Organizers:

- ENSIAS College of engineering (Mohammed V University in Rabat)

- Association of Research and Innovation in Science and Technology (ARINST).

Sponsors and partners:

- FST Settat, Hassan I University, Morocco

- IEEE Morocco Section.

- Mohammed V University in Rabat.

- Centre National pour la Recherche Scientifique et Technique (CNRST)

About

The 2nd International Conference on Advanced Communication Technologies and Networking (CommNet'19) is a forum for scientists, engineers, and practitioners to present their latest research results, ideas, developments, and applications in all areas of advanced communication systems and networking.

CommNet'19 will be held on April 12-14, 2019 in Rabat, Morocco. CommNet'19 will be held right before WCNC 2019, which will be organized on April 15-18, 2019 in Marrakech, Morocco. Transportations to Marrakech after the conference are offered for participants wishing to attend IEEE WCNC 2019.

Friday April 12th, 2019	
08:00-09:00	**Registration**
09:00-09:30	**Opening Ceremony**
09:30-10:10	**Plenary Speaker 1:** Pr. Lajos Hanzo, University of Southampton, UK **Title: ”*The Myths, Realities and Future of Machine Learning Aided wireless*”** **Session Chair**: Pr. Mohammed Essaaidi, ENSIAS, Mohammed V University, Morocco
10:10-10:30	**Coffee break**
10:30-11:45	**Technical Sessions**

	Session I *PHY & Performance Analysis 1* *Session Chair:* Pr. Julian Cheng, University of British Columbia (UBC), Canada.	*Session II* *Networking & Cloud 1* *Session Chair:* Pr. Abdellatif Kobbane, ENSIAS, Mohammed V University in Rabat, Morocco

11:45-12:15	**Keynote Speaker 1:** Pr. Basem Shihada, KAUST, KSA **Title: ”*IoT: a Journey from Wireless Sensor Devices to Data Centers*”** *Session Chair:* Pr. Julian Cheng, University of British Columbia (UBC), Canada.
12:30-14:30	**Lunch**
14:30-15:00	**Keynote speaker 2:** Pr. Marco Di Renzo, Paris- Saclay University/ CNRS, France **Title: “*Smart Radio Environments and Environmental AI - Wireless Networks Design in the Era of Deep Learning: Model-Based, AI-Based, or Both?”*** • *Session Chair:* Pr. Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland.
15:00-16:00	**Technical Sessions**

	Session III *Smart Applications 1* *Session Chair:* Pr. Zhiguo Ding, University of Manchester, UK	*Session IV* *Cryptology & Security 1* *Session Chair:* Pr. Hassan El Ghazi, INPT, Rabat Morocco.

16:00-19:30	**City Visit**
Saturday April 13th, 2019	
08:00-08:30	**Registration**
08:30-09:10	**Plenary Speaker 2:** Pr. Murat Uysal, Özyeğin University, Turkey **Title: ”*Visible Light Communications:* *From Theory to Industrial Standardization*”** *Session Chair:* Pr. Sami Muhaidat, Khalifa University, UAE
09:10-10:25	**Technical Sessions**

09:10-10:25	*Session V* *PHY & Performance Analysis 2* • *Session Chair:* Pr. Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland.	*Session VI* *Networking & Cloud 2* *Session Chair:* Pr. Sami Muhaidat, Khalifa University, UAE

