Linguistics  
at the address below.

Association for Computational Linguistics  
209 N. Eighth Street  
Stroudsburg, Pennsylvania 18360

Phone: 1-570-476-8006  
Fax: 1-570-476-0860

[acl@aclweb.org](mailto:acl@aclweb.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Table of Contents

<i>Model With Minimal Translation Units, But Decode With Phrases</i>	
Nadir Durrani, Alexander Fraser and Helmut Schmid .....	1
<i>Beyond Left-to-Right: Multiple Decomposition Structures for SMT</i>	
Hui Zhang, Kristina Toutanova, Chris Quirk and Jianfeng Gao .....	12
<i>Improved Reordering for Phrase-Based Translation using Sparse Features</i>	
Colin Cherry .....	22
<i>Simultaneous Word-Morpheme Alignment for Statistical Machine Translation</i>	
Elif Eyigöz, Daniel Gildea and Kemal Oflazer .....	32
<i>Multi-faceted Event Recognition with Bootstrapped Dictionaries</i>	
Ruihong Huang and Ellen Riloff .....	41
<i>Named Entity Recognition with Bilingual Constraints</i>	
Wanxiang Che, Mengqiu Wang, Christopher D. Manning and Ting Liu .....	52
<i>Minimally Supervised Method for Multilingual Paraphrase Extraction from Definition Sentences on the Web</i>	
Yulan Yan, Chikara Hashimoto, Kentaro Torisawa, Takao Kawai, Jun'ichi Kazama and Stijn De Saeger .....	63
<i>Relation Extraction with Matrix Factorization and Universal Schemas</i>	
Sebastian Riedel, Limin Yao, Andrew McCallum and Benjamin M. Marlin .....	74
<i>Extracting the Native Language Signal for Second Language Acquisition</i>	
Ben Swanson and Eugene Charniak .....	85
<i>An Analysis of Frequency- and Memory-Based Processing Costs</i>	
Marten van Schijndel and William Schuler .....	95
<i>Cross-Lingual Semantic Similarity of Words as the Similarity of Their Semantic Word Responses</i>	
Ivan Vulić and Marie-Francine Moens .....	106
<i>Combining multiple information types in Bayesian word segmentation</i>	
Gabriel Doyle and Roger Levy .....	117
<i>Training Parsers on Incompatible Treebanks</i>	
Richard Johansson .....	127
<i>Learning a Part-of-Speech Tagger from Two Hours of Annotation</i>	
Dan Garrette and Jason Baldridge .....	138
<i>Experiments with Spectral Learning of Latent-Variable PCFGs</i>	
Shay B. Cohen, Karl Stratos, Michael Collins, Dean P. Foster and Lyle Ungar .....	148

