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2022 IEEE WORLD CONGRESS ON SERVICES

JULY 11-15

HYBRID CONFERENCE

BARCELONA, SPAIN

AND VIRTUAL THROUGH UNDERLINE

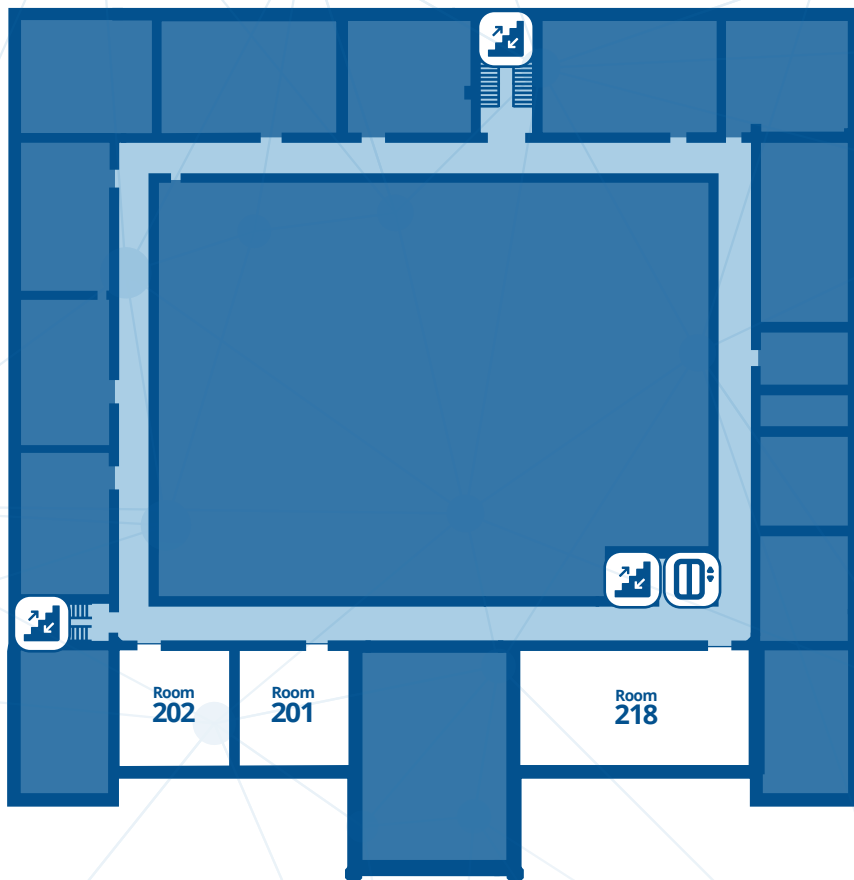
CLOUD | EDGE | ICDH | ICWS | QSW | SCC



2022 IEEE World Congress on SERVICES - Program TOC

Maps of UPC Terassa - Conference area & lunch	p. 3-5
Daily schedules	p. 6-10
Messages from Congress leadership	p. 11-16
Congress Welcome/Social events	p. 17
Alessandro Curioni Keynote	p. 18
Dejan Milojicic Keynote	p. 19
Elisa Bertino Keynote	p. 20
Wendy Hall Keynote	p. 21
Plenary Panel - Discovery Technology Foundations & Open Science	p. 22
Plenary Panel - Technology, Innovation & Partnership - From Lab to Home	p. 23
Plenary Panel - The Servitizing of IoT	p. 24
Plenary Panel - Software Services Engineering	p. 25
IEEE SERVICES Awards Ceremony	p. 27
IEEE International Conference on Cloud Computing (CLOUD 2022)	p. 28 - 40
IEEE International Conference on EDGE Computing (EDGE 2022)	p. 41-45
IEEE International Conference on Digital Health (ICDH 2022)	p. 46-54
IEEE International Conference on Web Services (ICWS 2022)	p. 55-65
IEEE International Conference on Quantum Software (QSW 2022)	p. 66-69
IEEE International Conference on Services Computing (SCC 2022)	p. 70-79
J1C2 Symposium	p. 80-83
IEEE International Symposium on Women in Services Computing (WISC 2022)	p. 83-84
IEEE International Symposium on Young Experts in Services Computing (YESC)	p. 85
IEEE World Congress on SERVICES Organizers	p. 86-89
Announcement - 2023 World Congress on SERVICES	p. 90

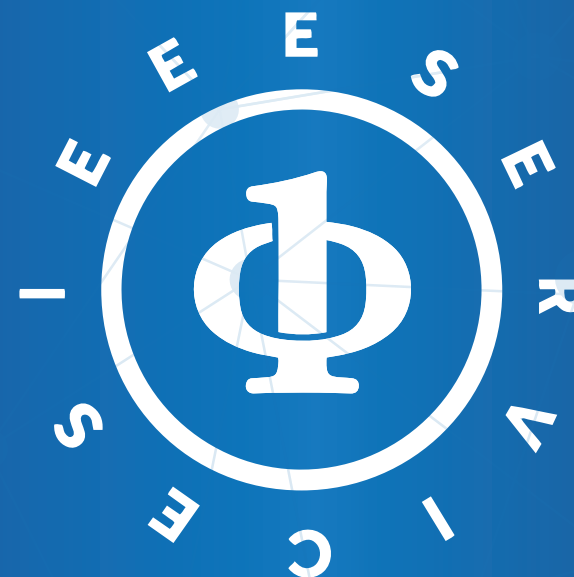
SECOND FLOOR



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Aeroespacial i Audiovisual de Terrassa



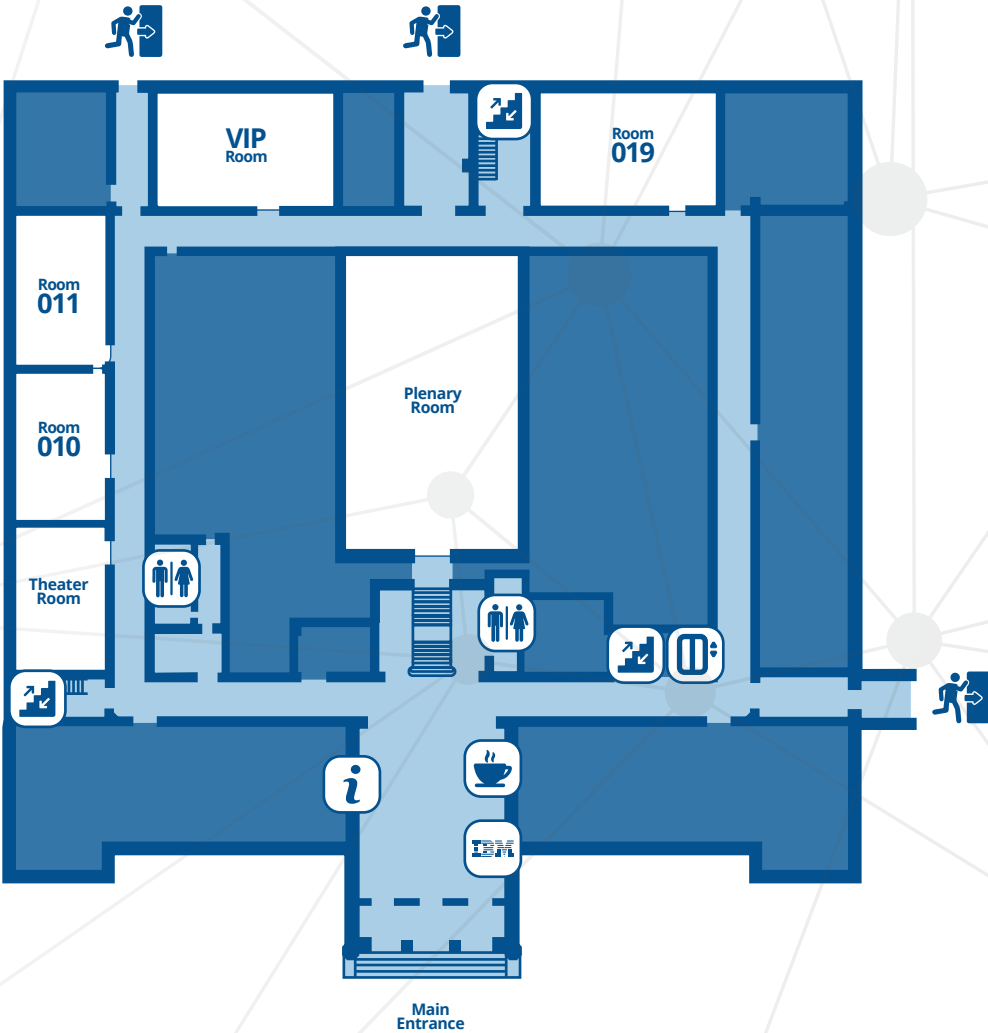
Ajuntament de
Terrassa



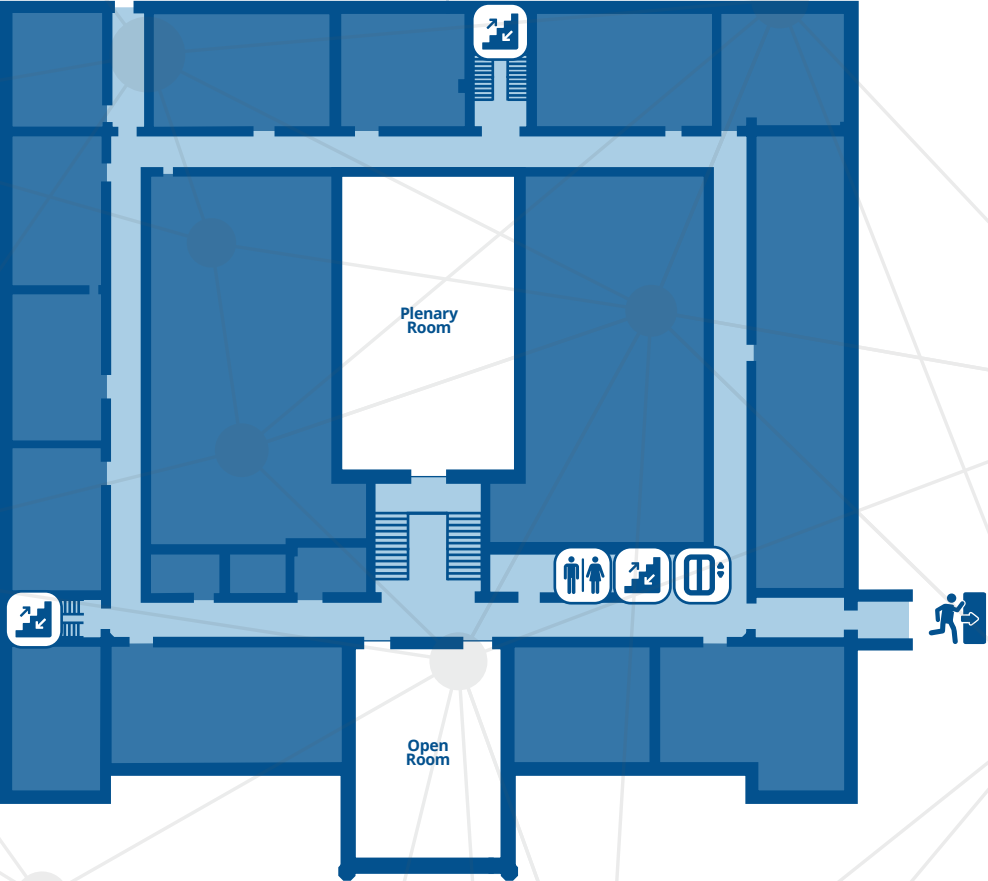
IEEE SERVICES 2022

MAP

GROUND FLOOR

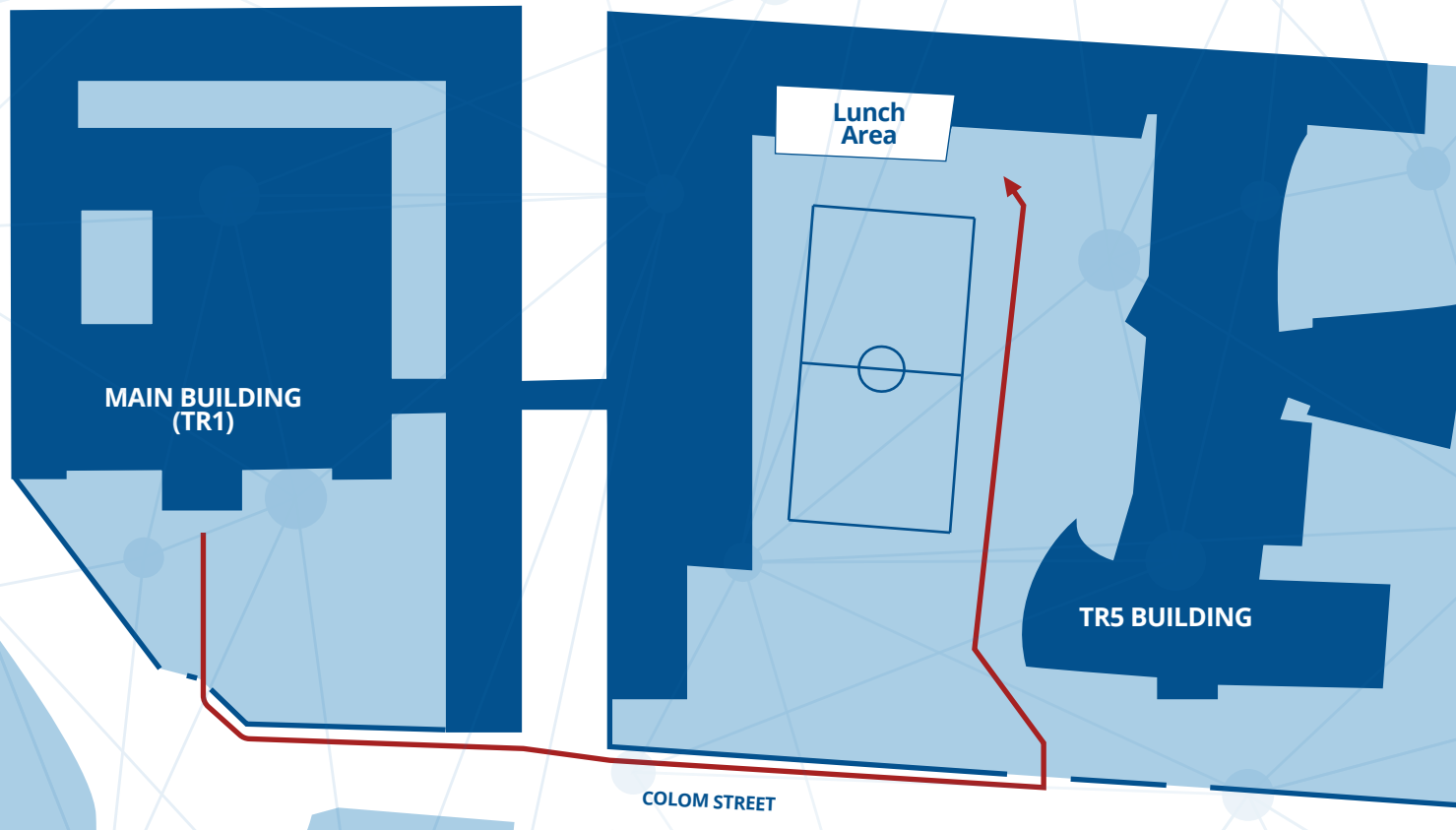


FIRST FLOOR





IEEE WORLD CONGRESS ON SERVICES



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Ajuntament de
Terrassa

MONDAY JULY 11

TIME	218	019	201	THEATER	202	010	011
09:00-10:15	CLOUD 1					QSW 1	PLA 1
10:15-10:45	COFFEE BREAK						
10:45-12:00	CLOUD 2					QSW 2	
12:00-12:40	OPENING CEREMONY GREETINGS FROM HOST CITY, UPC, AND CONGRESS						
12:40-14:00	CONGRESS LUNCHEON						
14:00-15:15	CLOUD 3		SCC 1	CWS SYMP 1			
15:15-16:30	CLOUD 4		SCC 2	CWS-SYM 2	ICDH 1		
16:30-17:00	COFFEE BREAK						
17:00-18:00	CLOUD 5	ICWS 1		QSW SYMP 1	ICDH 2		
19:00-21:00	CONGRESS WELCOME RECEPTION – CASA ALEGRE						

TUESDAY JULY 12

TIME	218	019	201	THEATER	202	010	011
09:00-10:15	CLOUD 6	ICWS 2	SCC 3	QSW SYMP 2	ICDH 3	EDGE 1	J1C2-1
10:15-10:45	COFFEE BREAK						
10:45-12:00	CLOUD 7	ICWS 3	SCC 4	QSW SYMP 3	ICDH 4	EDGE 2	J1C2-2
12:00-13:00	CLOUD 8		SCC 5	QSW SYMP 4	ICDH 5	EDGE 3	J1C2-3
13:00-14:20	CONGRESS LUNCHEON						
14:20-15:40	CONGRESS PLENARY KEYNOTE – ALLESANDRO CURIONI WHAT'S NEXT IN COMPUTING – THE ERA OF ACCELERATED DISCOVERY						
15:40-17:00	CONGRESS PLENARY PANEL DISCOVERY TECHNOLOGY FOUNDATIONS & OPEN SCIENCE						
17:00-17:30	COFFEE BREAK						
17:30-18:45	CLOUD 9	ICWS 4	SCC 6	WISC 1	ICDH 6	QSW 3	J1C2-4
18:45-19:45	CLOUD 10	ICWS 5	SCC 7	WISC 2	ICDH 7	QSW 4	

WEDNESDAY JULY 13

TIME	218	019	201	THEATER	202	010	011
09:00-10:15	CLOUD 11	ICWS 6	SCC 8	CLD SYMP 1	ICDH 8	EDGE 4	J1C2-5
10:15-10:45	COFFEE BREAK						
10:45-12:00	CLOUD 12	ICWS 7	SCC 9	CLD SYMP 2	ICDH 9	EDGE 5	J1C2-6
12:00-13:00	CLOUD 13	ICWS 8	SCC 10	CLD SYMP 3	ICDH 10	EDGE 6	J1C2-7
13:00-14:15	CONGRESS LUNCHEON						
14:15-15:30	CLOUD 14	ICWS 9	SCC 11	CLD SYMP 4	ICDH 11		
15:30-16:30	CONGRESS KEYNOTE – DEJAN MILOJICIC TECHNOLOGY PREDICTIONS						
16:30-17:00	COFFEE BREAK						
17:00-18:00	CONGRESS PLENARY PANEL TECHNOLOGY, INNOVATION & PARTNERSHIP – FROM LAB TO HOME						
18:00-19:00	CLOUD 15	SCM	SCC 12	TSC EB	ICDH 12		
20:30-23:30	CONGRESS BANQUET/GALA DINNER EL CANGREJO LOCO						

THURSDAY JULY 14

TIME	218	019	201	THEATER	202	010	011
09:00-10:15	CLOUD 16	ICWS 10	SCC 13	CLD SYMP 1	ICDH 13	EDGE 7	PLA 2
10:15-10:45	COFFEE BREAK						
10:45-12:00	CLOUD 17	ICWS 11	SCC 14	SCC-SSE 1	ICDH 14	EDGE 8	ICWS 12
12:00-13:00	CLOUD 18	ICWS INV	YESC (Plenary Room)	SCC-SSE 2	ICDH 15		
13:00-14:20	CONGRESS LUNCHEON						
14:20-15:40	CONGRESS PLENARY PANEL THE SERVITIZING OF IOT						
15:40-16:10	COFFEE BREAK						
16:10-17:30	CONGRESS KEYNOTE – ELISA BERTINO THE PERSISTENT PROBLEM OF SOFTWARE INSECURITY						
17:30-18:50	CONGRESS PLENARY PANEL THE ROLE OF SERVICES IN THE 5G/6G ARENA						

FRIDAY JULY 15

TIME	218	019	201	THEATER	202	010	011
09:00-10:20	CONGRESS KEYNOTE – WENDY HALL DATA, GEOPOLITICS AND THE GOVERNANCE OF CYBERSPACE						
10:20-11:40	CONGRESS PLENARY PANEL SOFTWARE SERVICES ENGINEERING						
11:40-12:10	COFFEE BREAK						
12:10-13:00	AWARDS CEREMONY						
13:00-14:00	CONGRESS LUNCHEON						
14:00-15:15	CLOUD 19	ICWS 13	CLOUD 21		ICDH SYMP 1	ICWS 15	
15:15-15:45	COFFEE BREAK						
15:45-17:00	CLOUD 20	ICWS 14	CLOUD 22			ICWS 16	
	FAREWELL!						



2022 IEEE World Congress on Services Message from Carl K. Chang, Steering Committee Chair (2017-2022)

Time flies! It has been five years since I was appointed as the Chair of the Steering Committee (SC) to spearhead the development of “future editions” of the IEEE World Congress on Services (IEEE SERVICES) in the summer of 2017. We have been riding the roller coaster from being a physical event (2018, 2019) to a virtual one for two consecutive years (2020, 2021), finally to engaging in the hybrid mode in 2022 due to the global pandemic. It posed steep challenges to the Congress organizers from all dimensions, demanding more realistic budgeting and inventive promotion and marketing measures in order to sustain the community for having lost that authentic, face-to-face, personal touch. Nevertheless, I am pleased to have witnessed that, in spite of all these challenges, collectively we prevailed.

In 2022, we continue to execute the multi-year agreement between SERVICES and IEEE Transactions on Services Computing (TSC) on the Journal-First-Conference-Second (J1C2) initiative, the first of its kind in the Computer Society. We also progressed into the second edition of the IEEE International Conference on Digital Health (ICDH) that continues to harvest the fine expertise of many like-minded professionals from both academia and industry to address emerging and burning issues in digital health. As you may have noticed, the Steering Committee has always been keen in undertaking the endeavor to organize new conferences. In 2022 we launched the first IEEE International Conference on Quantum Software (QSW) and have assembled an expert group to steer and accelerate this cutting-edge area.

