2021 International Conference on Computer, Information and Telecommunication Systems

Will Be Held Virtual
November 11-13, 2021
All Times are based on Istanbul, Turkey Local Time

Technical Sponsors:
Welcome to the 2021 International Conference on Computer, Information and Telecommunication Systems (CITS 2021). This year’s conference marks the 10th anniversary of CITS, which is being held on an annual basis.

CITS 2021 offers a unique forum for researchers and practitioners from academia, industry, business, and government to share their expertise results and research findings in all areas of Computer, Information and Telecommunication Systems.

This year’s conference includes an outstanding technical program, and four distinguished keynote speakers. We planned to have the conference to be held in Istanbul, Turkey, but due to COVID-19 situation, we will hold it virtual.

CITS 2021 technical program consists of several technical tracks. Each track consists of several sessions of top quality papers. The topics covered in the program include, wireless networks, wireless sensor networks, computer networks and telecommunications, admission control in networking, cyber security, information security, cell networks, 4G and 5G systems, data analytics, parallel and distributed computing, databases and data mining, hardware/architecture/real-time systems, MIMO systems, modeling and simulation, performance evaluation, digital signal processing, image processing, pattern recognition, multimedia systems and video processing, artificial intelligence, neural networks, deep learning, cloud computing, web systems, security and information assurance, algorithms, e-services and e-business, and collaborative learning systems, among others.

This year, we received a large number of quality papers. Only very high quality papers have been accepted. The acceptance ratio is 39.7%. This is indicative of the diligent work of the technical program committee chairs, technical program committee members and reviewers. The accepted papers come from all over the World with representation from academia, industry, business and government. Moreover, accepted papers will appear in IEEE Xplore and SCOPUS.

Many individuals have contributed to the success of this high caliber international conference. Our sincere appreciation goes to all authors including those whose papers were not included in the program. Many thanks are also due to our distinguished keynote speakers for their valuable contribution to the conference.

Special thanks are also due to the senior program chair, Prof. Petros Nicopolitidis, for his outstanding role in leading the technical program efforts. Thanks also are due to the other program chairs. Many thanks also go to the technical program committee members and reviewers for their timely work and efforts.

Special thanks go to the publication chair, Dr. Yu Guo for his outstanding work and dedication. Thanks to our dedicated Webmaster Antonio Bueno. Special thanks go to the international publicity committee members and international liaisons for their excellent work.

Special thanks are due to the international steering committee of the CITS. We also like to thank the IEEE Communication Society for technical co-sponsorship of the conference.

Finally, on behalf of the 2021 IEEE International Conference on Computer, Information and Telecommunication Systems (CITS 2021), we invite all of you to enjoy the program.
Prof. Mohammad S. Obaidat, General Chair, Fellow of IEEE, Fellow of SCS, Past President of the Society for Modeling & Simulation International (SCS), Founding Editor in Chief, Wiley Security and Privacy Journal, Editor in Chief, International Journal of Communication Systems, Recipient of SCS Hall of Fame Award, Recipient of the Technical Achievement Award from IEEE ComSoc-Technical Committee on Communication Software

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Rizwan Patan, Galgotias University
Jun Peng, UTRGV - Edinburg, TX
# Program At a Glance

All Times Listed here are Based on Turkey Local Time

<table>
<thead>
<tr>
<th>Thursday, November 11</th>
<th>Friday, November 12</th>
<th>Saturday, November 13</th>
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<tbody>
<tr>
<td>Join Zoom Meeting: *</td>
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<tr>
<td>12:00-12:30 Opening Session</td>
<td>12:00-13:30 Telecomm. 1</td>
<td>12:00-13:30 Inf. Tech 1</td>
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<tr>
<td>12:30-13:30 Keynote Speech 1</td>
<td>13:30-15:00 Telecomm. 2</td>
<td>13:30-15:00 Inf. Tech 2</td>
</tr>
<tr>
<td>13:30-14:00 Break</td>
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<tr>
<td>14:00-15:00 Keynote Speech 2</td>
<td>15:15-16:45 Security</td>
<td>15:15-16:45 Computer Systems</td>
</tr>
<tr>
<td>15:00-16:00 Keynote Speech 3</td>
<td>16:45-18:15 Networking 1</td>
<td>16:45-17:15 Closing Session</td>
</tr>
<tr>
<td>18:15-19:45 Networking 2</td>
<td></td>
<td></td>
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</tbody>
</table>

- Info was sent directly to presenting authors - Please do not share the info of ZOOM IDs and Passcodes with anyone except your co-authors.
Security Threats to Critical Infrastructures
Session Chair: Petros Nicopolitidis

Distinguished Keynote speaker: Prof. Mario Marchese, University of Genoa.

