



UvA-DARE (Digital Academic Repository)

Relation extraction methods for biomedical literature

Bui, Q.C.

Publication date
2012

[Link to publication](#)

Citation for published version (APA):

Bui, Q. C. (2012). *Relation extraction methods for biomedical literature*. [Thesis, fully internal, Universiteit van Amsterdam].

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

References

1. Ananiadou S, Pyysalo S, Tsujii J, Kell DB: **Event extraction for systems biology by text mining the literature.** *Trends in biotechnology* 2010, **28**:381-90.
2. Faro A, Giordano D, Spampinato C: **Combining literature text mining with microarray data: advances for system biology modeling.** *Briefings in bioinformatics* 2011, **13**:61-82.
3. Jensen LJ, Saric J, Bork P: **Literature mining for the biologist: from information retrieval to biological discovery.** *Nature Review* 2006, **7**:119-129.
4. Andronis C, Sharma A, Virvilis V, Deftereos S, Persidis A: **Literature mining, ontologies and information visualization for drug repurposing.** *Briefings in bioinformatics* 2011, **12**.
5. Garten Y, Coulet A, Altman RB: **Recent progress in automatically extracting information from the pharmacogenomic literature.** *Pharmacogenomics* 2010, **11**:1467-89.
6. Ananiadou S, Kell DB, Tsujii J-ichi: **Text mining and its potential applications in systems biology.** *Trends in biotechnology* 2006, **24**:571-9.
7. Chapman WW, Cohen KB: **Current issues in biomedical text mining and natural language processing.** *Journal of biomedical informatics* 2009, **42**:757-9.
8. Zweigenbaum P, Demner-Fushman D, Yu H, Cohen KB: **Frontiers of biomedical text mining: current progress.** *Briefings in bioinformatics* 2007, **8**:358-75.
9. Riedman CAF: **Automated Acquisition of Disease – Drug Knowledge from Biomedical and Clinical Documents: An Initial Study.** *Journal of the American Medical Informatics Association* 2008, **15**:87-98.
10. Shetty KD, Dalal SR: **Using information mining of the medical literature to improve drug safety.** *Journal of the American Medical Informatics Association : JAMIA* 2011:1-7.
11. Bankhead A, Mancini E, Sims AC, Baric RS, McWeeney S, Sloot PMA: **A simulation framework to investigate in vitro viral infection dynamics.** *Journal of Computational Science* 2011.
12. Sloot PMA, Coveney PV, Ertaylan G, Müller V, Boucher CA, Bubak M: **HIV decision support: from molecule to man.** *Philosophical transactions. Series A, Mathematical, physical, and engineering sciences* 2009, **367**:2691-703.
13. van Dijk D, Ertaylan G, Boucher CA, Sloot PMA: **Identifying potential survival strategies of HIV-1 through virus-host protein interaction networks.** *BMC systems biology* 2010, **4**:96.
14. Mei S, Quax R, van de Vijver D, Zhu Y, Sloot PMA: **Increasing risk behaviour can outweigh the benefits of antiretroviral drug treatment on the HIV incidence among men-having-sex-with-men in Amsterdam.** *BMC infectious diseases* 2011, **11**:118.
15. Senger C, Grüning BA, Erxleben A, Döring K, Patel H, Flemming S, Merfort I, Günther S: **Mining and Evaluation of Molecular Relationships in Literature.** *Bioinformatics* 2012, **28**:709-714.
16. Wang J, Zhang Y, Marian C, Resson HW: **Identification of aberrant pathways and network activities from high-throughput data.** *Briefings in bioinformatics* 2012.

