EMNLP 2021

2021 Conference on Empirical Methods in Natural Language Processing

Proceedings of the Conference

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Message from the General Chair

EMNLP 2021 is one of the first hybrid conferences in the field of natural language processing. It is also for us, the organizing team, uncharted domain. Organizing a hybrid conference has felt like organizing two conferences, a virtual one and an in-person one, which seamlessly must work together and with a kind of multi-task objective make the conference experience synergistic and successful both remotely and in person. With this challenge come opportunities. The hybrid format allows remote participation in a conference that is held onsite in Punta Cana, The Dominican Republic, and allows creating a real conference feeling for those who do not want to travel the many miles from the other side of the world and increase their carbon footprint, and for those who have budget restrictions for traveling. We welcome you all!

As in previous years, the purpose of the General Chair's preface is to express thanks to the amazing team of organizing chairs whose heroic efforts made this hybrid conference possible. The organizing team includes:

- The Programme Chairs – Xuanjing Huang, Lucia Specia and Scott Yih – who did a tremendous job to manage the reviewing process and set up an outstanding scientific program.
- The Senior Area Chairs, Area Chairs and Reviewers whose expertise enabled authors to learn from their reviews and to deliver papers that improved on their original submissions.
- The Demonstration Chairs – Heike Adel and Shuming Shi – who selected outstanding demonstrations to complement the program of the main conference.
- The Workshop Chairs – Minlie Huang and Parisa Kordjamshidi – who made a huge effort for organizing hybrid workshops and satellite conferences.
- The Publication Chairs – Loic Barrault, Greg Durrett and Yansong Feng – who met the challenge of identifying and correcting the myriad ways in which papers could be wrongly formatted, and who assembled the result into the conference proceedings.
- The Handbook Chair – Els Lefever – for the timely delivery of handbook information.
- The Publication Chairs of Findings – Gabriel Stanovsky and Tim Van de Cruys – who made it possible that many interesting papers and their findings can be accessed and cited by the public.
- The Tutorial Chairs – Jing Jiang and Ivan Vulic – who selected six excellent tutorials to be presented at the conference.
- The Ethics Chairs – Margot Mieskes and Christopher Potts – who undertook the delicate task of checking papers that had been flagged for potential ethical issues.
- The Website Chair – Miryam de Lhoneux – who ensured that the EMNLP 2021 website promoting this hybrid conference stayed up to date; Mingxiao Li who offered website support; and Nathan Cornille who was responsible for the graphical designs.
- The Virtual Infrastructure Chairs – Quinh Do, Zhaopeng Tu and Dani Yogatama – and the Underline team – Sol Rosenberg, Daniel Luise, Jernej Masnec, Luka Simic, Alexandru Pricop and various support staff.
- The Volunteer Coordinators and Scholarship Chairs – Qi Wu and Diyi Yang – who managed to attract over 200 student and early career volunteers willing to make EMNLP 2021 a success.
- The Publicity Chairs – Raffaella Bernardi and Preethi Jyothi – who have served as both the voice of EMNLP 2021 in communicating with the community and as its ears, reporting on community concerns as soon as they were expressed.

- The Diversity & Inclusion Chairs – Laura Alonso Alemany and Toshiaki Nakazawa – who have worked tirelessly to make EMNLP 2021 as welcoming and inclusive as possible for all participants. They have worked with community members to create Birds of a Feather sessions, Affinity Group sessions, student panels and mentoring sessions which contribute to reinforcing the EMNLP community (and sub-groups within this community).

We also want to express special thanks to Priscilla Rasmussen, the ACL Business Manager, first for booking EMNLP 2021 into a beautiful resort in the Dominican Republic, and for the local organization of a hybrid conference. Many thanks, Priscilla!