Critical Infrastructures are complex systems that provide many basic services such as Chemical, Commercial Facilities, Communications, Critical Manufacturing, Dams, Defence Industrial Base, Emergency Services, Energy, Financial Services, Food and Agriculture, Government Facilities, Healthcare and Public Health, Information Technology, Nuclear Reactors, Materials, and Waste, Transportation Systems, Water and Wastewater Systems. Many of them are monitored and controlled by Industrial Control Systems (ICSs) that are an umbrella term that refers to a group of process automation technologies, such as Supervisory Control and Data Acquisition (SCADA) systems, which unfortunately have been subject to a growing number of attacks in recent years. As critical infrastructures deliver vital services to people and nations, hostile intruders mounting attacks to them represent a serious threat. In the past, ICS were operated as separated networks unconnected to public communication infrastructures, but as businesses have turned to exploit the services and data provided by the Internet, such isolation that protected these systems has declined. The speech will highlight the need of security in critical infrastructures in this new context, including Smart Cities, Smart Industry and Smart Agriculture; will describe the essential features of a SCADA system; and will focus on ICS security requirements, on consequent security threats, and on possible countermeasures.

Bio

Mario Marchese (S’94–M’97–SM’04) was born in Genoa, Italy in 1967. He got his "Laurea" degree cum laude at the University of Genoa, Italy in 1992, and his Ph.D. (Italian "Dottorato di Ricerca") degree in "Telecommunications" at the University of Genoa in 1997.

From 1999 to January 2005, he worked with the Italian Consortium of Telecommunications (CNIT), by the University of Genoa Research Unit, where he was Head of Research. From February 2005 to January 2016 he was Associate Professor at the University of Genoa. Since February 2016 he has been Full Professor at the University of Genoa.

He was at the German Aerospace Center (DLR), Oberpfaffenhofen, Germany, as a Visiting Professor / Guest Scientist in the following periods: September 2004; October 2005; July 2006; July - August 2007; July 2008.

He is the founder and head of the Laboratory "Satellite Communications and Networking" (www.scnl.diten.unige.it) at the University of Genoa. The laboratory contains devices and instruments of great scientific and economic value and involves the management of different units of scientific-technical personnel. He formed and trained staff in research: PhD students, research
fellows, research associates and young researchers. He coordinated the technical-scientific and financial management of many research projects. He attracted and managed funds both at European and institutional level. He is (or was, where indicated):

- Rector’s Delegate to Doctoral Studies since 2020
- "Chair" (2006-2008), "Vice-Chair" (2004-2006) and "Secretary" (2002-2004) of the "Satellite and Space Communications Technical Committee" of "IEEE ComSoc".
- Winner of the IEEE ComSoc "Satellite Communications Distinguished Service Award" in 2008 for the scientific and professional contribution in the field of satellite technology and of numerous "Best Paper Awards".

He is the author of the book “Quality of Service over Heterogeneous Networks”, John Wiley & Sons, Chichester, 2007, and author/co-author of more than 300 scientific works, including international magazines, international conferences and book chapters. See https://www.scnl.diten.unige.it/publications for the complete list.

The most important contribution of Mario Marchese's scientific activity is in the field of: Networking, Quality of Service over Heterogeneous Networks, Software-Defined Networking, Satellite Networks, Network Security, Critical Infrastructure Security and Intrusion Detection Systems.

13:30 - 14:00

Break

14:00 - 15:00

Keynote Speech 2

The Nexus of AI and Communications: A Frontier for 6G
Session Chair: Sema Oktug

Distinguished Keynote speaker: Prof. Melike Erol-Kantarci, School of Electrical Engineering and Computer Science, University of Ottawa

