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Josep Lladós · Daniel Lopresti ·
Seiichi Uchida (Eds.)

Document Analysis and Recognition – ICDAR 2021

16th International Conference
Lausanne, Switzerland, September 5–10, 2021
Proceedings, Part IV

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Editors
Josep Lladós
Universitat Autònoma de Barcelona
Barcelona, Spain

Daniel Lopresti
Lehigh University
Bethlehem, PA, USA

Seiichi Uchida
Kyushu University
Fukuoka-shi, Japan

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Foreword

Our warmest welcome to the proceedings of ICDAR 2021, the 16th IAPR International Conference on Document Analysis and Recognition, which was held in Switzerland for the first time. Organizing an international conference of significant size during the COVID-19 pandemic, with the goal of welcoming at least some of the participants physically, is similar to navigating a rowboat across the ocean during a storm. Fortunately, we were able to work together with partners who have shown a tremendous amount of flexibility and patience including, in particular, our local partners, namely the Beaulieu convention center in Lausanne, EPFL, and Lausanne Tourisme, and also the international ICDAR advisory board and IAPR-TC 10/11 leadership teams who have supported us not only with excellent advice but also financially, encouraging us to setup a hybrid format for the conference.

We were not a hundred percent sure if we would see each other in Lausanne but we remained confident, together with almost half of the attendees who registered for on-site participation. We relied on the hybridization support of a motivated team from the Lule University of Technology during the pre-conference, and professional support from Imavox during the main conference, to ensure a smooth connection between the physical and the virtual world. Indeed, our welcome is extended especially to all our colleagues who were not able to travel to Switzerland this year. We hope you had an exciting virtual conference week, and look forward to seeing you in person again at another event of the active DAR community.

With ICDAR 2021, we stepped into the shoes of a longstanding conference series, which is the premier international event for scientists and practitioners involved in document analysis and recognition, a field of growing importance in the current age of digital transitions. The conference is endorsed by IAPR-TC 10/11 and celebrates its 30th anniversary this year with the 16th edition. The very first ICDAR conference was held in St. Malo, France in 1991, followed by Tsukuba, Japan (1993), Montreal, Canada (1995), Ulm, Germany (1997), Bangalore, India (1999), Seattle, USA (2001), Edinburgh, UK (2003), Seoul, South Korea (2005), Curitiba, Brazil (2007), Barcelona, Spain (2009), Beijing, China (2011), Washington DC, USA (2013), Nancy, France (2015), Kyoto, Japan (2017), and Syndey, Australia (2019).

The attentive reader may have remarked that this list of cities includes several venues for the Olympic Games. This year the conference was be hosted in Lausanne, which is the headquarters of the International Olympic Committee. Not unlike the athletes who were recently competing in Tokyo, Japan, the researchers profited from a healthy spirit of competition, aimed at advancing our knowledge on how a machine can understand written communication. Indeed, following the tradition from previous years, 13 scientific competitions were held in conjunction with ICDAR 2021 including, for the first time, three so-called “long-term” competitions addressing wider challenges that may continue over the next few years.

Other highlights of the conference included the keynote talks given by Masaki Nakagawa, recipient of the IAPR/ICDAR Outstanding Achievements Award, and Mickaël Coustaty, recipient of the IAPR/ICDAR Young Investigator Award, as well as our distinguished keynote speakers Prem Natarajan, vice president at Amazon, who gave a talk on "OCR: A Journey through Advances in the Science, Engineering, and Productization of AI/ML", and Beta Megyesi, professor of computational linguistics at Uppsala University, who elaborated on "Cracking Ciphers with 'AI-in-the-loop': Transcription and Decryption in a Cross-Disciplinary Field".

A total of 340 publications were submitted to the main conference, which was held at the Beaulieu convention center during September 8–10, 2021. Based on the reviews, our Program Committee chairs accepted 40 papers for oral presentation and 142 papers for poster presentation. In addition, nine articles accepted for the ICDAR-IJDAR journal track were presented orally at the conference and a workshop was integrated in a poster session. Furthermore, 12 workshops, 2 tutorials, and the doctoral consortium were held during the pre-conference at EPFL during September 5–7, 2021, focusing on specific aspects of document analysis and recognition, such as graphics recognition, camera-based document analysis, and historical documents.