Finally, we would like to express gratitude to our sponsors, whose generous support has been invaluable in building up EMNLP 2021 to what it is now. These include the Diamond-level sponsors – Apple, Bloomberg Engineering, Facebook AI and Google Research; the Platinum-level sponsors – Amazon Science, Baidu, ByteDance, DeepMind, G Research and Megagon Labs; the Gold-level sponsors – Grammarly and Microsoft; the Silver-level sponsors – duolingo, Naver and Naver Labs Europe; the Bronze-level sponsors – Adobe, Babelscape, human language technology center of excellence and LegalForce; and the Supporter servicenow. We would like to thank the Diversity and Inclusion Champion sponsors – Amazon Science, Deepmind, Google Research and Microsoft; the Diversity and Inclusion Ally sponsor – Morgan Stanley; and the Diversity and Inclusion Contributor sponsors – Adobe and IBM. ACL SIGDAT has also generously contributed to supporting scholarships for attending the conference.

Marie-Francine Moens, KU Leuven, Belgium
EMNLP 2021 General Chair

Message from the Program Chairs

Welcome to the EMNLP 2021, the first hybrid conference in EMNLP's history, which is to be held online and in Punta Cana, Dominican Republic.

EMNLP 2021 has received 3,717 full paper submissions, the largest number to date. After excluding papers withdrawn by the authors, and desk rejecting papers which violated the anonymity policy, the multiple submission policy, or the formatting requirements, we were left with 3,600 submissions to be sent out for review. Despite the record-breaking number of submissions, we were able to keep the acceptance rates at a similar level as past years. 840 submissions were accepted to the main conference. Among them, 315 were accepted as oral papers, and 525 were accepted as posters. The decision between oral and poster presentations was not based on the quality/merit of the papers, but on our understanding of what would be the best format for presentation of each individual paper.

We continued providing the acceptance option of "Findings", following last year's initiative in the form of a companion publication, for papers that narrowly missed acceptance to the main conference, but were judged to be solid, well-executed research, and worthy of publication. After the review process, 445 papers were invited to be included in the Findings. 26 papers declined the offer, leading to 419 papers to be published in the Findings. Some statistics of the accepted papers are shown below.

	Long	Short	Total
Reviewed	2,540	1,060	3,600
Accepted as Oral	249	66	315
Accepted as Poster	401	124	525
Acceptance Rate (Main Conference)	25.6%	17.9%	23.3%
Accepted to Findings	300	119	419
Acceptance Rate (Findings)	11.8%	11.3%	11.6%

To meet the reviewer demands of a large conference, we organized the program committee into 22 tracks, including a special "Multidisciplinary and Area Chair Conflict of Interest" track, based on the track information in past conferences. We also introduced a new track called "Efficient methods for NLP" to promote work aiming to reduce the costs of NLP design and experimentation, similar to the "Green NLP" tracks in EACL 2021 and NAACL 2021. In terms of submissions per track, 9 tracks received more than 200 submissions. Particularly popular were the tracks NLP Applications, Machine Learning for NLP, Machine Translation and Information Extraction, which have around 300 submissions each.

We adopted a hierarchical program committee structure similar to that of recent NLP conferences. For each area, we invited 1-4 Senior Area Chair (SACs), who worked with a team of Area Chairs (ACs) they nominated, as well as an army of reviewers that we put together. We used the submission numbers per track from past conferences to estimate the number of SACs and ACs required for each track, leading to 46 SACs and 236 ACs. For reviewer recruitment, we started with the reviewer lists from past conferences and sent out initial invitations asking reviewers to express their track preferences. We then passed the reviewer list to SACs and asked them to select reviewers from these candidate reviewers based on their expertise, and Semantic/Google Scholar profiles. Overall, this resulted in a total of 3,112 reviewers.

Each submission was assigned to three reviewers and one AC. The initial paper assignment was first made using an automatic algorithm to match the abstracts with ACs/reviewers' past publication records, then adjusted by SACs/PCs. We adapted the review forms from EMNLP 2020, NAACL 2021, and ACL-IJCNLP 2021. Besides the overall recommendation, reviewers were asked to evaluate how reproducible the results in the paper were, and whether there was any ethical concern. Our final decisions were made not just on the review scores, but also took into account the reviews, author responses, discussions among reviewers, meta-reviews and SAC/AC recommendations. To ensure the review quality, we provided

detailed guidelines about what reviewers should and shouldn't do in a review.

