

Natalia Sharonova  
Vasyl Lytvyn  
Olga Cherednichenko  
Yevhen Kupriianov  
Olga Kanishcheva  
Thierry Hamon  
Natalia Grabar  
Victoria Vysotska  
Agnieszka Kowalska-Styczen  
Izabela Jonek-Kowalska  
(Eds.)



# COMPUTATIONAL LINGUISTICS AND INTELLIGENT SYSTEMS

Proceedings of the 5<sup>th</sup> International Conference, COLINS-2021.  
Volume I: Main Conference

Kharkiv, Ukraine  
April, 2021, 22-23

N. Sharonova, V. Lytvyn, O. Cherednichenko, Y. Kupriianov, O. Kanishcheva, T. Hamon, N. Grabar, V. Vysotska, A. Kowalska-Styczen, I. Jonek-Kowalska (Eds.): Computational Linguistics and Intelligent Systems. Proceedings of the 5th International Conference on COLINS 2021. Volume I: Workshop. Kharkiv, Ukraine, April 22-23, 2021, CEUR-WS.org, online <sup>1</sup>

The 5th International Conference on COLINS 2021 is organized by:

- National Technical University «Kharkiv Polytechnic Institute», Ukraine
- Lviv Polytechnic National University, Ukraine
- Institut Galilée of Université Paris 13, France
- Politechnika Śląska, Poland
- Ukrainian Scientific and Educational IT Society, Ukraine

This volume represents the proceedings of the Workshop Conference, with Posters and Demonstrations track, of the 5th International Conference on Computational Linguistics and Intelligent Systems, held in Kharkiv, Ukraine, in April 2021. It comprises 137 contributed papers that were carefully peer-reviewed and selected from 181 submissions. The volume opens with the abstracts of the keynote talks. The rest of the collection is organized in two parts: (I) Computational Linguistics; (II) Intelligent Systems. Parts I contain the contributions to the Workshop COLINS Conference tracks, structured in three topical sections: (1) Natural Language Processing; (2) Corpus Technologies, Ontologies and Computer Lexicography; (3) Discourse Analysis and Social Media. Parts II contain the contributions to the Workshop COLINS Conference tracks, structured in four topical sections: (1) Knowledge-oriented Systems; (2) Applied Intelligent Systems; (3) Math Tools of Artificial Intelligence; (4) Machine Learning Applications.

COLINS Conference is intended to attract researchers with a strong background in the field of Computational Linguistics and Intelligent Systems. The COLINS Conference is soliciting literature review, survey and research papers including, whilst not limited to, the following areas of interest:

- Computational Linguistics
- Intelligent Systems

The Conference took the form of oral presentations of peer-reviewed regular papers. Proceedings of the COLINS Conference will be submitted to CEUR-WS.org for online publication.

Submitted papers will be peer-reviewed by three scholars based on technical quality, relevance, originality, significance, and clarity. If necessary, a fourth, additional reviewer will be involved. The Program Committee will use these reviews to determine which papers will be accepted for presentation at the conference. The result of the reviewing will be announced to the submitting authors by email, along with reviewer comments, if any. Only accepted papers, which will be presented at the conference, shall be submitted to CEUR-WS.org for online publication.

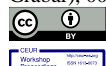
The Editorial team includes a highly-qualified academics and industry professionals (PhD or Doctoral graduates).

Further information can be found at:

- <http://colins.in.ua/>
- [https://www.youtube.com/channel/UCr74OG8oKIJE\\_ETVxRC9IPQ](https://www.youtube.com/channel/UCr74OG8oKIJE_ETVxRC9IPQ)
- <https://www.facebook.com/Computational-Linguistics-and-Intelligent-Systems-Conference-1403297853078941>

---

COLINS-2021: 5th International Conference on Computational Linguistics and Intelligent Systems, April 22–23, 2021, Kharkiv, Ukraine  
EMAIL: nvsharonova@ukr.net (N. Sharonova), Vasyl.V.Lytvyn@lpnu.ua (V. Lytvyn), olha.cherednichenko@gmail.com (O. Cherednichenko), eugeniokupriianov@gmail.com (Y. Kupriianov), kanichshevaolga@gmail.com (O. Kanishcheva), hamon@limsi.fr (T. Hamon), natalia.grabar@univ-lille3.fr (N. Grabar), victoria.a.vysotska@lpnu.ua (V. Vysotska), Agnieszka.Kowalska-Styczen@polsl.pl (A. Kowalska-Styczen), Izabela.Jonek-Kowalska@polsl.pl (I. Jonek-Kowalska)  
ORCID: 0000-0002-7555-1507 (N. Sharonova), 0000-0002-9676-0180 (V. Lytvyn), 0000-0002-9391-5220 (O. Cherednichenko), 0000-0002-0801-1789 (Y. Kupriianov), 0000-0002-9035-1765 (O. Kanishcheva), 0000-0002-1521-4875 (T. Hamon), 0000-0002-0237-4554 (N. Grabar), 0000-0001-6417-3689 (V. Vysotska), 0000-0002-7404-9638 (A. Kowalska-Styczen), 0000-0002-4006-4362 (I. Jonek-Kowalska)