10:25-10:45	**Coffee Break**

10:45-12:00	Technical Sessions	
	Session VII ***PHY & Performance Analysis 3*** <u>*Session Chair:*</u> Pr. Mohamed Chergui, CRMEF, Kenitra, Morocco	*Session VIII* ***Cryptology & Security 2*** <u>*Session Chair:*</u> Pr. Hussain Ben-Azza, Moulay Ismail University, Meknes.
12:00-12:30	**Keynote Speaker 3:** Pr. Sami Muhaidat, Khalifa University, UAE <u>**Title:**</u> ”*Opportunistic Ambient Backscatter Communications in RF-Powered Cognitive Radio Networks*” <u>*Session Chair:*</u> Pr. Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland.	
12:30-14:30	**Lunch**	
14:30-15:00	**Keynote Speaker 4:** Pr. Zhiguo Ding, University of Manchester, UK <u>**Title:**</u> ”*Embracing Non-Orthogonal Multiple Access in Future Wireless Networks*” <u>*Session Chair:*</u> Pr. Badr Abou El Majd, Mohammed V University in Rabat, Morocco.	
15:00-16:15	*Session IX* ***Smart Applications 2*** <u>*Session Chair:*</u> Pr. Fouad Ayoub, CRMEF, Kenitra, Morocco.	
16:15-16:35	**Coffee break**	
16:35-17:05	**Keynote Speaker 5:** Pr. Julian Cheng, University of British Columbia (UBC), Canada <u>**Title:**</u> ”*80 Years of Research on Sum of Lognormal Random Variables: Recent Breakthroughs and Applications in Wireless Communications*” <u>*Session Chair:*</u> Pr. Zhiguo Ding, University of Manchester, UK	
19:30-21:30	**Gala Dinner**	

Sunday April 14th, 2019	
08:00-09:00	**Registration**
09:00-09:40	**Plenary Speaker 3:** Pr. Robert Schober, Friedrich Alexander University, Germany *Session Chair:* Pr. Mohamed-Slim Alouini, KAUST, KSA <u>**Title:**</u>”*Synthetic Molecular Communication: Fundamentals, Opportunities, and Challenges*”
09:40-10:00	**Coffee break**
10:00-11:30	**Tutorial 1:** Pr. Mohamed-Slim Alouini, KAUST, KSA <u>**Title:**</u> ”*Optical Wireless Communication: Fundamental Limits, New Advances and Future Perspectives*”
11:30-12:00	**Closing Ceremony**
12:00-13:00	**Lunch**
13:00	**Travel to Marrakech**

Detailed program
Friday April 12th, 2019

Registration - (08:00-09:00)

Opening Ceremony - (09:00-09:30)

Plenary Speaker 1- (09:30-10:10)
- <u>**Speaker**</u>: Professor Lajos Hanzo, University of Southampton, UK
- <u>**Title:**</u> "*The Myths, Realities and Future of Machine Learning Aided wireless*"
- <u>**Session Chair**</u>: Professor Mohammed Essaaidi, ENSIAS, Mohammed V University in Rabat, Morocco.

Coffee Break- (10:10-10:30)

Session I- (10:30-11:45): PHY & Performance analysis 1
- <u>**Session Chair**</u>: Pr. Julian Cheng, University of British Columbia (UBC), Canada.

1570507830: "**Physical-Layer Security over Generalized SIMO Multipath Fading Channels**", Jules M. Moualeu, University of the Witwatersrand, South Africa, Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland, Daniel Benevides da Costa, Federal University of Ceará, Brazil, Walaa Hamouda, Concordia University, Canada, Ugo Dias, University of Brasilia, Brazil, Sami Muhaidat, Khalifa University, UAE

1570531874: "**Physical Layer Security of an Amplify-and-Forward Energy Harvesting-based mixed RF/UOW System**", Elmehdi Illi, ENSIAS, Mohammed V University in Rabat, Morocco, Faissal El Bouanani, ENSIAS, Mohammed V University in Rabat, Morocco, Fouad Ayoub, CRMEF Kenitra, Morocco.

1570526146: "**On the Secrecy Analysis of Dual-Hop Underlay Multi-Source CRNs with Multi-Eavesdroppers and a Multi-Antenna Destination**", Mounia Bouabdellah, ENSIAS, Mohammed V University in Rabat, Morocco, Faissal El Bouanani, ENSIAS, Mohammed V University in Rabat, Morocco, Daniel Benevides da Costa, Federal University of Ceará, Brazil, Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland, Hussain Ben-azza, ENSAM-Meknes, Morocco, Kahtan Mezher and Sami Muhaidat, Khalifa University, UAE.