<i>Representing Topics Using Images</i>	
Nikolaos Aletras and Mark Stevenson .....	158
<i>Drug Extraction from the Web: Summarizing Drug Experiences with Multi-Dimensional Topic Models</i>	
Michael J. Paul and Mark Dredze .....	168
<i>Towards Topic Labeling with Phrase Entailment and Aggregation</i>	
Yashar Mehdad, Giuseppe Carenini, Raymond T. Ng and Shafiq Joty .....	179
<i>Topic Segmentation with a Structured Topic Model</i>	
Lan Du, Wray Buntine and Mark Johnson.....	190
<i>Text Alignment for Real-Time Crowd Captioning</i>	
Iftekhar Naim, Daniel Gildea, Walter Lasecki and Jeffrey P. Bigham .....	201
<i>Discriminative Joint Modeling of Lexical Variation and Acoustic Confusion for Automated Narrative Retelling Assessment</i>	
Maider Lehr, Izhak Shafran, Emily Prud'hommeaux and Brian Roark.....	211
<i>Using Out-of-Domain Data for Lexical Addressee Detection in Human-Human-Computer Dialog</i>	
Heeyoung Lee, Andreas Stolcke and Elizabeth Shriberg .....	221
<i>Segmentation Strategies for Streaming Speech Translation</i>	
Vivek Kumar Rangarajan Sridhar, John Chen, Srinivas Bangalore, Andrej Ljolje and Rathinavelu Chengalvarayan.....	230
<i>Enforcing Subcategorization Constraints in a Parser Using Sub-parses Recombining</i>	
Seyed Abolghasem Mirroshandel, Alexis Nasr and Benoît Sagot .....	239
<i>Large-Scale Discriminative Training for Statistical Machine Translation Using Held-Out Line Search</i>	
Jeffrey Flanigan, Chris Dyer and Jaime Carbonell.....	248
<i>Measuring Term Informativeness in Context</i>	
Zhaohui Wu and C. Lee Giles.....	259
<i>Unsupervised Learning Summarization Templates from Concise Summaries</i>	
Horacio Saggion .....	270
<i>Classification of South African languages using text and acoustic based methods: A case of six selected languages</i>	
Peleira Nicholas Zulu .....	280
<i>Improving Syntax-Augmented Machine Translation by Coarsening the Label Set</i>	
Greg Hanneman and Alon Lavie .....	288
<i>Keyphrase Extraction for N-best Reranking in Multi-Sentence Compression</i>	
Florian Boudin and Emmanuel Morin .....	298
<i>Development of a Persian Syntactic Dependency Treebank</i>	
Mohammad Sadegh Rasooli, Manouchehr Kouhestani and Amirsaeid Moloodi .....	306

<i>Improving reordering performance using higher order and structural features</i>	
Mitesh M. Khapra, Ananthakrishnan Ramanathan and Karthik Visweswarah . . . . .	315
<i>Massively Parallel Suffix Array Queries and On-Demand Phrase Extraction for Statistical Machine Translation Using GPUs</i>	
Hua He, Jimmy Lin and Adam Lopez . . . . .	325
<i>Discriminative Training of 150 Million Translation Parameters and Its Application to Pruning</i>	
Hendra Setiawan and Bowen Zhou . . . . .	335
<i>Applying Pairwise Ranked Optimisation to Improve the Interpolation of Translation Models</i>	
Barry Haddow . . . . .	342
<i>Dialectal Arabic to English Machine Translation: Pivoting through Modern Standard Arabic</i>	
Wael Salloum and Nizar Habash . . . . .	348
<i>What to do about bad language on the internet</i>	
Jacob Eisenstein . . . . .	359
<i>Minibatch and Parallelization for Online Large Margin Structured Learning</i>	
Kai Zhao and Liang Huang . . . . .	370
<i>Improved Part-of-Speech Tagging for Online Conversational Text with Word Clusters</i>	
Olutobi Owoputi, Brendan O'Connor, Chris Dyer, Kevin Gimpel, Nathan Schneider and Noah A. Smith . . . . .	380
<i>Parser lexicalisation through self-learning</i>	
Marek Rei and Ted Briscoe . . . . .	391
<i>Mining User Relations from Online Discussions using Sentiment Analysis and Probabilistic Matrix Factorization</i>	
Minghui Qiu, Liu Yang and Jing Jiang . . . . .	401
<i>Focused training sets to reduce noise in NER feature models</i>	
Amber McKenzie . . . . .	411
<i>Learning to Relate Literal and Sentimental Descriptions of Visual Properties</i>	
Mark Yatskar, Svitlana Volkova, Asli Celikyilmaz, Bill Dolan and Luke Zettlemoyer . . . . .	416
<i>Morphological Analysis and Disambiguation for Dialectal Arabic</i>	
Nizar Habash, Ryan Roth, Owen Rambow, Ramy Eskander and Nadi Tomeh . . . . .	426
<i>Using a Supertagged Dependency Language Model to Select a Good Translation in System Combination</i>	
Wei-Yun Ma and Kathleen McKeown . . . . .	433
<i>Dudley North visits North London: Learning When to Transliterate to Arabic</i>	
Mahmoud Azab, Houda Bouamor, Behrang Mohit and Kemal Oflazer . . . . .	439

