

# **2021 International Symposium on Networks, Computers and Communications (ISNCC 2021)**

**Dubai, United Arab Emirates  
31 October – 2 November 2021**

**Pages 1-492**



**IEEE Catalog Number: CFP2168Y-POD  
ISBN: 978-1-6654-4829-1**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2168Y-POD
ISBN (Print-On-Demand):	978-1-6654-4829-1
ISBN (Online):	978-1-6654-0304-7

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# TABLE OF CONTENTS

THE RELATIVE TOLERANCES OF POLARIZATION MULTIPLEX ON LONG OPTICAL PATHS .....	1
<i>Martin Kyselak, David Grenar, Cestmir Vlcek, Karel Slavicek, Jiri Vavra</i>	
NETWORK GROWTH IN SMART CITIES .....	5
<i>Anood Al Hamedi, Bashaer Al Seiri, Meera Al Taher, Hasan Abu Hilal</i>	
ANTENNA ARRAY INTER-ELEMENT COUPLING IMPACT ON LINEARIZATION OF ACTIVE PHASED ARRAY .....	11
<i>Feridoon Jalili, Daniel E. Serup, Ondrej Franek, Ming Shen, Gert F. Pedersen</i>	
A SINGLE-BAND OPTICALLY TRANSPARENT ANTENNA FOR WEARABLE SMART GLASSES.....	16
<i>Haider Khaleel Raad, Heidrun Schmitzer, Ali Hammoodi, Casey White, Dennis Tierney, Wilbur Walters, Khalid Abed</i>	
ON THE SENSITIVITY OF IMPLANTABLE ANTENNA PERFORMANCE TO VARIATIONS IN THE ELECTRICAL PROPERTIES OF BODY TISSUES .....	20
<i>Ala Alemaryeen</i>	
CDNET: A CONTENT DELIVERY NETWORK EMULATOR .....	24
<i>Hoang-Loc La, Anh-Tu Ngoc Tran, Masato Yoshimi, Takuma Nakajima, Nam Thoai</i>	
MACHINE LEARNING TO FIND PURCHASE DURATION OF CHAIN HOTELS IN THE UAE.....	31
<i>Elezabeth Mathew, Sherief Abdulla</i>	
SCENARIOS AND IMPLEMENTATION USE-CASES FOR SATELLITE-BASED NB-IOT .....	37
<i>M. Luglio, M. Quadrini, C. Roseti, F. Zampognaro</i>	
MODEL PREDICTIVE CONTROL OF AUTONOMOUS DRIVING USING UNSCENTED KALMAN FILTER WITH SPARSE SPECTRUM GAUSSIAN PROCESSES .....	43
<i>Shitian Zhang, Yunduan Cui, Naitian Deng, Huiyun Li</i>	
LINGUISTIC DESCRIPTIONS OF AIRPORT EVALUATION DATA FOR RECOMMENDATION STRATEGIES.....	49
<i>Betul Dundar, Diyar Akay, Suat Ozdemir</i>	
CLUSTERING BASED USER ALLOCATION IN 5G NETWORKS .....	57
<i>Christos Bouras, Rafail Kalogeropoulos, Ioannis Sina</i>	
PUBLIC TRANSIT HUB (PTHUB).....	63
<i>Navid Shaghghi, Adi Relan, James Ossam, Hanna Albright</i>	
LOW-POWER CHARACTERISTICS AND DATA RETENTION ABILITIES OF A NEW MULTIPLEXER LOGIC FOR INTERCONNECT LOGIC OF FPGAS .....	68
<i>Karol Niewiadomski, Dietmar Tutsch</i>	
COUNTERING PRESENCE PRIVACY ATTACK IN EFFICIENT AMI NETWORKS USING INTERACTIVE DEEP-LEARNING .....	75
<i>Mohamed I. Ibrahem, Mahmoud M. Badr, Mohamed Mahmoud, Mostafa M. Fouda, Waleed Alasmary</i>	