17. Jelier R, Goeman JJ, Hettne KM, Schuemie MJ, den Dunnen JT, 't Hoen PAC: **Literature-aided interpretation of gene expression data with the weighted global test.** *Briefings in bioinformatics* 2011.
18. Tsuruoka Y, Miwa M, Hamamoto K, Tsujii J, Ananiadou S: **Discovering and visualizing indirect associations between biomedical concepts.** *Bioinformatics* 2011, **27**:i111-i119.
19. Mons B, van Haagen H, Chichester C, Hoen P-B 't, den Dunnen JT, van Ommen G, van Mulligen E, Singh B, Hooft R, Roos M, Hammond J, Kiesel B, Giardine B, Velterop J, Groth P, Schultes E: **The value of data.** *Nature genetics* 2011, **43**:281-3.
20. Leitner F, Valencia A: **A text-mining perspective on the requirements for electronically annotated abstracts.** *FEBS Letters* 2008, **582**:1178-1181.
21. Bader GD: **BIND: the Biomolecular Interaction Network Database.** *Nucleic Acids Research* 2003, **31**:248-250.
22. Reguly T, Breitkreutz A, Boucher L, Breitkreutz B-joe, Hon GC, Myers CL, Parsons A, Friesen H, Oughtred R, Tong A, Stark C, Ho Y, Botstein D, Andrews B, Boone C, Troyanskaya OG, Ideker T, Dolinski K, Batada NN, Tyers M: **Comprehensive curation and analysis of global interaction networks in *Saccharomyces cerevisiae*.** *Journal of biology* 2006, **5**:11.
23. Mishra GR, Suresh M, Kumaran K, Kannabiran N, Suresh S, Bala P, Shivakumar K, Anuradha N, Reddy R, Raghavan TM, Menon S, Hanumanthu G, Gupta M, Upendran S, Gupta S, Mahesh M, Jacob B, Mathew P, Chatterjee P, Arun KS, Sharma S, Chandrika KN, Deshpande N, Palvankar K, Raghavnath R, Krishnakanth R, Karathia H, Rekha B, Nayak R, Vishnupriya G, Kumar HGM, Nagini M, Kumar GSS, Jose R, Deepthi P, Mohan SS, Gandhi TKB, Harsha HC, Deshpande KS, Sarker M, Prasad TSK, Pandey A: **Human protein reference database--2006 update.** *Nucleic acids research* 2006, **34**:D411-4.
24. Cusick ME, Yu H, Smolyar A, Venkatesan K, Carvunis A-ruxandra, Simonis N, Rual J-françois, Borick H, Braun P, Dreze M, Vandenhaute J, Galli M, Yazaki J, Hill DE, Ecker JR, Roth FP, Vidal M: **Literature-curated protein interaction datasets perspective.** *Nature Methods* 2009, **6**:39-46.
25. Ananiadou SM, John: *Text Mining for Biology and Biomedicine.* ARTECH HOUSE; 2006, **33**:300.
26. Miyao Y, Sagae K, Saetre R, Matsuzaki T, Tsujii J: **Evaluating contributions of natural language parsers to protein-protein interaction extraction.** *Bioinformatics* 2009, **25**:394-400.
27. Kang N, van Mulligen EM, Kors JA: **Comparing and combining chunkers of biomedical text.** *Journal of biomedical informatics* 2011, **44**:354-60.
28. Zhou D, He Y: **Extracting interactions between proteins from the literature.** *Journal of Biomedical Informatics* 2008, **41**:393-407.
29. Pyysalo S, Airola A, Heimonen J, Björne J, Ginter F, Salakoski T: **Comparative analysis of five protein-protein interaction corpora.** *BMC bioinformatics* 2008, **9 Suppl 3**:S6.
30. Jaeger S, Gaudan S, Leser U, Rebholz-Schuhmann D: **Integrating protein-protein interactions and text mining for protein function prediction.** *BMC bioinformatics* 2008, **9 Suppl 8**:S2.