<i>Better Twitter Summaries?</i>	445
Joel Judd and Jugal Kalita .....	
<i>Training MRF-Based Phrase Translation Models using Gradient Ascent</i>	450
Jianfeng Gao and Xiaodong He .....	
<i>Automatic Morphological Enrichment of a Morphologically Underspecified Treebank</i>	460
Sarah Alkuhlani, Nizar Habash and Ryan Roth .....	
<i>A Beam-Search Decoder for Normalization of Social Media Text with Application to Machine Translation</i>	471
Pidong Wang and Hwee Tou Ng .....	
<i>Parameter Estimation for LDA-Frames</i>	482
Jiří Materna .....	
<i>Approximate PCFG Parsing Using Tensor Decomposition</i>	487
Shay B. Cohen, Giorgio Satta and Michael Collins .....	
<i>Negative Deceptive Opinion Spam</i>	497
Myle Ott, Claire Cardie and Jeffrey T. Hancock .....	
<i>Improving speech synthesis quality by reducing pitch peaks in the source recordings</i>	502
Luisina Violante, Pablo Rodríguez Zivic and Agustín Gravano .....	
<i>Robust Systems for Preposition Error Correction Using Wikipedia Revisions</i>	507
Aoife Cahill, Nitin Madnani, Joel Tetreault and Diane Napolitano .....	
<i>Supervised Bilingual Lexicon Induction with Multiple Monolingual Signals</i>	518
Ann Irvine and Chris Callison-Burch .....	
<i>Creating Reverse Bilingual Dictionaries</i>	524
Khang Nhut Lam and Jugal Kalita .....	
<i>Identification of Temporal Event Relationships in Biographical Accounts</i>	529
Lucian Silcox and Emmett Tomai .....	
<i>Predicative Adjectives: An Unsupervised Criterion to Extract Subjective Adjectives</i>	534
Michael Wiegand, Josef Ruppenhofer and Dietrich Klakow .....	
<i>Modeling Syntactic and Semantic Structures in Hierarchical Phrase-based Translation</i>	540
Junhui Li, Philip Resnik and Hal Daumé III .....	
<i>Using Derivation Trees for Informative Treebank Inter-Annotator Agreement Evaluation</i>	550
Seth Kulick, Ann Bies, Justin Mott, Mohamed Maamouri, Beatrice Santorini and Anthony Kroch .....	
<i>Embracing Ambiguity: A Comparison of Annotation Methodologies for Crowdsourcing Word Sense Labels</i>	556
David Jurgens .....	

