

**Federation of the Scientific-Technical Unions in Bulgaria (FNTS)  
Union of Electronics, Electrical Engineering and Telecommunications (CEEC)  
IEEE Bulgarian Section**

**Ministry of Transport, Information Technology and Communications**

**Communications Regulation Commission**

**Technical University of Sofia**

**Faculty of Telecommunications - TUS**

**Union of Scientists in Bulgaria (USB)**

**Telecommunications Association (ASTEL)**

**29-th NATIONAL CONFERENCE  
WITH INTERNATIONAL PARTICIPATION**

# **TELECOM 2021**

**THE WAYS TO CONNECT THE FUTURE**



## **P R O G R A M M E**

**28 - 29 October 2021**  
*National Science and Technical Centre,  
108 Rakovsky St. – Sofia*  
&  
*Virtual room*

# **TELECOM 2021**

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**2021 29th National Conference with  
International Participation - #53156**

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## Telecom 2021 Sessions Timetable

<i>Date</i>	<i>Time</i>	<i>Sessions</i>
<b>Wednesday 27.10.2021</b>	<b>10.00-12.00 16.00-18.00</b>	<b>Registration of participants &amp; test the system</b> <a href="#">(Virtual room 1)</a> Webex Platform (Phone: +359 2 987 97 67, Mail: ceec@mail.bg)
<b>Thursday 28.10.2021</b>		<b>Plenary Session 1, Hall 3 &amp; <a href="#">Virtual room 1</a></b>
	<b>10.00 – 12.15</b>	<b>Conference Opening</b> Chairman: Assoc. Prof. Plamen Vachkov, PhD Prof. Seferin Mirtchev, DSc  <b>Greetings</b>  <b>Presentations: 1. MTITC, 2. KPC, 3. A1, 4. Huawei</b>
	<b>13.00 - 14.00</b>	<b>Plenary Session 2, Hall 3 &amp; <a href="#">Virtual room 1</a></b> Chairman: Assoc. Prof. Dimitar Arnaudov, PhD  <b>Presentations: 5. Ivan Ganchev - invited paper, 6. Kamen Rangelov, 7. Kiril Konov</b>
	<b>14.15 – 15.15</b>	<b>Section Session 1, Hall 3 &amp; <a href="#">Virtual room 1</a></b> <b>Wireless systems – 5G, mobile and satellite communications, wireless access, cognitive radio.</b> Chairman: Prof. Seferin Mirtchev, DSc  <b>Presentations: Papers 1.1, 1.2, 1.3,.1.4, 1.5</b>
<b>15.30 – 17.30</b>	<b>Section Session 2, Hall 3 &amp; <a href="#">Virtual room 1</a></b> <b>Internet of Things (IoT). Smart home and cities. eHealth. Better living with ICT.</b> Chairman: Prof. Elena Shoikova, DSc  <b>Presentations: Papers 2.1, 2.2, 2.3,.2.4, 2.5, 2.6, 2.7, 2.8</b>	

<i>Date</i>	<i>Time</i>	<i>Sessions</i>
<b>Friday 29.10.2021</b>	<b>09.00 – 10.15</b>	<p style="text-align: center;"><b>Section Session 3, Hall 3 &amp; <a href="#">Virtual room 1</a></b></p> <p style="text-align: center;"><b>Telecommunication networks. Big data networking. Cybersecurity.</b></p> <p style="text-align: center;">Chairman: Assoc. Prof. Georgi Petrov, PhD</p> <p style="text-align: center;"><b>Presentations:</b> Papers 3.1, 3.2, 3.3, 3.4, 3.5, 3.6</p>
	<b>10.30 – 12.15</b>	<p style="text-align: center;"><b>Section Session 4, Hall 3 &amp; <a href="#">Virtual room 1</a></b></p> <p style="text-align: center;"><b>Communication issues, supercomputers, artificial intelligence, machine learning. Intelligent Transport Systems.</b></p> <p style="text-align: center;">Chairman: Assist. Prof. Rositsa Goleva, PhD</p> <p style="text-align: center;"><b>Presentations:</b> Papers 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9</p>
	<b>13.00 – 14.00</b>	<p style="text-align: center;"><b>Section Session 5, Hall 3 &amp; <a href="#">Virtual room 1</a></b></p> <p style="text-align: center;"><b>Communication circuits, signals and systems. Image processing and coding.</b></p> <p style="text-align: center;">Chairman: Prof. Seferin Mirtchev, DSc</p> <p style="text-align: center;"><b>Presentations:</b> Papers 5.1, 5.2, 5.3, 5.4, 5.5</p>
	<b>14.15 – 15.15</b>	<p style="text-align: center;"><b>Section Session 6, Hall 3 &amp; <a href="#">Virtual room 1</a></b></p> <p style="text-align: center;"><b>Economics and marketing of electronic communications. Education in the field of telecommunication.</b></p> <p style="text-align: center;">Chairman: Eng. Stefan Patchedjiev, PhD</p> <p style="text-align: center;"><b>Presentations:</b> Papers 6.1, 6.2, 6.3, 6.4, 6.5</p>
	<b>15.30 – 15.55</b>	<p style="text-align: center;"><b>Section Session 7, Hall 3 &amp; <a href="#">Virtual room 1</a></b></p> <p style="text-align: center;"><b>Telecommunications.</b></p> <p style="text-align: center;">Chairman: Assoc. Prof. Alexander Nenkov, PhD</p> <p style="text-align: center;"><b>Presentations:</b> Papers 7.1, 7.2</p>
	<b>16.00</b>	<p style="text-align: center;"><b>Closing of the Conference, hall 3 &amp; <a href="#">Virtual room 1</a></b></p>
		<p style="text-align: center;"><b>Assoc. Prof. Plamen Vachkov, PhD</b> <b>Prof. Seferin Mirtchev, DSc</b></p>

