

Lecture Notes in Artificial Intelligence

11697

Subseries of Lecture Notes in Computer Science

Series Editors

Randy Goebel

University of Alberta, Edmonton, Canada

Yuzuru Tanaka

Hokkaido University, Sapporo, Japan

Wolfgang Wahlster

DFKI and Saarland University, Saarbrücken, Germany

Founding Editor

Jörg Siekmann

DFKI and Saarland University, Saarbrücken, Germany

More information about this series at <http://www.springer.com/series/1244>

Kamil Ekštein (Ed.)

Text, Speech, and Dialogue

22nd International Conference, TSD 2019
Ljubljana, Slovenia, September 11–13, 2019
Proceedings

Editor
Kamil Ekštein
University of West Bohemia
Pilsen, Czech Republic

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Artificial Intelligence
ISBN 978-3-030-27946-2 ISBN 978-3-030-27947-9 (eBook)
<https://doi.org/10.1007/978-3-030-27947-9>

LNCS Sublibrary: SL7 – Artificial Intelligence

© Springer Nature Switzerland AG 2019

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The annual International Conference on Text, Speech, and Dialogue (TSD), which emerged in 1998, constitutes a recognized platform for the presentation and discussion of state-of-the-art technology and recent achievements in computer processing of natural language. It has become a broad interdisciplinary forum, interweaving the topics of speech technology and language processing. The conference attracts researchers not only from Central and Eastern Europe but also from other parts of the world. Indeed, one of its goals has always been bringing together NLP researchers with various interests from different parts of the world and to promote their mutual co-operation. One of the ambitions of the conference is, as its name suggests, not only to deal with dialogue systems but also to improve dialogue among researchers in areas of NLP, i.e., among the “text” and the “speech” and the “dialogue” people.

The TSD 2019 was again a very special year: The TSD conference got truly international as it left the Czech Republic for the first time in its 22-year-long history. The Program Committee decided that the existing good repute of the conference might be further boosted by embedding it into the group of international conferences not only by international participants but also by changing venues around the world and involving local Organizing Committees from different countries. In order to make this beginning of the new era as smooth as possible, we picked a destination in Central Europe not far from the country of TSD origin, the Czech Republic. Thanks to long-lasting co-operation and friendship with the ASR & NLP researchers from the University of Ljubljana, Slovenia, the choice was thus easier. The first non-Czech venue of the TSD conference was therefore the beautiful Slovenian capital Ljubljana.

The TSD 2019 conference was held on the campus of the co-organizing institution, the Faculty of Electrical Engineering of the University of Ljubljana, during September 11–13, 2019. The conference schedule and the keynote topic was again co-ordinated with the Interspeech Conference and TSD 2019 was listed as an Interspeech 2019 satellite event. Like its predecessors, TSD 2019 highlighted the importance of language and speech processing to both the academic and scientific worlds and their most recent breakthroughs in current applications. Experienced researchers and professionals as well as newcomers in the field found in the TSD conference a forum to communicate with people sharing similar interests.

This volume contains a collection of submitted papers presented at the conference. Each of them was thoroughly reviewed by three members of the conference reviewing team consisting of more than 60 top specialists in the conference topic areas. A total of 33 accepted papers out of 73 submitted, altogether contributed by 174 authors and co-authors, were selected by the Program Committee for presentation at the conference and for publication in this book. Theoretical and more general contributions were presented in common (plenary) sessions. Problem-oriented sessions as well as panel discussions then brought together specialists in narrower problem areas with the aim of exchanging knowledge and skills resulting from research projects of all kinds.

Last but not least, we would like to express our gratitude to the authors for providing their papers on time, to the members of the conference reviewing team and the Program Committee for their careful reviews and paper selection, and to the editors for their hard work preparing this volume. Special thanks go to the members of both local Organizing Committees for their tireless effort and enthusiasm during the conference organization.

September 2019

Kamil Ekštein
Miloslav Konopík

Organization

The 22nd International Conference on Text, Speech, and Dialogue – TSD 2019 – was organized by the NTIS (New Technologies for the Information Society) P2 Research Centre of the Faculty of Applied Sciences, University of West Bohemia in Plzeň (Pilsen), Czech Republic, in co-operation with the Faculty of Electrical Engineering, University of Ljubljana, Ljubljana, Slovenia, and co-organized by the Faculty of Informatics, Masaryk University in Brno, Czech Republic.