<i>Compound Embedding Features for Semi-supervised Learning</i>	563
Mo Yu, Tiejun Zhao, Daxiang Dong, Hao Tian and Dianhai Yu .....	563
<i>On Quality Ratings for Spoken Dialogue Systems – Experts vs. Users</i>	569
Stefan Ultes, Alexander Schmitt and Wolfgang Minker .....	569
<i>Overcoming the Memory Bottleneck in Distributed Training of Latent Variable Models of Text</i>	579
Yi Yang, Alexander Yates and Doug Downey .....	579
<i>Processing Spontaneous Orthography</i>	585
Ramy Eskander, Nizar Habash, Owen Rambow and Nadi Tomeh .....	585
<i>Purpose and Polarity of Citation: Towards NLP-based Bibliometrics</i>	596
Amjad Abu-Jbara, Jefferson Ezra and Dragomir Radev .....	596
<i>Estimating effect size across datasets</i>	607
Anders Søgaard .....	607
<i>Systematic Comparison of Professional and Crowdsourced Reference Translations for Machine Translation</i>	612
Rabih Zbib, Gretchen Markiewicz, Spyros Matsoukas, Richard Schwartz and John Makhoul .....	612
<i>Down-stream effects of tree-to-dependency conversions</i>	617
Jakob Elming, Anders Johannsen, Sigrid Klerke, Emanuele Lapponi, Hector Martinez Alonso and Anders Søgaard .....	617
<i>The Life and Death of Discourse Entities: Identifying Singleton Mentions</i>	627
Marta Recasens, Marie-Catherine de Marneffe and Christopher Potts .....	627
<i>Automatic Generation of English Respellings</i>	634
Bradley Hauer and Grzegorz Kondrak .....	634
<i>A Simple, Fast, and Effective Reparameterization of IBM Model 2</i>	644
Chris Dyer, Victor Chahuneau and Noah A. Smith .....	644
<i>Phrase Training Based Adaptation for Statistical Machine Translation</i>	649
Saab Mansour and Hermann Ney .....	649
<i>Translation Acquisition Using Synonym Sets</i>	655
Daniel Andrade, Masaki Tsuchida, Takashi Onishi and Kai Ishikawa .....	655
<i>Supersense Tagging for Arabic: the MT-in-the-Middle Attack</i>	661
Nathan Schneider, Behrang Mohit, Chris Dyer, Kemal Oflazer and Noah A. Smith .....	661
<i>Zipfian corruptions for robust POS tagging</i>	668
Anders Søgaard .....	668
<i>A Multi-Dimensional Bayesian Approach to Lexical Style</i>	673
Julian Brooke and Graeme Hirst .....	673

<i>Unsupervised Domain Tuning to Improve Word Sense Disambiguation</i>	680
Judita Preiss and Mark Stevenson .....	680
<i>What's in a Domain? Multi-Domain Learning for Multi-Attribute Data</i>	685
Mahesh Joshi, Mark Dredze, William W. Cohen and Carolyn P. Rosé .....	685
<i>An opinion about opinions about opinions: subjectivity and the aggregate reader</i>	691
Asad Sayeed .....	691
<i>An Examination of Regret in Bullying Tweets</i>	697
Jun-Ming Xu, Benjamin Burchfiel, Xiaojin Zhu and Amy Bellmore .....	697
<i>A Cross-language Study on Automatic Speech Disfluency Detection</i>	703
Wen Wang, Andreas Stolcke, Jiahong Yuan and Mark Liberman.....	703
<i>Distributional semantic models for the evaluation of disordered language</i>	709
Masoud Rouhizadeh, Emily Prud'hommeaux, Brian Roark and Jan van Santen .....	709
<i>Atypical Prosodic Structure as an Indicator of Reading Level and Text Difficulty</i>	715
Julie Medero and Mari Ostendorf .....	715
<i>Using Document Summarization Techniques for Speech Data Subset Selection</i>	721
Kai Wei, Yuzong Liu, Katrin Kirchhoff and Jeff Bilmes .....	721
<i>Semi-Supervised Discriminative Language Modeling with Out-of-Domain Text Data</i>	727
Arda Çelebi and Murat Saraçlar .....	727
<i>More than meets the eye: Study of Human Cognition in Sense Annotation</i>	733
Salil Joshi, Diptesh Kanodia and Pushpak Bhattacharyya.....	733
<i>Improving Lexical Semantics for Sentential Semantics: Modeling Selectional Preference and Similar Words in a Latent Variable Model</i>	739
Weiwei Guo and Mona Diab .....	739
<i>Linguistic Regularities in Continuous Space Word Representations</i>	746
Tomas Mikolov, Wen-tau Yih and Geoffrey Zweig .....	746
<i>TruthTeller: Annotating Predicate Truth</i>	752
Amnon Lotan, Asher Stern and Ido Dagan .....	752
<i>PPDB: The Paraphrase Database</i>	758
Juri Ganitkevitch, Benjamin Van Durme and Chris Callison-Burch .....	758
<i>Exploiting the Scope of Negations and Heterogeneous Features for Relation Extraction: A Case Study for Drug-Drug Interaction Extraction</i>	765
Md. Faisal Mahbub Chowdhury and Alberto Lavelli .....	765
<i>Graph-Based Seed Set Expansion for Relation Extraction Using Random Walk Hitting Times</i>	772
Joel Lang and James Henderson .....	772