1570528890: "**An Importance Sampling Method for Monte-Carlo Integration Model for Ultraviolet Communication**", Renzhi Yuan, University of British Columbia, Canada, Jianshe Ma, Ping Su and Yuhan Dong, Tsinghua University, P.R. China, Julian Cheng, University of British Columbia, Canada.

1570516582: "**Adaptive Self-Interference Cancellation for Full Duplex Systems with Auxiliary Receiver**", Maggie Shammaa, German University in Cairo, Egypt, Hendrik Vogt, Ruhr University Bochum, Germany, Ahmed E. El-Mahdy, German University in Cairo, Egypt, Aydin Sezgin, Ruhr University Bochum, Germany.

Session II (Room 2) - (10:30-11:45): Networking & Cloud 1
- <u>**Session Chair**</u>: Pr. Abdellatif Kobbane, ENSIAS, Mohammed V University in Rabat, Morocco.

1570516425: "**Network Traffic Monitoring and Analysis using Packet Sniffer**", Apri Siswanto, Abdul Syukur, Evizal Abdul Kadir, Suratin, Islamic University of Riau, Indonesia

1570516499: "**Smart Sensor Node of WSNs for River Water Pollution Monitoring System**", Evizal Abdul Kadir, Apri Siswanto, Sri Listia Rosa and Abdul Syukur, Islamic University of Riau, Indonesia, Hitoshi Irie, Chiba University, Japan, Mohmod Othman, University of Technology, PETRONAS, Malaysia.

1570527538: "**Routing-Plan duplicator: A reliable assistant for safe and seamless migration toward SDN**", Madjed Bencheikh Lehocine and Salim Djaaboub, Mila University Center, Algeria, Mohamed Batouche, Princess Nourah University, Riyadh, Saudi Arabia

1570527242: "**Towards a Clustering-Based Approach to Speed up IaaS Services Discovery Process**", Driss Riane and Ahmed Ettalbi, Mohammed V University in Rabat, Morocco.

Keynote Speaker 1- (11:45-12:15)
- **Speaker:** Pr. Basem Shihada, KAUST, KSA
- <u>**Title:**</u> *"IoT: a Journey from Wireless Sensor Devices to Data Centers"*
- <u>*Session Chair:*</u> Pr. Julian Cheng, University of British Columbia (UBC), Canada.

Lunch- (12:30-14:30)

Keynote Speaker 2- (14:30-15:00)
- **Speaker:** Pr. Marco Di Renzo, Paris- Saclay University/ CNRS, France.
- <u>**Title:**</u> *" Smart Radio Environments and Environmental AI - Wireless Networks Design in the Era of Deep Learning: Model-Based, AI-Based, or Both?"*
- <u>*Session Chair:*</u> Pr. Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland.

Session III (Room 1) -(15:00-16:00): Smart Applications 1
- <u>**Session Chair**</u>: Pr. Zhiguo Ding, University of Manchester, UK

1570516676: "**A High Capacity Geometrical Domain Based 3D Image Steganography Scheme**", Sara Farrag and Wassim Alexan, German University in Cairo, Egypt.
1570516681: "**Secure 2D Image Steganography Using Recamán's Sequence**", Sara Farrag and Wassim Alexan, German University in Cairo, Egypt
1570531011: "**GIS Based Fuzzy Analytic Hierarchy Process for wind Energy Sites Selection",** Fatma Elmahmoudi, Oum Elkheir Abra, Abdelhadi Raihani, and Lhousine Bahatti, University Hassan 2, Casablanca, Morocco, Ouafae Serrar, Mohammed V University, Rabat, Morocco, Mohamed Rafik, University Hassan 2, Casablanca, Morocco.
1570527185: "**Performance Analysis of a Smart Street Lighting application using LoRaWan**", Yaye Sarr, University of Thiès, Senegal, Bamba Gueye, Université Cheikh Anta Diop de Dakar, Senegal, Cheikh Sarr, University of Thies, Senegal.

Session IV (Room 2) - (15:00-16:00): Cryptology & Security 1
- <u>**Session Chair**</u>: Pr. Hassan El Ghazi, INPT, Rabat, Morocco.