We also formed an Ethics Committee (EC) dedicated to ethical issues. 203 papers with ethical concerns raised by the technical reviewing committee were sent to the EC. The EC chairs went over the papers to determine whether a full EC review would be required. If so, the paper received one or two ethics reviews from additional reviewers recruited by the EC chairs. For any paper that was recommended to be accepted based on technical reviews and that had been referred to the EC, the EC chairs recommended one of the following to the PC chairs: (a) accept (12 EMNLP, 11 Findings), (b) conditionally accept (the ethical issues must be addressed in the camera-ready version; 17 EMNLP, 20 Findings), and (c) reject due to ethical issues (1 paper). The authors of all conditionally accepted papers (except 1 paper declining the Findings offer) submitted the camera-ready version and a short response that explained how they had made the changes requested by the EC meta-reviews. The EC chairs double-checked these revised submissions and responses, and confirmed that the ethical concerns had been addressed. As a result, all conditionally accepted papers were accepted to the main conference or Findings.

ACL Rolling Review (ARR) is a new initiative of the Association for Computational Linguistics, where the reviewing and acceptance of papers to publication venues are done in a two-step process: (1) centralized rolling review and (2) submission to a publication venue. Working closely with the ARR organizers, we ran a pilot at EMNLP 2021. 17 papers (16 long, 1 short) were submitted via ARR to EMNLP 2021, accounting for 25% of the ARR May submissions. After the decision process involving only PCs and SACs, 6 papers (5 long, 1 short) were accepted to the main conference, among which 2 papers were accepted orally. The other 5 long papers were accepted to the Findings. These papers will be published in the respective proceedings as any other EMNLP/Findings paper.

Based on the nominations from SACs and ACs, we identified 21 candidates for the best papers and outstanding papers award. These papers are assessed by the Best Paper Award Committee. The award winners will be announced at the closing ceremony.

EMNLP 2021 will also feature 28 papers accepted by the Transactions of the Association for Computational Linguistics (TACL) and 7 papers from the journal of Computational Linguistics (CL), out of which 29 will be presented as orals and 6 as posters.

Another highlight of our program is the three exciting keynote talks, presented by Professor Ido Dagan from Bar-Ilan University, entitled "Where next? Towards multi-text consumption via three inspired research lines", Professor Steven Bird from Charles Darwin University, entitled "LT4All!? Rethinking the Agenda", and Professor Evelina Fedorenko from Massachusetts Institute of Technology, entitled "The language system in the human brain".

There are many people we would like to thank for their significant contributions. EMNLP 2021 would not be possible without their support:

- Our General Chair, Marie-Francine Moens, who has led the whole organizing team, and helped with many of our decision processes;
- 46 SACs who have helped us comprehensively throughout the entire review process, from recruiting ACs and reviewers, assigning papers, checking review quality, making recommendation on final paper decisions, suggesting presentation formats, to recommending best paper candidates; special thanks to Jesse Dodge, who advocated to set up the "Efficient methods for NLP" track, volunteered to serve as the SAC, and helped us update the Reproducibility Checklist to encourage authors to report the computational budget for the experiments in their paper;
- 236 ACs who checked the initial submissions, led paper discussions, wrote meta reviews, ensured review quality, suggested best paper candidates, and recommended outstanding reviewers;
- 3,112 reviewers, 370 secondary reviewers for reviewing papers and actively participating in paper discussions; special thanks to those who stepped in at the last minute to serve as emergency reviewers;