31. Oda K, Kim JD, Ohta T, Okanohara D, Matsuzaki T, Tateisi Y, Tsujii J: **New challenges for text mining: mapping between text and manually curated pathways.** *BMC bioinformatics* 2008, **9 Suppl 3**:S5.
32. Kilicoglu H, Rosemblat G, Fiszman M, Rindflesch TC: **Constructing a semantic prediction gold standard from the biomedical literature.** *BMC Bioinformatics* 2011, **12**:486.
33. Tikk D, Thomas P, Palaga P, Hakenberg J, Leser U: **A comprehensive benchmark of kernel methods to extract protein-protein interactions from literature.** *PLoS computational biology* 2010, **6**:e1000837.
34. Kabiljo R, Clegg AB, Shepherd AJ: **A realistic assessment of methods for extracting gene/protein interactions from free text.** *BMC bioinformatics* 2009, **10**:233.
35. Katrenko S: **A Closer Look At Learning Relations From Text.** PhD Thesis 2009:241.
36. Hakenberg J: **Mining Relations from the Biomedical Literature.** PhD Thesis 2009:179.
37. Fayruzov T: **Mining and Modelling Interaction Networks for Systems Biology.** PhD Thesis 2010:204.
38. Erhardt R a-a, Schneider R, Blaschke C: **Status of text-mining techniques applied to biomedical text.** *Drug discovery today* 2006, **11**:315-25.
39. Ohta T, Pyysalo S, Kim J-D, Tsujii J: **A Re-Evaluation of Biomedical Named Entity-Term Relations.** *Journal of Bioinformatics and Computational Biology* 2010, **08**:917.
40. Leaman R, Gonzalez G: **BANNER: an executable survey of advances in biomedical named entity recognition.** *Pacific Symposium on Biocomputing. Pacific Symposium on Biocomputing* 2008, **663**:652-63.
41. Hawizy L, Jessop DM, Adams N, Murray-Rust P: **ChemicalTagger: A tool for semantic text-mining in chemistry.** *Journal of cheminformatics* 2011, **3**:17.
42. Sasaki Y, Tsuruoka Y, McNaught J, Ananiadou S: **How to make the most of NE dictionaries in statistical NER.** *BMC bioinformatics* 2008, **9 Suppl 11**:S5.
43. Giles CB, Wren JD: **Large-scale directional relationship extraction and resolution.** *BMC bioinformatics* 2008, **9 Suppl 9**:S11.
44. Barrett N, Weber-Jahnke J: **Building a biomedical tokenizer using the token lattice design pattern and the adapted Viterbi algorithm.** *BMC bioinformatics* 2011, **12 Suppl 3**:S1.
45. Saetre R, Yoshida K, Miwa M, Matsuzaki T, Kano Y, Tsujii J: **Extracting protein interactions from text with the unified AkaneRE event extraction system.** *IEEE/ACM transactions on computational biology and bioinformatics / IEEE, ACM* 2010, **7**:442-53.
46. Smith L, Rindflesch T, Wilbur WJ: **MedPost: a part-of-speech tagger for bioMedical text.** *Bioinformatics* 2004, **20**:2320-1.
47. Tsuruoka Y, Tateisi Y, Kim JD, Ohta T, McNaught J, Ananiadou S, Tsujii J: **Developing a Robust Part-of-Speech Tagger for Biomedical Text.** In *Advances in Informatics - 10th Panhellenic Conference on Informatics.* 2005, **3746**.

48. Rinaldi F, Schneider G, Kaljurand K, Hess M, Andronis C, Konstandi O, Persidis A: **Mining of relations between proteins over biomedical scientific literature using a deep-linguistic approach.** *Artificial intelligence in medicine* 2007, **39**:127-36.
49. Witten IH, Frank E: *Data Mining: Practical Machine Learning Tools and Techniques*. 2nd edition. Morgan Kaufmann Publishers; 2005:525.
50. Miwa M, Saetre R, Miyao Y, Tsujii J: **Protein-protein interaction extraction by leveraging multiple kernels and parsers.** *International journal of medical informatics* 2009, **78**:e39-46.
51. Kim S, Yoon J, Yang J: **Kernel approaches for genic interaction extraction.** *Bioinformatics* 2008, **24**:118-26.
52. Kim J-D, Ohta T, Tateisi Y, Tsujii J: **GENIA corpus--a semantically annotated corpus for bio-textmining.** *Bioinformatics* 2003, **19**:i180-i182.
53. Bunescu R, Ge R, Kate RJ, Marcotte EM, Mooney RJ, Ramani AK, Wong YW: **Comparative experiments on learning information extractors for proteins and their interactions.** *Artificial intelligence in medicine* 2005, **33**:139-55.
54. Pyysalo S, Ginter F, Heimonen J, Björne J, Boberg J, Järvinen J, Salakoski T: **BioInfer: a corpus for information extraction in the biomedical domain.** *BMC bioinformatics* 2007, **8**:50.
55. Fundel K, Küffner R, Zimmer R: **RelEx--relation extraction using dependency parse trees.** *Bioinformatics* 2007, **23**:365-71.
56. Ding J, Berleant D, Nettleton D, Wurtele E: **Mining medline: abstracts, sentences, or phrases?** In *Pac Symp Biocomput*. 2002:326-337.
57. Nédellec C: **Learning Language in Logic - Genic Interaction Extraction Challenge.** In *The ICML05 workshop: Learning Language in Logic (LLL'05)*. Bonn, Germany: 2005:97-99.
58. Airola A, Pyysalo S, Björne J, Pahikkala T, Ginter F, Salakoski T: **All-paths graph kernel for protein-protein interaction extraction with evaluation of cross-corpus learning.** *BMC bioinformatics* 2008, **9 Suppl 11**:S2.
59. Kim JD, Ohta T, Tsujii J: **Corpus annotation for mining biomedical events from literature.** *BMC bioinformatics* 2008, **9**:10.
60. Kim JD, Wang Y, Takagi T, Yonezawa A: **Overview of Genia Event Task in BioNLP Shared Task 2011.** In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:7-15.
61. Huang M, Zhu X, Li M: **A hybrid method for relation extraction from biomedical literature.** *International journal of medical informatics* 2006, **75**:443-55.
62. Segura-Bedmar I, Martínez P, de Pablo-Sánchez C: **A linguistic rule-based approach to extract drug-drug interactions from pharmacological documents.** *BMC bioinformatics* 2011, **12 Suppl 2**:S1.
63. Miwa M, Saetre R, Miyao Y, Tsujii J: **A Rich Feature Vector for Protein-Protein Interaction Extraction from Multiple Corpora.** In *Proceedings of the 2009 Conference on Empirical Methods in Natural Language Processing*. Association for Computational Linguistics; 2009:121-130.