1570531570: "**Analysis of Identity Management Systems Using Blockchain Technology**", Samia El Haddouti, Mohamed V University, ENSIAS, Morocco, Mohamed Dafir Ech-Cherif El Kettani, Mohammed V University in Rabat, Morocco.
1570530349: "**Improve R2L Attack Detection using Trimmed PCA**", Zyad Elkhadir, Taha Archi, and Mohammed Benattou, Ibn Tofail University, Morocco.
1570530556: "**An access authentication algorithm based on a hierarchical identity-based signature over lattice for the space-ground integrated network**", Zhuo Yi, Xuehui Du, Ying Liao and Xin Lu, Information Engineering University, P.R. China.
1570530876: "**Managing Security Policies within Cloud Environments Using Aspect-Oriented State Machines**", Meryeme Ayache, University Mohammed V, ENSIAS, Morocco, Ahmed Khoumsi, University of Sherbrooke, Canada, Mohammed Erradi, ENSIAS: Ecole Nationale Supérieure d'Informatique et d'Analyse des Systèmes, Morocco.

City Visit - (16:00-19:30)

Saturday April 13th, 2019

Registration - (08:00-08:30)

Plenary Speaker 2- (08:30-09:10)
- *Speaker*: Pr. Murat Uysal, Özyeğin University, Turkey
- **Title:** ”*Visible Light Communications:From Theory to Industrial Standardization*”
- *Session Chair:* Pr. Sami Muhaidat, Khalifa University, UAE

Session V (Room 1) - (09:10-10:25): PHY & Performance analysis 2
- **Session Chair**: Pr. Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland.

Invited Paper: "**Superior Selective Reporting-based Spectrum Sensing in Energy Harvesting-Aided HCRNs**", Rajalekshmi Kishore, Khalifa University, UAE, Sanjeev Gurugopinath, PES University, Bangalore, Sami Muhaidat, Khalifa University, UAE, Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland, Kahtan Mazher, Khalifa University, UAE, Octavia A. Dobre, Memorial University of Newfoundland, Canada, and Naofal Al-Dhahir, UT Dallas, USA.

1570536920: "**On the Physical Layer Security of a Regenerative Relay-Based mixed RF/UOWC**", Elmehdi Illi, ENSIAS, Mohammed V University in Rabat, Morocco, Faissal El Bouanani, ENSIAS, Mohammed V University in Rabat, Morocco, Daniel Benevides da Costa, Federal University of Ceará, Brazil, Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland, Fouad Ayoub, CRMEF Kenitra, Morocco, Kahtan Mezher and Sami Muhaidat, Khalifa University, UAE.

1570531239: "**Performance Improvement of White LED-based VLC Systems using Blue and Flattening Filters**", Sezer Can Tokgoz and Noha Anous, Texas A&M University at Qatar, Qatar, Serhan Yarkan, Istanbul Commerce University, Turkey, Diaa Khalil, Faculty of Engineering, Ain Shams University, Cairo, Egypt, Khalid A. Qaraqe, Texas A&M University at Qatar, Qatar.

1570531197:"**H.264/AVC Video Transmission over UWB AV PHY IEEE 802.15.3c using UEP and Adaptive Modulation Techniques**", Asma Ben Abdallah, University of Carthage, Tunisia & CNAM, Paris, France, Amin Zribi, University of Carthage, Tunisia & National Engineering School of Tunis, Tunisia, Ali Dziri, CNAM, Paris, France, Fethi Tlili, of Carthage, Tunisia and Michel Terré, CNAM, Paris, France.

1570533291: "**Achievable Ergodic Capacity under F Composite Fading Conditions**", Paschalis C. Sofotasios, University, UAE & Tampere University, Seong Ki Yoo and Simon L. Cotton, Queen's University, Belfast, UK, Sami Muhaidat, Khalifa University, UAE, F. Javier Lopez-Martinez, Juan M. Romero-Jerez, University of Málaga, Spain, Kahtan Mezher, Khalifa University, UAE, and George K. Karagiannidis, Aristotle University of Thessaloniki.