The conference website is located at <http://www.kiv.zcu.cz/tsd2019/> or <http://www.tsdconference.org/>.

Program Committee

Elmar Nöth (General Chair), Germany
Rodrigo Agerri, Spain
Eneko Agirre, Spain
Vladimír Benko, Slovakia
Archana Bhatia, USA
Jan Černocký, Czech Republic
Simon Dobrišek, Slovenia
Kamil Ekštejn, Czech Republic
Karina Evgrafova, Russia
Yevhen Fedorov, Ukraine
Volker Fischer, Germany
Darja Fišer, Slovenia
Eleni Galiotou, Greece
Björn Gambäck, Norway
Radovan Garabík, Slovakia
Alexander Gelbukh, Mexico
Louise Guthrie, USA
Tino Haderlein, Germany
Jan Hajič, Czech Republic
Eva Hajičová, Czech Republic
Yannis Haralambous, France
Hynek Hermansky, USA
Jaroslava Hlaváčová, Czech Republic
Aleš Horák, Czech Republic
Eduard Hovy, USA
Denis Jouvet, France
Maria Khokhlova, Russia
Aidar Khusainov, Russia
Daniil Kocharov, Russia

Miloslav Konopík, Czech Republic
Ivan Kopeček, Czech Republic
Valia Kordoni, Germany
Evgeny Kotelnikov, Russia
Pavel Král, Czech Republic
Siegfried Kunzmann, USA
Nikola Ljubešić, Croatia
Natalija Loukachevitch, Russia
Bernardo Magnini, Italy
Oleksandr Marchenko, Ukraine
Václav Matoušek, Czech Republic
France Mihelič, Slovenia
Roman Mouček, Czech Republic
Agnieszka Mykowiecka, Poland
Hermann Ney, Germany
Juan Rafael Orozco-Arroyave, Colombia
Karel Pala, Czech Republic
Nikola Pavešić, Slovenia
Maciej Piasecki, Poland
Josef Psutka, Czech Republic
James Pustejovsky, USA
German Rigau, Spain
Leon Rothkrantz, The Netherlands
Anna Rumshisky, USA
Milan Rusko, Slovakia
Pavel Rychlý, Czech Republic
Mykola Sazhok, Ukraine
Pavel Skrelin, Russia
Pavel Smrž, Czech Republic

Petr Sojka, Czech Republic
 Georg Stemmer, Germany
 Marko Robnik Šikonja, Slovenia
 Vitomir Štruc, Slovenia
 Marko Tadić, Croatia
 Jan Trmal, Czech Republic
 Tamas Varadi, Hungary
 Zygmunt Vetulani, Poland

Aleksander Wawer, Poland
 Pascal Wiggers, The Netherlands
 Yorick Wilks, UK
 Marcin Wolinski, Poland
 Alina Wróblewska, Poland
 Victor Zakharov, Russia
 Jerneja Žganec Gros, Slovenia

Local Organizing Committee (Plzeň Team)

Miloslav Konopík (Chair)	Pavel Král
Václav Matoušek (Chair Emeritus)	Roman Mouček
Lucie Tauchenová (Secretary)	Ondřej Pražák
Kamil Ekštejn	Jakub Sido

Local Organizing Committee (Ljubljana Team)

Simon Dobrišek (Chair)	Martin Pernuš
Vitomir Štruc (Co-chair)	Olga Zakrajšek
Kaja Dobrovoljc	

Keynote Speakers

The organizers would like to thank the following respected scientists and researchers for delivering their keynote talks:

Ryan Cotterell	Bhiksha Raj
Denis Jouvett	Aline Villavicencio

Acknowledgments

The organizers would like to give special thanks to the following reviewers who substantially contributed to the successful completion of the TSD 2019 review process by voluntarily agreeing to deliver reviews beyond their duties:

Anuj Goyal	Carlos Ariel Ferrer Riesgo
Ondřej Pražák	Jakub Sido

Sponsoring Institutions

The organizers would like to express their immense gratitude to the following establishments for providing extra funding that helped to keep the conference fees reasonable:

Springer-Verlag GmbH, Heidelberg, Germany
CLARIN.SI, Ljubljana, Slovenia

Abstracts of Invited Talks

Mitigating Gender Bias in Morphologically Rich Languages

Ryan Cotterell

Department of Computer Science and Technology, Natural Language
and Information Processing Research Group, University of Cambridge,
William Gates Building, 15 JJ Thomson Avenue, Cambridge CB3 0FD, UK
<https://www.cl.cam.ac.uk/research/nl/>
ryan.cotterell@jhu.edu

Abstract. Gender bias exists in corpora of all of the world’s languages: the bias is a function what people talk about, not of the grammar of a language. For this reason, data-driven systems in NLP that are trained on this data will inherit such bias. Evidence of bias can be found in all sorts of NLP technologies: word vectors, language models, coreference systems and even machine translation. Most of the research done to mitigate gender bias in natural language corpora, however, has focused solely on English. For instance, in an attempt to remove gender bias in English corpora, NLP practitioners often augment corpora by swapping gendered words: i.e., if “he is a smart doctor” appears, add the sentence “she is a smart doctor” to the corpus as well before training a model. The broader research question asked in this talk is the following: How can we mitigate gender bias in corpora from any of the world’s languages, not just in English? As an example, the simple swapping heuristic for English will not generalize to most of the world’s languages. Indeed, such a solution would not even apply to German, since it marks gender on both nouns and adjectives and requires gender agreement throughout a sentence. In the context of German, this task is far more complicated: mapping “er ist ein kluger Arzt” to “sie ist eine kluge Ärztin” requires more than simply swapping “er” with “sie” and “Arzt” with “Ärztin”—one also has to modify the article (“ein”) and the adjective (“klug”). In this talk, we present a machine-learning solution to this problem: we develop a novel neural random field that generates such sentence-to-sentence transformations, enforcing agreement with respect to gender. We explain how to perform inference and morphological reinflection to generate such transformations without any labeled training examples. Empirically, we illustrate that the model manages to reduce gender bias in corpora without sacrificing grammaticality with a novel metric of gender bias. Additionally, we discuss concrete applications to coreference resolution and machine translation.

Adversarial Attacks on ML Systems

Bhiksha Raj

Language Technologies Institute, School of Computer Science,
Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, USA
<http://mlsp.cs.cmu.edu/people/bhiksha/>
bhiksha@cs.cmu.edu

Abstract. As neural network classifiers become increasingly successful at various tasks ranging from speech recognition and image classification to various natural language processing tasks and even recognizing malware, a second, somewhat disturbing discovery has also been made. It is possible to fool these systems with carefully crafted inputs that appear to the lay observer to be natural data, but cause the neural network to misclassify in random or even targeted ways.

In this talk we will discuss why such attacks are possible, and the problem of designing, identifying, and avoiding attacks by such crafted “adversarial” inputs.

Multiword Expressions and Idiomaticity: How Much of the Sailing Has Been Plain?

Aline Villavicencio^{1,2}

¹ Department of Computer Science, University of Sheffield, UK
www.sheffield.ac.uk/dcs

² Institute of Informatics, Federal University of Rio Grande do Sul, Brazil
www.inf.ufrgs.br
a.villavicencio@sheffield.ac.uk

Extended Abstract

Much progress has been made in designing accurate word representations [2–4], with improvements for language technology applications like machine translation and text simplification. Precise natural language understanding requires adequate treatments both of single words and of larger units. In particular, one commonly held assumption for constructing the representation for larger units like expressions, phrases and sentences, is that the meaning of the unit can be constructed from the meanings of its parts, in what is known as the Compositionality Principle. While it allows an interpretation to be generated even for unseen combinations of known words, it may not be adequate for expressions like idioms, verb-particle constructions and compound nouns as they often display idiomaticity. For instance, this is the case of *loan shark* with the meaning of a person who lends money at extremely high interest rates (rather than a fish that can be borrowed). Therefore it is important to identify which words in a sentence form an expression [5], and whether an expression is idiomatic [1, 6] and should be treated as a unit, as this determines if it can be interpreted from a combination of the meanings of their component words or not. In this talk I discuss advances on the identification and treatment of multiword expressions in texts, focusing in particular on techniques for modelling idiomaticity.