64. Kilicoglu H, Bergler S: **Adapting a General Semantic Interpretation Approach to Biological Event Extraction**. In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:173-182.
65. Baumgartner WA, Cohen KB, Hunter L: **An open-source framework for large-scale, flexible evaluation of biomedical text mining systems**. *Journal of biomedical discovery and collaboration* 2008, **3**:1.
66. Leitner F, Mardis SA, Krallinger M, Cesareni G, Hirschman LA, Valencia A: **An Overview of BioCreative II.5**. *IEEE/ACM transactions on computational biology and bioinformatics / IEEE, ACM* 2010, **7**:385-99.
67. He M, Wang Y, Li W: **PPI finder: a mining tool for human protein-protein interactions**. *PLoS one* 2009, **4**:e4554.
68. Torvik VI, Smalheiser NR: **A quantitative model for linking two disparate sets of articles in MEDLINE**. *Bioinformatics* 2007, **23**:1658-65.
69. Zhou D, He Y, Kwoh CK: **From Biomedical Literature to Knowledge: Mining Protein-Protein Interactions**. In *Comp. Intel. in Biomed. & Bioinform.* Springer; 2008:397-421.
70. Hao Y, Zhu X, Huang M, Li M: **Discovering patterns to extract protein-protein interactions from the literature: Part II**. *Bioinformatics* 2005, **21**:3294-300.
71. Yakushiji A: **Automatic Construction of Predicate-argument Structure Patterns for Biomedical Information Extraction**. In *EMNLP '06 Proceedings of the 2006 Conference on Empirical Methods in Natural Language Processing*. 2006:284-292.
72. Wang H-C, Chen Y-H, Kao H-Y, Tsai S-J: **Inference of transcriptional regulatory network by bootstrapping patterns**. *Bioinformatics* 2011, **27**:1422-8.
73. Liu H, Komandur R, Verspoor K: **From Graphs to Events: A Subgraph Matching Approach for Information Extraction from Biomedical Text**. In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:164-172.
74. Hakenberg J, Leaman R, Vo NH, Jonnalagadda S, Sullivan R, Miller C, Tari L, Baral C, Gonzalez G: **Efficient extraction of protein-protein interactions from full-text articles**. *IEEE/ACM transactions on computational biology and bioinformatics / IEEE, ACM* 2010, **7**:481-94.
75. Nguyen QL, Tikk D, Leser U: **Simple tricks for improving pattern-based information extraction from the biomedical literature**. *Journal of biomedical semantics* 2010, **1**:9.
76. Rebholz-Schuhmann D, Jimeno-Yepes A, Arregui M, Kirsch H: **Measuring prediction capacity of individual verbs for the identification of protein interactions**. *Journal of biomedical informatics* 2010, **43**:200-7.
77. Fox AD, Jr WAB, Johnson HL, Hunter LE, Slonim DK: **Mining Protein-Protein Interactions from GeneRIFs with OpenDMAP**. In *LNBI6004*. 2010:43-52.
78. Choi YS: **Tree pattern expression for extracting information from syntactically parsed text corpora**. *Data Mining and Knowledge Discovery* 2010, **22**:211-231.
79. Spasic I, Sarafraz F, Keane JA, Nenadic G: **Medication information extraction with linguistic pattern matching and semantic rules**. *Journal of the American Medical Informatics Association : JAMIA* 2010, **17**:532-5.