AN INTELLIGENT MANAGEMENT FUNCTIONALITY FOR IN-VEHICLE DRIVING STYLE RECONFIGURATIONS LEVERAGING ON BAYESIAN NETWORKING PRINCIPLES .....	82
<i>Ilias E. Panagiotopoulos, George J. Dimitrakopoulos</i>	
ENERGY EFFICIENT MECHANISM OVER LORA FOR SEARCH AND RESCUE OPERATIONS .....	88
<i>Christos Bouras, Apostolos Gkamas, Spyridon Aniceto Katsampiris Salgado</i>	
RESEARCH ON SATELLITE NETWORK SECURITY MECHANISM BASED ON BLOCKCHAIN TECHNOLOGY .....	94
<i>Chengjie Li, Lidong Zhu, Michele Luglio, Zhongqiang Luo, Zhen Zhang</i>	
CSES: CUSTOMIZED SEARCHABLE ENCRYPTION SCHEME WITH EFFICIENT KEY MANAGEMENT OVER MEDICAL CLOUD DATA.....	100
<i>Sherif Abdelfattah, Mohamed Baza, Mohamed Mahmoud, Waleed Alasmary</i>	
DETECTING ELECTRICITY FRAUD IN THE NET-METERING SYSTEM USING DEEP LEARNING.....	107
<i>Mahmoud M. Badr, Mohamed I. Ibrahim, Mohamed Baza, Mohamed Mahmoud, Waleed Alasmary</i>	
VARIATIONAL LEARNING OF THE MIXTURE OF SHIFTED-SCALED DIRICHLET DISTRIBUTIONS VIA ENTROPY SPLITTING .....	113
<i>Ahmed Rebei, Oumayma Dalhoumi, Narges Manouchehri, Ali Baghdadi, Manar Amayri, Nizar Bouguila</i>	
TASK ORDERING MATTERS FOR INCREMENTAL LEARNING .....	119
<i>Zhaonan Yang, Huiyun Li</i>	
INTELLIGENT DDOS DETECTION IN BOTNET COMBINED WITH PACKET-LEVEL FEATURES UNDER SDN .....	125
<i>Shuhan Chen, Congqi Shen, Danrui Yu, Yuqin Wu, Chunming Wu</i>	
FEDERATED LEARNING FOR ANOMALY-BASED INTRUSION DETECTION .....	131
<i>Mohamed Ali Ayed, Chamseddine Talhi</i>	
BUILDING AUTONOMOUS FEATURES IN A SMALL ELECTRIC VEHICLE MODEL .....	139
<i>Deena Z. Khalaf, Noor A. Almohammad, Maitha K. Alshebli, Fadi T. El-Hassan</i>	
ENHANCED SECURE PROCESS CONTROL AND DATA ROUTING FOR MULTI-PLANT BIOGAS PRODUCTION SYSTEM IN IOT ENVIRONMENT : *A PRACTICAL APPROACH TO SECURING SMART BIO-ENERGY INFRASTRUCTURE.....	145
<i>Oladayo Olufemi Olakanmi, Kosisochukwu Pal Nnoli, Kehinde O. Odeyemi, Mbadiwe Samuel Benyeogor</i>	
NETWORK SUM-RATE MAXIMIZATION FOR NOMA-BASED MULTICAST COGNITIVE RADIO NETWORKS WITH SWIPT-ENABLED RELAYS.....	150
<i>Alaa Al-Refaei, Mohammed W. Baidas</i>	
SDN FOR GATEWAY DIVERSITY IMPLEMENTATION IN SATELLITE NETWORKS.....	157
<i>Mario Minardi, Christos Politis, Frank Zimmer, Symeon Chatzinotas</i>	
OVERLAP-MINIMIZATION SCHEDULING STRATEGY FOR DATA TRANSMISSION IN VANET .....	162
<i>Yong Zhang, Mao Ye, Lin Guan</i>	

ON COGNITIVE MANAGEMENT ARCHITECTURES FOR ENHANCING SEPTIC SHOCK PREDICTIONS IN INTENSIVE CARE UNITS .....	169
<i>Christina-Athanasia I. Alexandropoulou, Ilias E. Panagiotopoulos, George J. Dimitrakopoulos</i>	
STATISTICAL MODELING OF LAND MOBILE SATELLITE DUAL-POLARIZED MIMO PROPAGATION CHANNEL .....	175
<i>Mingchuan Yan, Yingzhe Dou, Bingyu Xie</i>	
MASSIVE MIMO LINEAR PRECODING TECHNIQUES PERFORMANCE ASSESSMENT .....	180
<i>Tewelgn Kebede, Yihene Wondie, Johannes Steinbrunn</i>	
OPTIMIZED MULTI-LEVEL PRIME ARRAY CONFIGURATIONS .....	188
<i>Saleh A. Alawsh, Ali H. Muqaibel</i>	
PERFORMANCE EVALUATION OF MILLIMETERWAVE-MASSIVE MIMO WITH BEAMFORMING TECHNIQUES .....	192
<i>Tewelgn Kebede, Yihene Wondie, Johannes Steinbrunn</i>	
IMPLEMENTATION OF A SECURE MULTI-CLOUD STORAGE FRAMEWORK WITH NEXT-GENERATION CRYPTOSYSTEMS AND SPLIT-PROTOCOL .....	200
<i>Bharat S Rawal, Gunasekaran Manogaran</i>	
EDGE COMPUTING SERVICES FOR SMART CITIES: A REVIEW AND CASE STUDY .....	206
<i>Ali Alnoman</i>	
AN EIGHT-ELEMENT MIMO ANTENNA SYSTEM FOR 5G MOBILE HANDSETS .....	212
<i>Muhannad Y. Muhsin, Ali J. Salim, Jawad K. Ali</i>	
DESIGN OF A WIRELESS HELIOSTAT SYSTEM .....	216
<i>Mohammed Yafeai, Ibrahim Abou Shehada, Sultan Alsulami, Ibrahim Abou Mahmoud, Ali Muqaibel, Mohamed Abido, Aboubakr Salem</i>	
DESIGN OF AN ACTIVE INDUCTOR BASED RECONFIGURABLE MIXER FOR SOFTWARE-DEFINED RADIOS .....	221
<i>Shilpa Mehta, Xue Jun Li</i>	
AN ADAPTIVE DOA ESTIMATION METHOD BASED ON TRANSFER JOINT MATCHING FOR SPACE COMMUNICATIONS .....	227
<i>Qi Tan, Lidong Zhu, Xu Deng, Zhongru Zhu</i>	
MULTI-LAYER SATELLITE NETWORK RESOURCE MANAGEMENT BASED ON GENETIC ALGORITHM .....	232
<i>Xu Deng, Lidong Zhu, Qi Tan, Ying Yang, Yong Zhang</i>	
A HYBRID SPREAD SPECTRUM COMMUNICATION METHOD BASED ON CHAOTIC SEQUENCE .....	238
<i>Guomin Tang, Lidong Zhu, Qi Wu, Qihui He, Le Yu</i>	
AUTONOMOUS VEHICLE MOTION PLANNING USING KERNELIZED MOVEMENT PRIMITIVES.....	243
<i>Naitian Deng, Yunduan Cui, Shitian Zhang, Huiyun Li</i>	
AUTOMATIC DATA REPAIRS WITH STATISTICAL RELATIONAL LEARNING .....	249
<i>Ling Li, Weibang Li, Lidong Zhu, Chengjie Li, Zhen Zhang</i>	