Acknowledgements. This talk includes joint work with Carlos Ramisch, Marco Idiart, Silvio Cordeiro, Rodrigo Wilkens, Felipe Paula and Leonardo Zilio.

References

1. Cordeiro, S., Villavicencio, A., Idiart, M., Ramisch, C.: Unsupervised compositionality prediction of nominal compounds. *Comput. Linguist.* **45**(1), 1–57 (2019). https://doi.org/10.1162/coli_a_00341

2. Lin, D.: Automatic retrieval and clustering of similar words. In: Boitet, C., Whitelock, P. (eds.) 36th Annual Meeting of the Association for Computational Linguistics and 17th International Conference on Computational Linguistics, COLING-ACL 1998, 10–14 August 1998, Université de Montréal, Montréal, Quebec, Canada. Proceedings of the Conference, pp. 768–774. Morgan Kaufmann Publishers/ACL (1998)
3. Mikolov, T., Sutskever, I., Chen, K., Corrado, G., Dean, J.: Distributed representations of words and phrases and their compositionality. CoRR abs/1310.4546 (2013). <http://arxiv.org/abs/1310.4546>
4. Peters, M.E., et al.: Deep contextualized word representations. In: Walker, M.A., Ji, H., Stent, A. (eds.) Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, NAACL-HLT 2018, New Orleans, Louisiana, USA, 1–6 June 2018, vol. 1 (Long Papers), pp. 2227–2237. Association for Computational Linguistics (2018)
5. Ramisch, C.: Multiword Expressions Acquisition - A Generic and Open Framework. Theory and Applications of Natural Language Processing, Springer, Switzerland (2015). <https://doi.org/10.1007/978-3-319-09207-2>
6. Reddy, S., McCarthy, D., Manandhar, S.: An empirical study on compositionality in compound nouns. In: Fifth International Joint Conference on Natural Language Processing, IJCNLP 2011, Chiang Mai, Thailand, 8–13 November 2011, pp. 210–218. The Association for Computer Linguistics (2011)

Contents

Keynote Talks

Speech Processing and Prosody	3
<i>Denis Jouvét</i>	

Text

Using a Database of Multiword Expressions in Dependency Parsing	19
<i>Tomáš Jelínek</i>	
Explicit Discourse Argument Extraction for German	32
<i>Peter Bourgonje and Manfred Stede</i>	
Consonance as a Stylistic Feature for Authorship Attribution of Historical Texts.	45
<i>Lubomir Ivanov and Brandon Neilsen</i>	
Bidirectional LSTM Tagger for Latvian Grammatical Error Detection	58
<i>Daiga Deksnė</i>	
Methods for Assessing Theme Adherence in Student Thesis.	69
<i>Mikhail Tikhomirov, Natalia Loukachevitch, and Boris Dobrov</i>	
Natural Language Analysis to Detect Parkinson's Disease	82
<i>P. A. Pérez-Toro, J. C. Vásquez-Correa, M. Strauss, J. R. Orozco-Arroyave, and E. Nöth</i>	
Using Auto-Encoder BiLSTM Neural Network for Czech Grapheme-to-Phoneme Conversion	91
<i>Markéta Jůzová and Jakub Vít</i>	
The FRENK Datasets of Socially Unacceptable Discourse in Slovene and English	103
<i>Nikola Ljubešić, Darja Fišer, and Tomaž Erjavec</i>	
KAS-term: Extracting Slovene Terms from Doctoral Theses via Supervised Machine Learning	115
<i>Nikola Ljubešić, Darja Fišer, and Tomaž Erjavec</i>	
A Self-organizing Feature Map for Arabic Word Extraction	127
<i>Hassina Bouressace and János Csirik</i>	