## CONFERENCE PROGRAMME

**Wednesday,**  
**27.10.2021 г.**  
**10.00 – 12.00**  
**16.00 – 18.00**

**Registration of participants & test the system**  
**([Virtual room 1](#))**  
Webex Platform

**Thursday,**  
**28.10.2021 г.**

**NATIONAL SCIENCE AND TECHNICAL CENTRE**  
**Hall 3 & [Virtual room 1](#)**

**10.00 – 12.15**  
**28.10.2021 г.**

**Plenary Session 1, Hall 3 & [Virtual room 1](#)**  
**Conference Opening, Greetings**

Chairman: Assoc. Prof. Plamen Vachkov, PhD

1. **“Europe's Digital Decade: goals in the field of digital technologies for 2030”**  
**Dimitar Dimitrov** - Director of Communications Directorate,  
*Ministry of Transport, Information Technology and Communications*
2. **"Regulatory aspects related to the use of radio spectrum for wireless networks"**  
**Daniela Aleksieva** - Head of Regulation and Coordination Department in  
the Directorate of Limited Resource Management  
**Plamen Bonev**, Senior Expert in the Radio Frequency Spectrum Control Department of the General  
Directorate for Monitoring and Control of Communication  
*Communications Regulation Commission*
3. **“Development of the 5G network of A1: 5G ULTRA”**  
**Georgi Raykov**, Senior Manager "Quality Assurance and OSS Competence Centre"  
*A1 Bulgaria EAD*
4. **“Huawei”**  
**Ivan Ivanov** - Manager,  
*Huawei Technologies Bulgaria Ltd*

12.15 – 13.00      **Lunch Break**

**13.00 – 14.00**  
**28.10.2021 г.**

**Plenary Session 2, Hall 3 & [Virtual room 1](#)**  
Chairman: Assoc. Prof. Dimitar Arnaudov, PhD

5. “Smart Recommendation of Telecommunication Services” invited paper  
**Ivan Ganchev** - University of Plovdiv “Paisii Hilendarski”, Haiyang Zhang, Máirtín O’Droma
6. “Notes on Telecommunications – 2021”  
**Kamen Rangelov** – CEEC
7. „Status of the Digital TV Broadcasting,“  
**Kiril Konov** - CEEC

**14.15 – 15.15**      **Section Session 1, Hall 3 & [Virtual room 1](#),**  
**28.10.2021 г.**      **WIRELESS SYSTEMS – 5G, MOBILE AND SATELLITE COMMUNICATIONS,**  
**WIRELESS ACCESS, COGNITIVE RADIO.**

Chairman: Prof. Seferin Mirtchev, DSc

- 1.1. Implementation Aspects of Mobile Edge Location Service in 5G  
Ivaylo Atanasov, Evelina Pencheva, Emilia Dimitrova
- 1.2. Prediction of Radio Wave Attenuation due to Clouds using ANN and its business aspects  
Hitesh Singh, Vivek Kumar, Kumud Saxena, Boncho Bonev, Ramjee Prasad
- 1.3. An ANN Model for Predicting Radio Wave Attenuation Due to Rain and its Business Aspect  
Vivek Kumar, Hitesh Singh, Kumud Saxena, Boncho Bonev, Ramjee Prasad
- 1.4. Channel Activity Analysis of Cognitive Radio with PCA Preprocessing and Different Clustering Methods  
Todor D. Tsvetkov, Iliia G. Iliev
- 1.5. Study of band gap structure for improving antenna radiation pattern  
Ivaylo Nachev, Iliia G. Iliev

**15.30 – 17.30**      **Section Session 2, Hall 3 & [Virtual room 1](#),**  
**28.10.2021 г.**      **INTERNET OF THINGS (IOT). SMART HOME AND CITIES.**  
**eHEALTH. BETTER LIVING WITH ICT.**

Chairman: Prof. Elena Shoikova, DSc

- 2.1. Multichannel IoT System for Weather and Air Quality Monitoring  
Rosen Miletiev, Emil Iontchev, Rumen Yordanov
- 2.2. Assessment of Energy Absorption and Hemolysis of RBCs Due to a Wearable Antenna  
Gabriela Atanasova, Boyana Angelova, Margarita Kouzmanova, Nikolay Atanasov,  
Momchil Paunov, Maria Gurmanova
- 2.3. Intelligent Support System for People with Visual Impairments  
Nikolay Gospodinov, Georgi Krastev
- 2.4. Design and Research of Smart IoT Control System for Electrical Appliances  
Neven Nikolov, Ognyan Nakov, Daniela Gotseva
- 2.5. Design of a System for Intelligent Agriculture and Monitoring of the Optimal Parameters of Agricultural Crops  
Stanyo Kolev
- 2.6. Most Favorable Results for Forecasting Methods for Natural Gas and Photovoltaic Energy Consumption  
Silvia Baeva, Ivelina Hinova
- 2.7. Intelligent architecture for real-time personal health monitoring in the context of 3G/4G/5G technology  
Valia Markova, Todor Ganchev, Evelina Pencheva, Ivaylo Atanasov
- 2.8. Smart System for Control and Monitoring a DC Motor  
Nikolay Hinov, Spas Ivanov



**Friday,**  
**29.10.2021 г.**      **NATIONAL SCIENCE AND TECHNICAL CENTRE**  
**Hall 3 & [Virtual room 1](#)**

**09.00 – 10.15**      **Section Session 3, Hall 3 & [Virtual room 1](#)**  
**29.10.2021 г.**      **TELECOMMUNICATION NETWORKS. BIG DATA NETWORKING.**  
**CYBERSECURITY.**  
Chairman: Assoc. Prof. Georgi Petrov, PhD