OPTIMIZATION OF CHANNEL ALLOCATION IN HETEROGENEOUS 5G NETWORKS BASED ON GENETIC ALGORITHM AND FUZZY LOGIC.....	255
<i>Ghazal Najafi, Saeed Ghazi-Maghrebi</i>	
STORE-LOAD PHASED ARRAY ANTENNA FOR TRACKING AND COMMUNICATION WITH LEO SATELLITES.....	261
<i>Yong Zhang, Lidong Zhu, Chengjie Li, Xu Deng, Huazhi Feng</i>	
ON THE DESIGN OF TRIPLE BAND DIPOLE FLEXIBLE ANTENNA FOR WEARABLE RFID DEVICES .....	267
<i>Aya N. Alkhafaji, Jawad K. Ali, Sinan M. Abdulsatar, Ali I. Hammoodi</i>	
ENHANCING IP ADDRESS GEOCODING, GEOLOCATING AND VISUALIZATION FOR DIGITAL FORENSICS .....	270
<i>Mohammad Meraj Mirza, Umit Karabiyik</i>	
DISTRIBUTED KNOWLEDGE INFERENCE AND REASONING IN THE NETWORK BASED ON NEW IP.....	277
<i>Lijun Dong, Richard Li</i>	
TOR NETWORK DETECTION BY USING MACHINE LEARNING AND ARTIFICIAL NEURAL NETWORK.....	284
<i>Murat Soykan, Pinar Sarisaray Bölük</i>	
AN ENTROPY-BASED HYBRID MECHANISM FOR LARGE-SCALE WIRELESS NETWORK TRAFFIC PREDICTION.....	288
<i>Guilherme N. N. Barbosa, Martin Andreoni Lopez, Dianne S. V. Medeiros, Diogo M. F. Mattos</i>	
PERFORMANCE COMPARISON OF VIDEO ENCODING AT LOW SAMPLING RATES .....	294
<i>Vusi Skosana, Adnan M. Abu-Mahfouz</i>	
HIGH SPEED LOW POWER SEU TOLERANT PSEUDO DUAL PORT MEMORY IN 7NM .....	301
<i>Suresh Babu Kotha, Kumar Rahul, Mohammad Anees, Santosh Yachareni, Subodh Kumar</i>	
IDENTIFYING THE MAIN CAUSES OF MEDICAL DATA INCOMPLETENESS IN THE SMART HEALTHCARE ERA.....	306
<i>Colin Wilcox, Soufiene Djahel, Vasileios Giagos</i>	
A NOVEL FORWARDING AND CACHING SCHEME FOR INFORMATION-CENTRIC SOFTWARE-DEFINED NETWORKS .....	312
<i>Khuhawar Arif Raza, Alia Asheralieva, Md Monjurul Karim, Kashif Sharif, Mehdi Gheisari, Salabat Khan</i>	
AN ADAPTIVE POWER OUTPUT CONTROL SYSTEM FOR CAM.....	320
<i>Amr Sayed Abdelfattah</i>	
TOWARDS FLEXIBLE HARDWARE AUTHENTICATION FOR IOT .....	326
<i>Anjana Prabhakar, Tricha Anjali</i>	
EXTENDING DIRECT SEQUENCE SPREAD-SPECTRUM FOR SECURE COMMUNICATION .....	332
<i>Avinash Kumar, Ye Zhu</i>	
OPTIMIZING SUB BYTES AND MIX COLUMN TO IMPROVE PERFORMANCE OF AES IN VIRTEX 7 FPGA .....	337
<i>Mahendrakumar Gunasekaran, Kumar Rahul, Santosh Yachareni</i>	