6G is expected to support a multitude of services demanded by Enhanced Mobile Broadband (eMBB), Ultra-Reliable and Low-latency Communications (uRLLC), and massive Machine Type Communications (mMTC) user types that are already carried over 5G, and additionally provide extensive support for traffic emerging from Internet of Senses, high-precision navigation and coordinated machine applications. Heterogeneous devices with different quality of service (QoS) demands will require intelligent and flexible allocation of network resources in response to network dynamics. For instance, a highly reliable and low-latency network is needed to enable rapid transfer of messages between connected autonomous vehicles. At the same time, the same physical infrastructure is expected to serve users with high-quality video demand or even mobile Augmented/Virtual Reality entertainment applications. Next-generation wireless networks are expected to accommodate such diverse use cases. In addition, resource efficiency, reliability, and robustness are becoming more stringent for 6G. To meet this, future wireless networks must incorporate a paradigm shift in network resource optimization, in which efficient and intelligent resource management techniques are employed. Artificial intelligence, or more specifically machine learning algorithms stand as promising tools to intelligently manage the networks such that network efficiency, reliability, robustness goals are achieved and quality of service demands are satisfied. The opportunities that arise from learning the environment parameters under varying behavior of the wireless channel, positions AI-enabled
5G and 6G, superior to preceding generations of wireless networks. In this keynote, we will provide an overview of the state-of-art in machine learning algorithms and their applications to wireless networks, in addition to their challenges and the open issues in terms of their applicability to various functions of future wireless networks.

Bio

Melike Erol-Kantarci is Canada Research Chair in AI-enabled Next-Generation Wireless Networks and Associate Professor at the School of Electrical Engineering and Computer Science at the University of Ottawa. She is the founding director of the Networked Systems and Communications Research (NETCORE) laboratory. She is also a Faculty Affiliate at the Vector Institute, Toronto. She has over 150 peer-reviewed publications which have been cited over 6000 times and she has an h-index of 39. Dr. Erol-Kantarci has received numerous awards and recognitions. In 2019, she was named as N2Women Stars in Computer Networking and Communications (formerly known as “people you should know in networking and communications”). Dr. Erol-Kantarci has delivered 60+ keynotes, tutorials and panels around the globe and has acted as the general chair and technical program chair for many international conferences and workshops. Her main research interests are AI-enabled wireless networks, 5G and 6G wireless communications, smart grid and Internet of things. She is an IEEE ComSoc Distinguished Lecturer, IEEE Senior member and ACM Senior Member.

15:00 - 16:00

Keynote Speech 3

The Quest for Efficient and Trustworthy Systems

Session Chair: Semih Bilgen

Distinguished Keynote speaker: Prof. Baris Kasikci, Electrical Engineering and Computer Science Department, University of Michigan

The current growth of the software ecosystem is faster than ever before. Software systems are increasingly more complex and consist of deep stacks. Software’s soaring complexity is causing a shift to a more heterogeneous hardware landscape, comprising CPUs, GPUs, FPGAs, fast networks, and denser memory technologies. For the foreseeable future, improving the efficiency of computer systems will be crucial to enable society’s growing reliance on feature-rich software. Alas, trustworthiness in this complex ecosystem is often an afterthought. Consequently, software and hardware have been plagued with bugs that cause data loss, security vulnerabilities, and failures of critical infrastructure. The estimated cost of poor software quality in the US alone was above 2 trillion USD in 2020. Building systems that are simultaneously efficient (i.e., deliver high performance at scale, leverage heterogeneous resources) and trustworthy (i.e., contain fewer bugs, achieve greater security, and have verified properties) is extremely challenging. In this talk, I will give an overview of the research in my lab that focuses on developing techniques for building systems that are simultaneously efficient and trustworthy, with a focus on real-world technical and societal impact.

Bio

Baris Kasikci is an assistant professor in the Electrical Engineering and Computer Science Department at the University of Michigan. His research is centered around building efficient and trustworthy computer systems. His group has built a number of techniques to improve the efficiency of datacenter applications, provide systems support for heterogeneous platforms, verify properties of complex distributed systems, detect, analyze, and fix failures, and improve the security of modern hardware. Previously, Baris was a researcher in the Systems and Networking
Group at Microsoft Research Cambridge, UK. He completed his Ph.D. in Computer Science at EPFL. He also held roles at Intel, VMware, and Siemens. He is the recipient of an NSF CAREER award, a Microsoft Research Faculty Fellowship, a VMware Early Career Grant, an Intel Rising Star Award, a Google Faculty Award, multiple Google and Intel research awards, a Jay Lepreau Best Paper Award at OSDI, IEEE MICRO Top Picks Award, multiple IEEE MICRO Top Picks Honorable Mentions, a VMware fellowship, the Roger Needham Ph.D. Award for the best Ph.D. thesis in computer systems in Europe, and the Patrick Denantes Memorial Prize for best Ph.D. thesis in the Department of Information and Communication Sciences at EPFL. More details can be found on his webpage https://web.eecs.umich.edu/~barisk/.
Friday, November 12