Session VI (Room 2) - (09:10-10:25): Networking & Cloud 2
- **Session Chair**: Pr. Sami Muhaidat, Khalifa University, UAE

1570529434: "**Automated trust negotiation for Cloud applications in Identity-as-a-Service**", Tri Hoang Vo, Deutsche Telekom, Germany, Woldemar Fuhrmann, University of Applied Sciences Darmstadt, Germany, Klaus-Peter Fischer-Hellmann, Digamma GmbH, Germany, Steven Furnell, University of Plymouth, United Kingdom.

1570530619: "**A Clever Approach to Develop an Efficient Deep Neural Network Based IDS for Cloud Environments Using a Self-Adaptive Genetic Algorithm**", Zouhair Chiba, LIMDAS Labs, Faculty of Sciences Ain Chock, Hassan II University of Casablanca Casablanca, Morocco, Noreddine Abghour, Khalid Moussaid, Amina El omri and Mohamed Rida, LIMDAS Labs, Faculty of Sciences Ain Chock, Hassan II University of Casablanca, Morocco.

1570531044: "**Software Defined Networking for Energy efficient Wireless Sensor Network**", Mohamed Saad Azizi, EST Moulay-Ismail University Meknes, Morocco, Moulay Lahcen Hasnaoui, Université Moulay Ismail, Meknès, Ecole Supérieure de Technologie, Meknès, Morocco.

1570531903: "**MPBRP- Mobility Prediction Based Routing Protocol in VANETs**", Mao Ye, Lin Guan and Mohammed Quddus, Loughborough University, United Kingdom.

1570530319: "**A Meter Band Rate mechanism to improve the native QoS capability of OpenFlow and OpenDaylight**", Maohmed Al Breiki, Suiping Zho, Yuan Roger Luo, Middlesex University, London, UK.

Coffee break - (10:25-10:45)

Session VII (Room 1) -(10:45-12:00): PHY & Performance analysis 3
- **Session Chair**: Pr. Mohamed Chergui, CRMEF, Kenitra, Morocco

1570530386: "**PAPR reduction in MIMO-OFDM based on polar codes and companding technique**", Brahim Bakkas, Moulay Ismail University, Meknes, Morocco, Idriss Chana, EST, Moulay Ismail University, Meknes, Morocco, Hussain Ben-Azza, ENSAM-Meknes, Morocco.

1570530817: "**Receiver Design for Dual-Mode Index Modulation Aided OFDM**", Yusuf Acar, Istanbul Kultur University, Turkey, Sultan Aldirmaz Colak, Kocaeli University, Turkey.

1570516759: "**BER Analysis in Relay-Based DF Cooperative Diversity Systems over Rayleigh Fading Channels with Non-Identical Interferers near the Destination**", Mamoun F. Al-Mistarihi and Rami Mohaisen, Jordan University of Science and Technology, Jordan, Khalid A. Darabkh, The University of Jordan, Jordan.

1570533294: "**Achievable Fixed Rate in Emerging Wireless Systems**", Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland , Seong Ki Yoo and Simon L. Cotton, Queens University, Belfast, UK, Sami Muhaidat, Khalifa University, UAE, F. Javier Lopez-Martinez and Juan M. Romero-Jerez, University of Málaga, Spain, Kahtan Mezher, Khalifa University, UAE, and George K. Karagiannidis, Aristotle University of Thessaloniki

1570533296: "**Modulation Schemes for Visible Light Communications**", Amna AlJaberi, Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland, and Sami Muhaidat, Khalifa University, UAE

Session VIII (Room 2) -(10:45-12:00): Cryptology & Security 2
- **Session Chair**: Pr. Hussain Ben-Azza, Moulay Ismail University, Meknes.

1570493138: "**Substitution Box Design Based on Chaotic Maps and Cuckoo Search Algorithm**", Tanveer Akhtar, Iqra National University Peshawar, Pakistan, Nizamud Din, University of Chitral, Pakistan, Jamal Uddin, Qurtaba University of Science IT, Pakistan.

