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KDD '21

Proceedings of the 27th ACM SIGKDD Conference on
Knowledge Discovery and Data Mining

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General Chairs:

Feida Zhu, Beng Chin Ooi, & Chunyan Miao

Associate General Chair:

Gao Cong

Proceedings:

Jiliang Tang & Tyler Derr



**Association for
Computing Machinery**

Advancing Computing as a Science & Profession

The Association for Computing Machinery

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A Message from the 2021 KDD Conference Chairs

On behalf of the organizing committee, we would like to extend our warmest welcome to all of you to the 27th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, which is held virtually between August 14th and 18th, 2021, due to COVID-19. While a decision to move an offline gathering opportunity fully online is never easy, we are glad that we are able to present a truly global conference experience by combining the benefit of a virtual gathering and the unique flavor of Singapore – the Lion City.

Virtual conferences, often following a chosen time zone, are always challenging for the great number of attendees half a globe apart. At KDD 2021, it is our belief that a truly global conference should offer a good experience to a maximum number of people, instead of maximizing the experience for a good number of people. We therefore introduce three new features in the history of KDD: Firstly, KDD 2021 accommodates both Singapore Time and US Time by allocating events and sessions to time slots best fit for authors and organizers within a full 24-hour time window for each conference day. Wherever you are, there are some events you can attend live without staying up till midnight. Secondly, registered participants are able to view papers and videos one month before the actual conference date to better digest the material and interact with the authors through online chatting, enjoying the maximized benefit of getting rid of constraints of physical meeting space and time. Finally, live paper sessions are made more interactive and engaging with mini-panels at the end on topics of common interest to the audience of each session.

KDD 2021 continues the tradition of KDD of featuring an exciting program. We are honoured to have Dr. Janil Puthucherry, Senior Minister of State, Ministry of Communications & Information and Ministry of Health to welcome the audience with an opening speech. We bring to the community 4 keynote talks led by 2021 Turing Award winner, Prof. Jeff Ullman, and 20 Applied Data Science track invited talks featuring the best and state-of-the-art from the industry of data science community. The program includes 40 lecture-style tutorials and 52 workshops covering an amazingly wide range of both classic and trending topics in data science. Besides the usual Health Day and Deep Learning Day, KDD 2021 launches two new special-theme days --- the “Trust Day” and the “ESG (Environmental, Social and Corporate Governance) Day” --- to bring together researchers, practitioners and experts from various communities to exchange and explore ideas, frontiers, opportunities and challenges of these domains of ever-growing importance in a highly interdisciplinary manner. This year’s KDD Cup has attracted thousands of teams around the world to compete in three challenges of great novelty. We feature “Women in KDD” to highlight Diversity and Inclusion in our community.

A virtual conference can still provide a riveting experience to sample and savour unique Singapore local attractions. KDD 2021 makes this possible by embedding a near-realistic virtual world into Gather.Town with 10 Singapore iconic attraction neighbourhoods, in which participants can roam, explore and interact with conference materials as well as multimedia showcasing Singapore local fun and delights.

The success of a conference of the scale of KDD is not possible without the collective effort of all members of the organization committee, as well as the many staff and volunteers who contributed numerous hours into this project. We would like to express our gratitude in particular to the Program co-Chairs, Wynne Hsu and Sanjay Chawla for the Research Track, Iryna Skrypnyk and Haixun Wang

for the Applied Data Science Track; Associate Chair Gao Cong for their dedicated service throughout the conference preparation. We want to thank Jian Pei, Chair of the SIGKDD Steering Committee, for his leadership, guidance, and support for the entire scope of the conference.

We owe special thanks to all our sponsors of the conference, Executive Events led by Kristi Audette for diligently driving the organization of the conference and the team at Havas Formula in carrying out marketing and outreach activities for KDD. Last but not least, we would like to thank the many authors who submitted papers to the conference and all the attendees. We are encouraged by your scholarship, passion, trust and support. Thank you!

Finally, we thank all researchers, practitioners and students in the community for staying united in this special time and continuing to push the boundary of data science. While we cannot welcome you in person in beautiful Singapore, we wish you a productive conference with new discoveries, new collaborations, new friendships and a most memorable time at KDD 2021.

Feida Zhu, Beng Chin Ooi, and Chunyan Miao
ACM SIGKDD 2021 Conference General Co-Chairs

KDD 2021 Program Chairs' Welcome

Welcome to the 27th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. For nearly three decades, path breaking research in “Data Science” has first appeared in SIGKDD and has set the agenda for the community. We are privileged to share a new set of research papers and we are confident that they will continue to define our field and shape the future of the discipline in a rapidly transforming world. Work presented at SIGKDD has unique attributes - it is rigorous, grounded in data science foundations and at the same time directly relevant to end users.

SIGKDD is organized around two tracks: Research and Applied Data Science. Both tracks had a separate reviewing structure and a shared objective of selecting innovative contributions that will define the Data Science ecosystem. The Research Track received 1541 submissions out of which 239 were finally accepted for presentation at the conference. The Applied Data Science Track received 705 submissions with a final acceptance of 155 papers.

The reviewing structure was organized into a Senior Program Committee (SPC) and the Program Committee (PC) for each track. For the Research Track, the SPC and PC consisted of 145 and 578 members respectively. For the ADS Track, the SPC and PC breakdown was 44 and 426 members respectively. In addition, 313 external reviewers helped with additional reviewing on the Research Track, and 51 on the Applied Data Science Track. We are grateful to all the reviewers for coming together to deliver their reviews on time and participate in the ensuing discussions. There were several papers for which the discussion was contentious but collegial resulting in, what we believe, is a sharp program.

There is a distinct trend in the types of research topics that are being pursued. Topics related to Causality, Interpretability, Privacy and Anomaly Detection are gaining ground while brute-force applications of deep learning are receding. There is a sustained interest in Graphs and Networks and an emerging interest in coupling of Natural and Data Science. True to its tradition, works that highlight trade-offs between model accuracy and algorithmic efficiency continue to be popular.

Applied Data Science Track has an equal number of deployed and evidential papers this year. While topics such as recommender systems and e-commerce are still the most popular, we have seen a clear trend of applying machine learning in the physical world, as submissions related to IoT, autonomous driving, smart city, and climate change soared.

We would also like to thank our general chairs, Feida Zhu, Beng Chin Ooi and Chunyan Miao and our Associate Chair Gao Cong for their herculean and sustained effort since August 2020 to manage the different components of the program; Jian Pei, Chair of the SIGKDD Steering Committee, for his guidance and a historical perspective on the conference.

Finally and most importantly we would like to thank all the authors who submitted their work to SIGKDD. With your active participation, the Conference has become an important rendezvous for the Data Science community and we hope that this continues into the foreseeable future. While we will not be able to meet in-person this year in Singapore, our virtual avatars will interact and sustain the research experience.

Haixun Wang and Iryna Skrypnik
KDD'21 Applied Data Science Track Chairs

Wynne Hsu and Sanjay Chawla
KDD'21 Research Track Chairs

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