80. Jang H, Lim J, Lim J-H, Park S-J, Lee K-C, Park S-H: **Finding the evidence for protein-protein interactions from PubMed abstracts.** *Bioinformatics* 2006, **22**:e220-6.
81. Ono T, Hishigaki H, Tanigami A, Takagi T: **Automated extraction of information on protein-protein interactions from the biological literature.** *Bioinformatics* 2001, **17**:155-61.
82. Koike A, Niwa Y, Takagi T: **Automatic extraction of gene/protein biological functions from biomedical text.** *Bioinformatics* 2005, **21**:1227-36.
83. Kim J-H, Mitchell A, Attwood TK, Hilario M: **Learning to extract relations for protein annotation.** *Bioinformatics* 2007, **23**:i256-63.
84. Rinaldi F, Schneider G, Kaljurand K, Hess M, Romacker M: **An environment for relation mining over richly annotated corpora: the case of GENIA.** *BMC bioinformatics* 2006, **7 Suppl 3**:S3.
85. Kim J-J, Zhang Z, Park JC, Ng S-K: **BioContrasts: extracting and exploiting protein-protein contrastive relations from biomedical literature.** *Bioinformatics* 2006, **22**:597-605.
86. Malik R, Franke L, Siebes A: **Combination of text-mining algorithms increases the performance.** *Bioinformatics* 2006, **22**:2151-7.
87. Giuliano C, Lavelli A, Romano L, Sommarive V: **Exploiting Shallow Linguistic Information for Relation Extraction from Biomedical Literature.** In *ACL 2006*. 2006, **18**:401-408.
88. Katrenko S, Adriaans P: **Learning Relations from Biomedical Corpora Using Dependency Tree Levels.** In *In Proceedings of the Fifteenth Dutch-Belgian Conference on Machine Learning (Benelearn)*. 2006.
89. Erkan G, Ozgur A, Radev DR: **Semi-Supervised Classification for Extracting Protein Interaction Sentences using Dependency Parsing.** In *Proceedings of the 2007 Joint Conference on Empirical Methods in Natural Language Processing and Computational Natural Language Learning*. 2007:228-237.
90. Sætre R, Sagae K, Tsujii J: **Syntactic features for protein-protein interaction extraction.** In *The 2nd International Symposium on Languages in Biology and Medicine LBM 2007 Short Papers*. 2007.
91. Landeghem SV, Saeys Y, Peer YVD, Baets BD: **Extracting Protein-Protein Interactions from Text using Rich Feature Vectors and Feature Selection.** In *Proceedings of the Third International Symposium on Semantic Mining in Biomedicine 2008*. 2008.
92. Kim M-Y: **Detection of gene interactions based on syntactic relations.** *Journal of biomedicine & biotechnology* 2008, **2008**:371710.
93. Kim S, Shin S-Y, Lee I-H, Kim S-J, Sriram R, Zhang B-T: **PIE: an online prediction system for protein-protein interactions from text.** *Nucleic acids research* 2008, **36**:W411-5.
94. Ahmed ST, Nair R, Patel C, Davulcu H: **BioEve : Bio-Molecular Event Extraction from Text Using Semantic Classification and Dependency Parsing.** In *Proceedings of the Workshop on BioNLP Shared Task - BioNLP '09*. 2009:99-102.