As some of you may know, the Steering Committee of IEEE SERVICES has long established the policy to allow General Chairs (GCs) of all affiliated conferences of IEEE SERVICES to submit papers, resulting from a sound reasoning and decision process. All GCs of an IEEE SERVICES event are professional leaders with worldwide reputations, and many have served as Program Chairs (PC) before. It is unfair to the GCs and it is a loss to the community if they are not allowed to co-author quality papers in response to our call-for-papers. With this realization, we also reasoned that there must be an independent and rigorous submission and review procedure for GC co-authored papers, different from the ordinary process. That is to say, historically, as a large and complex professional forum, the multi-tier structure of the Congress has followed a uniformly applied policy for independent review of GC co-authored papers by senior researchers rather than program chairs and program committees of the affiliated conferences. This allows the Congress to maintain the integrity of the conferences and protect Program Chairs from any potential dilemma or conflict-of-interest situations in handling GC co-authored papers. Pursuant to this policy, IEEE SERVICES 2022 used a separate EasyChair Track to host papers co-authored by conference GCs with an independent Senior Review Panel, composed of senior researchers. The procedure followed strict professional standards, including the composition of the Program Committee for the GC-track, the double-blind requirements for paper submission, and the modality and sufficient number of reviews. Please read the 2022 Congress General Chair’s message written by Dr. Ernesto Damiani for other execution details in this proceedings. Certainly, the SC can review and adjust this policy as needed for future planning and development cycles.

Now, with great pleasure I would like to introduce to you my successor, Steering Committee Chair-elect Dr. Rong N. Chang, although not a stranger to many of you. His term will commence on the last day of the 2022 edition in Barcelona. I trust that under his leadership the Congress will prosper and better serve the community in the next five years.

To conclude my tenure as the SC chair, I would like to say thank you – to our sustained audience and supporters, to my dear fellow SC members, to a dream team of organizers, to my loyal co-workers as well as my past and current colleagues and students, and to the wonderful partners and professional staff of the IEEE Computer Society. Last but not least, thanks are also due to my dear family members - without their support I would not be able to focus my time and energy on serving this outstanding community. So long, but hope to see you in Chicago in 2023.

Steering Committee (2017-July 14, 2022)

Elisa Bertino, Purdue University | Carl K. Chang, Iowa State University (Chair) | Rong N. Chang, IBM TJ Watson Research Center |

Peter Chen, Carnegie Mellon University | Ernesto Damiani, Università degli Studi di Milano | Ian Foster, University of Chicago | Dennis Gannon, Indiana University | Michael Goul, Arizona State University (deceased) | Frank Leymann, University of Stuttgart | Hong Mei, Beijing Institute of Technology | Stephen S. Yau, Arizona State University |



2022 IEEE World Congress on Services Message from Rong N. Chang Steering Committee Chair-Elect

A warm welcome to the first hybrid event of the IEEE World Congress on Services (SERVICES). I am honored to be the Steering Committee Chair of IEEE SERVICES for the next five years, starting from July 15, 2022.

I have been participating in the affiliated technical conferences of IEEE SERVICES since 2005, and have been on the Steering Committee for the past five years. I have been inspired by many volunteer leaders of IEEE SERVICES and have learned a lot from all of them. Since the end of IEEE SERVICES 2017, I have witnessed the exceptional leadership of the Steering Committee, led by Professor Carl K. Chang, in strategizing and executing the first-of-its-kind multi-conference transformation for IEEE SERVICES. Financial health of IEEE SERVICES 2018–2022 has enabled IEEE TCSVC to do more for the community, e.g., with creative scholarship for women students, cash awards for students and professionals, and monetary sponsorship to diversity & inclusion gatherings.

Services computing is still a young software-centric transdiscipline, though its impact has become pervasive in the global evolution towards everything-as-a-service (XaaS). The current Steering Committee has made various structural changes to the Congress, including composing forward-looking symposia (e.g., convergence of cloud & high performance computing, HPC) and spearheading emerging conference themes. Many world class leaders jointly created the IEEE International Conference on Digital Health (ICDH), IEEE International Conference on Edge Computing & Communications (EDGE), and IEEE International Conference on Quantum Software (QSW). The IEEE Open Software Services Award is created this year with the goal of fueling the creation and adoption of invaluable open data, software, and/or services as well as the advances in services computing technologies.

IEEE SERVICES is an open, collaborative, and forgiving community. We are committed to Diversity & Inclusion (D&I). We welcome accountable volunteers to contribute to the growth of the community and to the delivery of future IEEE SERVICES events. Please be proactive in getting connected with others at IEEE SERVICES 2022 while enjoying participating in the event, either on-site or virtually.

I thank all of those that helped transform IEEE SERVICES during the past five years, particularly those who have assumed the roles of Steering Committee Member, Congress General Chair, Program Chair in Chief, General Chairs, Program Chairs, Program Committee, and Operations Committee Member. I look forward to opening a new chapter for the IEEE SERVICES jointly with the new Steering Committee, IEEE Computer Society (IEEE-CS), IEEE Technical Community on Services Computing (TCSVC), IEEE Transactions on Services Computing (TSC), and China Computer Federation (CCF) Technical Committee on Service Computing (TCSC) and all leaders of our community.

IEEE World Congress on SERVICES Steering Committee (2022-07-15 – 2027-07-15)

Elisa Bertino, Purdue University | Carl K. Chang, Iowa State University (Chair Emeritus) |
Rong N. Chang, IBM T.J. Watson Research Center (Chair) | Peter Chen, Carnegie Mellon University |
Ernesto Damiani, University of Milan | Sumi Helal, University of Florida |
Dennis Gannon, Indiana University | Frank Leymann, University of Stuttgart |
Hong Mei, Beijing Institute of Technology | Dejan Milojicic, Hewlett Packard Labs |
Stephen S. Yau, Arizona State University |

2022 IEEE World Congress on Services (IEEE SERVICES 2022)

Message from Ernesto Damiani, Congress General Chair



The 2022 edition of the IEEE World Congress on Services returns to hybrid mode, providing again the large international community working on services with a physical venue where to meet and exchange new ideas. The Congress is also back to Europe, where some of the leading research centers and innovative companies are based. I am grateful and proud to serve as the Congress General Chair for this 2022 edition held in Barcelona, sponsored as usual by the IEEE Computer Society under the auspice of the Technical Committee on Services Computing (TCSVC). SERVICES 2022 covers all aspects of services computing and applications, including emerging topics pertaining to the edge-to-cloud continuum fostered by 5G/6G networks, ML-based intelligent services, quantum technologies and blockchain applications. All the Congress' conferences feature their own top research papers, panels and symposium contributions; in addition, plenary keynotes by leading researchers will provide guidance on how to address open issues such as the performance, security, trustworthiness, and cost-effectiveness of this new generation of services.

Pursuant to the established IEEE SERVICES policy that has been practiced for several years to allow General Chairs (GCs) of all affiliated conferences to submit papers, IEEE SERVICES 2022 used a separate EasyChair Track to host papers co-authored by the conferences GCs with a separate program committee composed of senior researchers (Senior Review Panel). Per the policy, the conferences program committees were not involved in the submissions handling for that EasyChair track, and the involved reviewers were invited by me. The submission handling procedure was the same as that for the corresponding conference.

The impressive program included in the Proceedings is due to the hard work of the IEEE Services Steering Committee, of the conferences General and Program Chairs, and of the other officers and PC members; but it could not be achieved without the hundreds of authors worldwide who chose our Congress to submit their valuable research work. Thanks to them, SERVICES 2022 is once again the premier professional event for the services computing field.

Senior Review Panel

- Karl Aberer
- Luciano Baresi
- Djamal Benslimane
- Elisa Bertino
- Fabio Casati
- Paolo Ciancarini
- Elena Ferrari
- Roch Glitho
- Mario Piattini
- Antonio Puliafito
- Stefano Russo
- Shanguang Wang
- Andrea Zisman



WELCOME MESSAGE FROM THE GENERAL CO-CHAIR OF THE IEEE SERVICES 2022

As a General Co-chair of IEEE SERVICES 2022 and, on behalf of the UPC BarcelonaTech, the host institution, I would like to welcome all participants to the congress!

Services has become a fundamental field in the digital ecosystems of today. *Servitization* is not only key technology driver for the IT field but also for the society at large, by impacting directly on the everyday life of people. It is in this context that the IEEE SERVICES congress plays an indispensable role to the IEEE's goal of "*advancing the technology for humanity*".

I believe the IEEE SERVICES 2022 has contributed to the state of the art in the field of services, and I would like to thank all authors, keynote and invited speakers, panelists, reviewers and PC members for contributing to the congress' success. Likewise, this congress edition is held in hybrid mode after two years of covid-19 pandemics and has therefore contributed to bringing back the *in-situ* community building and social networking of the IEEE SERVICES congress.

I would like to thank Prof. Carl Chang, the Steering Committee Chair of the IEEE SERVICES for the opportunity to organize the congress at BarcelonaTech. His trust, support and encouragement throughout are highly appreciated! My appreciation to fluid and friendly collaboration with Prof. Ernesto Damiani, the General Chair of the Congress, as well as with Program Chair in Chief Prof. Claudio Ardagna and other conferences chairs for their work and for selecting and compiling an interesting technical and social programme. The support and collaboration of Ms. Carmen Saliba, the IEEE team and Ms. Laurel Ming are appreciated.

Finally, my heartfelt thanks to my colleagues of the Local Committee of the ESEIAAT School of Universitat Politècnica de Catalunya for their time, dedication and efforts for an excellent local organization and social programme of the congress. My special thanks to Dr. Xavier Roca, the School Director, for his leading role in the local organization, to Mrs. Mercedes Jiménez, the Head of the School Administration, to Ms. Sofia Pascual and colleagues of the IT staff for their collaboration in the local organization of the congress. Lastly, I would like to thank my colleague and friend, Dr Jordi Marco, for his contribution as SCC 2022 Symposium Chair / ISASSE 2022 Chair, the successful organization of the Panel "*Software development methods in the IoT-laden, AI/ML-driven era*" and for his tireless work and sorting out many day-to-day issues with the local organization.

I wish all participants enjoy the IEEE SERVICES 2022 and, to those who travel to Barcelona, an enjoyable stay!

Fatos Xhafa
Professor, IEEE SERVICES 2022 General
co-chair

Full Professor of Computer Science
Departament of Computer Science
Universitat Politècnica de Catalunya
Barcelona, SPAIN

Email: fatos@cs.upc.edu
Website: <http://www.cs.upc.edu/~fatos>



Claudio Ardagna
Università degli Studi di
Milano



Jia Zhang
Southern Methodist
University

2022 IEEE World Congress on Services (IEEE SERVICES 2022) Message from Program Chairs-in-Chief

Welcome to the 2022 IEEE World Congress on Services (IEEE SERVICES 2022). This year, IEEE SERVICES 2022 is a hybrid event and, for the first time since the beginning of the COVID-19 pandemic, we are ready to host you (at least partly) in person in Barcelona. This is also the second time, after Milan 2019, that IEEE SERVICES is hosted in Europe. We are really excited about it!

IEEE SERVICES 2022 includes six co-located flagship IEEE conferences. Three conferences are well-known: IEEE International Conference on Web Services (ICWS) and IEEE International Conference on Services Computing (SCC) since 2004, and IEEE International Conference on Cloud Computing (CLOUD) since 2010. IEEE International Conference on Edge Computing (EDGE) has joined IEEE SERVICES since 2017, and IEEE International Conference on Digital Health (ICDH) since 2021. This year, a new conference, IEEE International Conference on Quantum Software (QSW), is included under the IEEE SERVICES umbrella.

In addition to the main conferences, this year's program is further enriched with five symposia focusing on emerging research themes on services: IEEE International Symposium on Convergence of Cloud & HPC, IEEE International Symposium on Software Services Engineering, IEEE International Symposium on Quantum Software, IEEE Digital Health Security and Privacy Symposium, and IEEE ICWS Symposium on Services for Machine Learning.

IEEE SERVICES 2022 is a complex event, thus relying on the work and dedication of many volunteers from all around the world. Building on this diversity and the exceptional skills of all volunteers, IEEE SERVICES 2022 aims to provide a coordinated and consistent event. We, as Program Chairs-in-Chief (PCICs), have ensured high and uniform quality standards across conferences and symposia toward the aim of defining novel good practices, while safeguarding personality, peculiarities and scientific autonomy.

We would like to express our sincere gratitude to all the general chairs, program chairs, technical program committee members, and organizing committee members, for their dedication and support made of collaboration and dialogue in the spirit of the IEEE community. Specially, we want to thank the Services Congress Steering Committee led by Carl K. Chang, the Steering Committee Chair-elect Rong N. Chang, the Services Congress General Chair Ernesto Damiani, and the Services Congress General Co-Chair Fatos Xhafa. We also want to thank all volunteers who have been supporting us in managing the whole process: SERVICES Publications Chairs Nimanthi Atukorala, Hongyi Bian, and Robert Ward, SERVICES Registration Chairs Sheng-Zhi Huang and Shaiqur Rahman, SERVICES - IEEE Conference Operations Carmen Saliba, and SERVICES Web Chair Laurel Ming.

Finally, we thank all authors submitting the results of their research work to IEEE SERVICES 2022 conferences and symposia and all of you who, virtually or in-person, participate in the congress. We hope you find IEEE SERVICES 2022 both stimulating and enjoyable, and we hope we will be able to meet you all in person next year!

2022 IEEE World Congress on Services (SERVICES)

Message from Shangguang Wang

Chair of IEEE Computer Society (IEEE-CS) Technical Community on Services Computing (TCSVC)



IEEE Computer Society (IEEE-CS) Technical Community on Services Computing (TCSVC), <http://tab.computer.org/tcsvc>, has endorsed the affiliated technical conferences of IEEE World Congress on Services (SERVICES) since 2004. Many innovative growth initiatives have been delivered for the best interests of the worldwide services computing community, a fast-growing R&D community with more than 12,000 active participants.

For the past five years, TCSVC has been collaborating with IEEE SERVICES on transforming the planning and execution of the technical conferences affiliated with IEEE SERVICES. Noteworthy changes include establishing IEEE compliant bylaws, institutionalizing a two-year conference planning process, and selecting non-US venues for IEEE SERVICES. Financial health of the annual events also enables TCSVC to provide cash prizes in support of the comprehensive [awards program of IEEE SERVICES 2022](#). Moreover, the first IEEE Open Software Services Award is organized with cash prizes for teams of students and professionals. Finally, the second J1C2 (Journal-1st, Conference 2nd) track is organized jointly with IEEE TSC and IEEE SERVICES. We look forward to your proactive effort in growing the services computing community. IEEE-CS TCSVC website has information on [free membership subscription](#) and [sponsored social media groups](#). I thank all members of the TCSVC Committee listed at the end of this message. They are pivotal to the services provided by TCSVC.

I have been honored to serve as the IEEE-CS TCSVC Chair since last year. I thank all community members' support and trust. Thanks to the former Chair, Dr. Rong N. Chang, for his pivotal contributions to the community. Under his leadership, the community has experienced strong and rapid growth. I will work with the new Executive Committee to keep growing the community. I wish for everyone to enjoy participating in IEEE SERVICES 2022.

IEEE TCSVC will celebrate her 20th birthday in 2023. We will organize many celebration parties in IEEE SERVICES 2023. Join the celebration parties with us next year!

Shangguang Wang, IEEE-CS TCSVC Chair

Executive Committee of IEEE-CS TCSVC

Chair: Shangguang Wang, BUPT

Executive Vice Chairs

Jing Fan, Zhejiang University of Technology

Kaoutar El Maghraoui, IBM

Michael Sheng, Macquarie University

Manar Abu Talib, University of Sharjah

Treasurer: Wensheng Zhang, Iowa State University

Secretary

Qiang He, Swinburne University of Technology

Mengwei Xu, BUPT

Chair of Awards Committee: Rong N. Chang, IBM

Chairs of Publicity

Nicola Bena, University of Milan

Houda Chakiri, Al Akhawayn University

Zhiying Tu, Harbin Institute of Technology

Chairs of WISC

HyeJung Moon, Sejong University

Xiwei (Sherry) Xu, CSIRO Data61

Chen Wang, IBM

Chairs of YESC

Marco Anisetti, University of Milan

Xiao Xue, Tianjin University

Lingyan Zhang, Central South University

Chairs of Membership Committee

Shiping Chen, CSIRO Data61

Yutao Ma, Wuhan University

Chairs of Diversity and Inclusion (D&I):

Shubhi Asthana, IBM

Yingjie Wang, Yantai University

Kenneth K. Fletcher, UMB

Advisory Committee

Carl K. Chang, Iowa State University

Ernesto Damiani, University of Milan

Lorraine Herger, IBM Research

Xiaofei Xu, Harbin Institute of Technology

Stephen S. Yau, Arizona State University

MONDAY JULY 11
12:00-12:40 CET

**WELCOME AND OPENING
CEREMONY
UPC CAMPUS**

Join us to open the 2022 IEEE World Congress on SERVICES, with remarks from local hosts and Congress leadership.

- Daniel Crespo, Rector of the UPC
- Dani Marco, General Director of Innovation
- Ernesto Damiani, SERVICES Congress General Chair
- Jordi Ballart, Mayor of Terrassa
- Claudio Ardagna, SERVICES Congress Program Chair
- Fatos Xhafa, SERVICES Congress Local Host Chair

MONDAY JULY 11
19:00-21:00 CET

**WELCOME RECEPTION
CASA ALEGRE (near UPC campus)**

WEDNESDAY JULY 13

20:30-23:30

**CONGRESS BANQUET/GALA DINNER
EL CANGREJO LOCO
PORT OLIMPIC**

Directions to the locations for the Welcome Reception and Congress Banquet are available on the IEEE SERVICES Congress 2022 website:

<https://conferences.computer.org/services/2022/venue/>



TUESDAY JULY 12

14:20-15:40 CET

*Session Chair: Stephen S. Yau,
Arizona State University*

PLENARY KEYNOTE ALESSANDRO CURIONI

*IBM FELLOW, VICE PRESIDENT OF IBM
RESEARCH EUROPE AND AFRICA, DIRECTOR
OF THE IBM RESEARCH LAB IN ZURICH*

WHAT'S NEXT IN COMPUTING: THE ERA OF ACCELERATED DISCOVERY

Computing is more important than ever in society today, and it is allowing researchers, companies, and governments to super-charge the scientific method – humanity's most powerful and successful process for advancing our knowledge and solving complex problems. The world hasn't run out of problems to solve. Be it global warming, food security, energy storage and so much more – we need science and cutting-edge technology to accelerate the discovery of new ways to tackle global challenges.

We're at a moment in time where computing is poised to reshape just about every industry, field of study — and even society itself. Across the fields of AI, cloud, and quantum computing, we've seen substantial advancements. AI has emerged as a driver of automation for critical businesses processes. Cloud computing, and in particular hybrid cloud, has reached massive scale and agility which unlocks access to virtually limitless compute resources. And quantum computing has matured from a theoretical concept to practical systems with a roadmap to disrupt industries.

Separately, these technologies are capable of transforming business and society. But leveraging the convergence of AI, cloud, and quantum will fundamentally change the way we innovate and discover. The term we use to describe this convergence of technologies is accelerated discovery, and it is based on an unprecedented acceleration of the scientific method.

In my presentation, I will discuss this convergence of AI, hybrid cloud, and quantum computing, its implications for implementing the scientific method, and how we can leverage it all to accelerate the discovery of solutions to deep problems. As a particular example, I will describe how novel sustainable materials can be discovered at unprecedented rates to help society tackle challenges from climate change to pandemics.



WEDNESDAY JULY 13

15:30-16:30 CET

Session Chair:

Carl K. Chang, Iowa State University

PLENARY KEYNOTE DEJAN MILOJICIC

*DISTINGUISHED TECHNOLOGIST AT
HEWLETT PACKARD LABS, IEEE FELLOW,
ACM DISTINGUISHED ENGINEER, HKN AND
USENIX MEMBER, 2014 PRESIDENT OF THE
IEEE COMPUTER SOCIETY*

TECHNOLOGY PREDICTIONS

IEEE Computer Society (IEEE CS) has unveiled its annual Technology Predictions, addressing the long-lasting influence of the pandemic on tech advancements, new technology fundamentals, and anticipated trends shaping the industry for 2022 and beyond. No one can say with 100% certainty what path the future of technology will take, but IEEE CS experts in the field offer useful insights and predictions into some of the most influential possibilities. The top three tech trends that are anticipated to dominate in 2022 are datacentric AI, remote medicine, and health, safety, and wearable biomedical technologies.

Converging technologies increasingly play crucial roles in disruption and are becoming essential for our survival. Predicting technologies helps address pandemic impacts and concerns; it goes well beyond hypothetical exercise. The 2022 Technology Predictions provides a deep dive into each prediction with analysis of specific problems and current demands; the opportunities for the technology; the impact the technology will have on the public, products, services, and related technologies; and the sustainable solutions and business opportunities that it could potentially inhibit and/or enable.