SECURE MATRIX OPERATIONS FOR MACHINE LEARNING CLASSIFICATIONS OVER ENCRYPTED DATA IN POST QUANTUM INDUSTRIAL IOT .....	342
<i>Artrim Kjamilji, Albert Levi, ErKay Savas, Osman Berke Güney</i>	
AI-BASED ENERGY MODEL FOR ADAPTIVE DUTY CYCLE SCHEDULING IN WIRELESS NETWORKS.....	350
<i>Nadia Charef, Adel Ben Mnaouer, Ouns Bouachir</i>	
A GAME-THEORETICAL APPROACH FOR DATA ACQUISITION FROM FITNESS TRACKING DEVICES.....	356
<i>Natalia Khuri, Esteban Murillo Burford, Sarah Parsons, Chenqi Xu</i>	
AUTONOMOUS LEARNING INTELLIGENT VEHICLES ENGINEERING IN A PROGRAMMING LEARNING APPLICATION FOR YOUTH: ALIVE PLAY .....	362
<i>Jihene Rezgui, Félix Jobin, Simon Beaulieu, Zarine Ardekani-Djoneidi</i>	
A LIGHT NEURAL NETWORK FOR MODULATION DETECTION UNDER IMPAIRMENTS .....	368
<i>Thomas Courtat, Hélion Du Mas Des Bourboux</i>	
ENHANCED FUZZY LOGIC-BASED CLUSTER STABILITY IN VEHICULAR AD HOC NETWORK.....	375
<i>Mohamed Aissa, Badia Bouhdid, Adel Ben Mnaouer</i>	
CHARACTERISING THE IMPACT OF ANTENNA BEAMWIDTH ON THE PERFORMANCE OF VEHICLE-TO-INFRASTRUCTURE (V2I) MILLIMETRE WAVE COMMUNICATION.....	381
<i>Khalid A. Al Mallak, Manish Nair, Geoffrey Hilton, Tian H. Loh, Mark A Beach</i>	
API SECURITY IN LARGE ENTERPRISES: LEVERAGING MACHINE LEARNING FOR ANOMALY DETECTION .....	387
<i>Gaspard Baye, Fatima Hussain, Alma Oracevic, Rasheed Hussain, S. M. Ahsan Kazmi</i>	
DETECTING INSIDER ATTACKS IN BLOCKCHAIN NETWORKS .....	393
<i>Oluwaseyi Ajayi, Tarek Saadawi</i>	
PERFORMANCE EVALUATION OF ADVANCED MESSAGE QUEUING PROTOCOL (AMQP): AN EMPIRICAL ANALYSIS OF AMQP ONLINE MESSAGE BROKERS.....	400
<i>Nandeesh Basavaraju, Naveen Alexander, Jochen Seitz</i>	
DELAY-AWARE SCHEDULING SCHEME FOR UBIQUITOUS IOT APPLICATIONS IN EDGE COMPUTING.....	408
<i>Ali Alnoman</i>	
TRANSITION FROM IPV4 TO IPV6 MECHANISMS BY GNS3 EMULATION: YPTC AS A CASE STUDY .....	412
<i>Ammar Qaid, Özgür Ertug</i>	
A SYSTEMC MODEL OF THE IEEE 802.11 EDCA PROTOCOL FOR VIRTUAL PROTOTYPING .....	419
<i>Benjamin Beichler, Michael Rethfeldt, Hannes Raddatz, Lukas Steffen, Dirk Timmermann, Christian Haubelt</i>	
ENHANCED NON-ORTHOGONAL MULTIPLE ACCESS USING DATA-AWARE POWER ASSIGNMENT .....	426
<i>Hamad Yahya, Emad Alsusa, Arafat Al-Dweik</i>	

ANALYSIS OF SELF-BLOCKAGE IMPACT ON HANDOVER PROBABILITY FOR USER WITH MOBILITY IN 5G MM-WAVE CELLULAR NETWORK .....	432
<i>Abdanaser Okaf, Amamer Saied, Dongyu Qiu</i>	
AN EFFICIENT RESOURCE ALLOCATION FOR D2D COMMUNICATIONS UNDERLAYING IN HETNETS .....	437
<i>Amamer Saied, Abdanaser Okaf, Dongyu Qiu</i>	
MULTI-STEP AHEAD GRANT PREDICTION FOR DYNAMIC POWER MANAGEMENT IN CELLULAR MODEMS.....	443
<i>Peter Brand, Joachim Falk, Eduard Potwigin, Jürgen Teich</i>	
IMAGE-BASED WITH PEAK LOAD ENSEMBLE PREDICTION SYSTEM FOR DEMAND RESPONSE IN SMART GRID .....	449
<i>Jiawei Dong, Abdulsalam Yassine, Andy Armitage</i>	
EFFICIENT AND ROBUST KEYED HASH FUNCTION BASED ON ARTIFICIAL NEURAL NETWORKS.....	455
<i>Hassan Noura, Ali Chehab</i>	
A NETWORK TOMOGRAPHY APPROACH FOR ANOMALY LOCALIZATION IN SERVICE FUNCTION CHAINING .....	462
<i>Mohamed Rahali, Jean-Michel Sanner, Cao-Thanh Phan, Gerardo Rubino</i>	
DETECTING NETWORK ATTACKS EXHIBITING IRREGULAR PERIODIC BEHAVIOR .....	468
<i>Abdalmuneem Bashaiwth, Basil Assadhan</i>	
HUMAN MOBILITY BRINGS SCALABILITY TO BITTORRENT OVER MANET .....	475
<i>Eduardo Andrés-Marcelo, Elizabeth Pérez-Cortés, Adán G. Medrano-Chávez, Miguel Lopez-Guerrero</i>	
OFDM LAGS SC/FDE FOR ULTRA WIDEBAND (UWB) IN CONTEXT OF IOT.....	481
<i>Hisham Sager, Tufik M. Buzid, Masoud M. Eddaghel</i>	
CHALLENGES AND PROMISES OF 5G FOR SMART GRID TELEPROTECTION APPLICATIONS.....	486
<i>Kinan Ghanem, Stephen Ugwuanyi, Rameez Asif, James Irvine</i>	
INTEGRATED MODELING TOOL FOR INDEXING AND ANALYZING STATE MACHINE TRACE.....	493
<i>Simon Delisle, Naser Ezzati-Jivan, Michel R. Dagenais</i>	
KERNEL DENSITY ESTIMATION-BASED SAMPLING FOR NEURAL NETWORK CLASSIFICATION.....	501
<i>Firuz Kamalov, Ashraf Elnagar</i>	
ORTHOGONAL VARIANCE-BASED FEATURE SELECTION FOR INTRUSION DETECTION SYSTEMS.....	505
<i>Firuz Kamalov, Sherif Moussa, Ziad El Khatib, Adel Ben Mnaouer</i>	
REAL-TIME INTELLIGENT SPEED ADAPTATION IN HETEROGENEOUS ROAD NETWORKS.....	510
<i>Jamal Raiyn</i>	
TIME SERIES SIGNAL RECOVERY METHODS: COMPARATIVE STUDY .....	517
<i>Firuz Kamalov, Hana Sulieman</i>	