95. Niu Y, Otasek D, Jurisica I: **Evaluation of linguistic features useful in extraction of interactions from PubMed; application to annotating known, high-throughput and predicted interactions in I2D.** *Bioinformatics* 2010, **26**:111-9.
96. Van Landeghem S, Abeel T, Saeyns Y, Van de Peer Y: **Discriminative and informative features for biomolecular text mining with ensemble feature selection.** *Bioinformatics* 2010, **26**:i554-60.
97. Segura-Bedmar I, Martínez P, de Pablo-Sánchez C: **Using a shallow linguistic kernel for drug-drug interaction extraction.** *Journal of biomedical informatics* 2011.
98. Kim S, Yoon J, Yang J, Park S: **Walk-weighted subsequence kernels for protein-protein interaction extraction.** *BMC bioinformatics* 2010, **11**:107.
99. Li J, Zhang Z, Li X, Chen H: **Kernel-Based Learning for Biomedical.** *Journal of the American Society for Information Science* 2008, **59**:756-769.
100. Fayruzov T, De Cock M, Cornelis C, Hoste V: **Linguistic feature analysis for protein interaction extraction.** *BMC bioinformatics* 2009, **10**:374.
101. Riedel S: **Robust Biomedical Event Extraction with Dual Decomposition and Minimal Domain Adaptation.** In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:46-50.
102. Björne J, Salakoski T: **Generalizing Biomedical Event Extraction.** In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:183-191.
103. Quirk C, Choudhury P, Gamon M, Vanderwende L: **MSR-NLP Entry in BioNLP Shared Task 2011.** In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:155-163.
104. UNAIDS: *AIDS epidemic update: December 2006*. 2006.
105. Richman DD, Margolis DM, Delaney M, Greene WC, Hazuda D, Pomerantz RJ: **The challenge of finding a cure for HIV infection.** *Science (New York, N.Y.)* 2009, **323**:1304-7.
106. Vercauteren J, Vandamme A-M: **Algorithms for the interpretation of HIV-1 genotypic drug resistance information.** *Antiviral research* 2006, **71**:335-42.
107. Lengauer T, Sing T: **Bioinformatics-assisted anti-HIV therapy.** *Nature reviews. Microbiology* 2006, **4**:790-7.
108. Saigo H, Uno T, Tsuda K: **Mining complex genotypic features for predicting HIV-1 drug resistance.** *Bioinformatics* 2007, **23**:2455-62.
109. Cohen AM, Hersh WR: **A survey of current work in biomedical text mining.** *Briefings in bioinformatics* 2005, **6**:57-71.
110. Saric J, Jensen LJ, Ouzounova R, Rojas I, Bork P: **Extraction of regulatory gene/protein networks from Medline.** *Bioinformatics* 2006, **22**:645-50.
111. Chowdhary R, Zhang J, Liu JS: **Bayesian inference of protein-protein interactions from biological literature.** *Bioinformatics* 2009, **25**:1536-42.
112. Abulaish M, Dey L: **Biological relation extraction and query answering from MEDLINE abstracts using ontology-based text mining.** *Data & Knowledge Engineering* 2007, **61**:228-262.