THURSDAY JULY 14

16:10-17:30 CET

*Session Chair: Munindar Singh,
North Carolina State University*

PLENARY KEYNOTE

ELISA BERTINO

*SAMUEL CONTE PROFESSOR OF COMPUTER
SCIENCE AT PURDUE UNIVERSITY, FELLOW OF
IEEE, ACM AND AAAS, 2021 IEEE INNOVATION IN
SOCIETAL INFRASTRUCTURE AWARDEE, 2005
IEEE COMPUTER SOCIETY TSUTOMU KANAI
AWARDEE, AND 2022 IEEE TECHNICAL
ACHIEVEMENT AWARDEE*

THE PERSISTENT PROBLEM OF SOFTWARE INSECURITY

Software is increasingly playing a key role in all infrastructure and application domains we may think of. Unfortunately, as we all know, software systems are still often insecure, despite the fact the “problem of software security” had been known to the industry and research communities for decades. In this talk, as an example of insecure software, we present the results of an extensive study to detect vulnerable implementations of pseudo-random number generator (PRNG) in mobile apps. The study has been carried out using an analysis tool, OTP-Lint that assesses implementations of the PRNGs in an automated manner without requiring the source code. By analyzing 6,431 commercial apps downloaded from two well-known apps market, OTP-Lint identified 399 vulnerable apps that generate predictable OTP values. We then discuss other factors that today complicate the problem of software security - a notable factor being the software supply chain. We then discuss “what it takes” to convince all parties involved in the software ecosystem to address the problem of software insecurity and outline research directions.



FRIDAY JULY 15

09:00-10:20 CET

Session Chair:

Ernesto Damiani, Università degli Studi di Milano

PLENARY KEYNOTE

WENDY HALL

*DBE.FRS, FEng, REGIUS PROFESSOR OF
COMPUTER SCIENCE, EXECUTIVE DIRECTOR OF
THE WEB SCIENCE INSTITUTE, UNIVERSITY OF
SOUTHAMPTON, DAME COMMANDER OF THE
BRITISH EMPIRE*

DATA, GEOPOLITICS AND THE GOVERNANCE OF CYBERSPACE

There is no doubt that the world is very dependent on the Internet these days. If it wasn't obvious before, we certainly realised our dependency during the Covid-19 pandemic. Also, when the whole world piled onto the Internet in order to do anything during the lockdowns, it stayed up and running which is a huge testament to the foresight of the Internet pioneers in terms of its design and in built resilience and scalability. But the Internet has never been under such threat and its whole future as a globally interconnected system is in much doubt for many different reasons. In this talk we will explore the future of the Internet through the perspective of geopolitics and data governance. We will argue that through this lens we see at least four internets, maybe more, rather than just one interconnected ecosystem. We will explore what aspects of the governance of cyberspace we must protect the most in order for us to continue to use the technical infrastructure of the Internet that we all rely on to support cloud and data services.



PLENARY PANEL DISCOVERY TECHNOLOGY FOUNDATION & OPEN SCIENCE TUESDAY JULY 12 15:40-17:00 CET

The ability to make rapid progress in science is more urgent than ever, as demanded by the tremendous societal challenges we are facing, from ensuring our health broadly to climate change to food shortages to energy to security. Scientific discovery – built on the scientific method, is our best tool to advance our knowledge and capabilities for solving to these challenges. At the same time, powered by technology advances in Artificial Intelligence, High Performance Computing, and Hybrid Cloud ... with even further impact expected from Quantum Computing, we are entering a new era of Accelerated Discovery. New computational methods built on growing volumes of data are helping significantly to break through bottlenecks and speed up key steps in discovery, and enable new levels of automation and autonomy. This pace and scale is being further amplified through collaborative efforts that create and build on open data, open source, and open challenges. This panel will explore both the evolving landscape of discovery technologies and opportunities for further advancing open science.



(from left to right) Panel Chair: John Smith, IBM Research | Panelists: Alexy Khrabrov, IBM Accelerated Discovery | Ahment Erdemir, Cleveland Clinic | Ernesto Damiani, Università degli Studi di Milano

PLENARY PANEL TECHNOLOGY, INNOVATION & PARTNERSHIP – FROM LAB TO HOME WEDNESDAY JULY 13 17:00-18:00 CET

According to the National Science Foundation (NSF), to enter into the TIP (Technology, Innovation, and Partnerships) program, a concept (for example, from Lab to Home) should develop breakthrough technologies, address social and economic demands, lead to new, high-wage employment, and encourage all Americans to engage in the United States' research and innovation business. Under the concept of "Technology, Innovation & Partnership - from Lab to Home," we proposed our lab-invented technology as a product that can be transitioned from the research lab to the home setting. This concept also forecasts a proof-of-concept product for the home setting originating from the lab but that has a market and societal benefits. For example, about twenty years ago, in the Ubicomp lab (<http://ubicomp.mscs.mu.edu/>) a prototype was developed to remotely control home electronics (light or fan) by using a mobile phone and the internet (IoT). Today, the concept is prevalent as commercialized smart-home products (such as ring.com) in the market. After the COVID-19 pandemic, market demand for home-oriented tech products has skyrocketed. Based on the increased demand for home-oriented products, taking another look at academic lab projects through the lens of marketability and home use can create new pathways for entrepreneurship and the growth of the national economy. NSF is promoting the building of innovative products from research labs through the Partnerships for Innovation (PFI) program, encouraging future leaders of these innovations.



(from left to right) Panel Chair: Sheikh Iqbal Ahamed, Marquette University | Panelists: Sumi Helal, University of Florida | Thaya Nandagopal, National Science Foundation | Li-Shan Chou, Iowa State University | Mauro Grigioni, Italian National Institute of Health

PLENARY PANEL

THE SERVITIZING OF IoT

THURSDAY JULY 14

14:20-15:40 CET

Internet of Things (IoT) has become a household term. Everyday objects (a.k.a. things) come now equipped with various sensors and are Internet-enabled. These IoT devices are usually enhanced with ubiquitous intelligence. IoT technologies are the key enablers of many cutting-edge applications such as smart cities, smart campuses, smart grids, and smart transportation. It has been recognized that the concept of IoT is congruent with the service paradigm. In this respect, each “thing” is represented by a set of functional and non-functional (a.k.a. quality of service) properties. In this regard, the service paradigm may provide the perfect framework for innovating in IoT and provide a greater opportunities for wider deployment. This would provide the same as, and perhaps greater opportunities than those afforded to cloud computing. The assembled panel consists of leading experts in service computing and IoT to discuss the opportunities and challenges servitizing IoT.



(from left to right)

Panel Chair: Athman Bouguettaya, University of Sydney

Panelists: Schahram Dustdar, TU Wien | Omer F. Rana, Cardiff University | Michael Sheng, Macquarie University | Brahim Madjahed, University of Michigan | Boualem Benatallah, Dublin City University | Fabio Casati, Servicenow

PLENARY PANEL

THE ROLE OF SERVICES IN THE 5G/6G ARENA

THURSDAY JULY 14

17:30-18:50 CET

The fifth generation (5G) wireless networks technologies support diverse vertical applications by connecting heterogeneous devices and machines, promising drastic improvements in terms of low latency, increased network capacity and enhanced system throughput. Despite all these advantages that 5G will bring about, there are still major challenges to be addressed, including decentralization, transparency, risks of data interoperability, and above all, network privacy and security vulnerabilities. On paper, Distributed Ledger Technologies provide a framework to effectively handle most challenges in 5G networks. The panel provides a forum to discuss recent developments in 5G services, focusing on the potential of key 5G technologies, including edge computing, Network Function Virtualization, Network Slicing, and M2M communications, spectrum management, virtualization, and resource management.



(from left to right)

Panel Chair: Gabriele Elia, TIM

Panelists: Franco Vatalaro, University of Rome | Sami Muhaidat, Khalifa University | Ben Azvine, BT | Marco Anisetti, Università degli Studi di Milano |

PLENARY PANEL SOFTWARE SERVICES ENGINEERING FRIDAY JULY 15 10:20-11:40 CET

Industry observers with keen eyes have found that services computing and software engineering are becoming more and more intertwined. That is, services computing professionals and software engineers have been finding ways to intersect theories and practices that used to be more of a concern for the other camp. This emerging interdisciplinary field of study is hereby termed Software Services Engineering (SSE).

Generally speaking, Services Computing grew out of the notion of “Software as a Service” that provides a general production framework to encapsulate the underlying software functionalities meeting both functional and nonfunctional requirements – two key concerns of Software Engineering. Central to SSE, this general production framework allows for modular service requirements decomposition and modular service composition during the development, enforces end-to-end assurance of service quality, and supports the operation, maintenance and evolution of the encapsulated software functionalities instantiated as services. We have also observed that next generation of software services will become more context/situation-aware, self-aware and autonomous, ultra-mobile, ultra-fine-grained, ultra-trustworthy and driven by behaviors observed and captured from both the environment and humans of concern.

In this panel, audience will be informed of and, hopefully, intrigued by a myriad of emerging research trends and interesting topics pertaining to SSE.



(from left to right)

Panel Chairs: Carl K. Chang, Iowa State University | Zhongjie Wang, Harbin Institute of Technology

Panelists: Athman Bouguettaya, University of Sydney | Rong N. Chang, IBM TJ Watson Research Center | Ernesto Damiani, Università degli Studi di Milano | Dejan Milojicic, Hewlett Packard Labs | Stephen S. Yau, Arizona State University

IEEE WORLD CONGRESS ON SERVICES AWARD CEREMONY FRIDAY JULY 15 12:10-13:00 CET



IEEE COMPUTER SOCIETY
TCSVC

Technical Community on Services Computing

IEEE World Congress on Services (SERVICES) recognizes outstanding individuals and team efforts annually with the goal of inspiring members of the services computing community and facilitating transdisciplinary collaborations. Cash prizes are provided selectively for awards administered by IEEE Technical Community on Services Computing (TCSVC).

This year, every Best Paper and Best Student Paper will receive a cash prize of USD 400.00 from IEEE TCSVC. Moreover, every recipient of IEEE TCSVC Awardee will receive a cash prize of USD 400.00

2022 IEEE TCSVC Outstanding Leadership Award
2022 IEEE TCSVC Research Innovation Awards
2022 IEEE TCSVC Outstanding Service Award
2022 IEEE TCSVC Rising Star Award 2022 IEEE TCSVC
Women in Services Computing Award

2022 IEEE Open Software Services Awards

2022 WISC Scholarship Awards

CLOUD 2022 Best Paper Award
CLOUD 2022 Best Student Paper Award

EDGE 2022 Best Paper Award
EDGE 2022 Best Student Paper Award

ICDH Student Grants & Awards
ICDH 2022 Best Paper Award
ICDH 2022 Best Student Paper Award

ICWS 2022 Best Paper Award
ICWS 2022 Best Student Paper Award

QSW 2022 Best Paper Award
QSW 2022 Best Student Paper Award

SCC 2022 Best Paper Award
SCC 2022 Best Student Paper Award



General Chair
Dejan Milojicic
Hewlett Packard Labs



Program Co-Chair
Rajkumar Buyya
The University of
Melbourne



Program Co-Chair
Tuan M Hoang Trong
IBM Research



Program Co-Chair
Gargi B Dasgupta
IBM Research



HPC Symposium Co-Chair
Fabrizio Gagliardi
Barcelona Supercomputing
Center



HPC Symposium Co-Chair
Christoph Hagleitner
IBM Research

Message from the Chairs of the 2022 IEEE International Conference on Cloud Computing

Welcome to the 2022 IEEE International Conference on Cloud Computing (CLOUD 2022) sponsored by the IEEE Technical Committee on Services Computing!

The IEEE International Conference on Cloud Computing (CLOUD) has been a prime international forum for both researchers and industry practitioners to exchange the latest fundamental advances in the state of the art and practice of cloud computing, identify emerging research topics, and define the future of cloud computing. All topics regarding cloud computing, including Cloud as a Service, Cloud Infrastructure, Cloud Applications, Cloud Management and Operations, and Cloud Security and Privacy, align with the theme of the conference.

Since its inception, IEEE CLOUD conference has rapidly grown to become one of the prominent international forums for researchers and practitioners in the area of cloud computing to share their research findings/contributions. This year, IEEE CLOUD 2022 will be part of the IEEE World Congress on SERVICES hosted in “hybrid” mode in Barcelona, Spain on July 11-16, 2022. As the most prestigious academic conference in the field of Cloud Computing, the CLOUD conferences have proven to be an important venue for enabling research and collaboration, and we expect that CLOUD 2022 will continue this trend.

This year’s conference attracted 192 submissions from 50 countries from 5 different continents. After initial review and follow-up discussions, the program committee selected 43 articles to appear as full papers (resulting in an acceptance rate of 22.4%) for presentation in the research track. From the same submission pool of papers, another 11 articles have been selected as short papers. In addition, we have an exciting “work in progress” track that consisted of recent work related to emerging cloud computing research challenges. These accepted papers cover a variety of topics including cloud resource management, monitoring, data management in the cloud, deep learning framework leveraging cloud architectures, and data security. In addition to these papers, the conference program included three invited research papers.

Finally – exploring the future of cloud computing – we organize a *Symposium on the Convergence of Cloud & HPC*, which features 7 invited speakers as well as a panel discussion. Cloud and HPC computing have been for a long time two different and often competing computing paradigms. We are now seeing a clear convergence of these two different worlds for the best of the user community. We look forward to an exciting symposium on this subject during the conference.

The organization of a conference like CLOUD requires the collaboration of many individuals. First of all, we would like to thank the authors for submitting their work to the reviewers for their efforts in reviewing the papers, engaging in active online discussion during the tough selection process, and providing valuable feedback to the authors. Meanwhile, we want to thank the Service Congress Program Chairs in Chief led by Claudio Ardagna and Jia Zhang, Service Congress General Chair Ernesto Damiani, and the Service Congress Organizing Committee for their help in putting together such an interesting program. Also, we would like to thank Carl Chang for his invaluable feedback during the entire process. Finally, we thank all of you who have come to the conference. We hope you find the meeting both stimulating and enjoyable, and that you will also be able to take time to appreciate the beautiful city of Barcelona!

Dejan Milojicic
General Chair

Rajkumar Buyya, Tuan M Hoang Trong, and Gargi B Dasgupta
Program Co-Chairs

Fabrizio Gagliardi and Christoph Hagleitner
Symposium on Convergence of Cloud & HPC Co-Chairs

Program for the 2022 IEEE International Conference on Cloud Computing (CLOUD 2022)

Cloud As a Service (CLD1)

Monday July 11, 09:00-10:15

Room 218

Session Chair: Anshul Jindal, Technical University of Munich

CLD_REG_016

Application Deployment Strategies for Reducing the Cold Start Delay of AWS Lambda

Jaime Dantas, Hamzeh Khazaei and Marin Litoiu

CLD_REG_041

A State-aware Method for Flows with Fairness on NVMe SSDs with Load Balance

Chin-Hsien Wu and Liang-Ting Chen

CLD_REG_050

Bayesian Uncertainty Modelling for Cloud Workload Prediction

Andrea Rossi, Andrea Visentin, Steven Prestwich and Kenneth N. Brown

Cloud As a Service (CLD2)

Monday July 11, 10:45-12:00

Room 218

Session Chair: Andrea Rossi, University College Cork

CLD_REG_076

SLAM: SLO-Aware Memory Optimization for Serverless Applications

Gor Safaryan, Anshul Jindal, Mohak Chadha and Michael Gerndt

CLD_REG_104

Resource Scaling Strategies for Open-Source FaaS Platforms compared to Commercial Cloud Offerings

Johannes Manner and Guido Wirtz

CLD_REG_150

Handling Heterogeneous Workflows in the Cloud while Enhancing Optimizations and Performance

Emile Cadorel, Helene Coullon and Menaud Jean-Marc

Cloud As a Service (CLD3)

Monday July 11, 14:00-15:15

Room 218

Session Chair: Francesco Minna, Vrije Universiteit Amsterdam

CLD_REG_159

Stay at the Helm: Secure Kubernetes Deployments via Graph Generation and Attack Reconstruction

Agathe Blaise and Filippo Rebecchi

CLD_REG_167

QoS aware FaaS for Heterogeneous Edge-Cloud continuum

Sheshadri K R and Lakshmi J

CLD_REG_198

Sequence Clock: A Dynamic Resource Orchestrator for Serverless Architectures

Ioannis Fakinos, Achilleas Tzenetopoulos, Dimosthenis Masouros, Sotirios Xydis and Dimitrios Soudris

Cloud As a Service (CLD4)

Monday July 11, 15:15-16:30

Room 218

Session Chair: Thomas Parnell, IBM Research

CLD_WIP_164

A Guided Approach Towards Complex Chaos Selection, Prioritisation and Injection

Ojaswa Sharma, Mudit Verma, Saumya Bhaduria and Praveen Jayachandran

CLD_WIP_196

Towards More Effective and Explainable Fault Management Using Cross-Layer Service Topology

Dhanya R. Mathews, Mudit Verma, J. Lakshmi and Pooja Aggarwal

CLD_SHT_021

Dynamic Energy and Expenditure Aware Data Replication Strategy

Morgan Séguéla, Riad Mokadem and Jean-Marc Pierson

CLD_SHT_177

OrcBench: A Representative Serverless Benchmark

Ryan Hancock, Sreeharsha Udayashankar, Ali Mashtizadeh and Samer Al-Kiswany

Cloud Applications (CLD5)

Monday July 11, 17:00-18:00

Room 218

Session Chair: Anshul Jindal, Technical University of Munich

CLD_WIP_181

Serving Distributed Inference Deep Learning Models in Serverless Computing

Kunal Mahajan and Rumit Desai

CLD_WIP_046

Xonar: Profiling-based Job Orderer for Distributed Deep Learning

Changyong Shin, Gyeongsik Yang, Yeonho Yoo, Jeunghwan Lee and Chuck Yoo

CLD_REG_201

Konveyor Move2Kube: A Framework for Automated Application Replatforming

Padmanabha Venkatagiri Seshadri, Harikrishnan Balagopal, Akash Nayak, Ashok Pon Kumar
Sree Prakash and Pablo Loyola

Cloud Infrastructure (CLD6)

Tuesday July 12, 09:00-10:15

Room 218

Session Chair: Scott Trent, IBM Research

CLD_REG_005

Smart Edge Power Management to Improve Availability and Cost-efficiency of Edge Cloud

Amardeep Mehta and Lackis Eleftheriadis

CLD_REG_028

Bypass Container Overlay Networks with Transparent BPF-driven Socket Replacement
Sunyanan Choochotkaew, Tatsuhiko Chiba, Scott Trent and Marcelo Amaral

CLD_REG_039

RADIO: Reconciling Disk I/O Interference in a Para-virtualized Cloud
Guangwen Yang, Liang Wang and Wei Xue

Cloud Infrastructure (CLD7)

Tuesday July 12, 10:45-12:00

Room 218

Session Chair: Abdul Alim, IBM Research

CLD_REG_047

Secure Offloading of User-level IDS with VM-compatible OS Emulation Layers for Intel SGX
Takumi Kawamura and Kenichi Kourai

CLD_REG_061

Layered Contention Mitigation Capabilities for Cloud Storage
Meng Wang, Cesar A. Stuardo, Daniar Heri Kurniawan, Ray A. O. Sinurat and Haryadi S. Gunawi

CLD_REG_085

Distributed Online Extraction of a Fluid Model for Microservice Applications using Local Tracing Data
Johan Ruuskanen and Anton Cervin

Cloud Applications (CLD8)

Tuesday July 12, 12:00-13:00

Room 218

Session Chair: Thomas Parnell, IBM Research

CLD_SHT_062

Towards a Security Stress-Test for Cloud Configurations
Francesco Minna, Fabio Massacci and Katja Tuma

CLD_SHT_111

Applying Value-Based Deep Reinforcement Learning on KPI Time Series Anomaly Detection
Yu Zhang and Tianbo Wang

CLD_SHT_169

Building Golden Signal Based Signatures for Log Anomaly Detection
Seema Nagar, Suranjana Samanta, Prateeti Mohapatra and Debanjana Kar

Cloud Infrastructure (CLD9)

Tuesday July 12, 17:30-18:45

Room 218

Session Chair: Amardeep Mehta, Ericsson

CLD_REG_094

Cop-Flash: Utilizing Hybrid Storage to Construct a Large, Efficient, and Durable Computational Storage for DNN Training
Chunhua Xiao, Shi Qiu and Dandan Xu

CLD_REG_109

Q-percentile Bandwidth Billing Based Geo-Scheduling Algorithm
Yaoyin You, Binbin Feng and Zhijun Ding

CLD_REG_114

MicroLens: A Performance Analysis Framework for Microservices Using Hidden Metrics With BPF
Marcelo Amaral, Tatsuhiro Chiba, Scott Trent, Takeshi Yoshimura and Sunyanan Choochotkaew

Cloud Management and Operations (CLD10)

Tuesday July 12, 18:45-19:45

Room 218

Session Chair: Dejan Milojevic, HP Labs

CLD_WIP_113

Data Access Pattern Recommendations for Microservices Architecture
Dasari Surya Sai Venkatesh and Shivali Agarwal

CLD_WIP_139

A Case For Cross-Domain Observability to Debug Performance Issues in Microservices

Ranjitha K, Praveen Tammanna, Pravein Govindan Kannan and Priyanka Naik

CLD_INV_207

A Continuum Approach for Collaborative Task Processing in UAV MEC Networks

Lorson Blair, Carlos Varela and Stacy Patterson

Cloud Infrastructure (CLD11)

Wednesday July 13, 09:00-10:15

Room 218

Session Chair: Amardeep Mehta, Ericsson

CLD_SHT_070

Latency-based Vector Scheduling of Many-task Applications for a Hybrid Cloud

Shifat Mithila and Gerald Baumgartner

CLD_REG_128

Cloud Data Center Fabric Virtualization

Ali Sydney, Abdul Alim, Chris Ward, Claude Basso and Bengi Karacali

CLD_REG_135

Event-Driven Approach for Monitoring and Orchestration of Cloud and Edge-Enabled IoT Systems

Mohamed Mouine and Mohamed Aymen Saied

Cloud Symposium on Convergence of Cloud & HPC (CLDSYM1)

Wednesday July 13, 09:00-10:15

Room: Theater Room

Session Chair: Christoph Hagleitner, IBM Research

HPC and Cloud Fusion - Extreme Data Driven Workflows using Supercomputing Infrastructure-as-Code (IaC)