SIGMAR: ENSURING INTEGRITY AND AUTHENTICITY OF MARITIME SYSTEMS USING DIGITAL SIGNATURES.....	522
<i>Christian Hemminghaus, Jan Bauer, Konrad Wolsing</i>	
DETECTION OF DENIAL OF CHARGE (DOC) ATTACKS IN SMART GRID USING CONVOLUTIONAL NEURAL NETWORKS.....	528
<i>Ahmed Shafee, Mahmoud Nabil, Mohamed Mahmoud, Waleed Alasmary, Fathi Amsaad</i>	
A STUDY ON NATURAL LANGUAGE CHATBOT-BASED AUTHENTICATION SYSTEMS .....	535
<i>Peter Voege, Abdelkader Ouda</i>	
LIFI/WIFI AUTHENTICATION AND HANDOVER PROTOCOLS: SURVEY, EVALUATION, AND RECOMMENDATION .....	539
<i>Iman I. M. Abu Sulayman, Rongji He, Marlin Manka, Andrew Ning, Abdelkader Ouda</i>	
RF LNA WITH ACTIVE INDUCTOR LINEARIZER FOR WIRELESS COMMUNICATION .....	545
<i>Ziad El-Khatib, Firuz Kamalov, Sherif Moussa, Ahmed Algindy</i>	
A PERMISSIONED CONSENSUS ALGORITHM BASED DAGS-TO-BLOCKCHAIN IN HIERARCHICAL ARCHITECTURE FOR DECENTRALIZED INTERNET OF THINGS.....	549
<i>Istabraq M. Al-Joboury, Emad H. Al-Hemiary</i>	
NEURAL NETWORKS ARCHITECTURE FOR COVID-19 EARLY DETECTION .....	555
<i>Rita Zgheib, Ghazar Chahbandarian, Firuz Kamalov, Osman El Labban</i>	
OPENFUNCTION FOR SOFTWARE DEFINED IOT .....	561
<i>Nian Xue, Daojing Guo, Jie Zhang, Jihao Xin, Zhen Li, Xin Huang</i>	
FRACTAL-SHAPED KOCH-RING MICROSTRIP PATCH.....	569
<i>Omar Saraereh, Jeevani Jayasinghe, Aurora Andijar, Jaume Anguera</i>	
CRYPTOCURRENCY CRIME: BEHAVIORS OF MALICIOUS SMART CONTRACTS IN BLOCKCHAIN.....	574
<i>Malaw Ndiaye, Pr. Karim Konate</i>	
BLOCKCHAIN-BASED RIDE-SHARING SYSTEM WITH ACCURATE MATCHING AND PRIVACY-PRESERVATION .....	582
<i>Mahmoud M. Badr, Mohamed Baza, Sherif Abdelfattah, Mohamed Mahmoud, Waleed Alasmary</i>	
AN OPEN SOURCE TOOL TO EXTRACT TRAFFIC DATA FROM GOOGLE MAPS: LIMITATIONS AND CHALLENGES.....	590
<i>Sifatul Mostafi, Khalid Elgazzar</i>	
LIGHTWEIGHT DIAGNOSTIC-BASED SECURE FRAMEWORK FOR ELECTRONIC CONTROL UNITS IN VEHICLES .....	598
<i>Tasneem A. Awaad, M. Watheq El-Kharashi, Mohamed Taher</i>	
UTILIZING SPATIO-TEMPORAL REDUNDANCY TO MAXIMIZE THE PERFORMANCE OF VIDEO STEGANOGRAPHY: AN OCTREE APPROACH .....	603
<i>Mohammed Baziyad, Tamer Rabie, Ibrahim Kamel</i>	
LEVERAGING SDN SLICING ISOLATION FOR IMPROVED ADAPTIVE SATELLITE-5G DOWNLINK SCHEDULER.....	609
<i>Saloua Hendaoui, C. Nawel Zangarz</i>	