<i>Distant Supervision for Relation Extraction with an Incomplete Knowledge Base</i>	777
Bonan Min, Ralph Grishman, Li Wan, Chang Wang and David Gondek .....	777
<i>Measuring the Structural Importance through Rhetorical Structure Index</i>	783
Narine Kokhlikyan, Alex Waibel, Yuqi Zhang and Joy Ying Zhang .....	783
<i>Separating Fact from Fear: Tracking Flu Infections on Twitter</i>	789
Alex Lamb, Michael J. Paul and Mark Dredze .....	789
<i>Differences in User Responses to a Wizard-of-Oz versus Automated System</i>	796
Jesse Thomason and Diane Litman .....	796
<i>Improving the Quality of Minority Class Identification in Dialog Act Tagging</i>	802
Adinoyi Omuya, Vinodkumar Prabhakaran and Owen Rambow .....	802
<i>Discourse Connectors for Latent Subjectivity in Sentiment Analysis</i>	808
Rakshit Trivedi and Jacob Eisenstein .....	808
<i>Coherence Modeling for the Automated Assessment of Spontaneous Spoken Responses</i>	814
Xinhao Wang, Keelan Evanini and Klaus Zechner .....	814
<i>Disfluency Detection Using Multi-step Stacked Learning</i>	820
Xian Qian and Yang Liu .....	820
<i>Using Semantic Unification to Generate Regular Expressions from Natural Language</i>	826
Nate Kushman and Regina Barzilay .....	826
<i>Probabilistic Frame Induction</i>	837
Jackie Chi Kit Cheung, Hoifung Poon and Lucy Vanderwende .....	837
<i>A Quantum-Theoretic Approach to Distributional Semantics</i>	847
William Blacoe, Elham Kashefi and Mirella Lapata .....	847
<i>Answer Extraction as Sequence Tagging with Tree Edit Distance</i>	858
Xuchen Yao, Benjamin Van Durme, Chris Callison-Burch and Peter Clark .....	858
<i>Open Information Extraction with Tree Kernels</i>	868
Ying Xu, Mi-Young Kim, Kevin Quinn, Randy Goebel and Denilson Barbosa .....	868
<i>Finding What Matters in Questions</i>	878
Xiaoqiang Luo, Hema Raghavan, Vittorio Castelli, Sameer Maskey and Radu Florian .....	878
<i>A Just-In-Time Keyword Extraction from Meeting Transcripts</i>	888
Hyun-Je Song, Junho Go, Seong-Bae Park and Se-Young Park .....	888
<i>Same Referent, Different Words: Unsupervised Mining of Opaque Coreferent Mentions</i>	897
Marta Recasens, Matthew Can and Daniel Jurafsky .....	897
<i>Global Inference for Bridging Anaphora Resolution</i>	907
Yufang Hou, Katja Markert and Michael Strube .....	907