- 3.1. Power Conscious Routing Protocol for Ad-hoc 6LoWPAN Networks  
Ravinder Beniwal, Kamelia Nikolova, Georgi Iliev
- 3.2. Comparison between Different Topologies of IP Networks Using MPLS  
Ivan Nedyalkov, Georgi Georgiev
- 3.3. Benefits and Challenges of Big Data Analysis in Telecom Industry  
Boyan Jekov, Milena Petkova, Lyubomir Gotsev
- 3.4. Analysis of Software Vulnerabilities, Measures for Prevention and Protection and Security Testing  
Ognian Nakov, Roumen Trifonov, Galya Pavlova, Plamen Nakov
- 3.5. Performance Evaluation of Constellation Diagram Analysis-based Methods for PCA Detection  
Dimitriya Mihaylova, Viktor Stoykov, Georgi Iliev, Zlatka Valkova-Jarvis, Vladimir Poulkov
- 3.6. Simulation and Test of RSA Algorithm on Mail Server Device  
Eriselda Guri Malaj, Galia Ilieva Marinova

**10.30 – 12.15**      **Section Session 4, Hall 3 & [Virtual room 1](#),**  
**29.10.2021 г.**      **COMMUNICATION ISSUES, SUPERCOMPUTERS, ARTIFICIAL**  
**INTELLIGENCE, MACHINE LEARNING. INTELLIGENT**  
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Chairman: Assist. Prof. Rositsa Goleva, PhD

- 4.1. A Study of Documents Management System Based on Web, Case Study: University  
Besart Prebreza, Daniela Gotseva, Plamen Nakov
- 4.2. Recommendation Systems Based on Textual Document Analysis  
Rrezart Prebreza, Daniela Gotseva, Ognyan Nakov
- 4.3. Face Recognition by Wavelet Transformation, Deep FFNN and ANFIS Approach  
Ivelina Balabanova; Georgi Georgiev
- 4.4. Speech Profile Recognition by Fourier Spectral, FFNN and ANFIS Techniques  
Ivelina Balabanova, Georgi Georgiev
- 4.5. Design and Deployment of Kubernetes Cluster on Raspberry Pi OS  
Milen Hrabarov Todorov
- 4.6. Contactless Charging of an Electric Scooter  
Dimitar Arnaudov, Bozhidar Tashkov, Ivailo Hristov, Ivan Yutidjian
- 4.7. Urban Intelligent Transport Management Systems  
Ivan Stankov, Varbinka Stefanova-Stoyanova

- 4.8. Comparative Analysis of MTP and DSR Routing Protocols in VANET  
Tsvetan Marinov, Maria Nenova, Georgi Iliev
- 4.9. Pasture Research Using Aerial Photography and Photogrammetry  
Kalin Dimitrov, Durhan Saliev, Iliyan Damyanov, Tsvetan Valkovski

**13.00 – 14.00**

**29.10.2021 г.**

**Section Session 5, Hall 3 & [Virtual room 1](#),**

**COMMUNICATION CIRCUITS, SIGNALS AND SYSTEMS.  
IMAGE PROCESSING AND CODING.**

Chairman: Prof. Seferin Mirtchev, DSc

- 5.1. An Adaptive Pan-Tilt Camera Control for Visual Target Tracking  
Plamen Petrov
- 5.2. Two-Dimensional Significant Bit Prediction of Wavelet Image Decomposition Coefficients  
Mikola Patlayenko, Abdullah Qays Taher, Olena Osharovska, Valentina Solodka,  
Volodymyr Pyliavskiy
- 5.3. Gaussian Adaptive Filtering of Low Resolution Video Using Anisotropic Tensor  
Ivo Draganov, Rumen Mironov
- 5.4. The Prediction of Weather's Data for Wind Power System Using Graph Database  
Arbër Sh. Perçuku, Ivan S. Stankov
- 5.5. Loss Power Investigation in an LLC DC-DC Converter Operating above the Resonant  
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Tsvetana Grigороva, Aleksandar Vuchev, Stoyan Vuchev

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**29.10.2021 г.**

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**ECONOMICS AND MARKETING OF ELECTRONIC  
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TELECOMMUNICATION.**

Chairman: Eng. Stefan Patchedjiev, PhD

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Ivanka Tsvetkova, Adriana Borodzhieva
- 6.2. Low-Cost Remote Laboratory for Cyber-Physical Experiments  
Yassen Gorbounov, Hao Chen
- 6.3. Classification of Business Processes in Telecommunications  
Anna Bekyarova-Tokmakova, Nevena Mileva, Dimitar Tokmakov
- 6.4. A concept of a New Knowledge Based Multimodal Affective Tutoring System  
Miroslav Markov, Todor Ganchev
- 6.5. Synthesis and Implementation of a Digital Control System for a Buck DC-DC Converter  
Nikolay Hinov, Kiril Genev, Vladimir Dimitrov

**15.30 – 15.55**      **Section Session 7, Hall 3 & [Virtual room 1](#),**  
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Chairman: Assoc. Prof. Alexander Nenkov, PhD

7.1. Time series interpolation with Volatility Bridge  
Ventsislav Nikolov, Snezhina Yanakieva, Aleksandar Krastev

7.2. Perspectives for the Strategy Industry 4.0  
Josif Avramov

**16.00**      **CLOSING OF THE CONFERENCE, Hall 3 & [Virtual room 1](#).**  
**29.10.2021 г.**

**Assoc. Prof. Plamen Vachkov, PhD**  
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<b>P3</b>	<b>A1 (Presentation)</b> <b>“Development of the 5G network of A1: 5G ULTRA”</b> <b>Georgi Raykov</b> , Senior Manager "Quality Assurance and OSS Competence Centre"
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## P.7