The conference would not have been possible without hundreds of hours of work done by volunteers in the organizing committee. First of all we would like to express our deepest gratitude to our Program Committee chairs, Joseph Lladós, Dan Lopresti, and Seiichi Uchida, who oversaw a comprehensive reviewing process and designed the intriguing technical program of the main conference. We are also very grateful for all the hours invested by the members of the Program Committee to deliver high-quality peer reviews. Furthermore, we would like to highlight the excellent contribution by our publication chairs, Liangrui Peng, Fouad Slimane, and Oussama Zayene, who negotiated a great online visibility of the conference proceedings with Springer and ensured flawless camera-ready versions of all publications. Many thanks also to our chairs and organizers of the workshops, competitions, tutorials, and the doctoral consortium for setting up such an inspiring environment around the main conference. Finally, we are thankful for the support we have received from the sponsorship chairs, from our valued sponsors, and from our local organization chairs, which enabled us to put in the extra effort required for a hybrid conference setup.

Our main motivation for organizing ICDAR 2021 was to give practitioners in the DAR community a chance to showcase their research, both at this conference and its satellite events. Thank you to all the authors for submitting and presenting your outstanding work. We sincerely hope that you enjoyed the conference and the exchange with your colleagues, be it on-site or online.

September 2021

Andreas Fischer
Rolf Ingold
Marcus Liwicki

Preface

It gives us great pleasure to welcome you to the proceedings of the 16th International Conference on Document Analysis and Recognition (ICDAR 2021). ICDAR brings together practitioners and theoreticians, industry researchers and academics, representing a range of disciplines with interests in the latest developments in the field of document analysis and recognition. The last ICDAR conference was held in Sydney, Australia, in September 2019. A few months later the COVID-19 pandemic locked down the world, and the Document Analysis and Recognition (DAR) events under the umbrella of IAPR had to be held in virtual format (DAS 2020 in Wuhan, China, and ICFHR 2020 in Dortmund, Germany). ICDAR 2021 was held in Lausanne, Switzerland, in a hybrid mode. Thus, it offered the opportunity to resume normality, and show that the scientific community in DAR has kept active during this long period.

Despite the difficulties of COVID-19, ICDAR 2021 managed to achieve an impressive number of submissions. The conference received 340 paper submissions, of which 182 were accepted for publication (54%) and, of those, 40 were selected as oral presentations (12%) and 142 as posters (42%). Among the accepted papers, 112 had a student as the first author (62%), and 41 were identified as coming from industry (23%). In addition, a special track was organized in connection with a Special Issue of the International Journal on Document Analysis and Recognition (IJDAR). The Special Issue received 32 submissions that underwent the full journal review and revision process. The nine accepted papers were published in IJDAR and the authors were invited to present their work in the special track at ICDAR.

The review model was double blind, i.e. the authors did not know the name of the reviewers and vice versa. A plagiarism filter was applied to each paper as an added measure of scientific integrity. Each paper received at least three reviews, totaling more than 1,000 reviews. We recruited 30 Senior Program Committee (SPC) members and 200 reviewers. The SPC members were selected based on their expertise in the area, considering that they had served in similar roles in past DAR events. We also included some younger researchers who are rising leaders in the field.

In the final program, authors from 47 different countries were represented, with China, India, France, the USA, Japan, Germany, and Spain at the top of the list. The most popular topics for accepted papers, in order, included text and symbol recognition, document image processing, document analysis systems, handwriting recognition, historical document analysis, extracting document semantics, and scene text detection and recognition. With the aim of establishing ties with other communities within the concept of reading systems at large, we broadened the scope, accepting papers on topics like natural language processing, multimedia documents, and sketch understanding.

The final program consisted of ten oral sessions, two poster sessions, three keynotes, one of them given by the recipient of the ICDAR Outstanding Achievements Award, and two panel sessions. We offer our deepest thanks to all who contributed their time

and effort to make ICDAR 2021 a first-rate event for the community. This year's ICDAR had a large number of interesting satellite events as well: workshops, tutorials, competitions, and the doctoral consortium. We would also like to express our sincere thanks to the keynote speakers, Prem Natarajan and Beta Megyesi.

Finally, we would like to thank all the people who spent time and effort to make this impressive program: the authors of the papers, the SPC members, the reviewers, and the ICDAR organizing committee as well as the local arrangements team.

September 2021

Josep Lladós
Daniel Lopresti
Seiichi Uchida

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