<i>Classifying Temporal Relations with Rich Linguistic Knowledge</i>	918
Jennifer D'Souza and Vincent Ng .....	
<i>Improved Information Structure Analysis of Scientific Documents Through Discourse and Lexical Constraints</i>	928
Yufan Guo, Roi Reichart and Anna Korhonen .....	
<i>Adaptation of Reordering Models for Statistical Machine Translation</i>	938
Boxing Chen, George Foster and Roland Kuhn .....	
<i>Multi-Metric Optimization Using Ensemble Tuning</i>	947
Baskaran Sankaran, Anoop Sarkar and Kevin Duh .....	
<i>Grouping Language Model Boundary Words to Speed K-Best Extraction from Hypergraphs</i>	958
Kenneth Heafield, Philipp Koehn and Alon Lavie .....	
<i>A Systematic Bayesian Treatment of the IBM Alignment Models</i>	969
Yarin Gal and Phil Blunsom .....	
<i>Unsupervised Metaphor Identification Using Hierarchical Graph Factorization Clustering</i>	978
Ekaterina Shutova and Lin Sun .....	
<i>Three Knowledge-Free Methods for Automatic Lexical Chain Extraction</i>	989
Steffen Remus and Chris Biemann .....	
<i>Combining Heterogeneous Models for Measuring Relational Similarity</i>	1000
Alisa Zhila, Wen-tau Yih, Christopher Meek, Geoffrey Zweig and Tomas Mikolov .....	
<i>Broadly Improving User Classification via Communication-Based Name and Location Clustering on Twitter</i>	1010
Shane Bergsma, Mark Dredze, Benjamin Van Durme, Theresa Wilson and David Yarowsky .....	
<i>To Link or Not to Link? A Study on End-to-End Tweet Entity Linking</i>	1020
Stephen Guo, Ming-Wei Chang and Emre Kiciman .....	
<i>A Latent Variable Model for Viewpoint Discovery from Threaded Forum Posts</i>	1031
Minghui Qiu and Jing Jiang .....	
<i>Identifying Intention Posts in Discussion Forums</i>	1041
Zhiyuan Chen, Bing Liu, Meichun Hsu, Malu Castellanos and Riddhiman Ghosh .....	
<i>Dependency-based empty category detection via phrase structure trees</i>	1051
Nianwen Xue and Yaqin Yang .....	
<i>Target Language Adaptation of Discriminative Transfer Parsers</i>	1061
Oscar Täckström, Ryan McDonald and Joakim Nivre .....	
<i>Emergence of Gricean Maxims from Multi-Agent Decision Theory</i>	1072
Adam Vogel, Max Bodoia, Christopher Potts and Daniel Jurafsky .....	

<i>Open Dialogue Management for Relational Databases</i>	1082
Ben Hixon and Rebecca J. Passonneau .....	
<i>A method for the approximation of incremental understanding of explicit utterance meaning using predictive models in finite domains</i>	1092
David DeVault and David Traum.....	
<i>Paving the Way to a Large-scale Pseudosense-annotated Dataset</i>	1100
Mohammad Taher Pilehvar and Roberto Navigli.....	
<i>Labeling the Languages of Words in Mixed-Language Documents using Weakly Supervised Methods</i>	1110
Ben King and Steven Abney .....	
<i>Learning Whom to Trust with MACE</i>	1120
Dirk Hovy, Taylor Berg-Kirkpatrick, Ashish Vaswani and Eduard Hovy.....	
<i>Supervised All-Words Lexical Substitution using Delexicalized Features</i>	1131
György Szarvas, Chris Biemann and Iryna Gurevych.....	
<i>A Tensor-based Factorization Model of Semantic Compositionalty</i>	1142
Tim Van de Cruys, Thierry Poibeau and Anna Korhonen .....	
<i>A Participant-based Approach for Event Summarization Using Twitter Streams</i>	1152
Chao Shen, Fei Liu, Fuliang Weng and Tao Li.....	
<i>Towards Coherent Multi-Document Summarization</i>	1163
Janara Christensen, Mausam, Stephen Soderland and Oren Etzioni .....	
<i>Generating Expressions that Refer to Visible Objects</i>	1174
Margaret Mitchell, Kees van Deemter and Ehud Reiter .....	
<i>Supervised Learning of Complete Morphological Paradigms</i>	1185
Greg Durrett and John DeNero .....	
<i>Optimal Data Set Selection: An Application to Grapheme-to-Phoneme Conversion</i>	1196
Young-Bum Kim and Benjamin Snyder.....	
<i>Knowledge-Rich Morphological Priors for Bayesian Language Models</i>	1206
Victor Chahuneau, Noah A. Smith and Chris Dyer.....	