### Smart Recommendation of Telecommunication Services

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**In this paper, a new vision is presented for highly contextualized, customized, and personalized recommendation of telecommunication services to mobile users (consumers) by considering the current consumer-, network-, and service context. A framework for smart recommendation of telecommunication services, which builds up and dynamically manages personal profiles of consumers, is elaborated. This seeks to facilitate service discovery and recommendation for the consumers, in support of the consumer-choice optimization process, and achieving the best quality of experience (QoE) when utilizing different telecommunication services, accessible through any kind of mobile devices (e.g., smartphones, tablets, laptops, etc.) via heterogeneous wireless access networks, *anytime-anywhere-anyhow*. The smart algorithm-driven recommended services range from classic telecommunication services (e.g., outgoing voice calls) to Internet services (e.g., multimedia streaming) and to Internet of Things (IoT) services. The algorithms also could be adapted and expanded to cover more sophisticated services working towards satisfying the health and safety needs of consumers, such as finding (with subsequent dynamic changing, if required) the most 'healthy' or 'safe' driving/biking/jogging/walking route to follow in order to avoid areas posing particular, consumer-specific, health or safety risk.**

**Keywords:** Service recommendations, telecommunication services, intelligent framework, smart recommendations.

## 1.1.

### Implementation Aspects of Mobile Edge Location Service in 5G

Ivaylo Atanasov

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**Multi-access edge computing (MEC) exposes network capabilities and information closer to end users and enables latency sensitive applications. Standardized MEC Location service provides location related information to authorized edge applications which may benefit from active device location tracking and awareness. The paper studies implementation issues of MEC Location service in fifth generation networks, including location service models and performance evaluation of service interfaces.**

**Keywords:** Location service, Application Programming Interfaces, state models, interface performance

## 1.2.

### **Prediction of Radio Wave Attenuation due to Clouds using ANN and its business aspects**

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**The demand for more radio spectrum bandwidths has risen as a result of recent developments in wireless technology from every field of the wireless industry. It's getting faster by the day, and we're on our way to greater mobility as the market for higher data rates grows. The growth of the internet has fuelled demand for wireless networks, causing the available radio spectrum to become increasingly congested. Various studies have found that the rising demand for spectrum is due to regulatory schemes put in place by authorities to protect the rapidly growing number of spectrum users. Researchers are putting in a lot of effort to establish a methodology for coping with the looming spectrum crisis. Several regulators have recently expressed interest in funding free radio channels to give unlicensed devices entry. Clouds, hail, dust, gases, and other troposphere phenomena are more vulnerable to frequencies above 10 GHz. This paper describe about the attenuation of radio wave signals due to the presence of clouds. It also proposes ANN model to predict the attenuation due to clouds. The proposed model accuracy is 99.6 %. This paper also discuss about the business aspect of the proposed model.**

**Keywords: Cloud Attenuation, ITU model, Satellite Communication, Millimeter Waves, Clustering, Rgression Analysis, ANN, Machine Learning**

## 1.3.

### **An ANN Model for Predicting Radio Wave Attenuation Due to Rain and its Business Aspect**

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**Wireless carriers must be prepared for a thousand-fold rise in mobile traffic in 2020, given the huge increase in demand for capacity in wireless data telecommunications every year. It forces**



researchers to look for new wireless spectrum that can handle high data rate demands. Next-generation technologies must address issues such as increased spectrum allocation in millimeter wave frequency bands, the installation of directional beam forming antennas, better battery life, high bit rates with lower outage probability, lower infrastructure, and increased capacity for multiple simultaneous users. The impact of rain on both satellite and terrestrial communications is discussed in this paper. An intelligent model based on ANN is proposed in this paper. The accuracy was 97.6% was observed in this model, which was better than another proposed model. Business aspect of proposed work was also discussed in this work.

**Keywords:** Rain Attenuation, Satellite Communication, ITU Model, Millimeter Waves, Clustering, Regression Analysis, ANN, Machine Learning.

#### 1.4.

### **Channel Activity Analysis of Cognitive Radio with PCA Preprocessing and Different Clustering Methods**

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**This paper studies methods for channel activity analysis in cognitive radio that do not require a priori information about the signal, the channel and the noise power. Channel identification is a great challenge for cognitive devices, so channel activity plays an important role in spectrum management decisions. Dimension reduction with Principal Component Analysis (PCA) and various clustering methods (agglomerative, K-means and K-medoids) are used to reduce the hardware and software requirements while maintaining and improving detection accuracy. The goal of the proposed analysis is to discover the optimal parameters for data processing in spectrum hole allocation for cognitive radio systems by using preprocessing and cluster analysis.**

**Keywords:** Channel Identification, Cognitive Radio, Channel Activity, Principal Component Analysis, Cluster Analysis, Spectrum Monitoring

#### 1.5.

### **Study of band gap structure for improving antenna radiation pattern**

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**In this work, an antenna system consisted of a Z shape EBG structure placed in front of a radiate patch is studied to narrow radiation pattern (RP) beamwidth and gain increasing are studded. Antenna system simulation and measurement results are presented with different Z shape EBG structures. Parametric optimization of the complex antenna structure is made to discover necessary geometric dimensions and the system is made and measured. A comparison between simulation and measurement results is done. The results show that the new antenna**

system with optimal dimension has increased gain by 2dB and narrowed RP beamwidth approximately 20° versus ordinary patch antenna.