© 2021 Copyright for the individual papers by the papers' authors. Copying permitted only for private and academic purposes. This volume is published and copyrighted by its editors. Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).

CEUR Workshop Proceedings (CEUR-WS.org)

## Preface

It is our pleasure to present you the proceedings of the Workshop Conference of COLINS-2021, the fourth edition of the International Conference on Computational Linguistics and Intelligent Systems, held in Kharkiv (Ukraine) on April 22-23, 2021.

The main purpose of the CoLInS conference is a discussion of the recent research results in all areas of Natural Language Processing and Intelligent Systems Development.

The conference is soliciting literature review, survey and research papers comments including, whilst not limited to, the following areas of interest:

- machine learning;
- discourse analysis;
- segmentation, tagging, and parsing;
- speech recognition;
- sentiment analysis and opinion mining;
- text categorization and topic modeling;
- text mining;
- information retrieval;
- artificial intelligent;
- information extraction;
- statistical language analysis;
- text summarization;
- data mining and data analysis;
- computer lexicography;
- social network analysis;
- question answering systems;
- web and social media;
- NLP applications;
- machine translation;
- intelligent text processing systems;
- memory systems and computer-aided translation tools;
- computer-aided language learning;
- knowledge representation;
- knowledge-oriented systems;
- natural language processing;
- ontologies and ontology-based systems;
- corpus linguistics

The language of COLINS Conference is English.

The conference took the form of oral presentation by invited keynote speakers plus presentations of peer-reviewed individual papers. The papers were distributed among 90 external reviewers from France, Germany, India, Moldova, Poland, Serbia, Slovenia and Ukraine. The total number of reviews is 645. To take more correct decision regarding the acceptance or rejection the papers got 3-6 reviews. The peer review statistics is as follows: 110 papers (3 reviews), 46 papers (4 reviews), 19 papers (5 reviews), and 6 papers (6 reviews). There was also an exhibition area for poster and demo sessions. A Student section of the conference for students and PhD students ran in parallel to the main conference.

The conference gathered participants from different countries including Azerbaijan, Germany, India, Kazakhstan, Kuwait, Morocco, Poland, Russia, Serbia, Slovenia, Turkey, Uganda, Ukraine and United Kingdom.

This year Organizing Committee received 181 submissions, out of which 137 were accepted for presentation as a regular papers. The papers are submitted to the following tracks: machine learning (9), discourse analysis (5), segmentation, tagging, and parsing (2), speech recognition (3), text categorization and topic modeling(1), sentiment analysis and opinion mining (4), text mining (2), information retrieval (3), artificial intelligent (38), statistical language analysis (6), text summarization (1), data mining and data analysis (9), computer lexicography (4), social network analysis (5), web and social media (3), NLP applications (5), machine translation (1), computer-aided language learning (4), knowledge representation (1), knowledge-oriented systems (6), natural language processing (13), ontologies and ontology-based systems (7), corpus linguistics (5). The papers directly deal with such languages: Ukrainian, Polish, Russian, Spanish, Arabic, English and German.

These papers and extended abstracts were published in this Volume I of COLINS 2021 proceedings.

The conference would not have been possible without the support of many people. First of all, we would like to thank all the authors who submitted papers to COLINS 2021 and thus demonstrated their interest in the research problems within our scope. We are very grateful to the members of our Program Committee for providing timely and thorough reviews and, also, for being cooperative in doing additional review work. We would like to thank the Organizing Committee of the conference whose devotion and efficiency made this instance of COLINS a very interesting and effective scientific forum.

April, 2021

Natalia Sharonova  
Vasyl Lytvyn  
Olga Cherednichenko  
Yevhen Kupriianov  
Olga Kanishcheva  
Thierry Hamon  
Natalia Grabar  
Victoria Vysotska  
Agnieszka Kowalska-Styczen  
Izabela Jonek-Kowalska