Sadaf Alam, CSCS

The Cloud – Past Present and Future – An HPC Perspective

Andrew Jones

Cloud Infrastructure (CLD12)

Wednesday July 13, 10:45-12:00

Room 218

Session Chair: Scott Trent, IBM Research

CLD_SHT_175

Guaranteeing Service Level Agreements for Triangle Counting via Observation-based Admission Control Algorithm

Chinthaka Weerakkody, Miyuru Dayarathna, Sanath Jayasena and Toyotaro Suzumura

CLD_REG_156

SAPPARCHI: an Osmotic Platform to Execute Scalable Applications on Smart City Environments

Arthur Souza, Nelio Cacho, Thais Batista and Rajiv Ranjan

CLD_REG_168

Towards Complete Dis-aggregation of Data Center Rack Power using Light-weight Mechanisms

Kalyan Dasgupta, Umamaheswari Devi and Aanchal Goyal

Cloud Symposium on Convergence of Cloud & HPC (CLDSYM2)

Wednesday July 13, 10:45-12:00

Room: Theater Room

Session Chair: Bernd Mohr, Juelich Supercomputing Center

The Last Mile: Cloud Native and HPC

Ricardo Rocha

Cloud and HPC Computing in the EGI Federated Infrastructure

Enol Fernandez

Cloud Management and Operations (CLD13)

Wednesday July 13, 12:00-13:00

Room 218

Session Chair: Tatsushi Inagaki, IBM

CLD_SHT_029

AutoDECK: Automated Declarative Performance Evaluation and Tuning Framework on Kubernetes

Sunyanan Choochootkaew, Tatsuhiko Chiba, Scott Trent, Takeshi Yoshimura and Marcelo Amaral

CLD_SHT_051

Data Leakage Free ABAC Policy Construction in Multi-Cloud Collaboration

John C. John, Arobinda Gupta and Shamik Sural

Cloud Symposium on Convergence of Cloud & HPC (CLDSYM3)

Wednesday July 13, 12:00-13:00

Room: Theater Room

Session Chair: Seelam Seetharami, IBM Research

Supercomputing and European Sovereignty

Mateo Valero

Data Traceability and Results Explainability on the Cloud

Michaela Taufer

Cloud Infrastructure (CLD14)

Wednesday July 13, 14:15-15:30

Room 218

Session Chair: Marcelo Amaral, IBM Research

CLD_REG_191

Performance and Revenue Analysis of Hybrid Cloud Federations with QoS Requirements

Bowen Song, Marco Paolieri and Leana Golubchik

CLD_INV_205

MetaNet: Automated Dynamic Selection of Scheduling Policies in Cloud Environments

Shreshth Tuli, Giuliano Casale and Nicholas Jennings

CLD_INV_206

Fog Computing out of the Box with FogDEFT Framework: A Case Study

Satish Narayana Srirama and Suvam Basak

Cloud Symposium on Convergence of Cloud & HPC (CLDSYM4)

Wednesday July 13, 14:15-15:30

Room: Theater Room

Session Chair: Fabrizio Gagliardi, Barcelona Supercomputing Center

Quantum for HPC and HPC for Quantum: A Cloud Perspective

Talia Gershon

Panel Discussion

Cloud Security and Privacy (CLD15)

Wednesday July 13, 18:00-19:00

Room 218

Session Chair: Mohsen Amini Salehi, University of Louisiana at Lafayette

CLD_SHT_173

vTPM-SM: An Application Scheme of SM2/SM3/SM4 Algorithms Based on Trusted Computing in Cloud Environment

Mingxing Zhou, Shuhua Ruan, Junwei Liu, Xingshu Chen, Miaomiao Yang and Qixu Wang

CLD_SHT_183

Towards Practical Privacy-Preserving Solution for Outsourced Neural Network Inference

Pinglan Liu and Wensheng Zhang

Cloud Applications (CLD16)

Thursday July 14, 09:00-10:15

Room 218

Session Chair: Sunyanan Choochotkaew, IBM Research

CLD_REG_020

Delivering Document Conversion as a Cloud Service with High Throughput and Responsiveness

Christoph Auer, Michele Dolfi, André Carvalho, Cesar Berrospi Ramis and Peter W.J. Staar

CLD_REG_040

Trimmer: Cost-Efficient Deep Learning Auto-tuning for Cloud Datacenters

Damian Borowiec, Gingfung Yeung, Adrian Friday, Richard Harper and Peter Garraghan

CLD_REG_045

Detecting Layered Bottlenecks in Microservices

Tatsushi Inagaki, Yohei Ueda, Moriyoshi Ohara, Sunyanan Choochotkaew, Marcelo Amaral, Scott Trent, Tatsuhiro Chiba and Qi Zhang

Cloud Applications (CLD17)

Thursday July 14, 10:45-12:00

Room 218

Session Chair: Malgorzata Lazuka, IBM Research

CLD_REG_090

Network Aware Container Orchestration for Telco Workloads

Kavya Govindarajan, Chander Govindarajan and Mudit Verma

CLD_REG_130

TIFF: Tokenized Incentive for Federated Learning

Jingoo Han, Ahmad Faraz Khan, Syed Zawad, Ali Anwar, Nathalie Baracaldo Angel, Yi Zhou, Feng Yan and Ali R. Butt

Cloud Security and Privacy (CLD18)

Thursday July 14, 12:00-13:00

Room 218

Session Chair: Tatsushi Inagaki, IBM

CLD_REG_179

DeTrust-FL: Privacy-Preserving Federated Learning in Decentralized Trust Setting

Runhua Xu, Nathalie Baracaldo, Yi Zhou, Ali Anwar, Heiko Ludwig and Swanand Kadhe

CLD_REG_192

Compliance-as-Code for Cybersecurity Automation in Hybrid Cloud

Vikas Agarwal, Chris Butler, Lou Degenaro, Arun Kumar, Anca Sailer and Gosia Steinder

Cloud Applications (CLD19)

Friday July 15, 14:00-15:15

Room 218

Session Chair: Marcelo Amaral, IBM Research

CLD_REG_176

Search-based Methods for Multi-Cloud Configuration

Malgorzata Lazuka, Thomas Parnell, Andreea Anghel and Haralampos Pozidis

CLD_REG_182

A Data-Loader Tunable Knob to Shorten GPU Idleness for Distributed Deep Learning

Danlin Jia, Geng Yuan, Xue Lin and Ningfang Mi

CLD_REG_190

FELARE: Fair Scheduling of Machine Learning Tasks on Heterogeneous Edge Systems

Ali Mokhtari, Pooyan Jamshidi and Mohsen Amini Salehi

Cloud Management and Operations (CLD20)

Friday July 15, 15:45-17:00

Room 218

Session Chair: Dejan Milojevic, HP Labs

CLD_REG_015

Multi-Objective Robust Workflow Offloading in Edge Cloud Continuum

Hongyun Liu, Ruyue Xin, Peng Chen and Zhiming Zhao

CLD_REG_022

An Efficient Approach to Move Elements in a Distributed Geo-Replicated Tree

Parwat Singh Anjana, Adithya Rajesh and Sathya Peri

CLD_REG_054

Localizing and Explaining Faults in Microservices using Distributed Tracing

Jesus Rios, Saurabh Jha and Laura Shwartz

Cloud Management and Operations (CLD21)

Friday July 15, 14:00-15:15

Room 201

Session Chair: Sunyanan Choochotkaew, IBM Research

CLD_REG_071

A Study of Contributing Factors to Power Aware Vertical Scaling of Deadline Constrained Applications

Pradyumna Kaushik, Srinidhi Raghavendra and Madhusudhan Govindaraju

CLD_REG_092

Automated Configuration for Agile Software Environments

Negar Mohammadi Koushki, Sanjeev Sondur and Krishna Kant

CLD_REG_180

An Approximation Algorithm for Minimizing the Cloud Carbon Footprint through Workload Scheduling

Tayebeh Bahreini, Asser Tantawi and Alaa Youssef

Cloud Security and Privacy (CLD22)

Friday July 15, 15:45-17:00

Room 201

Session Chair: Mohsen Amini Salehi, University of Louisiana at Lafayette

CLD_REG_027

GenoPPML – A Framework for Genomic Privacy-preserving Machine Learning

Sergiu Carpov, Nicolas Gama, Mariya Georgieva and Dimitar Jetchev

CLD_REG_044

Avengers, Assemble! Survey of WebAssembly Security Solutions

Minseo Kim, Hyerean Jang and Youngjoo Shin

CLD_REG_126

Secure Cloud Storage with Joint Deduplication and Erasure Protection

Rasmus Vestergaard, Elena Pagnin, Rohon Kundu and Daniel E. Lucani



Qiang He
Swinburne
University of
Technology
Program Chair

IEEE International Conference on Edge Computing (EDGE 2022) Message from the Chairs

IEEE EDGE 2022 is the 6th edition of the IEEE reputable international forum for researchers and practitioners in the fast-growing area of Edge Computing and Fog Computing, which is closely related to many other critical techniques such as cloud computing, Internet-of-Things, 5G, among other. This conference brings together a diverse community to share ideas, present experimental results, and discuss experiences in building some of the world's most challenging systems. We expect that this conference will provide answers to many open questions regarding the architecture, abstraction, resource management, and communication nature of edge computing.



Vicenç Puig
Universitat
Politècnica de
Catalunya
Program Chair

EDGE 2022 received a total of 63 submissions. Each paper was reviewed by at least 3 PC members followed by online discussions. The final decisions were made by the PC chairs according to the review results. As a result, 22 papers were accepted, including 18 regular papers and 4 short papers. The overall quality of submissions was high and many difficult decisions had to be made to ensure the selection of the highest quality submissions. The technical program of the conference consists of 8 sessions devoted to several aspects of edge computing.

We sincerely appreciate the work and effort of the authors for preparing their submissions for review, considering and addressing the reviewers' comments before submitting the camera-ready versions of their accepted papers, and attending the conference to present and discuss their work.

We would like to thank the PC members and additional reviewers for their dedicated service that they provided to the EDGE community to ensure that all the submissions received the consideration and attention they deserve. As program committee chairs, we have appreciated the detailed and very thorough, and timely completion of reviews and the input into the final selection process.

We also want to thank the IEEE 2022 Congress of Services Organizing Committee, especially the Congress Program Chair in Chief Claudio Ardagna for the continuous support. Finally, we want to thank all of you who have come to the conference and hope you find the conference both stimulating and enjoyable!

Program for the IEEE International Conference on Edge Computing (EDGE 2022)

Learning (EDG 1)

Tuesday July 12, 09:00-10:15

Room 010

Session Chair: Achintya Kundu, IBM Research

EDG_REG_016

Robustness and Personalization in Federated Learning: A Unified Approach via Regularization
Achintya Kundu, Pengqian Yu, Laura Wynter and Shiao Hong Lim

EDG_REG_056

Computationally Efficient Auto-Weighted Aggregation for Heterogeneous Federated Learning
Zahidur Talukder and Mohammad A. Islam

EDG_REG_024

ECBA-MLI: Edge Computing Benchmark Architecture for Machine Learning Inference
Mathias Schneider, Ruben Prokscha, Seifeddine Saadani and Alfred Höß

IoT (EDG 2)

Tuesday July 12, 10:45-12:00

Room 010

Session Chair: Chinmaya Kumar Dehury, University of Tartu

EDG_REG_020

CCEI-IoT: Clustered and Cohesive Edge Intelligence in Internet of Things
Chinmaya Kumar Dehury, Praveen Kumar Donta, Schahram Dustdar and Satish Narayana
Srirama

EDG_REG_035

Monitoring of IoT Systems at the Edge with Transformer-based Graph Convolutional Neural
Networks
Amadou Ba, Fabio Lorenzi and Joern Ploennigs

EDG_REG_037

Spatio Goal Refinement Patterns for IoT Applications

Yazeed Alzahrani, Jun Shen and Jun Yan

Edge Computing (EDG 3)

Tuesday July 12, 12:00-13:00

Room 010

Session Chair: Tom Goethals, Univeriteit Gent

EDG_REG_047

A Functional and Performance Benchmark of Lightweight Virtualization Platforms for Edge Computing

Tom Goethals, Merlijn Sebrechts, Mays Al-Naday, Bruno Volckaert and Filip De Turck

EDG_REG_044

Role of Fog Computing in Smart Spaces

Raafat Aburukba, Fatema Elwy and A.R. Al-Ali

EDG_SHT_001

uDiscover: User-Driven Service Discovery in Pervasive Edge Computing using NDN

George Torres, Abderrahmen Mtibaa, Satyajayant Misra, Reza Tourani, Diana Stelmakh,

Srikathyayani Srikanteswara, Yi Zhang and Sanzida Hoque

Edge Devices (EDG 4)

Wednesday July 13, 09:00-10:15

Room 010

Session Chair: Arthur Desuert, Institut Polytechnique de Grenoble

EDG_REG_048

A Middleware for Secure Integration of Heterogeneous Edge Devices

Arthur Desuert, Stephanie Chollet, Laurent Pion and David Hely

EDG_REG_019

EdgeFaaS Bench: Benchmarking Edge Devices Using Serverless Computing

Kaustubh Rajendra Rajput, Chinmay Dilip Kulkarni, Byungjin Cho, Wei Wang and In Kee Kim

Security (EDG 5)

Wednesday July 13, 10:45-12:00

Room 010

Session Chair: Yusen Wu, University of Maryland Baltimore County

EDG_REG_036

Bring Trust to Edge: Secure and Decentralized IoT Framework with BFT and Permissioned Blockchain

Yusen Wu, Jinghui Liao, Phuong Nguyen, Weisong Shi and Yelena Yesha

EDG_REG_022

A Privacy-aware Data Sharing Framework for Internet of Things Through Edge Computing Platform

Akbar Telikani, Jun Shen, Peng Wang and Jie Yang

EDG_REG_061

Continuous Authentication for UAV Delivery Systems Under Zero-Trust Security Framework

Chengzu Dong, Frank Jiang, Shiping Chen and Xiao Liu

Resilience (EDG 6)

Wednesday July 13, 12:00-13:00

Room 010

Session Chair: Zhongjie Wang, Harbin Institute of Technology

EDG_REG_021

A Novel Skill Model Supporting Complex and Reliable Interactions between Users, VPA and External Services

Xizhe Zhang, Demin Yu, Min Liu and Zhongjie Wang

EDG_REG_028

CONTINUER: Maintaining Distributed DNN Services During Edge Failures

Ayesha Abdul Majeed, Peter Kilpatrick, Ivor Spence and Blessen Varghese

EDG_SHT_049

Resilience-Focused Monitoring Framework for Edge Systems

Alex Skov Klitgaard, Anders Alexander S nderby, Henrik Stensgaard J rgensen, Kristian Walstr m Petersen, Junior Dongo and Michele Albano

Edge Networks (EDG 7)

Thursday July 14, 09:00-10:15

Room 010

Session Chair: Dixit Bhatta, University of Delaware

EDG_REG_030

Physics-Inspired Mobile Cloudlet Placement in Next-Generation Edge Networks

Dixit Bhatta and Lena Mashayekhy

EDG_REG_041

Memory Efficient Binary Convolutional Neural Networks on Microcontrollers

Fouad Sakr, Riccardo Berta, Joseph Doyle, Hamoud Younes, Alessandro De Gloria and

Francesco Bellotti

EDG_SHT_023

A Robust Latent Factor Analysis Model for Incomplete Data Recovery in Wireless Sensor Networks

Zhikai Yu, Di Wu and Yi He

Distributed Edge (EDG 8)

Thursday July 14, 10:45-12:00

Room 010

Session Chair: Xiaofei Xu, Harbin Institute of Technology

EDG_REG_018

A Novel Heterogeneous Computing Middleware for Mobile AI Services

Zihao Shao, Tonghua Su, Manyang Xu, Qinglin Liu, Ruipeng Han and Zhongjie Wang

EDG_SHT_014

Querying Distributed Sensor Streams in the Edge-to-Cloud Continuum

Roman Karlstetter, Robert Widhopf-Fenk and Martin Schulz

Message from the Organizing Committee

2022 IEEE International Conference on Digital Health



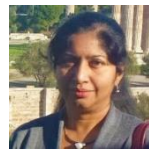
**Sheikh Iqbal
Ahamed**
Marquette
University
General Chair



**Corrado
Priami**
University of
Pisa
General Chair



Misha Pavel
Northeastern
University
Khoury College
General Chair



**Farhana
Zulkernine**
Queen's
University
Program Chair



**Mario
Bochicchio**
University of
Bari
Program Chair



Lin Liu
Tsinghua
University
Program Chair



**Hossain
Shahriar**
Kennesaw State
University
*WIP Track
Chair*

The organizing committee cordially welcomes you to the 2022 IEEE International Conference on Digital Health (ICDH) at the reputed 2022 IEEE World Congress on Services, which is being held in hybrid mode from July 11-15, 2022 in Barcelona, Spain. Sponsored by the IEEE Computer Society under the auspice of the Technical Committee on Services Computing (TCSVC), the Congress brings together researchers working on various systems and networking research pertaining to cloud, edge and Internet-of-Things (IoT), intelligent computing, learning, Big Data and blockchain applications, and security through the co-located conferences on 2022 IEEE Cloud, Edge, ICWS, SCC and SMDS. As a part of the Congress, ICDH offers a venue for visionaries, researchers, and practitioners to share knowledge and present novel research in digital health services to ensure sustainable health and social care transformations. Specifically, ICDH aims to bring together researchers from computer science, communication, biology, medical science, and public health under the general umbrella of digital health to advance the future of health care service provisioning and improve the quality of care. A complete program description is available online on the conference website along with the registration information for authors and participants.

The technical program of ICDH 2022 has been carefully designed to cover a wide range of topics on the advances of the state-of-the-art research and practices in digital health technologies, and the future of digital health. Distinguished researchers and leaders from the academia, multinational industry, leading healthcare, and government organizations will get together, giving talks and attending panel discussions. Foci of discussions include recent advances in models, tools and architectures of digital and integrated digital health care systems and services, therapeutic algorithms and disease/condition-specific intervention service design, health education, ethics of digital health, and patient/user-side design for digital health care.

With advances in 5G network, cybernetic and mediatic digital health platforms are enabling assisted living, remote real time patient monitoring, and round the clock global mobile health (mHealth) services. Crowdsourcing and social media analysis are allowing prediction and monitoring of infectious disease outbreaks. The accepted papers in 2022 ICDH encompass the above topics and will set a rich and exciting stage for the participants to engage in invigorating discussions. This year we have accepted 10 regular, 8 short, 13 invited and 6 work-in-progress papers submitted by authors around the globe. The program also includes panel discussions, distinguished talks, and a student competition event.

While we aimed for an in-person event, the global pandemic situation called for a hybrid ICDH event with the other collocated conferences at the 2022 IEEE World Congress on Services. The program organizers have tried their best to offer an accessible time window for the audiences and presenters from Asia, Europe, and America in scheduling the event. Please join the 2022 ICDH conference to become a member of our vibrant research community and contribute to its success.