**Keywords:** Band Gap structures, EBG, periodic structures, antennas, radiation pattern narrowing, antenna gain increasing, metamaterials, UAV

## 2.1.

### **Multichannel IoT System for Weather and Air Quality Monitoring**

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**The current paper represents an IoT system, which is capable to read the data from multiple sensors for air quality monitoring such as particulate matter, hydrogen sulfide, sulphur dioxide, carbon monoxide, nitrogen oxides, ozone, etc. Lots of these sensors require additional sensors for environment monitoring such as temperature, air pressure and humidity ones for the calibration purposes. The proposed system supports lots of interfaces to read the sensor measurements such as analog, 4-20mA converter circuits, I2C, PWM, SPI, UART or custom digital communication protocols and send the sensor data to the remote station via Bluetooth or GSM/GPRS network.**

**Keywords:** IoT, air quality, weather monitoring

## 2.2.

### **Assessment of Energy Absorption and Hemolysis of RBCs Due to a Wearable Antenna**

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**This paper presents results of numerical analysis of the amount and distribution of the energy absorbed in a suspension from human erythrocytes exposed by a wearable textile antenna. It also reports levels of hemoglobin released by the blood suspension after 20 min exposure with EMF from the wearable textile antenna. The results suggest that irradiation of the RBCs with EMF from the wearable textile antenna (exposure duration 20 min, at 2.41 GHz and peak 1 g average SAR from 0.5386 W/kg produced in cell suspensions at the input power of 6.3 mW) probably have a weak stabilizing effect on the erythrocyte membranes.**

**Keywords: wearable antenna, SAR, hemolysis, erythrocytes, dosimetry, RBCs**

### **2.3.**

#### **Intelligent Support System for People with Visual Impairments**

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**This paper aims to present a prototype of glasses that work with specialized software that will help people with visual problems more easily cope with the obstacles of their environment. The software that is developed meets the hardware and software requirements of the glasses. Simplified user interface further facilitates its use by people, regardless of the degree and severity of their visual problems.**

**Keywords: glasses, visual problems, software, medicine**

### **2.4.**

#### **Design and Research of Smart IoT Control System for Electrical Appliances**

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**The current article has developed a system for measuring temperature, humidity and pressure in a room. The topic allows the development of new methods of making such an application, embedded in this thesis, concerning the user interface, as well as various functional design solutions. Various technologies are used, such as WiFi boards, sensors for measuring various quantities, Arduino environment, Web technologies and others.**

**Keywords: Raspberry, WiFi, smart home, IoT**

## 2.5.

### **Design of a System for Intelligent Agriculture and Monitoring of the Optimal Parameters of Agricultural Crops**

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**This article offers a way to solve the main problem in agriculture through an automated system for monitoring and control of the irrigation process. The main goal is to facilitate the development of agriculture through the application of information technology. The implementation of the system increases many times the competitiveness of the producers, high yields are achieved, the costs for growing the products are minimized and the quality is increased. This type of investment will bring security and a quick return on investment to the farmer.**

**Keywords: ICT in agriculture, sensors, pH, temperature, humidity, soil.**

## 2.6.

### **Most Favorable Results for Forecasting Methods for Natural Gas and Photovoltaic Energy Consumption**

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**This article contrasts three forecasting methods (Statistical Method, Stochastic Method and Optimal Control Method) for calculating forecasts for energy consumption from natural gas and photovoltaic. Accurate forecasting is important to ensure network stability and reliability. The advantages and disadvantages of each method are summarized based on historical data, together with the forecast horizons and input parameters. A comparison is made of the effectiveness of the proposed three forecasting methods to help researchers choose the best approach to forecasting for future research.**

**Keywords: energy, forecasting methods, natural gas, photovoltaic**

## 2.7.

### **Intelligent architecture for real-time personal health monitoring in the context of 3G/4G/5G technology**

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**In this study, we report on ongoing research aimed at developing an intelligent architecture for real-time health monitoring that adapts to the 3G/4G/5G communication context. It builds on the integration of (i) intelligent sensor devices capable of registering specific behavioural indicators, (ii) mobile personal devices, which serve primarily as data concentrators, information gateways and displays, and (iii) remote storage and processing resources, where health data are aggregated for advanced statistical processing. This architecture builds on the principles of distributed computing and resource storing at the network edge, yet it also relies on methods and technologies typically used in cloud-computing applications and 5G technology. More importantly, however, it is capable to sense the communication context and providing a seamless transition between environments with dissimilar communication capacities and allowing for graceful degradation of functionality in case of a shortage of battery or local storage resources. The last is expected to provide numerous benefits that are expected to facilitate the pervasiveness of eHealth monitoring solutions.**

**Keywords— Real-time health monitoring, Quality-of-Service, smart sensors, computing and storage at the network edge.**

## **2.8.**

### **Smart System for Control and Monitoring a DC Motor**

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## **TELECOMMUNICATION NETWORKS. BIG DATA NETWORKING. CYBERSECURITY**

## **3.1.**

### **Power Conscious Routing Protocol for Ad-hoc 6LoWPAN Networks**

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**A power-conscious 6LoWPAN routing algorithm is proposed in this paper. The optimal path is based mainly on the next node's power level along route. The empirical results indicate that by reducing network overheads and maintaining high delivery ratio with low latency, the suggested power node-type conscious routing algorithm metric will significantly improve network performance.**

**Keywords: 6LoWPAN, routing algorithm, power conscious, resource constrained networks**

## **3.2.**

### **Comparison between Different Topologies of IP Networks Using MPLS**

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**In the present work, a comparison between two virtual IP networks with different topologies using the MPLS technology is made. The difference in topologies is the presence of an MPLS core network. In one topology there is no clearly defined MPLS core network, and in the other there is. The aim of the work is to make a comparison between the two virtual IP networks and to check which of the two topologies will have an improvement in the performance of the virtual IP network. For the purposes of the study, only VoIP traffic is exchanged in virtual networks and various tools for monitoring of IP networks are used.**