Daily Program Chair: Pinar Yildirim

12:00 - 13:30

Telecommunications 1
Session Chair: Berk Canberk

FIR Filter Design Method Based on LASSO to Adjust the Number of Non-zero Coefficients
Clemens Klöck (University of Applied Science Esslingen, Germany)

Location based Routing in Opportunistic Networks using Cascade Learning
Jagdeep Singh (University of Delhi & Sant Longowal Institute of Engineering and Technology (SLIET) Longowal, Punjab, India - Govt. of India, India); Mohammad S. Obaidat (University of Jordan, USA); Sanjay Kumar Dhurandher (NSIT, University of Delhi, India)

Comparisons Between an Oblique Ionosphere Sounding Technique Based on KiwiSDR Receivers and a Proprietary Analytical Propagation Model
Mircea Stanic (Technical University of Cluj-Napoca, Romania)

Impact of Channel Imperfection on the Performance of RIS-Assisted Energy-Efficient Hybrid Precoding
Taissir Y. Elganimi (University of Tripoli Libya, Libya); Nura Daghari (University of Tripoli, Libya); Khaled M. Rabie (Manchester Metropolitan University, United Kingdom (Great Britain))

13:30 - 15:00

Telecommunications 2
Session Chair: Gokhan Secinti

A Low-Complexity Soft-Output Signal Data Detection Algorithm for UL Massive MIMO Systems
Salah Berra (Kasdi Merbah University & Electrical Engineering Laboratory, Algeria); Mahmoud A. M. Albreem (A'Sharqiyah University (ASU), Oman); Maha Malek (University of Science and Technology Beijing, China); Rui Dinis (Faculdade de Ciências e Tecnologia, University Nova de Lisboa & FCT-UNL, Portugal); Xingwang Li (Henan Polytechnic University, China); Khaled M. Rabie (Manchester Metropolitan University, United Kingdom (Great Britain))

Multi-Round Joint Belief Propagation Decoding with Perturbation for JSCC System Based on DP-LDPC Codes
Weiwei Lin, Zhiping Xu, Shaohua Hong and Lin Wang (Xiamen University, China)

Dynamic Positioning Interval Based On Reciprocal Forecasting Error (DPI-RFE) Algorithm for Energy-Efficient Mobile IoT Indoor Positioning
Alper Saylam (Yasar University, Turkey); Nur Kelesoglu (Yaşar University, Turkey); Rifat Orhán Çıkmazel (Yaşar University, Turkey); Mert Nakip (Institute of Theoretical and Applied Informatics, Polish Academy of Sciences, Poland); Volkan Rodoplu (Yasar University, Turkey)

An Energy Efficient Hybrid FEC-ARQ Communication Scheme for Small Satellite Applications
Oliver Vassallo (University of Malta, Malta); Victor Buttigieg and Marc Anthony Azzopardi (University of Malta, Malta)

15:00 - 15:15
Break

15:15 - 16:45

Security

Session Chair: Tahir Sandikkaya

Stealthy Data Exfiltration via TCP Sequence Numbers based Covert Channel
Jonah Goverman (Air National Guard, Champlain College, USA); Ali Tekeoglu (Johns Hopkins University Applied Physics Laboratory, USA)

Blockchain Enabled Electronics Medical System Proposed Framework with Research Directions
Mohammad S. Obaidat (University of Jordan, USA); Dwivedi Sanjeev Kumar (DSPM IIITNR, Naya Raipur, India); Ruhul Amin (IIIT Naya Raipur, India); Kuei-Fang Leila Hsiao (University of Sharjah, United Arab Emirates)

Amaligamation of Blockchain and AI to Classify Malicious Behavior of Autonomous Vehicles
Dhairya Jadav (Institute of Technology, Nirma University, India); Mohammad S. Obaidat (University of Jordan, USA); Sudeep Tanwar (Institute of Technology Nirma University Ahmedabad Gujarat, India); Rajesh Gupta (Institute of Technology, Nirma University, India); Kuei-Fang Leila Hsiao (University of Sharjah, United Arab Emirates)

Efficient and Secure Design of ID-3PAKA Protocol Using ECC
Daya Sagar Gupta (Rajiv Gandhi Institute of Petroleum Technology Jais Amethi INDIA, India); Krittibas Parai (Siliguri Institute of Technology, India); Mohammad S. Obaidat (University of Jordan, USA); SK Hafizul Islam (Indian Institute of Information Technology Kalyani, India)