1570531028: "**Towards a distributed token based payment system using blockchain technology**", Mouad Zouina, ENSIAS, Mohammed V University, Morocco, Benaceur Outtaj, FSJES Souissi, Mohammed V University, Rabat, Morocco.

1570530551: "**Double-Layer Image Security Scheme With Aggregated Mathematical Sequences** ", Marwa Tarek Elkandouz, GUC, Egypt, Wassim Alexan and Hisham Hussein, German University in Cairo, Egypt.

1570523603: "**Packet Scheduling in 4G and Beyond Networks Using Cross-Layer Design Approach**", Wisani Salani, Gbolahan Aiyetoro, and Fambirai Takawira, University of the Witwatersrand, Johannesburg, South Africa

---

Keynote Speaker 3- (12:00-12:30)
- *Speaker*: Pr. Sami Muhaidat, Khalifa University, UAE
- **Title:** "*Opportunistic Ambient Backscatter Communications in RF-Powered Cognitive Radio Networks*"
- *Session Chair:* Pr. Paschalis C. Sofotasios, Khalifa University, UAE & Tampere University, Finland.

Lunch - (12:30-14:30)

Keynote Speaker 4- (14:30-15:00)
- *Speaker*: Pr. Zhiguo Ding, University of Manchester, UK
- **Title:** "*Embracing Non-Orthogonal Multiple Access in Future Wireless Networks*"
- *Session Chair:* Pr. Badr Abou El Majd, Mohammed V University in Rabat, Morocco.

Session IX (Room 1) -(15:00-16:15): Smart Applications 2
- **Session Chair**: Pr Fouad Ayoub, CRMEF, Kenitra, Morocco.

1570533336: "**Maximal Codes for Finite Chain Rings**", Sabiri Mohammed, Moulay Ismail University, Morocco.
1570529102: "O**ptimal Decision on Placement of an Auxiliary Aerial Wireless Base Station Using the Artificial Bee Colony Algorithm**", Ashraf Tahat, Talal Edwan, Dana Mbaideen, Nada Murrar, Ola Qutob and Leen Ayman, Princess Sumaya University for Technology, Amman, Jordan.
1570531030: "**An improved Multi-objective Finite Control Set Model Predictive Control for Grid Connected Three-level Neutral-Point Clamped Inverter**", Abdiddaim Katkout and Ahmed Essadki, Mohammed V University, ENSET Rabat, Morocco, Tamou Nasser, ENSIAS, Mohammed V University, Rabat, Morocco.
1570530477: "**Triple-Layer Image Security Using a Zigzag Embedding Pattern**", Sara Farrag, Wassim Alexan and Hisham Hussein, German University in Cairo, Egypt

Coffee break - (16:15-16:35)

Keynote Speaker 5- (16:35-17:05)
- *Speaker*: Pr. Julian Cheng, University of British Columbia (UBC), Canada
- <u>Title:</u> "*80 Years of Research on Sum of Lognormal Random Variables: Recent Breakthroughs and Applications in Wireless Communications*"
- *Session Chair:* Pr. Zhiguo Ding, University of Manchester, UK.

Gala Dinner - (19:30-21:30)

Sunday April 14th, 2019

Registration - (08:00-09:00)

Plenary Speaker 3- (09:00-09:40)
- *Speaker*: Pr. Robert Schober, Friedrich Alexander University, Germany.
- <u>Title:</u> "*Synthetic Molecular Communication: Fundamentals, Opportunities, and Challenges*"
- *Session Chair:* Pr. Mohamed-Slim Alouini, KAUST, KSA.