**Keywords: IP network, MPLS, Topologies, Virtual network, VoIP**

### **3.3.**

#### **Benefits and Challenges of Big Data Analysis in Telecom Industry**

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**The analysis of big data used in Telecom industry has an advantage among the telecommunications companies which aim is to improve their performance. That case study aims to identify top contributions and challenges related to the usage of big data as a benefit for better efficiency in the field. In parallel, reveals the factors that might influence on the technology adoption of big data analytics in the organization. In addition, this review offers both scholars and practitioners an increased understanding of the link between big data analytics and overall company performance.**

**Keywords: big data, telecom industry, improvements, company performance, technology adoption**

### **3.4.**

#### **Analysis of Software Vulnerabilities, Measures for Prevention and Protection and Security Testing**

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**Analysis of top software vulnerabilities applications is made and effective measures to prevent intruders from exploiting these vulnerabilities during the code design are pointed out. The important role plays also software testing. Types of software testing and most popular testing tools are also considered in this paper. The results of conducted security tests are discussed.**

**Keywords: vulnerability, software testing, secure code**

### **3.5.**

#### **Performance Evaluation of Constellation Diagram Analysis-based Methods for PCA Detection**

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**A critical issue in wireless communication networks relates to their vulnerability to eavesdropping attacks. One active approach that an intruder can use to improve its downlink channel and intercept the private information of other users is initiating a pilot contamination attack (PCA). In this paper, two methods for the detection of PCA based on analyses of the constellation diagram are studied – 2-N-PSK and Shifted 2-N-PSK. Their performance is evaluated through two crucial parameters, namely the PCA detection probability and PCA false alarm probability, both investigated in scenarios with different number of antenna elements at the base station. Since the Shifted 2-N-PSK detection method improves the detection probability of 2-N-PSK by altered constellations, the paper proposes a low-complexity algorithm to compute simultaneously the shift values at the transmitter and receiver.**

**Keywords: physical layer security, pilot contamination attack, wireless communications, constellation diagram**

### **3.6.**

#### **Simulation and Test of RSA Algorithm on Mail Server Device**

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**Cybersecurity includes the protection of infrastructure, architecture, applications and hardware. Hardware security is a growing challenge in IT services. In electronic devices have been implemented Cryptographic algorithms to provide security by detecting Physical**

**Attacks, Trojan Hardware, Side Channel Attacks, Zero Value Attacks and Power Analysis Attacks. In this paper, will be realized a summary of some algorithms and cryptographic techniques to solve cybersecurity. In a mail server will be implemented some of them, that will be integrated in a datacenter. Finally, after stimulating some attacks on the datacenter we will draw some conclusions. The solution that we have suggested is fast, reliable and can be used to increase the security and integrity of information on the mail server.**

**Keywords: algorithm, cryptographic, hardware device, security, attack**

**COMMUNICATION ISSUES, SUPERCOMPUTERS, ARTIFICIAL INTELLIGENCE,  
MACHINE LEARNING. INTELLIGENT TRANSPORT SYSTEMS.**

#### **4.1.**

### **A Study of Documents Management System Based on Web, Case Study: University**

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**Nowadays, security access technology has reached a high point of development and research, although more may be deemed to be researched in this field. The purpose of this project is to develop a web application tool for Document Management, to simplify application procedures for students in diploma subject trying to help them increase the impact of their work. Given that the students to have so far applied for the thesis in classical way, despite the advancement in information technology and digitizing time, the aim has been to build this online application which will facilitate the application for thesis. Applying online will be more functional than the current application, which enables you to choose mentor online. Also based on finding shortcomings in the current application as the master thesis: Ways of physical access, greater engagement of professors and students, the way of communication student/mentor this has been one of the main reasons to develop this application. We have used laravel and other relevant of the PHP and MySQL ecosystem as framework.**

**Keywords: Document Management System, Database Management System, World Wide Web, Electronic documents management, The HyperText Markup Language**

#### **4.2.**

### **Recommendation Systems Based on Textual Document Analysis**

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**IN general, recommendation systems are defined as techniques used to predict an individual assessment that will provide an item or social entities. These items can be books, movies, restaurants and things to which individuals have different preferences. These systems help**



users to decide on the appropriate items, and facilitate the task of finding a favorite collection items. The aim of this project is to create a system of recommendation based on textual documents, exactly will create an application making the recommendation of the mentor and the committee automatically based on the proposal of the topic and documents that are in the archive database. The algorithms that we have used are Rake which used to extract the keyword through textual documents and Leveshtein distance algorithm. This algorithm used to derive the similarity between documents based on keyword extraction that have the textual documents. To be more efficient we have created a file with the stop words in three languages, exactly the words that we have decided are less important for the system (and, or, in, a, this, that, etc.). Programming language which is used to create our application is PHP and database MySQL. Initially, the student must apply the system to be registered on the database, after applying the system extract the keywords from the document applied and compares with the proposals of the topics that are in the archive of data base and in the end brings us automatically appropriate mentor for the topic and the commission.

**Keywords:** Recommendation System, Data mining, Text mining, Customizing users, RAKE

### 4.3.

#### **Face Recognition by Wavelet Transformation, Deep FFNN and ANFIS Approach**

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The paper presents the results of selection of multilayer Feed-Forward Neural Networks (FFNN) and Adaptive Neuro-Fuzzy Interface Systems (ANFIS) for face recognition using Daubechies wavelet image pre-processing. Neural structures have been investigated with two hidden layers in different ratios between hidden neurons in Levenberg-Marquardt learning processes. FFNNs have been synthesized with observed accuracies 100.00% and minimal MSE indicators, respectively  $8.4654e-04$ ,  $0.0016$  and  $5.6520e-04$ . A neuro-fuzzy classifier was found with achieved minimum RMSE =  $2.8091e-05$  and 100.00 % accuracy in Hybrid learning algorithm and Pi-shaped membership function.