Program for the IEEE International Conference on Digital Health (ICDH 2022)

Panel: Future of Digital Health (CDH 1)

Monday July 11, 15:15-16:30

Room 202

**Panel Chairs: Farhana Zulkernine, Queen's University and Mario
Bochicchio, University of Bari, CINI-Digital Health National Lab**

Panelists:

Shao Chun Li, Director of HCLS

Dr. Alex Singer, Manitoba, Department of Family Health

Mauro Grigioni, Director, National Center for Innovative Technologies, Public Health of the
Italian "Istituto Superiore di Sanità"

Panel: Health Data and Services (CDH 2)

Monday July 11, 17:00-18:00

Room 202

**Panel Chair: Mario Bochicchio, University of Bari, CINI-Digital Health
National Lab**

Panelists:

Kevin Woo, Queen's University

Ragib Hasan, Associate Professor and Director, UAB SECRETLab

Nauman Jaffar, Founder, MarkiTech.AI

Analytics and Visualization (CDH 3)

Tuesday July 12, 09:00-10:15

Room 202

Session Chair: Maryam Ehsanpour

CDH_SYM_061

Automated Analysis of Drawing Process for Detecting Prodromal and Clinical Dementia
Yasunori Yamada, Masatomo Kobayashi, Kaoru Shinkawa, Miyuki Nemoto, Miho Ota,
Kiyotaka Nemoto and Tetsuaki Arai

CDH_SYM_062

Extracting, Visualizing, and Learning from Dynamic Data: Perfusion in Surgical Video for
Tissue Characterization
Jonathan Epperlein, Niall Hardy, Pol Mac Aonghusa and Ronan Cahill

Health Policy (CDH 4)

Tuesday July 12, 10:45-12:00

Room 202

Session Chair: Hiroki Takakura, National Institute of Informatics

CDH_REG_030

Data-driven Interpretable Policy Construction for Personalized Mobile Health
Dimitris Bertsimas, Predrag Klasnja, Susan Murphy and Liangyuan Na

CDH_REG_025

Designing User-friendly Medical AI Applications - Methodical Development of User-centered
Design Guidelines
Laura Wiebelitz, Peter Schmid, Thomas Maier and Malte Volkwein

CDH_REG_029

Application of Operations Research Methods in Operating Room Scheduling - A Short Survey
Gaurav Rao, David Savage, Pawan Lingras and Vijay Mago

IoT Data Analytics (CDH 5)

Tuesday July 12, 12:00-13:00

Room 202

Session Chair: Stephan Reiff-Marganiec, University of Derby

CDH_SHT_018

Brain Tumor Segmentation in MRI Images Using A Modified U-Net Model
Thong Vo, Pranjal Dave, Gaurav Bajpai, Rasha Kashef and Naimul Khan

CDH_WIP_014

Preliminary Data Collection for Collaborative Emergency Department Crowd Management using Wearable Devices

Victoire Metuge, Maria Valero, Liang Zhao, Valentina Nino and David Claudio

CDH_WIP_028

Using Data from Wearables for Better Sleep

Juan Arias

Health Data Analytics Platform (CDH 6)

Tuesday July 12, 17:30-18:45

Room 202

Session Chair: Farhana Zulkernine, Queen's University

CDH_SYM_065

Health Guardian Platform: A Technology Stack to Accelerate Discovery in Digital Health Research

Bo Wen, Vince Siu, Jeffrey Rogers, Italo Buleje, Kuan Yu Hsieh, Takashi Itoh, Lukas Zimmerli, Nigel Hinds, Bing Dang and Stefan V. Cavallar

CDH_SYM_066

Definition and Clinical Calibration of Pain Patient States from High-dimensional Mobile Data: Application to a Chronic Pain Cohort

Jenna Reinen, Carla Agurto, Guillermo Cecchi, Jeffrey L. Rogers, Navitas And Envision Studies Physician Author Group and Boston Scientific Research Scientists Consortium

Systems and Interoperability (CDH 7)

Tuesday July 12, 18:45-19:45

Room 202

Session Chair: Rasha Kashef, Ryerson University

CDH_SHT_011

Digital Health Promotion for Fitness Enthusiasts in Africa

Oritsetimeyin Arueyingho and Korede Sanyaolu

CDH_SHT_042

Interoperability Challenges and Critical Success Factors in the Deployment of Cross-border Digital Medical Prescriptions in Finland and Estonia

Flor Nino Palma

CDH_WIP_041

The Need for an Adaptive Sociotechnical Model for Managing Mental Health in a Pandemic

Braden Tabisula and Chinazunwa Uwaoma

Behavior and Lifestyle Monitoring (CDH 8)

Wednesday July 13, 09:00-10:15

Room 202

Session Chair: Mohammad Ashiqur Rahman, Florida International University

CDH_REG_005

The Classification of Multiple Interacting Gait Abnormalities Using Insole Sensors and Machine Learning

Alexander Turner, David Scott and Steve Hayes

CDH_REG_016

On the Pose Estimation Software for Measuring Movement Features in the Finger-to-Nose Test

Enrico Martini, Nicola Vale, Michele Boldo, Anna Righetti, Nicola Smania and Nicola Bombieri

CDH_REG_023

Analysis of Mobile Typing Characteristics in the Light of Cognition

Maximilian Kapsecker, Simon Osterlehner and Stephan Jonas

Language and Social Media (CDH 9)

Wednesday July 13, 10:45-12:00

Room 202

Session Chair: Misha Pavel, Northeastern University

CDH_SYM_019

Emotional Climate Recognition in Interactive Conversational Speech Using Deep Learning

Ghada Alhussein, Mohanad Alkhodari, Ahsan Khandokher and Leontios Hadjileontiadis

CDH_SYM_068

Relationship between Smartphone Addiction and Self-Esteem among Teenage Students Aged 12–15 Years in Jakarta Province, Indonesia

Muhammad Arsyad Subu, Imam Waluyo, Nabeel Al-Yateem, Ika Riana, Jacqueline Maria Dias,

Ahmad Saifan, Syed Azizur Rahman, Jinten Jumiaty, Fatma Refaat Ahmed and Amina

Almarzouqi

CDH_REG_052

Using Deep Learning to Identify Linguistic Features that Facilitate or Inhibit the Propagation of Anti- and Pro-Vaccine Content on Social Media

Young Argyris, Nan Zhang, Bidhan Bashyal and Pang-Ning Tan

Surveillance and Nursing (CDH 10)

Wednesday July 13, 12:00-13:00

Room 202

Session Chair: Pang-Ning Tan, Michigan State University

CDH_INV_063

Surveillance of SARS-CoV-2 in Urban Wastewater in Italy

Mirko Rossi, Giuseppe D'Avenio, Giuseppina La Rosa, Giusy Bonanno Ferraro, Pamela Mancini, Carolina Veneri, Marcello Iaconelli, Luca Lucentini, Lucia Bonadonna, Mario Cerroni, Federica Simonetti, Elisabetta Suffredini and Mauro Grigioni

CDH_SHT_004

A New Low-Cost and Accurate Diagnostic mHealth System for Patients with COVID-19 Pneumonia

Tarek El Salti, Edward Sykes, Javier Nievas and Chen Tong

CDH_WIP_046

Implementing Virtual Nursing in Health Care: An evaluation of effectiveness and sustainability

Oana Tudorache, John Kenemer, Jana Pruiett, Maria Valero, Margaret Hedenstrom, Sweta Sneha and Hossain Shahriar

Activity Monitoring (CDH 11)

Wednesday July 13, 14:15-15:30

Room 202

Session Chair: Mauro Grigioni, Italian National Institute of Health

CDH_REG_024

GMH-D: Combining Google MediaPipe and RGB-Depth Cameras for Hand Motor Skills Remote Assessment

Gianluca Amprimo, Claudia Ferraris, Giulia Masi, Giuseppe Pettiti and Lorenzo Priano

CDH_REG_043

An mHealth Lifestyle Intervention Service for Improving Blood Pressure using Machine Learning and IoMTs

Jared Leitner, Po-Han Chiang, Brian Khan and Sujit Dey

CDH_SHT_015

Computer Vision Based Cognition Assessment for Developmental-Behavioral Screening

Chi-Yu Chen, Po-Chien Hsu, Tang-Chen Chang, Huan Ho, Min-Chun Hu, Chi-Chun Lee, Hui-Ju Chen, Mary Hsin-Ju Ko, Chia-Fan Lee and Pei-Yi Wang

Panel: Image Analytics (CDH 12)

Wednesday July 13, 18:00-19:00

Room 202

Panel Chair: Farhana Zulkernine, Queen's University

Panelists:

Daniel Neagu, University of Bradford

Shehriz Khan, Scientist, Artificial Intelligence and Rehab Robotics Lab, KITE

Michael Barnett-Cowan, University of Waterloo

Deep Learning in DH (CDH 13)

Thursday July 14, 09:00-10:15

Room 202

Session Chair: Mario Bochicchio, University of Bari, CINI Digital Health National Lab

CDH_SHT_032

Privacy Preserving Loneliness Detection: A Federated Learning Approach

Malik Muhammad Qirtas, Dirk Pesch, Evi Zafeiridi and Eleanor Bantry White

CDH_SHT_033

Combining Deep Learning and Fuzzy Logic to Predict Rare ICD-10 cCodes from Clinical Notes

Taridzo Chomutare, Andrius Budrionis and Hercules Dalianis

CDH_SHT_058

Deep Learning-Based Discrete Calibrated Survival Prediction

Patrick Fuhlert, Anne Ernst, Esther Dietrich, Fabian Westhaeusser, Karin Kloiber and Stefan Bonn

CDH_WIP_013

MultiGRehab: Developing a Multimodal Biosignals Acquisition and Analysis Framework for Personalizing Stroke and Cardiac Rehabilitation based on Adaptive Serious Games

Sofia Dias, Leontios J. Hadjileontiadis and Herbert Jelinek

Medical Image and Text Analytics (CDH 14)

Thursday July 14, 10:45-12:00

Room 202

Session Chair: Stefan Bonn, University Medical Center Hamburg-Eppendorf

CDH_SYM_021

CurvMRI: A Curvelet Transform-Based MRI Approach for Alzheimer's Disease Detection

Chahd Chabib, Leontios Hadjileontiadis, Sherlyn Jemimah and Aamna Alshehhi

CDH_SYM_069

Fatty liver Diagnosis Using Deep Learning in Ultrasound Image

Chun-Hsien Wu, Che-Lun Hung, Teng-Yu Lee, Chun-Ying Wu and William Cheng-Chung Chu

CDH_REG_505

Detection of Erythropoietin in Blood to Uncover Doping in Sports using Machine Learning

Maxx Richard Rahman, Jacob Bejder, Thomas Christian Bonne, Andreas Breenfeldt Andersen, Jesús Rodríguez Huertas, Reid Aikin, Nikolai Baastrup Nordsborg and Wolfgang Maass

Data and Knowledge Management (CDH 15)

Thursday July 14, 12:00-13:00

Room 202

Session Chair: Wolfgang Maass, Saarland University

CDH_SYM_064

A Comprehensive and Holistic Health Database

Melissa Morine, Corrado Priami, Edith Coronado, Juliana Haber and Jim Kaput

CDH_SYM_067

PHASE: Security Analyzer for Next Generation Smart Personalized Smart Healthcare System

Nur Imtiazul Haque and Mohammad Ashiqur Rahman

CDH_WIP_040

Knowledge Management in a Healthcare Enterprise: Creation of a Digital Knowledge Repository

Lee Solomon, Reddy Bhavya Gudy, Humera Asfandiyar, Sweta Sneha and Hossain Shahriar

Security-Privacy (CDH-SYM1)

Friday July 15, 14:00-15:15

Room 202

Session Chair: Sheikh Iqbal Ahamed, Marquette University

CDH_SYM_5669

DeepCAD: A Stand-alone Deep Neural Network-based Framework for Classification and Anomaly Detection in Smart Healthcare Systems

Nur Imtiazul Haque, Mohammad Rahman and Sheikh Iqbal Ahamed

CDH_INV_070

Towards Strengthening the Security of Healthcare Devices using Secure Configuration Provenance

Ragib Hasan

CDH_INV_036

Contactless Authentication for Wearable Devices Using RFID

Valerio Bellandi, Paolo Ceravolo, Mauro Conti and Maryam Ehsanpour

IEEE International Conference on Web Services (ICWS 2022)

Message from the Chairs



Athman
Bouguettaya
University of
Sydney



Xiaofei Xu
Harbin Institute
of Technology



Chirine Ghedira
Guegan
University of
Lyon

IEEE International Conference on Web Services (ICWS) has been a prime international forum for both researchers and industry practitioners to exchange the latest fundamental advances in the state of the art and practice of Web-based services, identify emerging research topics, and define the future of Web-based services. All topics regarding Web-based services lifecycle study and management align with the theme of ICWS.

From a technology foundation perspective, Service Computing has become the default discipline in the modern services industry. As a major implementation technology for modernizing services industry, Web services are Internet-based programmable application components published using standard interface description languages and universally available via uniform communication protocols. In its 26th version, the program of ICWS 2022 continues to feature research papers with a wide range of topics, focusing on various aspects of Internet and web-based services. Some of the topics include Web services discovery, selection and recommendation, Service Oriented Technology Trends, Service composition, Service QoS Management, Service security, privacy and trust, Semantic services, Service Applications beyond the Web, Semantic Service, Services and Data/Big Data, and Service Oriented Software Engineering.

The conference was made possible by the contributions from the research community. This edition of ICWS attracted 170 submissions from all over the world. Decision on acceptance or rejection was based on at least three reviews for each submitted paper. After a diligent double-blind review process, a robust discussion phase among the Program Committee members, Seniors Program Committee members, and Program chairs, to perform and ensure constructive reviews and consistent meta-reviews, the conference accepted 21 papers as regular-length papers (i.e., acceptance rate was 14% for regular length papers), and 24 short papers as short-length papers. In addition to the accepted contributions, the ICWS 2022 conference program includes one invited paper.

The 2022 IEEE Conferences on Web Services would not have been possible without the hard work and dedication of the many who volunteered their time and energy for the conference's success. The richness of this edition's program results from an intensive and full collaboration with Pr. Jianwen Su, the Senior program committee members and program committee members to whom we owe our acknowledgment and special thanks. Our appreciation extends to all the external reviewers for assisting the program committee.

This edition of ICWS also featured a Symposium on Services for Machine Learning aiming at bringing together experts from ML, process management, and service integration to create a community focused on understanding and proposing methods for leveraging and measuring ML services when integrated into processes to deliver customer value. The conference also included a plenary panel of experts on servitizing IoT.

We would also like to acknowledge the generous guidance and support of all Members of the Organizing Committee, in particular the Steering Committee Chair, Carl K. Chang, Steering Committee member, Rong N. Chang and Ian Foster, SERVICES Congress General Chairs, Ernesto Damiani and Fatos Xhafa, the SERVICES Congress Program Chairs-in-Chief, Claudio Ardagna and Jia Zhang, in Chief, and the Web Chair, Laurel Ming.

Lastly, we want to thank the authors, for making and keeping ICWS their preferred venue for their best work! For readers of this volume, we hope you will find it both interesting and informative and will inspire and embolden you to produce excellent research output.

Program for the IEEE International Conference on Web Services (ICWS 2022)

ICWS Symposium on Services for Machine Learning - Session 1 (CWS-SYM1)

Monday July 11, 14:00-15:15

Room: Theater Room

Session Chair: Fabio Casati, University of Trento

CWS_SYM_140

Temporal Match Analysis and Recommending Substitutions in Live Soccer Games

Yuval Berman, Sajib Mistry, Joby Mathew and Aneesh Krishna

CWS_SYM_189

Enabling Multi-Provider Cloud Network Service Bundling

Imen Jerbi, Nour Assy, Mohamed Sellami, Hayet Brabra, Walid Gaaloul, Sami Bhiri, Olivier Tirat and Djamal Zeghlache

CWS_SYM_191

How Composable is the Web? An Empirical Study on OpenAPI Data model Compatibility

Souhaila Serbout, Cesare Pautasso and Uwe Zdun

CWS_SYM_192

Knowledge Base 4.0: Using Crowdsourcing Services for Mimicking the Knowledge of Domain Experts (short paper)

Amin Beheshti

ICWS Symposium Session 2 (CWS-SYM2)

Monday July 11, 15:15-16:30

Room: Theater Room

Session Chair: Boualem Benatallah, Dublin City University

CWS_SYM_194

A Blockchain-based Framework in Support of Privacy Preferences Enforcement for Scientific Workflow

Federico Daidone, Barbara Carminati and Elena Ferrari

CWS_SYM_PNL

Panel: Bias in ML - From Bias in ML Service to Bias in ML-Powered Processes

Panelists:

Boualem Benatallah, Dublin City University

Fabio Casati, Servicenow

Cesare Pautasso, USI Lugano

Marcos Baez, Bielefeld University of Applied Sciences

Yacine Gaci, University of Lyon

Services and Data/Big Data I (CWS1)

Monday July 11, 17:00-18:00

Room 019

Session Chair: Chirine Ghedira, IAE - Lyon 3 University

CWS_INV_193

DevSecOps-based Assurance Process for Big Data Analytics

Marco Anisetti, Nicola Bena, Filippo Berto and Gwanggil Jeon

CWS_SHT_086

Multi-agent Multi-armed Bandit Learning for Content Caching in Edge Networks

Lina Su, Ruiting Zhou, Ne Wang, Junmei Chen and Zongpeng Li

Services Discovery, Selection and Recommendation I (CWS2)

Tuesday July 12, 09:00-10:15

Room 019

Session Chair: Buqing Cao, Hunan University of Science & Technology

CWS_REG_005

Spatio-Temporal Mogrifier LSTM and Attention Network for Next POI Recommendation

Yihao Zhang, Pengxiang Lan, Yuhao Wang and Haoran Xiang

CWS_REG_032

Integrating the Pre-trained Item Representations with Reformed Self-attention Network for Sequential Recommendation

Guanzhong Liang, Wei Zhou, Jie Liao and Junhao Wen

CWS_REG_169

Call Limit-Based Composite Service Selection

Karim Benouaret, Juba Agoun, Idir Benouaret and François Charoy

Service Oriented Technology Trends (CWS3)

Tuesday July 12, 10:45-12:00

Room 019

Session Chair: TBA

CWS_REG_163

Joint Service Placement and Computation Scheduling in Edge Clouds

Ran Bi, Ting Peng, Jiankang Ren, Xiaolin Fang and Guozhen Tan

CWS_REG_142

Low Latency Deployment of Service-based Data-intensive Applications in Cloud-Edge Environment

Jingtian Jia and Pengwei Wang

CWS_SHT_096

A Mobility-Aware and Fault-Tolerant Service Offloading Method in Mobile Edge Computing

Tingyan Long, Yong Ma, Yunni Xia, Xuan Xiao, Qinglan Peng and Jiale Zhao

Services Applications & Services and Data/Big Data (CWS4)

Tuesday July 12, 17:30-18:45

Room 019

Session Chair: Karim Benouaret, Lyon 1 University

CWS_SHT_020

CLOSED: A Cloud-Edge Dynamic Collaborative Strategy for Complex Event Detection

Jian Cao, He Huang and Siyou Qian

CWS_SHT_139

Databox-based Delivery Service via Blockchain

Minfeng Qi, Zhiyu Xu, Ziyuan Wang, Shiping Chen and Yang Xiang

CWS_SHT_048

Handling Memory Pointers in Communication Between Microservices

Vini Kanvar, Srikanth Tamilselvam and Raghavan Komondoor

Extended Session on Service Architecture (CWS5)

Tuesday July 12, 18:45-19:45

Room 019

Session Chair: TBA

CWS_SHT_3111

Quality of Experience Optimization in IoT Energy Services

Amani Abusafia, Athman Bouguettaya and Abdallah Lakhdari

CWS_SHT_5707

IoS-OSA: Open System Architecture for Internet of Services

Xiaofei Xu, Xiao Wang, Hanchuan Xu, Guiling Wang, Zhiying Tu, Shuangxi Huang and Zhongjie Wang

CWS_SHT_9713

Service-Oriented Architecture for Drone-based Multi-Package Delivery

Babar Shahzaad and Athman Bouguettaya

Services QoS Management I (CWS6)

Wednesday July 13, 09:00-10:15

Room 019

Session Chair: Sami Yangui, INSA de Toulouse

CWS_REG_094

TS-InvarNet: Anomaly Detection and Localization based on Tempo-spatial KPI Invariants in Distributed Services

Zijun Hu, Pengfei Chen, Guangba Yu, Zilong He and Xiaoyun Li

CWS_REG_134

Service Caching for Meteorological Emergency Decision-making in Cloud-Edge Computing

Hanzhi Yan, Xiaolong Xu, Fei Dai, Lianyong Qi, Xuyun Zhang and Wanchun Dou

CWS_REG_172

HRA: An Intelligent Holistic Resource Autoscaling Framework for Multi-service Applications

Chunyang Meng, Jingwan Tong, Maolin Pan and Yang Yu

Service Applications beyond the Web I (CWS7)

Wednesday July 13, 10:45-12:00

Room 019

Session Chair: TBA

CWS_REG_078

History-Assisted Online User Allocation in Mobile Edge Computing

Xin He, Jiaqi Zheng, Haipeng Dai, Bowen Liu, Wanchun Dou, Guihai Chen and Fu Xiao

CWS_REG_143

Context-aware IoT Service Recommendation: A Deep Collaborative Filtering-based Approach

Zhen Wang, Chang-ai Sun and Marco Aiello

CWS_REG_161

LightPro: Lightweight Probabilistic Workload Prediction Framework for Database-as-a-Service

Xiuqi Huang, Shiyi Cao, Yuanning Gao, Xiaofeng Gao and Guihai Chen

Services Discovery, Selection and Recommendation II (CWS8)

Wednesday July 13, 12:00-13:00

Room 019

Session Chair: Buqing Cao, Hunan University of Science & Technology

CWS_SHT_047

srVPA: A Multi-Domain Conversational Service Recommendation Approach

Min Liu, Demin Yu, Zhiying Tu and Zhongjie Wang

CWS_SHT_070

A Knowledge Graph based Approach for Apps Permission Recommendation

Huwei Zhang, Zhiyong Feng, Jianmao Xiao, Zhixiong Ye, Guodong Fan, Shizhan Chen and Xiao Xue

CWS_SHT_104

Capturing Users' Fresh Interests via Evolving Session-Based Social Recommendation

Hongqi Chen, Zhiyong Feng, Shizhan Chen, Xiao Xue, Hongyue Wu, Yingchao Sun, Yanwei Xu and Gaoyong Han

Services and Data/Big Data II (CWS9)

Wednesday July 13, 14:15-15:30

Room 019

Session Chair: Marco Anisetti, Università degli Studi di Milano

CWS_REG_028

CEDS:Center-Edge Collaborative Data Service for Mobile IoT Data Management

Ziang Huang, Haopeng Chen, Lin Gui, Jiansi Wang and Zhengtong Zhang

CWS_REG_090

Phoebe: QoS-Aware Distributed Stream Processing through Anticipating Dynamic Workloads

Morgan Geldenhuys, Dominik Scheinert, Odej Kao and Lauritz Thamsen

CWS_REG_146

Utility-aware Semantics for Alternative Service Expressions in Federated SPARQL Queries

Lars Heling and Maribel Acosta

Services Security, Privacy and Trust (CWS10)

Thursday July 14, 09:00-10:15

Room 019

Session Chair: Fillipo Berto, Università degli Studi di Milano

CWS_REG_106

Privacy Leakage Vulnerability Detection for Privacy-Preserving Computation Services

Su Zhang and Ying Zhang

CWS_REG_147

RuleCache: Accelerating Web Application Firewalls by On-line Learning Traffic Patterns

Xiaoyi Chen, Qingni Shen, Peng Cheng, Yongqiang Xiong and Zhonghai Wu

CWS_SHT_103

Dependable Workflow Scheduling for Microservice QoS Based on Deep Q-Network

Xiaoming Yu, Wenjun Wu and Yangzhou Wang

Service Oriented Software Engineering I (CWS11)

Thursday July 14, 10:45-12:00

Room 019

Session Chair: Marco Anisetti, Università degli Studi di Milano

CWS_REG_072

MisuseHint: A Service for API Misuse Detection Based on Building Knowledge Graph from Document and Codebase

Qingmi Liang, Zhirui Kuai, Yangqi Zhang, Zhiyang Zhang, Li Kuang and Lingyan Zhang

CWS_REG_077

ASTL: Accumulative Signal Temporal Logic for IoT Service Monitoring

Deng Zhao, Zhangbing Zhou, Zhipeng Cai, Teng Long, Sami Yangui and Xiao Xue

CWS_REG_186

An Integrated Framework for Fault Resolution in Business Processes

Muhammad Adeel Zahid, Ayesha Afzal, Ahmed Akhtar, Basit Shafiq, Jaideep Vaidya and Shafay Shamil