Coffee break - (09:40-10:00)

Tutorial- (10:00-11:30)
- *Presenter*: Pr. Mohamed-Slim Alouini, KAUST, KSA
- <u>Title:</u> "*Optical Wireless Communication: Fundamental Limits, New Advances and Future Perspectives*"

Closing Ceremony - (11:30-12:00)

Lunch - (12:00-13:00)

Travel to Marrakech - (13:00)

Tutorial Presenter: Pr. Mohamed-Slim Alouini, KAUST, Kingdom of Saudi Arabia

Title: "*Optical Wireless Communication: Fundamental Limits, New Advances and Future Perspectives*"

Plenary Speakers:

Speaker 1: Pr. Lajos Hanzo, University of Southampton, UK

Title: "*The Myths, Realities and Future of Machine Learning Aided wireless*"

Abstract: It is always a challenge, but also a privilege to embark on 'crystal-ball gazing', when we try and predict the directions of frontier-research beyond the horizon. So, valued Colleague, let's just just that together! Commencing on a broad note, let's adopt a light-hearted three-pronged approach, touching upon

A/ the performance metrics,

B/ the design and optimization tools and

C/ compelling solutions/applications;

Our research community is now poised to enter the era of designing Pareto-optimum systems, where - by definition - it is only possible to improve any of the above-mentioned metrics at the cost of degrading some of the others. Sophisticated bio-inspired, machine-learning and quantum-search assisted optimization techniques will have to be used for designing Pareto-optimum solutions with the aid of multi-component optimization algorithms, which tend to have a large search-space. We have some exciting research challenges ahead...!

Speaker 2: Pr. Murat Uysal, Özyeğin University, Turkey

Title: "*Visible Light Communications: From Theory to Industrial Standardization*"

Abstract: Visible light communication (VLC) builds upon the ubiquitous presence of LEDs and exploits the existing illumination infrastructure for wireless access. VLC provides high data rate transmission in unregulated optical spectrum and is considered as a powerful complement to radio frequency based solutions in user dense environments or as an alternative in places where radio waves may not be permitted or restricted. In this talk, we first provide an overview of this promising technology and highlight its unique advantages and applications areas. Then, we discuss the commercialization potential and present ongoing international standardization activities which are seen by the industry as a key requirement to address the mass market adoption.

Speaker 3: Robert Schober, Friedrich Alexander University, Germany

Title: *Synthetic Molecular Communication: Fundamentals, Opportunities, and Challenges"*

Abstract: Synthetic molecular communication is an emerging research area offering many interesting and challenging new research problems for engineers, biologists, chemists, and physicists. Synthetic molecular communication is widely considered to be an attractive option for communication between nano-devices such as (possibly artificial) cells and nano-sensors. Possible applications of nano-communication networks include targeted drug delivery, health monitoring, environmental monitoring, and "bottom-up" manufacturing. The IEEE and ACM have recently founded several new conferences and journals dedicated to this exciting new and fast growing research area.

In this talk, we will give first a general overview of the areas of synthetic molecular communication and nano-networking. Components of synthetic molecular communication networks, possible applications, and the evolution of the field will be reviewed. We will focus particularly on diffusion based synthetic molecular communication, identify the relevant basic laws of physics and discuss their implications for communication system design. Subsequently, several communication engineering design and signal processing problems will be discussed. Furthermore, experimental results obtained from a biological testbed will be provided. In the last part of the talk, we will discuss some research challenges in synthetic molecular communication.

Keynote Speakers:

Speaker 1: Pr. Basem Shihada, KAUST, KSA

Title: *"IoT: a Journey from Wireless Sensor Devices to Data Centers"*

Abstract: In this talk, I will take you through a quick journey in the IoT domain. I will identify the unique quality of service (QoS) needs of emerging IoT applications. I will talk about the recent advances in delay reduction and buffer management in IoT traffic and propose SADIQ system. SADIQ provides location-aware, context driven QoS for IoT applications by allowing applications to express their requirements using a location-based abstraction and a high-level SQL-like policy language, and the network to support these requirements through recent advances in SDNs. SADIQ is implemented using commodity OpenFlow-enabled switches and an open-source SDN controller and evaluate its effectiveness using traces from two real IoT applications. SADIQ system source code is made publicly available for the research community.