- 35 Ethics Committee members, chaired by Margot Mieskes and Chris Potts, for their hard work to provide ethical reviews and meta-reviews for all papers with serious ethical issues, and ensure that all the conditionally accepted papers have addressed the ethical issues appropriately;
- Best Paper Award Committee: Luke Zettlemoyer (chair), Raffaella Bernardi, Mikel L. Forcada, Pascale Fung, Jianfeng Gao, Min Yen KAN, Heng Ji, Mausam, and Ivan Titov, for selecting best papers and outstanding papers under a tight schedule;
- Our postdoc and student assistants Fernando Alva-Manchego, Zichu Fei, Yiding Tan, Yongxin Zhang and Xingwu Hu, who helped with the initial reviewer assignment, anonymity, multiple submission and format checking;
- Past *ACL PCs, including Trevor Cohn, Yulan He and Yang Liu (EMNLP 2020), Fei Xia, Wenjie Li, Roberto Navigli (ACL-IJCNLP 2021), and Anna Rumshisky, Luke Zettlemoyer and Dilek Hakkani-Tur (NAACL 2021) for all the useful guidance, tips and suggestions on the organization of NLP conferences;
- ARR Editors-in-chief Pascale Fung, Goran Glavaš, Sebastian Riedel, Amanda Stent, and CTO Graham Neubig, for their support in running the first ARR pilot, and providing the code for reviewer COI detection and paper assignment;
- Publication Chairs Loic Barrault, Greg Durrett and Yansong Feng, and Findings Chairs Gabriel Stanovsky and Tim Van de Cruys, for completing the final proceedings within a short period;
- ACL Anthology Director Matt Post, for his help in the production of the conference proceedings;
- TACL editors-in-chief Mark Johnson, Ani Nenkova, and Brian Roark, TACL Editorial Assistant Cindy Robinson, and CL Editor-in-Chief Hwee Tou Ng for coordinating TACL and CL presentations with us;
- Workshop Chairs Parisa Kordjamshidi and Minlie Huang, for connecting Findings paper authors with workshop organizers for possible presentations;
- Publicity Chairs Raffaella Bernardi and Preethi Jyothi, Website Chair Miryam de Lhoneux, and Website Support Mingxiao Li, who announced conference news on EMNLP Website and social media, collected feedback from the community, and disseminated EMNLP papers with potential public interests via media;
- Rich Gerber at SoftConf, who set up the EMNLP conference site, and was always quick to respond to our emails and resolve any problems we encountered with the START system;
- Sol Rosenberg, Daniel Luise and the whole Underline team, for creating the virtual site for the conference and helping put the hybrid program in place;
- Priscilla Rasmussen and members of the Local Organizing Committee, for various discussions on organizing EMNLP, and making the local arrangements for a hybrid programme;
- SIGDAT board members, Iryna Gurevych, Hang Li, Mona Diab and Chin-Yew Lin, for their guidance regarding various decisions;
- 11,425 authors for submitting their work to EMNLP 2021.

Our deepest gratitude to all of you. We hope you will enjoy the hybrid conference experience.

Xuanjing Huang, Fudan University
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Conference Program

Sunday, November 7, 2021

8:45–9:00 ***Opening Remarks***

9:00–10:00 ***Invited Talk 1 by Ido Dagan***

10:00–10:30 *Coffee Break*

10:30–12:00 Session 1A: Machine Translation and Multilinguality 1

Session 1B: Summarization 1

Session 1C: Information Extraction 1

Session 1D: Sentiment Analysis, Stylistic Analysis, and Argument Mining 1

Session 1E: Computational Social Science and Cultural Analytics

Session 1F: Efficient Methods for NLP 1

Session 1G: In-person Poster 1
Dialogue and Interactive Systems
Discourse and Pragmatics
Ethics and NLP
Generation
Information Retrieval and Text Mining

13:00–14:30 Session 2A: Machine Learning for NLP 1

Session 2B: Generation 1

Session 2C: Interpretability and Analysis of Models for NLP 1

Session 2D: NLP Applications 1

Sunday, November 7, 2021 (continued)