**Keywords:** wavelet transformation, face recognition, multilayer neural networks, MSE, neuro-fuzzy classifiers, RMSE.

### 4.4.

#### **Speech Profile Recognition by Fourier Spectral, FFNN and ANFIS Techniques**

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This paper presents a combined approach for recognition of speech profiles based on FFT windowing, Feed-Forward Neural Networks (FFNN) and Adaptive Neuro-Fuzzy Interface Systems (ANFIS). By using spectral analysis of the speech of physical entities, there have been carried out feature extraction during application of Hamming, 4 Term B-Harris, Flat Top and Hanning windows. Individual informative sets (data sets) have been specified for the employed

mathematical recognition apparatuses. A FFNN model has been synthesized during implementation of Scaled Conjugate Gradient (SCG) training for the purpose of speech profiles recognition with attained accuracy of 93.50 %. There has been selected neuro-fuzzy classifier in accordance with Hybrid learning algorithm and Pi shaped membership function of input variables. During testing of selected ANFIS model there has been established a 100.00% accuracy in speech profiles recognition.

**Keywords:** voice profiles, recognition, FFT windowing, artificial neural networks, adaptive neuro-fuzzy systems.

#### 4.5.

### **Design and Deployment of Kubernetes Cluster on Raspberry Pi OS**

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The rapidly growing number of Internetconnected devices and the plenty of services provided and performed on cloud platforms requires efficient and fast allocation of hardware resources. This is possible when workloads and services are containerized. Such an approach facilitates configuration and automation without downtime for the services and applications. To achieve this is needed tool that manages the running applications with provisioning of scalability. Such open source tool for container deployment and management on distributed systems is Kubernetes.

**Keywords:** Cloud Platforms, Cluster, GNU/Linux, Kubernetes, Raspberry Pi

#### 4.6.

### **Contactless Charging of an Electric Scooter**

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#### 4.7.

### **Urban Intelligent Transport Management Systems**

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Intelligent transport information systems support store data on traffic, vehicles, used by different types of transport. The core of intelligent systems stands Data Warehouse and OLAP. Data Warehouse store data coming from different sources and with the OLAP instrument can be achieved a multidimensional data analysis. The new transport technologies are emerging with the development of Smart Cities. This article introduces transport systems applicable in Smart Cities such as Connected Cars, Mobile as a Service (MaaS), Advanced Traffic Management Systems (ATMS), Active Traffic Management (ATM) which provide successful traffic management, traceability of the car from its manufacturer, mobile applications, which facilitate taxi services, bicycle sharing, electric scooter rental and others. A

comparative analysis of intelligent transport systems in developed world cities has been performed.

**Keywords:** ATMS, Intelligent transport, MaaS, Smart city

#### **4.8.**

### **Comparative Analysis of MTP and DSR Routing Protocols in VANET**

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**In the last few years, technology has developed rapidly. Telecommunications are also changing as higher transmission speeds are reached. Intelligent transport systems are part of these structures and promise to make our lives better by optimizing road traffic, increasing safety, reducing harmful emissions into the air and spending less money on automobiles. This paper compares two reactive routing protocols – Message Transmission Protocol and Dynamic Source Routing. They are part of the VANET network and it in its turn is part of ITS.**

**Keywords:** ITS, VANET, protocols, MTP, DSR

#### **4.9.**

### **Pasture Research Using Aerial Photography and Photogrammetry**

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**This article focuses on the topic of using unmanned aerial vehicles and modern software solutions and systems in the study of pastures, using aerial photography and aerial photogrammetry.**

**Keywords:** unmanned aerial vehicle, aerial photography, aerial photogrammetry, image analysis, pastures

### 5.1.

#### **An Adaptive Pan-Tilt Camera Control for Visual Target Tracking**

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**This paper considers the problem of target tracking with an active monocular camera. A mathematical model of the Pan-Tilt camera unit is developed using homogeneous transformation matrices. Using target offset (error) coordinates in the image plane, an adaptive control is proposed for the active camera system to track a moving target and keeps his image centered in the camera view. Simulation and experimental results are presented to illustrate the effectiveness of the proposed control scheme.**

**Keywords:** pan-tilt camera, adaptive control, target tracking

### 5.2.

#### **Two-Dimensional Significant Bit Prediction of Wavelet Image Decomposition Coefficients**

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**The paper presents the result of the development of an improved algorithm for eliminating the redundancy that present in the wavelet image decomposition coefficients. Two-dimensional prediction of significant bits of the wavelet coefficients in the horizontal and then in the vertical direction along the bit planes makes it possible to speed up the process of information transfer, and large-amplitude bursts in the most significant bits will be transmitted first. Thus, it is possible to transmit an image with ever increasing resolution or to perform a quick preview of an image at a low resolution.**

**Keywords:** image, wavelet, bit planes, image resolution, prediction

### 5.3.

#### **Gaussian Adaptive Filtering of Low Resolution Video Using Anisotropic Tensor**

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**In this paper an optimization procedure is proposed for finding the optimal parameters of the Anisotropic Gaussian filter for low resolution video, containing Additive White Gaussian Noise, using anisotropic tensor. The tensor is found from the video content by estimating the brightness gradient along horizontal and vertical direction, according to the algorithm of Kimmel et al. High quality of the filtered frames is achieved, corresponding to Peak signal to Noise Ratio of 30.07 dB and Structural Similarity Index Measure of 0.8641, when the input video contains noise with variance, equal to 0.001. Comparative analysis with the filter of Middendorf et al., employing also the structure tensor, along with the non-adaptive Average and Gaussian filters, reveal better structural preservation of the video, processed by the optimized version of the proposed filter.**

**Keywords: Gaussian filter, anisotropic tensor, Video, structure preservation, parameter optimization**

### 5.4.

#### **The Prediction of Weather's Data for Wind Power System Using Graph Database**

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**The modern power system is evolving by using new technologies that can produce large amounts of data from various devices. Big Data and data analytics can play important role in the power system to improve the prediction of weather's data conditions. Better prediction of the weather data is important to design and adjust optimization of power system planning. The aim of this paper is to use Neo4j Graph Algorithms Library to improve the prediction of weather's data for wind power system.**