Semantic & Services Composition (CWS12)

Thursday July 14, 10:45-12:00

Room 011

Session Chair: Karim Benouaret, Lyon 1 University

CWS_REG_098

Game Theory based D2D Collaborative Offloading for Workflow Applications in Mobile Edge Computing

Cheng Qian, Gansen Zhao and Haoyu Luo

CWS_REG_115

WoR Ontology: Modeling Resources in Web Connected Environments

Lara Kallab, Richard Chbeir, Sana Sellami and Omar Boucelma

CWS_SHT_066

Online Learning Using Incomplete Execution Data for Self-Adaptive Service-Oriented Systems

Niranjana Deshpande, Naveen Sharma, Qi Yu and Daniel Krutz

ICWS Keynote Address - Michael Sheng, Macquarie University
Unleashing the Full Potential of the Internet of Things: A Service Perspective
Thursday July 14, 12:00-13:00
Room 019

Extended Session on Service Systems (CWS13)
Friday July 15, 14:00-15:15
Room 019
Session Chair: TBA

CWS_REG_9462
Density-Based Pruning of Drone Swarm Services
Balsam Alkouz, Athman Bouguettaya and Abdallah Lakhdari

CWS_REG_9177
A Deep Learning based Personalized QoE/QoS Correlation Model for Composite Services
Min Li, Hanchuan Xu, Zhiying Tu, Tonghua Su, Xiaofei Xu and Zhongjie Wang

CWS_REG_5099
A Privacy-Preserving Oriented Service Recommendation Approach based on Personal Data
Cloud and Federated Learning
Haochen Yuan, Chao Ma, Zhenxiang Zhao, Xiaofei Xu and Zhongjie Wang

Services QoS Management II (CWS15)
Friday July 15, 14:00-15:15
Room 010
Session Chair: Sami Yangui, INSA de Toulouse

CWS_SHT_041
Online Pricing-based Content Cache Trading for Multi-Provider Vehicular Networks
Haowei Chen, Shuiguang Deng, Hongze Zhu and Cheng Zhang

CWS_SHT_043
Is it Fair? Resource Allocation for Differentiated Services on Demands
Ran Zhang, Ning Liu, Lei Liu, Wei Zhang, Haitao Yuan, Mianxiong Dong and Lizhen Cui

CWS_SHT_145
Interval-valued Skyline Web Service Selection on Incomplete QoS
Yanjun Shu, Jianhang Zhang, Decheng Zuo and Quan Z. Sheng

CWS_SHT_170

BIECS: A Blockchain-based Intelligent Edge Cooperation System for Latency-Sensitive Services

Xin Du, Xuzhao Chen, Zhihui Lu, Qiang Duan, Yujie Wang and Jie Wu

Service Applications beyond the Web II (CWS14)

Friday July 15, 15:45-17:00

Room 019

Session Chair: TBA

CWS_SHT_183

Evidential Temporal-Aware Graph-based Social Event Detection via Dempster-Shafer Theory
Jiaqian Ren, Lei Jiang, Hao Peng, Zhiwei Liu, Jia Wu and Philip Yu

CWS_SHT_155

A Declarative Approach to Topology-Aware Serverless Function-Execution Scheduling
Giuseppe De Palma, Saverio Giallorenzo, Jacopo Mauro, Matteo Trentin and Gianluigi Zavattaro

CWS_SHT_074

Improving Business Process Resilience to Long-tailed Business Events via Low-code
Jingwei Zhu, Jun Peng, Liang Zhang and Hong-Linh Truong

Service Oriented Software Engineering II (CWS16)

Friday July 15, 15:45-17:00

Room 010

Session Chair: Mehdi Bahrani, Fujitsu Research of America

CWS_SHT_027

Deep Attentive Anomaly Detection for Microservice Systems with Multimodal Time-Series Data

Yufu Chen, Meng Yan, Dan Yang, Xiaohong Zhang and Ziliang Wang

CWS_SHT_113

Cost-Aware Multidimensional Auto-Scaling of Service- and Cloud-Based Dynamic Routing to Prevent System Overload

Amirali Amiri, Uwe Zdun, André van Hoorn and Schahram Dustdar

CWS_SHT_175

An Intelligent Data-Centric Web Crawler Service for API Corpus Construction at Scale

Mehdi Assefi, Mehdi Bahrami, Sarthak Arora, Thiab Taha, Hamid R. Arabnia, Khaled Rasheed and Wei-Peng Chen

CWS_SHT_178

Log2MS: A Framework for Automated Refactoring Monolith into Microservices using Execution Logs

Bo Liu, Jingliu Xiong, Qiurong Ren, Shmuel Tyszberowicz and Zheng Yang

2022 IEEE International Conference on Quantum Software (QSW 2022)



Johanna Barzen
University of Stuttgart



Francisco
Martin-Fernandez
IBM



Manuel Wimmer,
Johannes Kepler
University Linz

Welcome to the First IEEE International Conference on Quantum Software (QSW 2022)!

Quantum computing is one of the latest fundamental advances in computation. Quantum computers can solve problems that are classically intractable or solve problems with higher precision, respectively. Software that makes use of quantum computers is referred to as quantum software. To gain experience with quantum software, it is important to allow users to access this technology, to continue research, and perform experiments with this technology. With this in mind, we observe that over the last years cloud-based access to quantum computers as well as associated services appeared.

There are a lot of challenges about how to create and use this next generation of software and services that take advantage of quantum computers, especially how we are going to combine them with classical infrastructures and services, or how we are going to integrate quantum software in our business processes and software production pipelines. Questions like these are the motivation for the creation of the IEEE International Conference on Quantum Software (QSW). QSW is focusing on quantum software engineering, including hybrid quantum software, quantum software development, quantum in the cloud, quantum applications, and quantum software analysis & evolution. The goal of QSW is to bring together researchers and practitioners from industry and academia from different areas of quantum computing and (classical) software and service engineering to strengthen the quantum software community and discuss emerging topics such as architectural styles, languages, and best practices of quantum software as well as many other aspects of the quantum software development lifecycle.

The conference attracted 21 submissions. Each paper was reviewed by three program committee members. After thorough reviewing and discussion, the program committee selected 4 submissions to appear as full papers out of 10 full paper submissions (resulting in an acceptance rate of 40%), 3 submissions as short papers, and 1 submission as work-in-progress paper.

The organization of IEEE QSW is a team effort! First of all, we would like to thank the authors for submitting their work to QSW. We also thank our program committee members for their efforts in reviewing the papers, engaging in active online discussions during the selection process, and providing valuable feedback to the authors. In addition, we want to thank the Services Congress General Chair Ernesto Damiani, the Services Congress Program Chairs in Chief Claudio Ardagna and Jia Zhang, and the QSW Conference General Chairs Ismael Faro and Frank Leymann for their help in putting together such an exciting program. Our special thanks go to the QSW Symposium Chairs, Shaukat Ali, Sebastian Feld, and Jessie Yu, for organizing a fantastic symposium. Finally, we also like to thank the QSW Publicity Chair Antonio Garmendia.

We hope you will enjoy this new conference and become an active member of the QSW community!

Johanna Barzen, Francisco Martin-Fernandez, Manuel Wimmer
IEEE QSW 2022 Program Co-Chairs

Program for the IEEE International Conference on Quantum Software (QSW 2022)

Quantum Annealing (QSW1)

Monday July 11, 09:00-10:15

Room 010

Session Chair: Manuel Wimmer, Johannes Kepler University Linz

QSW_REG_8294

Quantum and Digital Annealing for the Quadratic Assignment Problem

Philippe Codognet, Daniel Diaz and Salvador Abreu

QSW_REG_1127

Evaluating The Q-score of D-Wave's QUBO Solvers

Ward van der Schoot, Daan Leermakers, Robert Wezeman, Niels Neumann and Frank Phillipson

QSW_REG_1171

Reverse Engineering of Hamiltonian Expressions from D-Wave Programs

Ricardo Pérez-Castillo, Luis Jiménez-Navajas and Mario Piattini

Towards Quantum Applications (QSW2)

Monday July 11, 10:45-12:00

Room 010

Session Chair: Sebastian Feld, Delft University of Technology

QSW_SHT_614

Towards Process Centered Architecting for Quantum Software Systems

Aakash Ahmad, Arif Ali Khan, Muhammad Waseem, Mahdi Fahmideh and Tommi Mikkonen

QSW_SHT_5143

Backend Compiler Phases for Trapped-ion Quantum Computers

Tobias Schmale, Bence Temesi, Alakesh Baishya, Nicolas Pulido-Mateo, Ludwig Krinner,

Timko Dubielzig, Christian Ospelkaus, Hendrik Weimer and Daniel Borcharding

QSW_WIP_9208

Towards Quantum-based Search for Industrial Data-driven Services

Markus Zajac and Uta Störl

Keynote (QSW-SYM1)

Monday July 11, 17:00-18:00

Room: Theater Room

Session Chair: Shaukat Ali, Simula Research Laboratory

The Quantum Software Stack as a Lens

César A. Rodríguez Rosario

Invited Talk 1 (QSW-SYM2)

Tuesday July 12, 09:00-10:15

Room: Theater Room

Session Chair: Sebastian Feld, Delft University of Technology

Recent & Future Developments in Quantum Computing on Quantum Inspire, Europe's Cloud
Quantum Computing System

Richard Versluis

Enabling Quantum-classical Computation on Multiple Time Scales

Blake Johnson

Panel (QSW-SYM3)

Tuesday July 12, 10:45-12:00

Room: Theater Room

Session Chair: Shaukat Ali, Simula Research Laboratory

Quantum Software: Education, Application, and Commercialization

Sabrina Maniscalco, Stefan Woerner, Thomas Rappold, Dominic Marchand, Marco Pistoia,
Tatjana Wilk

Invited Talk 2 (QSW-SYM4)

Tuesday July 12, 12:00-13:00

Room: Theater Room

Session Chair: Sebastian Feld, Delft University of Technology

HPC+QC, NordIQuEst and the Future of Quantum Computing

Göran Wendin

Recent and Future Developments in Quantum Computing on Quantum Inspire, Europe's Cloud

Quantum Computing: A Scalable, Systems Approach

Anne Matsuura

Handling Errors in Quantum Software (QSW3)

Tuesday July 12, 17:30-18:45

Room 010

Session Chair: Shaukat Ali, Simula Research Laboratory

QSW_REG_5663

Towards a Layered Architecture for Error Mitigation in Quantum Computation

José Guimarães and Carlos Tavares

QSW_SHT_3926

Fault-tolerant Quantum Hybrid Software Systems

Max Scheerer, Jonas Klamroth and Oliver Denninger

INVITED KEYNOTE (QSW4)

Tuesday July 12, 18:45-19:45

Room 010

Session Chair: Manuel Wimmer, Johannes Kepler University Linz

Quantum Programming for the Full Stack Architecture - The PISQ Vision

Koen Bertels



General Chair
Schahram
Dustdar
TU Wein

Message from the Chairs

2022 IEEE International Conference on Services Computing (SCC 2022)

Welcome to the 2022 IEEE International Conference on Services Computing (SCC 2022), an affiliated conference of IEEE World Congress on Services 2022 (SERVICES 2022)!



General Chair
Munindar Singh
North Carolina
State University

The world has entered the era of “Service+”, and enterprises, industries and the entire economies are accelerating their shift to the evolving digital services. Real-world systems, including business processes, information platforms, and physical infrastructures, are rapidly converging to become part of such a digital fabric. As a scientific foundation of service-oriented society, industry, and the economy at large, Service Computing is drastically re-shaping the philosophy underlying business modeling, business consulting, solution creation, and service delivery as well as the DevOps of complex service systems. Besides its rich and widespread applications, Service Computing covers the science and technology perspectives on leveraging computing-related technologies to model, create, operate, and manage business and technical services. Many new networked economic structures for supporting innovative business models are emerging in both academia and industry.



PC Chair
Ernest Teniente
Universitat
Politécnica de
Catalunya

IEEE SCC, held since 2004, is a top-ranked, flagship international conference focusing on innovative service-oriented theories and technologies across all business and industry domains. As the most prestigious academic conference in the field of Service Computing, IEEE SCC brings together a diverse community to share ideas, present research results, and discuss experiences in building the world’s most challenging service-oriented systems and applications. The community has expanded over the past seventeen years of SCC editions: more and more researchers and practitioners have joined, many novel ideas have been proposed and discussed, and many high-quality papers have been published. We expect that IEEE SCC 2022 will continue this trend in contributing to the scientific foundations of modern digital services and shaping the future of Service Computing.



PC Chair
Zhongjie Wang
Harbin Institute
of Technology

Besides traditional technologies such as Service-Oriented Architecture (SOA), business process integration and management, and cloud services, the topics to be presented at IEEE SCC 2022 cover many emerging technologies such as edge and IoT services, big data services, artificial intelligence (AI) and cognitive services, blockchain-based services, and metaverse services. Researchers around the world will share their latest research progress on these new technologies.

The Program Committee of IEEE SCC 2022 comprises 81 experts from 14 countries. About 85 papers in total were submitted. After a rigorous review process, we accepted 23 full research papers (with an acceptance rate 27.1%), 11 short papers, and 3 Work-in-Progress papers. In addition, the conference program also included three exciting invited research papers that were contributed by renowned researchers in the field of service computing. In total, there are 14 technical sessions covering hot topics of services computing, including Service Composition and Recommendation, Microservices and API Services, Data-centric Services, Edge and IoT Services, Learning and Cognitive Services, Quality and Security of Services, Blockchain-based Services, Business Processes and Workflows, Optimization in Services, Service Intelligence, and Service Applications.

SCC 2022 will feature the IEEE International Symposium on Software Services Engineering

(ISASSE), with eight leading experts from industry and academia as invited speakers and panelists. A panel titled “Software development methods in the IoT-laden, AI/ML-driven era” and a special session named “Software Services Engineering with Blockchain” are to be organized. We thank Carl K. Chang and Jordi Marco as the ISASSE chairs for organizing this event as an integral part of SCC 2022.

The organization of a conference like IEEE SCC requires the collaboration of many individuals. First of all, we would like to thank the authors who submitted their papers to the conference. We express our gratitude to the program committee members for their efforts in reviewing the submissions rigorously, engaging in active online discussion during the tough selection process and providing valuable feedback to the authors. Meanwhile, we want to take this opportunity to express our appreciation to IEEE SERVICES 2022 leaders for their dedication to the event: the Steering Committee Chair Carl Chang, the Congress General Chairs Ernesto Damiani and Fatos Xhafa, and the Program Chair in Chief Claudio Ardagna and Jia Zhang. We also extend our appreciation to SCC 2022 Publicity Chair Yingjie Wang, the Congress Publication Chairs Nimanthi Atukorala, Hongyi Bian, and Robert Ward, the Congress Registration Chairs Sheng-Zhi Huang and Shaiqur Rahman, and the Congress Web Chair Laurel Ming. Without your delicate and diligent work, it is impossible to organize IEEE SCC 2022. We hope to meet all of you in person in Barcelona!

We look forward to engaging with all of you at IEEE SCC 2022 and enjoying inspiring discussions on how to advance the scientific foundations for modern digital services.

Schahram Dustdar and Munindar P. Singh
IEEE SCC 2022 General Co-Chairs

Ernest Teniente and Zhongjie Wang
IEEE SCC 2022 Program Co-Chairs

Program for the IEEE International Conference on Services Computing (SCC 2022)

Service Composition and Recommendation (SCC1)

Monday July 11, 14:00-15:15

Room 201

Session Chair: Davide Taibi, Tampere University of Technology

SCC_REG_2148

Caching Hierarchical Skylines for Efficient Service Composition on Service Graphs
Hadeel Alhosaini, Xianzhi Wang, Lina Yao, Yakun Chen and Guandong Xu

SCC_REG_4866

CPGCN: Collaborative Property-aware Graph Convolutional Networks for Service Recommendation
Hao Ge, Qianmu Li, Shunmei Meng and Jun Hou

Microservices and API Services (SCC2)

Monday July 11, 15:15-16:30

Room 201

Session Chair: Tatsushi Inagaki, IBM Research

SCC_REG_5755

Investigating the Linguistic Design Quality of Public, Partner, and Private REST APIs
Francis Palma, Tobias Olsson, Anna Wingkvist, Fredrik Ahlgren and Daniel Toll

SCC_REG_8800

Survey on Tools and Techniques Detecting Microservice API Patterns
Alexander Bakhtin, Abdullah Al Maruf, Tomas Cerny and Davide Taibi

SCC_SHT_4807

Discussing Microservices: Definitions, Pitfalls, and their Relations
Marcus Hilbrich and Fabian Lehmann

Data-centric Services (SCC3)

Tuesday July 12, 09:00-10:15

Room 201

Session Chair: Anshul Jindal, Technical University of Munich

SCC_REG_6468

A Lightweight General Adaptive Optimization Tool for Relational DBMSs under HTAP Workloads

Zhuo Yuan, Haopeng Chen, Ziang Huang, Jiansi Wang and Zhengtong Zhang

SCC_REG_1146

MATS: A Multi-aspect and Adaptive Trust-based Situation-aware Access Control Framework for Federated Data-as-a-Service Systems

Dae-young Kim, Nujood Alodadi, Zhiyuan Chen, Karuna Joshi, Adina Crainiceanu and Don Needham

SCC_REG_4673

QoE-aware Data Caching Optimization in Edge Computing Environment

Zhengguo Ni, Min Yuan and Hancheng Tang

Edge and IoT Services (SCC4)

Tuesday July 12, 10:45-12:00

Room 201

Session Chair: Wiebke Hutiri, TU Delft

SCC_INV_2810

Adaptive Edge-Cloud Environments for Rural AI

Omer Rana, Osama Almurshed, Panos Patros, Victoria Huang, Michael Mayo, Melanie Ooi, Ryan Chard, Kyle Chard, Matt Baughman, Ian Foster and Harshaan Nagra

SCC_REG_6456

MRoCO: A Novel Approach to Structured Application Scheduling with a Hybrid Vehicular Cloud-Edge Environment

Xifeng Xu, Peng Chen, Yunni Xia, Mei Long, Qinglan Peng and Tingyan Long

SCC_REG_7991

Probabilistic Analysis of Context Caching in Internet of Things Applications

Himadri Sikhar Khargharia, Prem Prakash Jayaraman, Abhik Banerjee, Arkady Zaslavsky,
Alireza Hassani, Abhinav Kumar and Amin Abken

Learning and Cognitive Services (SCC5)

Tuesday July 12, 12:00-13:00

Room 201

Session Chair: Jasmin Bogatinovski, Technical University Berlin

SCC_REG_5078

HSG-CDM: A Heterogeneous Service Graph Contextual Deep Model for Web Service
Classification

Vivek Lad, Eduardo Lima and Xumin Liu

SCC_SHT_883
General KPI Anomaly Detection using Attention Model

Yanjun Shu, Tianrun Gao, Zhan Zhang and Jianhang Zhang

SCC_WIP_3047

SimPO: Simultaneous Prediction and Optimization

Bing Zhang, Yuya Ong and Taiga Nakamura

Quality and Security of Services (SCC6)

Tuesday July 12, 17:30-18:45

Room 201

Session Chair: Scott Trent, IBM Research

SCC_REG_4982

Assessing Architecture Conformance to Security-Related Practices in Infrastructure as Code
Based Deployments

Evangelos Ntontos, Uwe Zdun, Ghareeb Falazi, Uwe Breitenbücher and Frank Leymann

SCC_SHT_6217

A Long-term Cloud Workload Prediction Framework for Reserved Resource Allocation

Tianyang Wu, Maolin Pan and Yang Yu

SCC_SHT_191

Double Security Guarantee: Protecting User Privacy and Model Security in QoS Prediction

Jianlong Xu, Zhuo Xu, Lin Jian and Weiwei She

Blockchain-based Services I (SCC7)

Tuesday July 12, 18:45-19:45

Room 201

Session Chair: Leyla Moctar M'Baba, Institut Polytechnique de Paris

SCC_SHT_1652

A Blockchain Implementation to Improve Collaboration Between Original Equipment Manufacturers (OEM) and Partnering Organizations

Niranjan Marathe, Lawrence Chung and Tom Hill

SCC_SHT_7103

A Decentralized Cross-Chain Service Protocol Based on Notary Schemes and Hash-Locking

Yangyang Sun, Longyang Yi, Li Duan and Wei Wang

SCC_SHT_2583

BELDaaS: Blockchain Enabled Lucky Draw as a Service

Sagnik Roy and Shamik Sural

Business Processes and Workflows (SCC8)

Wednesday July 13, 09:00-10:15

Room 201

Session Chair: Michele Dolfi, IBM Research

SCC_INV_7214

Fragment-Based Service Choreographies

Stephan Haarmann, Tom Lichtenstein and Mathias Weske

SCC_REG_6403

Fast, Transparent, and High-Fidelity Memoization Cache-Keys for Computational Workflows

Vassilis Vassiliadis, Michael Johnston and James McDonagh

SCC_REG_6381

PQ-Diff: A Business Process Difference Detection and Interpretation Method based on the Common Key Structure

Jiaxing Wang, Ying Zhao, Wuyuan Zhou and Xusheng Yang

Optimization in Services (SCC9)

Wednesday July 13, 10:45-12:00

Room 201

Session Chair: Gjorgji Madjarov, University Ss Cyril and Methodius, Skopje

SCC_REG_4509

An Enhanced Particle Swarm Approach for UAV Data Collection Service in Disaster Environment

Ru Jin, Rongheng Lin and Zheyu He

SCC_REG_8551

Automatically Design Heuristics for Multi-Objective Location-Aware Service Brokering in Multi-Cloud