Czech Text Processing with Contextual Embeddings: POS Tagging, Lemmatization, Parsing and NER	137
<i>Milan Straka, Jana Straková, and Jan Hajič</i>	
On GDPR Compliance of Companies' Privacy Policies	151
<i>Nicolas M. Müller, Daniel Kowatsch, Pascal Debus, Donika Mirdita, and Konstantin Böttinger</i>	
A Semi-automatic Structure Learning Method for Language Modeling.	160
<i>Vitor Pera</i>	
Coreference in English OntoNotes: Properties and Genre Differences	171
<i>Berfin Aktaş, Tatjana Scheffler, and Manfred Stede</i>	
The TransBank Aligner: Cross-Sentence Alignment with Deep Neural Networks.	185
<i>Ahmad Aghaebrahimian, Michael Ustaszewski, and Andy Stauder</i>	
Exploiting Large Unlabeled Data in Automatic Evaluation of Coherence in Czech	197
<i>Michal Novák, Jiří Mirovský, Kateřina Rysová, and Magdaléna Rysová</i>	
Examining Structure of Word Embeddings with PCA	211
<i>Tomáš Musil</i>	
Semantic Structure of Russian Prepositional Constructions	224
<i>Victor Zakharov and Irina Azarova</i>	
Explicit and Implicit Discourse Relations in the Prague Discourse Treebank.	236
<i>Šárka Zikánová, Jiří Mirovský, and Pavlína Synková</i>	
Speech	
On Practical Aspects of Multi-condition Training Based on Augmentation for Reverberation-/Noise-Robust Speech Recognition.	251
<i>Jiri Malek and Jindrich Zdansky</i>	
Evaluation of Synthetic Speech by GMM-Based Continuous Detection of Emotional States	264
<i>Jiří Přibíl, Anna Přibílová, and Jindřich Matoušek</i>	
Deep Representation Learning for Orca Call Type Classification.	274
<i>Christian Bergler, Manuel Schmitt, Rachael Xi Cheng, Hendrik Schröter, Andreas Maier, Volker Barth, Michael Weber, and Elmar Nöth</i>	

On Using Stateful LSTM Networks for Key-Phrase Detection	287
<i>Martin Bulín, Luboš Šmídl, and Jan Švec</i>	
Consonant-to-Vowel/Vowel-to-Consonant Transitions to Analyze the Speech of Cochlear Implant Users	299
<i>T. Arias-Vergara, J. R. Orozco-Arroyave, S. Gollwitzer, M. Schuster, and E. Nöth</i>	
Czech Speech Synthesis with Generative Neural Vocoder	307
<i>Jakub Vít, Zdeněk Hanzlíček, and Jindřich Matoušek</i>	
Linguistic Resources Construction: Towards Disfluency Processing in Spontaneous Tunisian Dialect Speech	316
<i>Emna Boughariou, Younès Bahou, and Lamia Hadrich Bleguith</i>	
Comparing Front-End Enhancement Techniques and Multiconditioned Training for Robust Automatic Speech Recognition.	329
<i>Meet H. Soni, Sonal Joshi, and Ashish Panda</i>	
Label-Driven Time-Frequency Masking for Robust Speech Command Recognition	341
<i>Meet Soni, Imran Sheikh, and Sunil Kumar Kopparapu</i>	
A Comparison of Hybrid and End-to-End Models for Syllable Recognition.	352
<i>Sebastian P. Bayerl and Korbinian Riedhammer</i>	
LSTM-Based Speech Segmentation for TTS Synthesis.	361
<i>Zdeněk Hanzlíček, Jakub Vít, and Daniel Tihelka</i>	
Spoken Language Identification Using Language Bottleneck Features	373
<i>Malo Grisard, Petr Motlíček, Wissem Allouchi, Michael Baeriswyl, Alexandros Lazaridis, and Qingran Zhan</i>	
Dialogue	
Question-Answering Dialog System for Large Audiovisual Archives	385
<i>Adam Chýlek, Luboš Šmídl, and Jan Švec</i>	
Crowd-Sourced Collection of Task-Oriented Human-Human Dialogues in a Multi-domain Scenario	398
<i>Norbert Braunschweiler, Panagiotis Papadakos, Margarita Kotti, Yannis Marketakis, and Yannis Tzitzikas</i>	
Author Index	413