UNSUPERVISED TIME-SERIES BASED ANOMALY DETECTION IN ICS/SCADA NETWORKS.....	614
<i>Ali Tekeoglu, Korkut Bekiroglu, Chen-Fu Chiang, Sam Sengupta</i>	
ENERGY REDUCTION IN BUILDING ENERGY MANAGEMENT SYSTEMS USING THE INTERNET OF THINGS: SYSTEMATIC LITERATURE REVIEW .....	620
<i>Alshaimaa Al Naqbi, Sheikha Salem Alyieliely, Manar Abu Talib, Qassim Nasir, Maamar Bettayeb, Chaouki Ghenai</i>	
A LIGHTWEIGHT DISTRIBUTED DATABASE MANAGEMENT IN WSN.....	627
<i>Shereen Ismail, Eman Alkhader, Aydan Gasimova, Hassan Reza</i>	
BAAS ARCHITECTURE FOR DAPPS AND APPLICATION FOR VETERINARY MEDICINE CASE STUDY IN IRELAND.....	632
<i>Kosala Yapa Bandara, John Breslin</i>	
EFFICIENT PROBABILISTIC PACKET MARKING FOR AS TRACEBACK .....	638
<i>Abdullah Yasin Nur</i>	
ANALYSIS OF AUTONOMOUS SYSTEM LEVEL INTERNET TOPOLOGY GRAPHS AND MULTIGRAPHS.....	644
<i>Abdullah Yasin Nur</i>	
A FOG-BASED REPUTATION EVALUATION MODEL FOR VANETS.....	651
<i>Rasha Jamal Atwa, Paola Flocchini, Amiya Nayak</i>	
ON SECRECY PERFORMANCE OF MULTIUSER FSO NETWORKS WITH OPPORTUNISTIC USER SCHEDULING .....	658
<i>Wafaa Mohammed Ridha Shakir</i>	
TUNING OF DEEP NEURAL NETWORKS FOR OVER-THE-AIR LINEARIZATION OF HIGHLY NONLINEAR WIDE-BAND ACTIVE PHASED ARRAYS .....	664
<i>Feridoon Jalili, Yufeng Zhang, Felice Francesco Tafuri, Ole Kiel Jensen, Yunfeng Li, Qingyue Chen, Ming Shen, Gert F. Pedersen</i>	
DESIGN OF A JOINT ALAMOUTI-MIMO AND WAVELET PACKET MODULATION SYSTEM.....	668
<i>Bradley Comar, R. Scott Frazier</i>	
DECODING AND EQUALIZATION IN A JOINT ALAMOUTI-WPM SYSTEM .....	676
<i>Bradley Comar</i>	
A REAL-TIME MOBILE APPLICATION FOR CATTLE TRACKING USING VIDEO CAPTURED FROM A DRONE .....	684
<i>Chuyang Liu, Zihao Jian, Minshan Xie, Irene Cheng</i>	
CHANNEL ESTIMATION AND BEAMFORMING TECHNIQUES FOR MM WAVE-MASSIVE MIMO: RECENT TRENDS, CHALLENGES AND OPEN ISSUES .....	690
<i>Tewelgn Kebede, Yihenew Wondie, Johannes Steinbrunn</i>	
LLR METRICS FOR 1024-QAM SOFT-DECISION: IMPLEMENTATION IN IEEE 802.11AX (WI-FI 6) .....	698
<i>Roger Pierre Fabris Hoefel</i>	
MOBILITY AWARE EDGE COMPUTING SEGMENTATION TOWARDS LOCALIZED ORCHESTRATION.....	704
<i>Sam Aleyadeh, Abdallah Moubayed, Abdallah Shami</i>	

DEVELOPING COMPUTER APPLICATIONS WITHOUT ANY OS OR KERNEL IN A MULTI-CORE ARCHITECTURE .....	710
<i>Navid Ordouie, Nirmala Soundararajan, Ramesh Karne, Alexander L. Wijesinha</i>	
IMPLEMENTATION AND ANALYSIS OF THE AODVV2 ROUTING PROTOCOL IN ARM DEVICES .....	718
<i>Enrica Zola, Israel Martin-Escalona, Francisco Barceló-Arroyo, Sergio Machado</i>	
GEOSPATIAL GUIDANCE OF UNMANNED AERIAL VEHICLES AROUND NO-FLY-ZONES BY GLOBAL POSITIONING SYSTEM SPOOFING .....	724
<i>Philipp Ortner, Raphael Steinhöfler, Patrick Hödl, Erich Leitgeb, Holger Flühr</i>	
DETECTING ELECTRICITY THEFT CYBER-ATTACKS IN CAT AMI SYSTEM USING MACHINE LEARNING .....	731
<i>Mohamed I. Ibrahem, Sherif Abdelfattah, Mohamed Mahmoud, Waleed Alasmary</i>	
A COMPARATIVE STUDY ON THE VARIANTS OF R METRIC FOR NETWORK ROBUSTNESS .....	737
<i>Balume Mburano, Weisheng Si, Wei Xing Zheng</i>	
INSTAGRAM FORENSIC ANALYSIS REVISITED: DOES ANYTHING REALLY VANISH? .....	743
<i>Shreya Tarur Kumar, Umit Karabiyik</i>	
CRC AIDED SHORT-CYCLE FREE BP DECODING FOR POLAR CODES .....	749
<i>Ahmet Serdar Tan, Onur Sahin, Sungkwon Hong</i>	
REMOVING SEASONAL EFFECT ON CITY BASED DAILY ELECTRICITY LOAD FORECASTING WITH LINEAR REGRESSION .....	755
<i>Shanga Kareem, Mustafa Akpınar</i>	
AUTONOMIC ARCHITECTURAL FRAMEWORK FOR INTERNET OF BRAIN CONTROLLED THINGS (IOBCT) .....	761
<i>Haider Khaleel Raad, Farah Fargo, Olivier Franza</i>	
ADAPTIVE KPCA FOR OUTLIER DETECTION IN WIRELESS SENSOR NETWORKS: WATER PIPELINE CASE .....	765
<i>Oussama Ghorbel, Rami Ayadi, Ahmed Sulaiman Alanazi, Rayen Alanazi, Raed N. Alabdali, Mohamed Abid</i>	
LAYER 3 FORWARDER APPLICATION - IMPLEMENTATION EXPERIMENTS BASED ON RYU SDN CONTROLLER .....	770
<i>Pantelimon-Teodor Tivig, Eugen Borcoci, Alexandru Brumaru, Andra-Isabela-Elena Ciobanu</i>	
TOWARD EFFICIENT AND ROBUST DEEP LEARNING-BASED MALWARE DETECTION IN FOG COMPUTING .....	776
<i>Danila Morozovskii, Krunal Thummar, Talal Halabi, Sheela Ramanna</i>	
5G BASE STATION DEPLOYMENT REVIEW FOR RF RADIATION .....	782
<i>Mohammed S. Elbasheir, Rashid A. Saeed, Salaheldin Edam</i>	
VOICE CONTROLLED ULTRAVIOLET STERILIZATION ROBOT FOR DISINFECTION WITH MONITORING FEATURES .....	787
<i>Argen Mary Arceño, Michael Buenviaje, Mave Rick Credo, Ronn Joaquin Cuenco, Rollison Joshua Tabuyan, Carlos Sison, Thaddeo Garcia, Antonio Tee</i>	
UTILITY-BASED SCHEDULING SOLUTION FOR SCIENTIFIC WORKFLOW ON CLOUD .....	793
<i>Alaa Albtoush, Noor Maizura Mohamad Noor, Farizah Yunus</i>	

