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Artificial Intelligence Research

Second Southern African Conference, SACAIR 2021
Durban, South Africa, December 6–10, 2021
Proceedings

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Preface

This volume of the Springer CCIS series (CCIS 1551) contains the revised accepted papers of SACAIR 2021, the 2nd Southern African Conference for Artificial Intelligence Research[1].

Message from the Conference Chairs

Dear authors and readers,

It is with great pleasure that we write this foreword to the proceedings of the second Southern African Conference for Artificial Intelligence Research (SACAIR 2021) held online during December 6–10, 2021[2]. The program included an unconference for students on December 6 (a student-driven event for students to interact with each other as well as with sponsors and other possible employers), a day of tutorials on December 7, and the main conference during December 8–10, 2021.

SACAIR 2021 is the second full international conference focussed on Artificial Intelligence hosted by the Centre for AI Research (CAIR), South Africa. The inaugural CAIR conference, the Forum for AI Research (FAIR 2019) was held in Cape Town, South Africa, in December 2019, and SACAIR 2020 was held in February 2021 after being postponed due to the COVID-19 pandemic.

The Centre for AI Research (CAIR)[3] is a South African distributed research network that was established in 2011 with the aim of building world class Artificial Intelligence research capacity in South Africa. CAIR conducts foundational, directed, and applied research into various aspects of AI through its nine research groups based at six universities (the University of Pretoria, the University of KwaZulu-Natal, the University of Cape Town, Stellenbosch University, the University of the Western Cape, and North-West University). Research groups at CAIR include an Adaptive and Cognitive Systems Lab situated at the University of Cape Town, an AI and Cybersecurity research group at the University of the Western Cape, an AI for Development and Innovation group at the University of Pretoria, two Machine Learning groups focused on deep learning at North-West University and the University of Kwa-Zulu Natal, a Knowledge Abstraction and Representation group at Stellenbosch University, an Ethics of AI research group at the University of Pretoria, a Knowledge Representation and Reasoning group at the University of Cape Town, and a Mathematical and Computational Statistics group focused on applied data science at the University of Pretoria.

The theme for SACAIR 2021 was AI for Science, Technology and Society. AI technologies in their current data-driven form have the potential to transform

[1] https://sacair.org.za/.

[2] The original plan was to have a hybrid event in Ballito, South Africa, but due to the emergence of the Omicron COVID-19 variant end of November 2021, and the rapid rise in infections, the event was online only.

[3] https://www.cair.org.za/.

our world for the better. However, humans are faced with serious challenges in the context of AI advances in all areas of their lives, as wide apart as employment and labour on the one hand and social companionship on the other. In the context of machine learning applications, these challenges lead to concerns around fairness, structural bias and amplification of existing social stereotypes, privacy, transparency, accountability and responsibility, and trade-offs among all these concerns, especially within the context of security, robustness, and accuracy of AI systems. Furthermore, AI technologies can perform tasks that previously only humans could perform, such as calculating the best treatment for certain illnesses and caring for older persons. In some cases this is a good thing, but in some it challenges human agency and experience, and even political stability, in profound ways. Human notions of morality, of responsibility, and of ethical decision-making are challenged in ways humanity has never before encountered. In addition, children grow up in novel contexts affected by technological manipulation of social narratives and we do not yet know what the impact of this will be. In turn, media and information literacy has become an essential skill, which is just as important as technical skills. Finally, there are also cultural concerns such as the loss of nuances of human languages and expression in the context of NLP, concerns around the ownership of art, and others.

The choice of conference theme was intended to ensure multi-disciplinary contributions that focus both on the technical aspects and the social impact and consequences of AI technologies. In addition, there was a healthy balance between contributions from logic-based AI and those from data-driven AI, as the focus on knowledge representation and reasoning remains an important ingredient of studying and extending human intelligence. In line with the above, it was decided that the conference topics would cover several broad areas of Artificial Intelligence namely Machine Learning, Knowledge Representation and Reasoning, Quantum Artificial Intelligence, Deep Learning, Computer Vision and Image Processing, Philosophy and Ethics of AI, AI in and for Information Systems, and AI in the Humanities and Society. Our keynote speakers were Knut Hinkelmann of FHNW Switzerland, Francesco Petruccione of UKZN, South Africa, and Vincent C. Müller of TU/e, the Netherlands.

We expect this multi- and interdisciplinary conference to grow into the premier AI conference in Southern Africa as it brings together nationally and internationally established and emerging researchers from across various disciplines including Computer Science, Mathematics, Statistics, Informatics, Philosophy, and Law. The conference is also focused on cultivating and establishing a network of talented students working in AI from across Africa.

We sincerely thank the technical program chairs for the hard work on the volume and the editorial duties performed. A thank you to the topic chairs, the local and international panel of reviewers, our keynotes, and the authors and participants for their contributions. Last but not least, our gratitude to the members of the organizing committee, student organizers, and our sponsors without whom this conference would not have been realised.

December 2021

Anban Pillay
Aurona Gerber

Message from the Technical Program Chairs

Dear readers,

This volume of the SACAIR proceedings contains the revised accepted papers of SACAIR 2021. We are thankful that our second annual Southern African Conference for Artificial Intelligence Research elicited the support it did during this challenging year with all the uncertainties due to the COVID-19 pandemic.

We received just over 100 abstracts, and after submission and a first round of evaluation, 71 papers were sent out for review to our SACAIR Programme Committee. The SACAIR submissions were solicited according to relevant SACAIR topics. The Program Committee comprised 88 members, 28 of whom were from outside Southern Africa. Each paper was reviewed by at least three members of the Program Committee in a rigorous, double-blind process whereby the following criteria were taken into consideration: Relevance to SACAIR, Significance, Technical Quality, Scholarship, and Presentation (which included quality and clarity of writing). For this SACAIR proceedings volume, 22 full research papers were selected for publication in Springer's CCIS series (which translates to an acceptance rate of 31%). The accepted full research papers per topic are as follows: Deep Learning (5), AI in and for Information Systems (3), Knowledge Representation and Reasoning (2), Machine Learning (6), Philosophy and Ethics of AI (3), AI in the Humanities and Society (1), and Computer Vision and Image Processing (2).

Thank you to all the authors and Program Committee members, and congratulations to the authors whose work was accepted for publication in this proceedings. We wish our readers a fruitful reading experience with these proceedings!

December 2021

Edgar Jembere
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