16:45 - 18:15

Networking 1

Session Chair: Berk Canberk

Efficient Frequency Planning for LoRaWAN networks with urgent traffic
Athanasios Tsakmakis, Anastasios Valkanis, Georgia Beletsioti, Konstantinos Kantelis and Petros Nicopolitidis (Aristotle University of Thessaloniki, Greece); Georgios Papadimitriou (Aristotle University, Greece)

A Reinforcement Learning assisted Backoff Algorithm for LoRa networks
Anastasios Valkanis, Georgia Beletsioti, Konstantinos Kantelis and Petros Nicopolitidis (Aristotle University of Thessaloniki, Greece); Georgios Papadimitriou (Aristotle University, Greece)

A Software-defined Delay-aware Traffic Load Control for WiFi-based Smart City Services
Basima Kurungadan and Atef Abdrabou (UAE University, United Arab Emirates)

Performance Analysis of the Spectrum Access Strategies in Cognitive Radio Networks
Bhoopendra Kumar (University of Delhi, India); Sanjay Kumar Dhurandher (NSIT, University of Delhi, India)

18:15 - 19:45

Networking 2

Session Chair: Gokhan Secinti

Handover with Network Slicing in 5G Networks
Kübra Sevim and Tuna Tugcu (Bogazici University, Turkey)

SCHOOL: Spectrum Allocation for D2D Communication Enabled HetNet using Stackelberg and Coalition Formation Game
Subha Ghosh (Maulana Abul Kalam Azad University of Technology, West Bengal, India); Mohammad S. Obaidat (University of Jordan, USA); Debashis De (West Bengal University of Technology, India); Kuei-Fang Leila Hsiao (University of Sharjah, United Arab Emirates)

V2X Architecture for Autonomous Platoon Management In Urban Environment
Naila Bouchemal (ECE Paris, France)
Saturday, November 13

Daily Program Chair: Ufuk S. Tureli

12:00 - 13:30

Information Technology 1
Session Chair: Petros Nicopolitidis

Automated essay scoring: A review of the field
Paraskevas Lagakis and Stavros Demetriadis (Aristotle University of Thessaloniki, Greece)

Facial Expressions and Body Postures Emotion Recognition based on Convolutional Attention Network
Tiehua Zhou, Shiru Gao, Yuanhao Mei and Ling Wang (Northeast Electric Power University, China)

Sentiment Analysis on Online Transportation Service Products Using K-Nearest Neighbor Method
Casi Setianingsih (Telkom University, Indonesia)

13:30 - 15:00

Information Technology 2
Session Chair: Tahir Sandikkaya

Blockchain and Multiple Linear Regression-based Energy Trading Scheme for Electric Vehicles
Riya Kakkar (Institute of Technology, Nirma University, India); Sudeep Tanwar (Institute of Technology Nirma University Ahmedabad Gujarat, India); Mohammad S. Obaidat (University of Jordan, USA); Rajesh Gupta (Institute of Technology, Nirma University, India)

LoRaWAN-aided Waste-to-Energy Concept Model in Smart Cities
Elif Ak, Kıymet Kaya, Yusuf Yaslan and Sema Oktug (Istanbul Technical University, Turkey)

Machine Learning-based Currency Information Retrieval for Aiding the Visually Impaired People
Kajal Chatterjee (CHRIST University, India); Mohammad S. Obaidat (University of Jordan, USA); Debabrata Samanta (Assistant Professor, India & CHRIST University, India); SK Hafizul Islam (Indian Institute of Information Technology Kalyani, India); Niju Joseph (CHRIST(Deemed to be University), India)

15:00 - 15:15

Break

15:15 - 16:45

Computing
Session Chair: Helen Karatza

Resource Assignment Strategies for Bags-of-Tasks in Distributed Systems
Georgios L. Stavrinides and Helen Karatza (Aristotle University of Thessaloniki, Greece)

Location analysis for a grocery store based on a multi-objective optimization approach
İpek Çebi and Dionysis Goularas (Yeditepe University, Turkey)

NFA Based Regular Expression Matching on FPGA
Kamil Sert (Middle East Technical University, Turkey); Cüneyt F. Bazlamaçı (İzmir Institute of Technology, Turkey)
Workload Distribution on Heterogeneous Platforms
Mahmoud Alasmar (Middle East Technical University, Turkey); Cüneyt F. Bazlamaçı (İzmir Institute of Technology, Turkey)

16:45 - 17:15

Closing Session