Yuheng Chen, Tao Shi, Hui Ma and Aaron Chen

SCC_SHT_6420

Attribute Inference Based on User Similarity and Random Walk

Shuai Yin and Wenming Ma

Service Applications I (SCC10)

Wednesday July 13, 12:00-13:00

Room 201

Session Chair: Amadou Ba, IBM Research

SCC_REG_5870

Context-driven Policies Enforcement for Edge-based IoT Data Sharing-as-a-Service

Huu-Ha Nguyen, Phu H. Phung, Phu H. Nguyen and Hong-Linh Truong

SCC_REG_9460

An EDA-based Genetic Algorithm for EV Charging Scheduling under Surge Demand

Tianyang Li, Xiaolong Li, Ting He and Yufeng Zhang

Service Intelligence (SCC11)

Wednesday July 13, 14:15-15:30

Room 201

Session Chair: Cesare Pautasso, University of Lugano

SCC_INV_1383

Towards Trustworthy Edge Intelligence: Insights from Voice-Activated Services

Wiebke Toussaint Hutiri and Aaron Yi Ding

SCC_REG_3348

Energy-efficient Edge-cloud Collaborative Intelligent Computing: A Two-timescale Approach

Tao Wang, Yuru Jiang, Kailan Zhao and Xiulei Liu

SCC_REG_1195

Inventory Pooling using Deep Reinforcement Learning

Kameshwaran Sampath, Sandeep Nishad, Sai Kota Reddy Danda, Pankaj Dayama and

Suryanarayana Sankagiri

Service Applications II (SCC12)

Wednesday July 13, 18:00-19:00

Room 201

Session Chair: Srikanth Govindaraj Tamilselvam, IBM Research

SCC_WIP_4636

A Microservice Framework for Efficient Navigation Service

Sheng Wang, Chaoyang Li, Dihao Fan, Yu Tang and Xu Wang

SCC_WIP_4229

A Dynamic QoS Guarantee Mechanism in NFV-enabled Networks

Yi Yue, Wencong Yang, Xuebei Zhang, Rong Huang and Xiongyan Tang

Blockchain-based Services II (SCC13)

Thursday July 14, 09:00-10:15

Room 201

Session Chair: Zhiming Zhao, University of Amsterdam

SCC_REG_7039

Extracting Artifact-Centric Event Logs From Blockchain Applications

Leyla Moctar M'Baba, Nour Assy, Mohamed Sellami, Walid Gaaloul and Mohamedade Farouk Nanne

SCC_REG_3821

Blockchain Simulators: A Systematic Mapping Study

Adel Albshri, Bakri Awaji, Ali Alzubaidi and Ellis Solaiman

SCC_REG_8970

HERMS: A Hierarchical Electronic Records Management System Based on Blockchain with Distributed Key Generation

Bo Xu, Xiaona Zhang, Heyang Cao, Yu Li and Li-Ping Wang

Service Applications III (SCC14)

Thursday July 14, 10:45-12:00

Room 201

Session Chair: Aneta Poniszewska-Maranda, Lodz University of Technology

SCC_REG_5037

Harnessing Confidence for Report Aggregation in Crowdsourcing Environments

Hadeel Alhosaini, Xianzhi Wang, Lina Yao, Zhong Yang, Farookh Hussain and Ee-Peng Lim

SCC_SHT_7515

A Task Offloading Method of Internet of Vehicles Based on Cloud-Edge Computing

Yilong Sun, Zhiyong Wu, Dayin Shi and Xiuwei Hu

SCC_SHT_1266

Leveraging Log Instructions in Log-based Anomaly Detection

Jasmin Bogatinovski, Gjorgji Madjarov, Sasho Nedelkoski, Jorge Cardoso and Odej Kao

**2022 IEEE INTERNATIONAL SYMPOSIUM ON SOFTWARE SERVICES
ENGINEERING (ISASSE 2022)**

Panel: Software development methods in the IoT-laden, AI/ML-driven era

Thursday July 14, 10:45-12:00

Room: Theater Room

Panel Chair: Jordi Marco, Universitat Politècnica de Catalunya

Panelists:

Cecilio Angulo, Universitat Politècnica de Catalunya

Christian Berger, University of Gothenburg

Schahram Dustdar, TU Wien

Ernest Teniente, Universitat Politècnica de Catalunya

**2022 IEEE INTERNATIONAL SYMPOSIUM ON SOFTWARE SERVICES
ENGINEERING (ISASSE 2022)**

Software Services Engineering with Blockchain

Thursday July 14, 12:00-13:00

Room: Theater Room

Session Chair: Jordi Marco, Universitat Politècnica de Catalunya

SSE_SYM_0658

A Comparative Analysis of Proof-of-Authority Consensus Algorithms: Aura vs. Clique

Md. Mainul Islam, Mpyana Mwamba Merlec and Hoh In

SSE_SYM_4811

Data Marketplaces with a Free Sampling Service

Rafael Genés-Durán, Oscar Esparza, Juan Hernández-Serrano, Fernando Román-García, Miquel

Soriano, Achille Zappa, Martin Serrano, Susanne Stahnke, Birthe Böhm, Edgar Fries, Vasiliki

Koniakou, Bruno Michel and Jose L. Muñoz-Tapia

SSE_SYM_9889

Decentralized Electronic Voting System using Hyperledger Fabric

Aneta Poniszewska-Maranda, Stanisław Rojek and Michał Pawlak

IEEE SERVICES J1C2 Program

J1C2 Session 1 (QSW)

Tuesday July 12, 09:00-10:15

Room 011

Session Chair: Mohan Baruwat Chhetri, CSIRO

SVC_J1C2_3209

High Throughput Implementation of Post-quantum Key Encapsulation and Decapsulation on GPU for Internet of Things Applications

Wai-Kong Lee and Seong Oun Hwang

SVC_J1C2_0250

Towards Efficient Cryptographic Data Validation Service in Edge Computing

Lei Xu, Xingliang Yuan, Zhengxiang Zhou, Cong Wang and Chungun Xu

J1C2 Session 2 (EDGE)

Tuesday July 12, 10:45-12:00

Room 011

Session Chair: Indika Priyantha

SVC_J1C2_6582

Latency-driven Model Placement for Efficient Edge Intelligence Service

Peiying Lin, Zhichen Shi, Zheng Xiao, Cen Chen and Kenli Li

SVC_J1C2_5481

A Novel Graph-based Computation Offloading Strategy for Workflow Applications in Mobile Edge Computing

Xuejun Li, Tianxiang Chen, Dong Yuan, Jia Xu and Xiao Liu

SVC_J1C2_4977

Dynamic User Allocation in Stochastic Mobile Edge Computing Systems

Phu Lai, Qiang He, Xiaoyu Xia, Feifei Chen, Mohamed Abdelrazek, John Grundy, John Hosking and Yun Yang

J1C2 Session 3 (AI/ML)

Tuesday July 12, 12:00-13:00

Room 011

Session Chair: Phu Lai, La Trobe University

SVC_J1C2_6210

Privacy-Aware Forecasting of Quality of Service in Mobile Edge Computing

Huiying Jin, Pengcheng Zhang, Hai Dong, Yuelong Zhu and Athman Bouguettaya

SVC_J1C2_1907

FOCloud: Feature Model Guided Performance Prediction and Explanation for Deployment Configurable Cloud Applications

Indika Kumara, Mohamed Hameez Ariz, Mohan Baruwal Chhetri, Majid Mohammadi, Willem-Jan van den Heuvel and Damian Andrew Tamburri

SVC_J1C2_5216

Optimizing Data Centre Energy Efficiency via Event-Driven Deep Reinforcement Learning

Yongyi Ran, Xin Zhou, Han Hu and Yonggang Wen

J1C2 Session 4 (COVID & Future Pandemics)

Tuesday July 12, 17:30-18:45

Room 011

Session Chair: TBA

SVC_J1C2_4659

Quest: Privacy-Preserving Monitoring of Network Data: A System for Organizational Response to Pandemics

Shantanu Sharma, Sharad Mehrotra, Nisha Panwar, Nalini Venkatasubramanian, Peeyush Gupta, Shanshan Han and Guoxi Wang

SVC_J1C2_9781

DisCOV: Distributed COVID-19 Detection on X-Ray Images with Edge-Cloud Collaboration

Xiaolong Xu, Hao Tian, Xuyun Zhang, Lianyong Qi, Qiang He and Wanchun Dou

SVC_J1C2_7105

An Empirical Study on How Well Do COVID-19 Information Dashboards Service User Information Needs

Xinyan Li, Han Wang, Chunyang Chen and John Grundy

J1C2 Session 5 (Business Process)

Wednesday July 13, 09:00-10:15

Room 011

Session Chair: Barbara Pernici, Politecnico di Torino

SVC_J1C2_2214

Integrated Exploration of Data-Intensive Business Processes

Carlo Combi, Barbara Oliboni and Francesca Zerbato

SVC_J1C2_1201

A multi-view deep learning approach for predictive business process monitoring

Vincenzo Pasquadibisceglie, Annalisa Appice, Giovanna Castellano and Donato Malerba

SVC_J1C2_5763

Evaluation Goals for Online Process Mining: A Concept Drift Perspective

Paolo Ceravolo, Gabriel Marques Tavares, Sylvio Barbon Junior and Ernesto Damiani

J1C2 Session 6 (Mixed)

Wednesday July 13, 10:45-12:00

Room 011

Session Chair: Moustafa Abdelbaky, University of California at Berkeley

SVC_J1C2_8542

Blockchain Based Multi-Authority Fine-Grained Access Control System With Flexible Revocation

Meiyan Xiao, Qiong Huang, Ying Miao, Shunpeng Li and Willy Susilo

SVC_J1C2_0812

Social-Sensor Composition for Tapestry Scenes

Tooba Aamir, Hai Dong and Athman Bouguettaya

SVC_J1C2_9732

xAFCL: Run Scalable Function Choreographies Across Multiple FaaS Systems

Sasko Ristov, Stefan Pedratscher and Thomas Fahringer

J1C2 Session 7 (QoS/QoE Assurance)

Wednesday July 13, 12:00-13:00

Room 011

Session Chair: Tooba Aamir, University of Sydney

SVC_J1C2_0355

A General Performance and QoS Model for Distributed Software-Defined Environments

Moustafa Abdelbaky and Manish Parashar

SVC_J1C2_3941

Multiservice Reliability Evaluation Algorithm Considering Network Congestion and Regional Failure Based on Petri Net

Lanlan Rui, Xushan Chen, Xiaomei Wang, Zhipeng Gao, Xuesong Qiu and Shangguang Wang

SVC_J1C2_2631

Dynamic Random Testing of Web Services: A Methodology and Evaluation

Chang-ai Sun, Hepeng Dai, Guan Wang, Dave Towey, Tsong Yueh Chen and Kai-Yuan Cai

IEEE SERVICES Congress Plenary Keynote & Panelist Bios

Sheikh Iqbal Ahamed is a professor and Chair of Computer Science and director of Ubicomp lab at Marquette University, USA. He is a senior member of the IEEE, ACM, and the IEEE Computer Society. He completed his Ph.D. in Computer Science from Arizona State University, USA in 2003. His research interests include mHealth, affective computing, non-intrusive technologies. He is active in system and application development of mHealth projects for Native American, Hispanic community and other underserved populations like Nepal, Bangladesh. Most of his mHealth projects are supported by NIH, Industry and Philanthropic organizations. He has published 200+ peer reviewed journal, conference and workshop papers. He has received twelve best paper/posters awards in last five years. Dr. Ahamed serves regularly on international conference program committees in software engineering and pervasive computing such as COMPSAC, PERCOM and SAC . He has been serving as the Standing Committee Vice Chair of IEEE COMPSAC (compsac.org), which is a signature conference of IEEE since 2015. He is the Guest Editor of Computer Communications Journal, Elsevier.

Cecilio Angulo, BSc/MSc in Mathematics from the University of Barcelona, Spain and PhD in Sciences from the Universitat Politècnica de Catalunya (UPC). Full Professor of Artificial Intelligence and Robotics at UPC. Founder and former Head Director of the Research Centre on Intelligent Data Science and Artificial Intelligence (IDEAI-UPC). He has worked on theoretical aspects on machine learning, computer vision and robotics and on applications on recommender systems, cognitive social robots and assistive technologies. He has authored books in machine learning and robotics, and published more than 275 papers in international and national journals and conferences. He has led and participated in many R&D competitive projects, most of them funded by the European Commission.

Marco Anisetti is an Associate Professor at the Università degli Studi di Milano, Italy. He received the Ph.D degree in Computer Science from the Università degli Studi di Milano in 2009. He is the winner of the GIRPR award for the best PhD thesis in 2010 and the winner of Chester Sall Award from IEEE Consumer Electronics Society in 2009. His research interests are in the area of Computational Intelligence and its application to the design and evaluation of complex systems and services. More in details, he has been investigating innovative solutions in the areas of Cloud and Web Service security assurance evaluation and software/service certification.

He is currently investigating the application of Big Data technologies to i) compute trustworthiness and assurance metrics in Cloud, Edge, IoT and for AI models, ii) provide analytics capabilities in continuum edge scenarios including 5G edge nodes. He participated in more than 10 EU projects including FP7 ASSET4SOA and FP7 CUMULUS, H2020 EVOTION, H2020 CONCORDIA, H2020 IMPETUS, H2020 CounteR to name but a few. The results of research activities have been published in more than 120 papers in international conference/workshop proceedings, journals, and chapters in books.

Ben Azvine holds a PhD in Intelligent Control Systems from Manchester University and an MBA from Imperial College, London. He is responsible for setting direction and strategy for security research, identifying innovation opportunities and leading a strong international team of researcher to develop new capabilities in collaboration with industrial and academic partners. Ben's previous

roles included leading the IT research centre and head of business intelligence and customer analytics research at BT Group Chief Technology Office. He joined BT in 1995 to lead a research programme to develop and exploit novel Artificial Intelligence technology to support next generation IT systems. Since then he has held senior, principal, chief research scientist posts at BT's global R&D headquarters in Adastral Park, Ipswich.

Boualem Benatallah is a full professor of computing at Dublin City University (DCU, Ireland) since Jan 2022. Professor Benatallah has had over 21 years as a research leader and academic (senior lecturer, associate professor, professor and then scientia professor), at UNSW Sydney (Australia). His main research interests are developing fundamental concepts and techniques in Web service composition, services engineering, crowd sourcing services, data curation, cognitive services, and business processes management. He has published more than 300 refereed papers including more than 90 journal papers. Most of his papers appeared in very selective and reputable conferences and journals. Boualem has been general and PC chair of a number of international conferences. He has been guest editor of several special issues for reputable international journals. He is a member of the steering committee of BPM and ICSOC conferences. He is member of the editorial board of numerous international journals including ACM Transactions on Web and IEEE transactions on services computing. He held visiting professor positions at several prestigious research institutes and universities. He was a member of the team (comprising multiple university, government, and industry partners) that constructed the successful bid for the Smart Services CRC (cooperative Research Centre). He was research leader of the data curation foundry research stream at the Data to Decisions CRC. He is fellow of the IEEE. He is member of Executive Committee of IEEE Computer Society's Technical Committee on Business Informatics and Systems. He is member of ACM.

Christian Berger is Full Professor at the Department of Computer Science and Engineering at University of Gothenburg, Sweden and received his Ph.D. degree from RWTH Aachen University, Germany in 2010. He coordinated the project for the vehicle "Caroline", which participated in the world's first urban robot race 2007 DARPA Urban Challenge Final. He co-led the Chalmers Truck Team during the 2016 Grand Cooperative Driving Challenge (GCDC), and is one of the two leading architects behind OpenDLV (Open Driverless Vehicle). His research expertise is on architecting complex and distributed realtime software systems, micro-services for cyber-physical and IoT-systems, and continuous integration/deployment/experimentation.

Elisa Bertino is Samuel Conte Professor of Computer Science at Purdue University. She serves as Director of the Purdue Cyberspace Security Lab (Cyber2Slab). Prior to joining Purdue, she was a professor and department head at the Department of Computer Science and Communication of the University of Milan. She has been a visiting researcher at the IBM Research Laboratory in San Jose (now Almaden), at Rutgers University, at Telcordia Technologies. She has also held visiting professor positions at the Singapore National University and the Singapore Management University. Her main research interests include security, privacy, database systems, distributed systems, and sensor networks. Her recent research focuses on cybersecurity and privacy of cellular networks and IoT systems, and on edge analytics for cybersecurity. Elisa Bertino is a Fellow member of IEEE, ACM, and AAAS. She received the 2002 IEEE Computer Society Technical Achievement Award for "For outstanding contributions to database systems and database security and advanced data management systems", the 2005 IEEE Computer Society Tsutomu Kanai

Award for “Pioneering and innovative research contributions to secure distributed systems”, the 2019-2020 ACM Athena Lecturer Award, and the 2021 IEEE 2021 Innovation in Societal Infrastructure Award.

Athman Bouguettaya received his PhD in Computer Science from the University of Colorado at Boulder in the US in 1992. Before joining the University of Sydney as Professor and Head of the School of Computer Science in 2016, he was Professor and Head of the School of Computer Science and IT at RMIT University in Melbourne. Prior to this he was Science Leader in Service Computing at the CSIRO ICT Centre (now DATA61) in Canberra, and a tenured faculty member and program director in the Computer Science department at Virginia Polytechnic Institute and State University (Virginia Tech) in the US.

Fabio Casati is a Principal Machine Learning Architect and Engineer at Servicenow. Fabio focuses on designing, architecting and deploying AI-powered workflows for enterprise customers. On the research side, he is working on AI applied to workflows and on quality in AI. Previously he was Professor at the University of Trento. In that role, he started research lines on crowdsourcing and hybrid human-machine computations, focusing on applications that have direct positive impact on society through tangible artefacts adopted by the community. Prior to that, he was technical lead for the research program on business process intelligence in Hewlett-Packard USA, where he contributed to several HP commercial products in the area of web services and business process management. He co-authored a best-selling book on Web services and is author of over 250 peer-reviewed papers.

Carl K. Chang is Professor of Computer Science, Professor of Human Computer Interaction and Director of Software Engineering Laboratory in the Department of Computer Science at Iowa State University where he served as its department chair from 2002-2013. He received a PhD in computer science from Northwestern University. He worked for GTE Automatic Electric and Bell Laboratories before joining the University of Illinois at Chicago in 1984, where he directed the International Center for Software Engineering. He served as Professor and Inaugural Director for the Institute for Mobile, Pervasive, and Agile Computing Technologies (IMPACT) at Auburn University from 2001–2002, before moving to Iowa State University in July 2002. Chang was the 2004 IEEE Computer Society president. Previously he served as the Editor-in-Chief for IEEE Software (1991–1994) and Editor-in-Chief for IEEE Computer (2007–2010). He launched and spearheaded the Computing Curricula 2001 (CC2001) project jointly sponsored by the IEEE Computer Society, the ACM, and the National Science Foundation. He is a Life Fellow of IEEE, a Fellow of AAAS, and a Life Academician and an officer of the European Academy of Sciences. He received the 2000 IEEE Third Millennium Medal, the 2006 Bulgaria Academy of Sciences Marin Drinov Medal, and the 2012 IEEE Computer Society Richard E. Merwin Medal. As a three times winner of IBM Faculty Award, Chang's research interests include software engineering, human computer interaction and digital health. He is the founder of Situation Analytics based on his Situ theoretical framework.

Rong N. Chang is Principal Research Staff Member at IBM T.J. Watson Research Center and a member of IBM Academy of Technology. He is leading an in-market R&D effort in creating an API-based fabric of composable enterprise microservices supporting advanced scientific discoveries. He received his Ph.D. degree in computer science & engineering from the University

of Michigan at Ann Arbor in 1990. He has received eight IBM corporate-level Outstanding Technical Achievement Awards, held 30+ patents, and published 50+ refereed technical papers in the areas of distributed services computing. Dr. Chang is an Associate Editor-in-Chief of the IEEE Transactions on Services Computing (TSC) and the Awards Chair of IEEE-CS Technical Community on Services Computing (TCSVC). He is the Steering Committee Chair-Elect of IEEE World Congress on Services (SERVICES). He is the Awards Chair of 2022 IEEE SERVICES, affiliated with IEEE CLOUD, EDGE, ICDH, ICWS, QSW, and SCC.

Li-Shan Chou is currently the Chair and Professor in Department of Kinesiology at the Iowa State University (ISU). He received his BS degree in Mechanical Engineering from Tatung Institute of Technology in Taiwan, and subsequently earned his MS and Ph.D. degrees, both in Mechanical Engineering, from University of Illinois at Chicago, as well as completed his postdoctoral training at University of Chicago and Mayo Clinic. He has served on the faculty of University of Oregon for 19 years (4 years as the Department Head of Human Physiology) before joining ISU in 2019. His interdisciplinary research investigates biomechanical markers that lead to sensitive detection and understanding of underlying mechanisms related to mobility/balance impairments associated with ageing, musculoskeletal diseases or injuries, and traumatic brain injury. He is a Fellow of American Society of Biomechanics and serves as the Deputy Editor and Section Editor to Gait and Posture and Archives of Physical Medicine and Rehabilitation, respectively. He is also the past-president of the International Society of Biomechanics 3D Analysis of Human Movement Technical Group.

Alessandro Curioni is an IBM Fellow, Vice President of IBM Research Europe and Africa and Director of the IBM Research lab in Zurich, Switzerland. He is responsible for IBM corporate research in Europe and leads IBM's global research strategy in Accelerated Discovery and Security. Dr. Curioni is an internationally recognized leader in the area of high-performance computing and computational science, where his innovative thinking and seminal contributions have helped solve some of the most complex scientific and technological problems in healthcare, aerospace, consumer goods and electronics. He was a member of the winning team recognized with the prestigious Gordon Bell Prize in 2013 and 2015. His primary research interests currently include accelerating the rate of discovery with AI, quantum computing, and novel computing paradigms. He is a member of the Swiss Academy of Technical Sciences.