PALM TREES DETECTION USING THE INTEGRATION BETWEEN GIS AND DEEP LEARNING.....	799
<i>E. A. Alburshaid, M. A. Mangoud</i>	
COMBINED INTERFERENCE AND COMMUNICATIONS STRATEGY EVALUATION AS A DEFENSE MECHANISM IN TYPICAL COGNITIVE RADIO MILITARY NETWORKS.....	805
<i>Marcelo Camilo, David Moura, Ronaldo Salles</i>	
EVALUATION OF A NEW RADIO TECHNOLOGY AND VISIBLE LIGHT COMMUNICATION FOR A PLATOONING APPLICATION .....	813
<i>Fouzi Boukhalfa, Mohamed Hadded, Paul Muhlethaler, Oyunchimeg Shagdar</i>	
TRAINING SEQUENCE DESIGN FOR BURST MODE SINGLE SIDE BAND CPM SYNCHRONIZATION .....	820
<i>Karim Kassan, Haïfa Farès, Yves Louët, Christian Glattli</i>	
GENERATING A PUF FINGERPRINT FROM AN ON-CHIP RESISTIVE LADDER DAC AND ADC .....	825
<i>Christian Zajc, Markus Haberler, Gerald Holweg, Christian Steger</i>	
INTERPRETABLE MACHINE LEARNING: A CASE STUDY OF HEALTHCARE .....	832
<i>Feyza Yildirim Okay, Mustafa Yildirim, Suat Özdemir</i>	
A NOVEL LOW-LATENCY AND COST-EFFECTIVE COMMUNICATION PROTOCOL DESIGN FOR INTERNET OF FLYING THINGS .....	838
<i>Burak Han Çorak, Ibrahim Kök, Suat Özdemir</i>	
REAL-TIME AIRCRAFT TRACKING SYSTEM: A SURVEY AND A DEEP LEARNING BASED MODEL.....	844
<i>Muhammed Emir Çakici, Feyza Yildirim Okay, Suat Özdemir</i>	
NOVEL TECHNIQUE IN 4G HANDOVER PARAMETER TUNING AND PREDICTION USING STATISTICAL TREND ANALYSIS AND SUPERVISED MACHINE LEARNING .....	850
<i>Tarek Elmahdy, Ahmed F. Bendary</i>	
PUNCTUAL CLOUD: UNBINDING REAL-TIME APPLICATIONS FROM CLOUD-INDUCED DELAYS .....	855
<i>Haorui Peng, William Tärneberg, Emma Fitzgerald, Maria Kihl</i>	
ADAPTIVE LEARNING ON FOG-CLOUD COLLABORATIVE ARCHITECTURE FOR STREAM DATA PROCESSING .....	863
<i>Nawaf Abdulla, Mehmet Demirci, Suat Özdemir</i>	
ENHANCED SECURITY LEVEL FOR SENSITIVE MEDICAL DATA TRANSMITTED THROUGH VISIBLE LIGHT .....	869
<i>Simona Riurean, Monica Leba, Lilia Crivoi</i>	
REMOTE CONTROL OF SOLENOID VALVES USING RS485 AND LIFI TECHNOLOGY .....	875
<i>Michael Windisch, Olimpiu Stoicuta, Monica Leba, Simona Riurean</i>	
JOINT POWER ALLOCATION AND ANTENNA SELECTION FOR NETWORK SUM-RATE MAXIMIZATION IN CLUSTERED DOWNLINK NOMA NETWORKS.....	881
<i>Mohammed W. Baidas, Ahmed M. Abdelghaffar, Emad Alsusa</i>	