113. Klein D, Manning CD: **Accurate unlexicalized parsing**. In *Proceedings of the 41st Annual Meeting on Association for Computational Linguistics - ACL '03*. Morristown, NJ, USA: Association for Computational Linguistics; 2003, 1:423-430.
114. Horn F, Lau AL, Cohen FE: **Automated extraction of mutation data from the literature: application of MuteXt to G protein-coupled receptors and nuclear hormone receptors**. *Bioinformatics* 2004, **20**:557-68.
115. Sanchez-Graillet O, Poesio M: **Negation of protein-protein interactions: analysis and extraction**. *Bioinformatics* 2007, **23**:i424-32.
116. Torvik VI, Smalheiser NR: **A quantitative model for linking two disparate sets of articles in MEDLINE**. *Bioinformatics* 2007, **23**:1658-65.
117. Liao JG, Chin K-V: **Logistic regression for disease classification using microarray data: model selection in a large p and small n case**. *Bioinformatics* 2007, **23**:1945-51.
118. Björne J, Ginter F, Pyysalo S, Tsujii J, Salakoski T: **Complex event extraction at PubMed scale**. *Bioinformatics* 2010, **26**:i382-90.
119. Sætre R, Miwa M, Yoshida K, Tsujii J: **From protein-protein interaction to molecular event extraction**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009:103-106.
120. Yang Z, Lin H, Li Y: **BioPPISVMEExtractor: a protein-protein interaction extractor for biomedical literature using SVM and rich feature sets**. *Journal of biomedical informatics* 2010, **43**:88-96.
121. Kim JD, Ohta T, Pyysalo S, Kano Y, Tsujii J: **Overview of BioNLP'09 shared task on event extraction**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009:1-9.
122. Krallinger M, Valencia A, Hirschman L: **Linking genes to literature: text mining, information extraction, and retrieval applications for biology**. *Genome biology* 2008, **9 Suppl 2**:S8.
123. Tari L, Anwar S, Liang S, Cai J, Baral C: **Discovering drug-drug interactions: a text-mining and reasoning approach based on properties of drug metabolism**. *Bioinformatics* 2010, **26**:i547-53.
124. Bui QC, Nualláin BO, Boucher CA, Sloot PMA: **Extracting causal relations on HIV drug resistance from literature**. *BMC Bioinformatics* 2010, **11**:101.
125. Bui QC, Sloot PMA: **Extracting biological events from text using simple syntactic patterns**. In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:143-146.
126. Kaljurand K, Schneider G, Rinaldi F: **UZurich in the BioNLP 2009 shared task**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009:28-36.
127. Kilicoglu H, Bergler S: **Syntactic dependency based heuristics for biological event extraction**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009:119-127.
128. Buyko E, Faessler E, Wermter J, Hahn U: **Event extraction from trimmed dependency graphs**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009:19-27.

129. Björne J, Heimonen J, Ginter F, Airola A, T: **Extracting complex biological events with rich graph-based feature sets**. In *Proceedings of BioNLP'09 Shared Task Workshop*. 2009:10-18.
130. Miwa M, Sætne R, Kim J-D, Tsujii J: **Event Extraction With Complex Event Classification Using Rich Features**. *Journal of Bioinformatics and Computational Biology* 2010, **08**:131.
131. Miwa M, Pyysalo S, Hara T, Tsujii J: **A Comparative Study of Syntactic Parsers for Event Extraction**. In *Proceedings of the 2010 Workshop on Biomedical Natural Language Processing*. Association for Computational Linguistics; 2010:37-45.
132. Vlachos A, Craven M: **Biomedical Event Extraction from Abstracts and Full Papers using Search-based Structured Prediction**. In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:36-40.
133. Riedel S, Andrew M: **Fast and Robust Joint Models for Biomedical Event Extraction**. In *Proceedings of the 2011 Conference on Empirical Methods in Natural Language Processing*. 2011:1-12.
134. Poon H, Vanderwende L: **Joint Inference for Knowledge Extraction from Biomedical Literature**. In *The 2010 Annual Conference of the North American Chapter of the Association for Computational Linguistics*. 2010:813-821.
135. Móra G, Farkas R, Szarvas G, Molnár Z: **Exploring ways beyond the simple supervised learning approach for biological event extraction**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009:137-140.
136. Neves ML, Carazo JM, Pascual-Montano A: **Extraction of biomedical events using case-based reasoning**. In *Proceedings of BioNLP'09 Shared Task Workshop*. Morristown, NJ, USA: Association for Computational Linguistics; 2009, **1**:68-76.
137. Mcclosky D, Surdeanu M, Manning CD: **Event Extraction as Dependency Parsing for BioNLP 2011**. In *Proceedings of BioNLP Shared Task 2011 Workshop*. 2011:41-45.
138. Cohen KB, Verspoor K, Johnson HL, Roeder C, Ogren PV, Jr WAB, White E, Tipney H, Hunter L: **High-precision biological event extraction with a concept recognizer**. In *Proceedings of BioNLP'09 Shared Task Workshop*. 2009:50-58.
139. Cohen KB, Johnson HL, Verspoor K, Roeder C, Hunter LE: **The structural and content aspects of abstracts versus bodies of full text journal articles are different**. *BMC bioinformatics* 2010, **11**:492.
140. Wren JD: **Question answering systems in biology and medicine--the time is now**. *Bioinformatics* 2011, **27**:2025-2026.