**Keywords: weather data, wind power system, graph database Neo4j algorithm**

### 5.5.

#### **Loss Power Investigation in an LLC DC-DC Converter Operating above the Resonant Frequency**

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**The paper presents a study of the power losses in a full-bridge LLC DC-DC converter circuit operating above the resonant frequency based on the State-Plane Analysis. The investigation is made at different control frequencies and load variation in the range from no-load to short circuit. Comparison between analytical and simulation results is presented.**

**Keywords: LLC DC/DC converter, Power Loss, State-plane Analysis**

## **ECONOMICS AND MARKETING OF ELECTRONIC COMMUNICATIONS. EDUCATION IN THE FIELD OF TELECOMMUNICATION**

### **6.1.**

#### **Classification of Business Processes in Telecommunications**

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**The beginning of the 21st century marks major changes in the world economy, associated with continuous globalization, deep transformation of enterprises and organizational culture, turning to an information and communication economy based on large arrays of information and knowledge. The implementation of innovative changes, the transition to new business models for supply chain management, changes in existing business processes and the creation of new ones has become a vital factor for the existence of the organization. In this regard, the purpose of this paper is to analyze the available classifications of business processes and to determine how current changes in the development strategy of telecommunications companies affect them. A new classification of business processes in telecommunications is presented which is a summary of the changes in the sector using a new developed qualification table. The proposed classification combines the scope, process area, functionality and nature of the process, using as a basis the qualification frameworks for business processes in telecommunications and at the same time pays attention to new processes and interaction with participants in new ecosystems.**

**Keywords: classification, qualification frameworks, business process, telecommunications,**

### **6.2.**

#### **Low-Cost Remote Laboratory for Cyber-Physical Experiments**

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**The article discusses methodology and examples of remote teaching in the field of engineering disciplines by building cyber-physical experimental laboratory setups. Unlike purely virtual laboratories, the presented approach provides realistic feedback from a physical object, giving a number of advantages in terms of accessibility, time of use and safety. Few examples of**

increasing complexity are considered, such as the digital design and implementation of finite state machines, configuration of programmable logic devices and control of more complex plants by means of the theory of automatic control. Guidelines for future development are given.

**Keywords:** cyber-physical systems, Internet-of-Things electrical engineering, remote laboratory, e-learning

### **6.3.**

#### **Designing and Simulation of Bistable Multivibrators with Operational Amplifiers in Multisim**

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**Multivibrators are widely applied for switching devices like shift registers or temporary memories, as well as time oscillators or clocks. These circuits are studied in the discipline “Pulse and Digital Devices” for specialties “Electronics”, “Internet and Mobile Communications”, “Information and Communication Technologies” and “Computer Control and Automation” at the University of Ruse. The paper presents an approach for synthesis and analysis of bistable multivibrators created with operational amplifiers describing the tasks performed by the students.**

**Keywords:** bistable multivibrators, Multisim, operational amplifiers

### **6.4.**

#### **A concept of a New Knowledge Based Multimodal Affective Tutoring System**

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**In this paper, we present a new concept of a multimodal Affective Tutoring System (mATS) based on knowledge, which is aimed at covering the entire functionalities of a human teacher - namely training and testing, and personal attitude towards every student. The system incorporates models of the student and of the task, as well as evaluation module for constant determination of the current states of both. Moreover, based on multimodal input signals and system-generated ones (performance, response time, etc.), supplemented with prior knowledge about the student (self-reported parameters, such as age, gender, level of experience, etc.) and user profiling approach mATS gives a variety of options for realization of adequate adaptive strategies.**

**Keywords:** Intelligent tutoring system, affective state, multimodal

## 6.5.

### **Synthesis and Implementation of a Digital Control System for a Buck DC-DC Converter**

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## TELECOMMUNICATIONS

### 7.1.

#### **Time series interpolation with Volatility Bridge**

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**When working with market data it is not always easy to rely on price series being consistent. Some of the series may contain gaps causing calculation errors. One way to approximate the data in these gaps is to perform a deterministic interpolation. However, deterministic interpolation techniques fail to capture the correct probability distribution at these intermediate times. Using Monte Carlo simulation the Volatility Bridge interpolation manages to capture the correct joint distribution of the data.**

### 7.2.

#### **Perspectives for the Strategy Industry 4.0**

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**The report reviews the implementation of the Republic of Bulgaria on the Concept for Digital Transformation of Bulgarian Industry (Industry 4.0) as a basis for developing a Strategy for Bulgaria's participation in the Fourth Industrial Revolution. It was adopted on the basis of the two-year draft Concept 4.0 adopted by the EC. The adoption of the Concept in the Bulgarian economy will create conditions for the development of modern industrial production through the integration of intelligent production systems and processes. The report synthesizes on the basis of the analysis some risks to the Bulgarian economy, as well as the possible effects of it as a result of the application of Concept 4.0 in our country. The prerequisites of the future Concept 5.0**

**Keywords: funds, economy, concept 5.0, innovation, management**



## Information for the participants and guests of Telecom 2021

Until 26 October 2021 detailed information on issues of the Conference can be obtained at the National House of Science and Technology in Sofia, 108 Rakovski St., V Floor, Room 506 or by phone: 02 987-97-67.

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Registration fee: Participants with/without a paper - Euro 200, Students - Euro 100, IEEE and CEEC Members Discount -15 %. The fee should be preferably paid before October 26, 2021 through a bank transfer on the account of:

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Participants are kindly requested to send a Payment Order copy with details of payment to the Organizing Committee, or present it upon registration.

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