Session 2E: Linguistic Theories, Cognitive Modeling and Psycholinguistics

Session 2F: Information Retrieval and Text Mining

14:30–14:45 *Mini Break*

14:45–16:15 Session 3A: Machine Learning for NLP 2

Session 3B: Dialogue and Interactive Systems 1

Session 3C: Information Extraction 2

Session 3D: Resources and Evaluation 1

Session 3E: Discourse and Pragmatics

Session 3F: Semantics 1

Session 3G: In-person Poster 2
Interpretability and Analysis of Models for NLP
Machine Translation and Multilinguality

16:15–16:45 *Coffee Break*

16:45–18:15 Session 4A: Machine Learning for NLP 3

Session 4B: Dialogue and Interactive Systems 2

Session 4C: Information Extraction 3

Session 4D: Ethics and NLP

Sunday, November 7, 2021 (continued)

Session 4E: Phonology, Morphology and Word Segmentation

Session 4F: Speech, Vision, Robotics, Multimodal Grounding 1

19:00–21:00 Virtual Poster & Demo Session 1

Monday, November 8, 2021

9:00–10:30 Session 5A: Question Answering 1

Session 5B: Generation 2

Session 5C: Dialogue and Interactive Systems 3

Session 5D: Sentiment Analysis, Stylistic Analysis, and Argument Mining 2

Session 5E: Resources and Evaluation 2

Session 5F: Interpretability and Analysis of Models for NLP 2

Session 5G: In-person Poster 3
Information Extraction
NLP Applications
Speech, Vision, Robotics, Multimodal Grounding
Syntax: Tagging, Chunking and Parsing

10:30–11:00 *Coffee Break*

11:00–12:00 ***Invited Talk 2 by Evelina Fedorenko***

12:30–14:30 Virtual Poster & Demo Session 2

14:30–14:45 *Mini Break*

14:45–16:15 Session 6A: Machine Learning for NLP 4

Session 6B: Summarization 2

Session 6C: Machine Translation and Multilinguality 2

Session 6D: Speech, Vision, Robotics, Multimodal Grounding 2

Monday, November 8, 2021 (continued)

Session 6E: Sentiment Analysis, Stylistic Analysis, and Argument Mining 3

Session 6F: Semantics 2

Session 6G: In-person Poster 4
NLP Applications
Question Answering
Resources and Evaluation

16:15–16:45 *Coffee Break*

16:45–18:15 Session 7A: Machine Translation and Multilinguality 3

Session 7B: Question Answering 2

Session 7C: Dialogue and Interactive Systems 4

Session 7D: Resources and Evaluation 3

Session 7E: Efficient Methods for NLP 2

Session 7F: Semantics 3

Tuesday, November 9, 2021

8:30–10:30 Virtual Poster & Demo Session 3

10:30–11:00 *Coffee Break*

11:00–12:30 Session 8A: Machine Learning for NLP 5

Session 8B: Question Answering 3

Session 8C: Information Extraction 4

Session 8D: NLP Applications 2

Session 8E: Speech, Vision, Robotics, Multimodal Grounding 3

Session 8F: Semantics 4

Session 8G: In-person Poster 5
Computational Social Science and Cultural Analytics
Efficient Methods for NLP
Linguistic Theories, Cognitive Modeling and Psycholinguistics
Sentiment Analysis

Tuesday, November 9, 2021 (continued)

13:25–14:25 SIGDAT Business Meeting

14:30–16:00 Session 9A: Machine Translation and Multilinguality 4

Session 9B: Interpretability and Analysis of Models for NLP 3

Session 9C: Information Extraction 5

Session 9D: Resources and Evaluation 4

Session 9E: Syntax

Session 9F: Efficient Methods for NLP 3

Session 9G: In-person Poster 6
Machine Learning for NLP
Phonology, Morphology and Word Segmentation
Semantics: Lexical, Sentence level, Textual Inference and Other areas

16:00–16:30 *Coffee Break*

16:30–17:30 ***Invited Talk 3 by Steven Bird***

17:30–18:00 ***Closing Ceremony***