Ernesto Damiani (Senior Member, IEEE) is currently a Full Professor with the Università degli Studi di Milano, Italy, the Senior Director of the Robotics and Intelligent Systems Institute, and the Director of the Center for Cyber Physical Systems (C2PS), Khalifa University, United Arab Emirates. He is also the Leader of the Big Data Area, Etisalat British Telecom Innovation Center (EBTIC) and the President of the Consortium of Italian Computer Science Universities (CINI). He is also part of the ENISA Ad-Hoc Working Group on Artificial Intelligence Cybersecurity. He has pioneered model-driven data analytics. He has authored more than 650 Scopus-indexed publications and several patents. His research interests include cyber-physical systems, big data analytics, edge/cloud security and performance, artificial intelligence, and machine learning. He was a recipient of the Research and Innovation Award from the IEEE Technical Committee on Homeland Security, the Stephen Yau Award from the Service Society, the Outstanding Contributions Award from IFIP TC2, the Chester-Sall Award from IEEE IES, the IEEE TCHS

Research and Innovation Award, and a Doctorate Honoris Causa from INSA-Lyon, France, for his contribution to big data teaching and research.

Schahram Dustdar is Full Professor of Computer Science heading the Research Division of Distributed Systems at the TU Wien, Austria. He holds several honorary positions: University of California (USC) Los Angeles; Monash University in Melbourne, Shanghai University, Macquarie University in Sydney, University Pompeu Fabra, Barcelona, Spain. From Dec 2016 until Jan 2017 he was a Visiting Professor at the University of Sevilla, Spain and from January until June 2017 he was a Visiting Professor at UC Berkeley, USA.

From 1999 – 2007 he worked as the co-founder and chief scientist of Caramba Labs Software AG in Vienna (acquired by Engineering NetWorld AG), a venture capital co-funded software company focused on software for collaborative processes in teams. Caramba Labs was nominated for several (international and national) awards: World Technology Award in the category of Software (2001); Top-Startup companies in Austria (CapGemini Ernst & Young) (2002); MERCUR Innovation award of the Austrian Chamber of Commerce (2002). He is co-founder of edorer.com (USA) and sinoaus.net (based in Nanjing, China), where he is the chief-scientist.

He is founding co-Editor-in-Chief of ACM Transactions on Internet of Things (ACM TIIoT) as well as Editor-in-Chief of Computing (Springer). He is an Associate Editor of IEEE Transactions on Services Computing, IEEE Transactions on Cloud Computing, ACM Computing Surveys, ACM Transactions on the Web, and ACM Transactions on Internet Technology, as well as on the editorial board of IEEE Internet Computing and IEEE Computer. Dustdar is recipient of multiple awards: IEEE TCSVC Outstanding Leadership Award (2018), IEEE TCSC Award for Excellence in Scalable Computing (2019), TCI Distinguished Service Award 2021 by the IEEE Technical Committee on the Internet (TCI) (2021), ACM Distinguished Scientist (2009), ACM Distinguished Speaker (2021), IBM Faculty Award (2012). He is an elected member of the Academia Europaea: The Academy of Europe, where he is chairman of the Informatics Section, as well as an IEEE Fellow (2016) and an Asia-Pacific Artificial Intelligence Association (AAIA) Fellow and President (2021).

Gabriele Elia holds a PhD from the Polytechnic of Turin, Italy. He has been working for TIM since 1994. Within TIM's Technology Innovation division, he leads the Technological Scouting, Trend Analysis and Future Center group where medium-term trends in networks and software are highlighted; digital life; digitization of industries; big data, robotics and AI; trends from the world of science and innovation processes. He has always dealt with innovation in the technological sectors on the topics of IP services, media, fixed and mobile broadband applications, and more recently with Open Innovation initiatives, startup acceleration and construction of innovative research, training and entrepreneurship collaborations.

Ahment Erdemir is Director at Computational Biomodeling (CoBi) Core and Erdemir Laboratory, Lerner Research Institute, Cleveland Clinic. His primary scientific and clinical contributions are in simulation-based medicine, primarily in biomechanics, which explores motion and deformation of biological structures as they interact with the environment. His technical niche has been in physics-based computational modeling and simulation.

Mauro Grigioni is Research Director at Italian National Institute of Health (ISS), MSc Degree in Electronics, telecommunications and biomedical engineering, Ultrasonography. Since 1988 he has been a researcher of the ISS involved in the research and Health Service control activities. He has published more than 300 scientific papers. Grigioni serves as head of the National Center for Innovative Technologies in Public Health at ISS, Rome (CN TISP), a Multisectorial Center (medical devices, biomedical engineering, radiological health, nuclear medicine, nanotechnologies and innovative therapies) with multidisciplinary integration (physics, medicine, IT, engineering, biology). From an Institutional point of view, main interests were medical device assessment for the Italian Ministry of Health and EU (Vigilance & Certification by EU directives).

He promotes the Consensus Conference CICERONE on the rehabilitative robotic technologies for Frailty. Within the framework of the Italian Ministry of Health the Center has set up a Regulatory Observatory for the SW Medical Devices, and participates in EU projects such as Label2Enable to create a quality assessment of App & Digital Therapeutics, following the ISO Technical Specification 82304-2: 2021. Finally, an Environmental Surveillance project is being carried out for complementing clinical surveillance for Covid – 19 incidence during the pandemic and set up a Dashboard for Wastewater Monitoring at national and regional level. He is a Italian Focal Point for WHO's Progress Indicators for assistive technologies access.

He was responsible for an Operative Unit within the finalized project of Italian Ministero della Salute to implement Virtual Reality therapeutics together with the Istituto Auxologico di Milano. - Collaboration in projects of Space Biomedicine to set algorithms for the 4D representation of cellular population under microgravity, by means of confocal microscopy. He is Senior Member of IEEE since 2000 and Member of the European Society for Artificial Organs (ESAO) since 1992.

Dame Wendy Hall, DBE, FRS, FREng is Regius Professor of Computer Science, Associate Vice President (International Engagement) and is an Executive Director of the Web Science Institute at the University of Southampton. She became a Dame Commander of the British Empire in the 2009 UK New Year's Honours list and is a Fellow of the Royal Society. Dame Wendy was co-Chair of the UK government's AI Review, which was published in October 2017, and is the first Skills Champion for AI in the UK. In May 2020, she was appointed as Chair of the Ada Lovelace Institute and joined the BT Technology Advisory board in January 2021.

Sumi Helal is a Professor at the Computer and Information Science and Engineering Department at the University of Florida and the Director of its Mobile and Pervasive Computing Laboratory. From 2017 to 2020, while on leave from Florida, he was the Chair in Digital Health at Lancaster University, the United Kingdom. Dr. Helal served as the Editor-In-Chief (2015-2018) of IEEE Computer, the flagship publication of IEEE Computer Society. He has published extensively and founded four successful startups. He co-founded and directed the legendary Gator-Tech Smart House which is an experimental facility for applied research development and validation in the domains of elder care and health telematics. He served as the Technology Director of the NIDRR-funded Rehabilitation Engineering Research Center on Successful Aging (RERC-Aging), 2001-2007. He is best known for his work in Pervasive Computing, Mobile Computing and the Internet of Things, and their human-centric applications in the domains of aging, personal health and disability. Dr. Helal is a Fellow of IEEE, AAAS and IET, and a member of Academia Europaea.

Alexy Khrabrov is the founder and organizer of Scale By the Bay and several Bay Area meetups, including SF Scala, SF Spark, and Bay Area AI. He is currently a Open Source Science Community Director, IBM Accelerated Discovery. Previously Alexy was a General Manager of the Reactive Foundation (a project of the Linux Foundation), a Chief Community Officer of the Trusted IoT Alliance, a Chief Scientist at Nitro, a software engineer at various internet companies before that, including Amazon, and a researcher at Dartmouth, UPenn, and NEC Research Institute. Alexy holds a Ph.D. in Computer Science from the University of Pennsylvania.

Brahim Medjahed is Associate Dean of Academic Programs and Initiatives at the Rackham Graduate School, University of Michigan, Ann Arbor. He is also Associate Dean of Undergraduate Education and Professor of Computer and Information Science at the University of Michigan – Dearborn’s College of Engineering and Computer Science (CECS). Dr. Medjahed received his PhD in Computer Science from Virginia Tech, USA in 2004. He was awarded the prestigious 2019 Michigan Distinguished Professor of the Year by the Michigan Association of State Universities (MASU). He also received several other reputable awards including three (3) best research paper awards, the University of Michigan – Dearborn Distinguished Teaching award, CECS Excellence in Teaching award, and the Outstanding Graduate Research award at Virginia Tech. Dr. Medjahed is Program Committee Co-Chair of the 2022 International Conference on Service-Oriented Computing. His research focuses on advancing the state of the art in developing and maintaining service-oriented software. In particular, he is interested in exploring solutions for service integration in emerging environments such as cloud computing, the Internet of Things, big data, social computing, and crowdsourcing. Dr. Medjahed has more than 120 publications in premier journals and highly competitive conferences as well as two (2) books published by Springer. His research is funded through multiple grants from federal agencies (e.g., National Science Foundation) and industry (e.g., Ford Motor Company).

Dejan Milojicic is a distinguished technologist and director at Hewlett Packard Labs, Palo Alto, CA [1998-present]. Previously, he worked in the OSF Research Institute, Cambridge, MA [1994-1998] and Institute "Mihajlo Pupin", Belgrade, Serbia [1983-1991]. He received his PhD from the University of Kaiserslautern, Germany (1993); and his MSc/BSc from Belgrade University, Serbia (1983/86). His research interests include systems software, distributed computing, systems management, and High Performance Computing. Dejan has over 200 papers, 2 books and 68 patents. Dejan is an IEEE Fellow (2010), ACM Distinguished Engineer (2008), and HKN and USENIX member. Dejan was on 8 PhD thesis committees, and he mentored over 50 interns. Dejan was president of the IEEE Computer Society (2014), IEEE presidential candidate in 2019, editor-in-chief of IEEE Computing Now (2008-2012) and IEEE Distributed Systems Online (2008-2009) and he has served on many editorial boards and TPCs. Dejan led large industry-government-university collaborations, such as Open Cirrus (2007-2011) and New Operating System (2014-2017).

Sami Muhaidat holds a PhD from the University of Waterloo, Ontario. He is currently a Full Professor at Khalifa University, in the UAE. His research interests focus on communication theory with particular emphasis on the physical layer aspects of wireless communication networks,

and on machine learning applications in the field of wireless networks. Sami is currently an Area Editor for IEEE Transactions on Communications. He served as a Senior Editor for IEEE Communications Letters, an Editor for IEEE Transactions on Communications, and an Associate Editor for IEEE Transactions on Vehicular Technology. He is a member of Mohammed Bin Rashid Academy of scientists.

Thyaga Nandagopal works at the National Science Foundation as a Division Director in the newly formed Directorate of Technology, Innovation and Partnerships (TIP), overseeing the Division of Innovation and Technology Ecosystems. Nandagopal has been at the National Science Foundation since 2012, serving in various programmatic and leadership roles, starting from a Program Officer to a Senior Advisor to the Director. Until October 2021, he was in the NSF Directorate of Computer & Information Science and Engineering (CISE), where he last served as the Deputy Division Director of the Division of Computer and Communication Foundations (CCF). Prior to that role, he was a Program Director in the Computer and Network Systems division, where he managed wireless networking and mobile computing research within the Networking Technologies and Systems (NeTS) program at NSF.

He currently serves as the co-chair of the Wireless Spectrum Research and Development Senior Steering Group (WSRD SSG), which co-ordinates spectrum-related research and development activities across the Federal government. He is an IEEE Fellow, elevated to this rank for the Class of 2016. He is spearheading the \$100 million Platforms for Advanced Wireless Research (PAWR) program that has created four advanced wireless research platforms in regions across the United States since 2018. Within the CCF Division, he enabled cutting-edge research in two of the 6 research themes within the Big Ideas @ NSF: "The Quantum Leap: Leading the next Quantum Revolution", and "Harnessing the Data Revolution".

He received his Ph.D. in Electrical Engineering from the University of Illinois at Urbana-Champaign in 2002. He previously received his Masters degrees in Applied Mathematics and Computer Engineering from UIUC in 2000, and 2002 as well. His undergraduate institution is the College of Engineering, Guindy, from where he earned my B. Engg. in Electronics and Communication Engineering in 1997. He is an IEEE Fellow, and a life member of the ACM.

Omer F. Rana is Professor of Performance Engineering at Cardiff University, with research interests in high performance distributed computing, data analysis/mining and multi-agent systems. He is the College Dean of International for Physical Sciences & Engineering at Cardiff University. Rana has contributed to specification and standardisation activities via the Open Grid Forum and worked as a software developer with London-based Marshall Bio-Technology Limited prior to joining Cardiff University, where he developed specialist software to support biotech instrumentation. He has held visiting professor positions at Shanghai Jiao Tong University (China) and Princess Noura University (Saudi Arabia). He also contributed to public understanding of science, via the Wellcome Trust funded "Science Line", in collaboration with BBC and Channel 4. Rana holds a PhD in "Neural Computing and Parallel Architectures" from Imperial College (London Univ.), an MSc in Microelectronics (Univ. of Southampton) and a BEng in Information Systems Eng. from Imperial College (London Univ.). More details available at: <https://www.cardiff.ac.uk/people/view/118157-rana-omer> (remote participation)

Michael Sheng is a full Professor and Head of School of Computing at Macquarie University. Before moving to Macquarie University, he spent 10 years at School of Computer Science, the University of Adelaide. From 1999 to 2001, he also worked at University of New South Wales as a visiting research fellow. Prior to that, he spent 6 years as a senior software engineer in industries. Michael Sheng's research interests include the Internet of Things (IoT), service computing, big data analytics, and Web technologies. He is ranked by Microsoft Academic as one of the Most Impactful Authors in Services Computing (ranked Top 5 All Time) and in Web of Things (ranked Top 20 All Time). Michael Sheng is the recipient of AMiner Most Influential Scholar in IoT (2018), ARC (Australian Research Council) Future Fellowship (2014), Chris Wallace Award for Outstanding Research Contribution (2012), and Microsoft Research Fellowship (2003). He is the Vice Chair of the Executive Committee of the IEEE Technical Community on Services Computing (IEEE TCSVC), the Associate Director of Macquarie University Smart Green Cities Research Center, and a member of the ACS (Australian Computer Society) Technical Advisory Board on IoT.

John R. Smith is an IBM Fellow at IBM Research, where he leads Discovery Technology Foundations as part of IBM's initiative on Accelerated Discovery. Dr. Smith received his B.S., M.S., M. Phil, and Ph.D. in Electrical Engineering from Columbia University. He has authored several hundreds of articles at top conferences and journals in AI, multimedia, information retrieval, and database systems and is an inventor of over 100 United States patents. In October 2020, he was awarded the ACM SIGMM Technical Achievement Award. Dr. Smith is a Fellow of IEEE. <https://researcher.watson.ibm.com/researcher/view.php?person=us-jsmith> (ESAO) since 1992.

Franco Vatalaro is a full professor at the Faculty of Engineering of the University of Rome "Tor Vergata". He was Visiting Professor at the University of Southern California (USC), Los Angeles, University of California Los Angeles (UCLA) where he taught the Satellite Networks course. He served as President of RADIOLABS (website: www.radiolabs.it), founded in 2001, which has carried out and carries out research projects funded by the European Commission and on behalf of numerous public and private. He was president of the Italian section of the IEEE (2010-2012).

Zhongjie Wang received the Ph.D. degree in computer science from the Harbin Institute of Technology (HIT) in 2006. He is currently a Professor with the School of Computer Science and Technology, HIT. His research interests include services computing, mobile and social networking services, software architecture, social software engineering, and software repositories mining.

Stephen S. Yau joined ASU in 1994. He is a professor in the School of Computing and Augmented Intelligence. He was professor and chair of the Department of Computer and Information Sciences at the University of Florida from 1988 to 1994. In 1961, he joined the faculty of Northwestern University, Evanston, Ill., and later became the Walter P. Murphy Professor and Chair of the Department of Electrical Engineering and Computer Science there. He has published more than 210 journal and conference papers and his research has been supported by NSF, AFRL, ONR, ARO, NIH and companies including Hitachi and Fujitsu.

IEEE SERVICES Women in Services Computing Symposium Program

WISC Session 1

Opening Session

Tuesday July 12, 17:30-18:45 CET

Room: Theater Room

Opening Welcome from the General Chair

Kaoutar El Maghraoui, Principal Research Staff Member, IBM TJ Watson Research Center

Acceptance Speech of the 2022 TCSVC WISC Awardee

Yanmei Zhang, Central University of Finance and Economics, Beijing

Keynote 1: Building Large-Scale Knowledge Bases with Human in the Loop

Yunhao Li, Head of Machine Learning, Apple Knowledge Platform, Apple Corporation

The ability to build large-scale knowledge bases that capture and extend the implicit knowledge of human experts is the foundation for many AI systems. In this talk, I will introduce an ontology-driven approach for the creation, representation, and consumption of such knowledge bases. This approach relies on several well-known building blocks: natural language processing, entity resolution, data transformation and fusion. I will present several ‘human-in-the-loop’ examples which extract the domain knowledge from human experts and map it into the "right" models or algorithms. Based on real use cases in domains such as compliance, finance, and healthcare, these tools enable the building of models that can match the level of accuracy achieved by manual efforts, but at a significantly lower cost and improved scalability.

Panel: The Future of Services Computing

WISC Session 2

Tuesday July 12, 18:45-19:45 CET

Session Chair: Ruchi Mahindru, Senior Technical Staff Member, AI and Knowledge Induction for IT Operations, IBM Master Inventor, IBM Research

Keynote 2: Beginning of a New Era of Computing

Valentina Salapura, Principal Engineer, Google

The explosion of data and new workloads requires large amounts of compute power and advances in computing performance. With the end of the Moore’s law era, new ways of providing compute power must be found. To address the need for more compute power, a multi-level approach spanning components, systems, and software advances is required.

I will talk about new trends in computer architecture to address this need, ranging from accelerators and heterogeneous computing, to disaggregated computer systems to harness the available hardware resources. This architecture will require support from the open software ecosystem to accelerate innovation and delivery via a cloud computing platform.

Keynote 3: AI Computing Services for AI: Unleashing the Power of Deep Learning for Robotics Trends and Challenges

Bouchra Bouqata, Senior Applied Scientist and Program Manager, Amazon Robotics Research

The recent rapid progress of deep learning algorithms in generating realistic images, especially in Generative Adversarial Networks (GAN) and Variational Auto-Encoders (VAE), has helped advance new applications. Examples of such applications range from generating and manipulating new synthetic data for self-driving cars, to building/urban architectures, to interior design, and gaming. Furthermore, several applications have benefited from deep learning generative advancement, such as robotic manipulations in structured and unstructured environments, virtual fashion clothes ‘try-on’, and item identification ‘on the go’. Real-life testing of robotic systems is expensive and slow. A fundamental challenge of applying deep supervised learning and deep reinforcement learning to several applications, such as robotics and self-driving cars, is data availability and the difficulty of collecting real-world data. In fact, state-of-the-art deep learning algorithms are data-hungry and need millions to tens of millions of labeled examples with variety for each application domain. However, obtaining labeled real-world data for robotics or self-driving cars, is challenging due to the fact that 3-dimensional data can be particularly difficult to label, and collecting this data with expensive robotic systems or autonomous vehicles can be costly and dangerous, since the underlying algorithms have to reach a certain level of accuracy to be deployed ‘in the wild’ for data collection. This talk will focus on robotics applications and the use of AI for AI and on how Deep learning algorithms such as GAN are leveraged. Additionally, we will discuss the Machine learning algorithms lifecycle at scale and how computing services enable it.

WISC Scholarship Announcements & Closing Remarks

Session Chair: Lorraine Herger, Director of Infrastructure and CIO of IBM Research

Young Experts in Services Computing Symposium (YESC)

Thursday July 14, 12:00-13:00

Plenary Room

Session Chair: Marco Anisetti, Università degli Studi di Milano

Acceptance Speech

Zibin Zheng, Sun Yat-Sen University - 2022 IEEE TCSVC Rising Star

Open Software Service Awards

Professional Awardees:

Alluxio: An Open-Source Data Orchestration System in the Cloud

Haoyuan Li, Bin Fan, Shouwei Chen, Adit Madan and David Zhu

Alluxio, Inc.

End-to-end Federated Learning Platform

Jinliang Yuan, Jiaying Sun, Huibing Zhou, Mengwei Xu and Shangguang Wang

Beijing University of Posts and Telecommunications

Generative Toolkit for Scientific Discovery (GT4SD)

Matteo Manica, Joris Cadow, Dimitrios Christofidellis, Ashish Dave, Jannis Born, Dean Clarke, Yves Gaetan Nana Teukam, Samuel Hoffman, Matthew Buchan, Enara Vijil, Tim Donovan, Hsiang-Han Hsu, Federico Zipoli, Oliver Schilter, Akihiro Kishimoto, Lisa Hamada, Inkit Padhi, Karl Wehden, Lauren McHugh, Alexy Khrabrov, Payel Das, Seiji Takeda and John Smith
IBM Research

LogPAI: An Open-Source Project for Automated Log Analysis

Pinjia He, Jieming Zhu, Shilin He, Zhuangbin Chen, Jinyang Liu, Yintong Huo, Yuxin Su, Zibin Zheng and Michael R. Lyu

The Chinese University of Hong Kong & Sun Yat-sen University & Huawei Noah's Ark Lab & Microsoft Research Asia

Student Awardees:

Blockchain Networks for Solar PV Electric Vehicles Charging Station to Support and Foster Clean Energy Transition

Takua Mokhamed, Fatima Dakalbab and Omnia Elmutasim

University of Sharjah

Miyamoto! Level Editor

Abdallahman Mohamed Elsheikh

University of Sharjah

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