HYBRID PRECODER DESIGN FOR MMWAVE MASSIVE MIMO SYSTEMS WITH PARTIALLY CONNECTED ARCHITECTURE.....	888
<i>Ahmed Osama, Mahmoud Elsaadany, Shoukry I. Shams, A. M. Aly Omar, Usama S. Mohammed, Ghyslain Gagnon</i>	
PERFORMANCE OF TIME AND FREQUENCY APPROACHES FOR SYNCHRONIZATION TRACKING IN 5G NR SYSTEMS.....	894
<i>Abdelmohsen Ali, Mahmoud Elsaadany, Ghyslain Gagnon</i>	
COMPARISON OF MEDIA SOURCES FOR COVID-19 BY MACHINE LEARNING SENTIMENT ANALYSIS.....	900
<i>Andrew Tao, Kevin Qi, Daniel Che, Mikhail Shalaginov, Tingying Helen Zeng</i>	
PERFORMANCE OF NOMA WITH MASSIVE MIMO FOR 5G.....	904
<i>Mário Marques Da Silva, Rui Dinis</i>	
RESEARCH OF THE MODULAR OPERATIONAL PERFORMANCE ANALYSIS FOR CONSORTIUM BLOCKCHAIN.....	909
<i>Yean-Fu Wen, Chen-Min Hsu</i>	
EVALUATION AND OPTIMIZATION OF LEARNING-BASED DNS OVER HTTPS TRAFFIC CLASSIFICATION.....	915
<i>Yue Li, Abdulhalim Dandoush, Ji Liu</i>	
AN EXPERIMENTAL INTER-SLICE RAN CONTROLLER FOR 4G/5G CELLULAR NETWORKS.....	921
<i>Ayman Maghrabi, Wibowo Hardjawana, Phee Lep Yeoh, Branka Vucetic</i>	
ARCHITECTURE DEFINITION FOR A MULTI-UTILITY MANAGEMENT PLATFORM .....	927
<i>R. Carlucci, A. Di Iorio, P. Fokaides, A. Ioannou, M. Luglio, M. Quadrini, C. Roseti, F. Zampognaro</i>	
A BLUETOOTH-BASED CONTACT-TRACING MOBILE APP FOR AIRBORNE-BASED EPIDEMIC CONTROL .....	933
<i>Manjul Shrestha, Xingya Liu, Moushmi Sreekanthan</i>	
ENERGY MINIMIZED FEDERATED FOG COMPUTING OVER PASSIVE OPTICAL NETWORKS.....	938
<i>Abdullah M. Alqahtani, Barzan Yosuf, Sanaa H. Mohamed, Taisir E. H. El-Gorashi, Jaafar M. H. Elmirghani</i>	
SIP-GAN: GENERATIVE ADVERSARIAL NETWORKS FOR SIP TRAFFIC GENERATION.....	944
<i>Amar Meddahi, Hassen Drira, Ahmed Meddahi</i>	
AI BASED 5G RAN PLANNING .....	950
<i>Siddhartha Shakya, Ashraf Roushdy, Himadri Sikhar Khargharia, Asad Musa, Amr Omar</i>	
QUADRATIC DETECTION-BASED MILLIMETER-WAVE MMIC FOR WIRELESS COMMUNICATION AND LOCALIZATION .....	956
<i>Christophe Loyez, Michael Bocquet, Kamel Haddadi</i>	
SELF-ADAPTIVE TRUST MANAGEMENT MODEL FOR SOCIAL IOT SERVICES.....	961
<i>Rihab Abidi, Nadia Ben Azzouna</i>	

THREATS, CRIMES AND ISSUES OF PRIVACY OF USERS' INFORMATION SHARED ON ONLINE SOCIAL NETWORKS.....	968
<i>Shahad Alotaibi, Khadijah Alharbi, Huda Alwabli, Hanan Aljoaey, Balsam Abaalkhail, Salim El Khediri</i>	
VOTE AND KNN OUTLIER DETECTION IN WIRELESS SENSOR NETWORKS.....	976
<i>Aymen Abid, Salim El Khediri, Tarek Moulahi, Rym Cheour, Abdennaceur Kachouri</i>	
A NOVEL REALISTIC DATASET FOR INTRUSION DETECTION IN IOT BASED ON MACHINE LEARNING.....	982
<i>Walid Dhifallah, Mounira Tarhouni, Tarek Moulahi, Salah Zidi</i>	
DEEP LEARNING AND AUGMENTED REALITY FOR IOT-BASED AIR QUALITY MONITORING AND PREDICTION SYSTEM.....	988
<i>M. Saifeddine Hadj Sassi, Lamia Chaari Fourati</i>	
A CONVOY OF GROUND MOBILE VEHICLES PROTECTION USING COOPERATIVE UAVS-BASED SYSTEM.....	994
<i>Aicha Idriss Hentati, Lamia Chaari Fourati</i>	
NOVEL MIND CONTROLLER TO ASSESS STUDENT CONCENTRATION WITH CONNECTED VEHICLES: ALIVE MIND.....	1000
<i>Jihene Rezgui, Enric Soldevila, Younes Kechout</i>	
USING VARIATIONAL AUTOENCODERS TO INCREASE THE PERFORMANCE OF MALWARE CLASSIFICATION.....	1006
<i>Thomas Taylor, Amna Eleyan</i>	

**Author Index**