Speaker 2: Pr. Marco Di Renzo, Paris- Saclay University/ CNRS, France

Title: *"Smart Radio Environments and Environmental AI - Wireless Networks Design in the Era of Deep Learning: Model-Based, AI-Based, or Both?"*

Abstract: Future wireless networks will be more than allowing people, mobile devices, and objects to communicate with each other. Future wireless networks will be turned into a distributed intelligent wireless communications, sensing, and computing platform, which, besides communications, will be capable of sensing the environment to realize the vision of smart living in smart cities by providing them with context-awareness capabilities, of locally storing and processing information in order to accommodate the time critical, ultra-reliable, and energy efficient delivery of data, of accurately localizing people and objects in environments and scenarios where the global positioning system is not an option. Future wireless networks will have to fulfill the challenging requirement of interconnecting the physical and digital worlds in a seamless and sustainable manner. To fulfill these challenging requirements, it is apparent that it is not sufficient anymore to rely solely on wireless networks whose logical operation is software-controlled and optimized (software networks). The wireless environment itself needs to be turned into a software-reconfigurable entity, whose operation is optimized to enable uninterrupted connectivity. Future wireless networks need a smart radio environment, i.e., a wireless environment that is turned into a reconfigurable space that plays an active role in transferring and processing information. This emerging concept is referred to as "smart radio environment". The concept of smart radio environment is a fundamental paradigm shift with respect to the design of current wireless networks. In current wireless networks, broadly speaking, the environment, i.e., the set of physical objects that alter the propagation of the radio waves, is not controllable. The environment ignores the underlying process of transferring and processing information, and is perceived, in addition, as an adversary to the communication process, i.e., it has usually a negative effect that needs to be counteracted by the transmitters and receivers. The advent of emerging electromagnetic materials and devices, such as the reconfigurable metasurfaces, reconfigurable reflectarrays, reconfigurable large-intelligent surfaces, etc. challenges this status quo, but asks for new methodologies for modeling, analyzing, and optimizing wireless networks, and, in addition, equips them with a distributed sensing platform for enabling their smart and adaptive optimization by capitalizing on reinforcement, transfer, and federated learning methods. In this talk, we will overview the challenges of this emerging wireless scenario, and will present some results on the application of deep transfer learning for networks optimization. The usual approach to use deep learning consists of acquiring large amount of empirical data about the system behavior and employ it for performance optimization (data-driven approach). We believe, however, that the application of deep learning to communication networks design and optimization offers more possibilities. As opposed to other fields of science, such as image classification and speech recognition, mathematical models for communication networks optimization are very often available, even though they may be simplified and inaccurate. We believe that this a priori expert knowledge, which has been acquired over decades of intense research, cannot be dismissed and ignored. In the talk, in particular, we put forth a new approach that capitalizes on the availability of (possibly simplified or inaccurate) theoretical models, in order to reduce the amount of empirical data to use and the complexity of training artificial neural networks (ANNs). We concretely show, with the aid of some examples, that synergistically combining prior expert knowledge based on analytical models and data-driven methods constitutes a suitable approach towards the design and optimization of communication systems and networks with the aid of deep learning based on ANNs.

Speaker 3: Pr. Sami Muhaidat, Khalifa University, UAE

Title: *"Opportunistic Ambient Backscatter Communications in RF-Powered Cognitive Radio Networks"*

Abstract: The exponential growth in data traffic, due to the emergence of the Internet of Things (IoT) and the increasing number of connected devices, poses unique challenging and stringent requirements for 5G wireless networks and beyond. These requirements include, but not limited to, high spectral and energy efficiency, low latency, and massive connectivity. A particularly interesting proposal was the development of cognitive radio (CR), which has been shown to be efficient in maximizing the utilization of the spectrum due to its inherent spectrum sensing (SS) capability. Recently, the integration of RF energy harvesting with CR networks has led to the development of a new communication paradigm, known as RF-powered CR networks. In these networks, a CR transmitter harvests RF energy when a primary user (PU) is present, which is then used for data transmission during the idle period of the PU. This protocol is referred to it as harvest-then-transmit (HTT). A major challenge, however, is the reduction in the throughput of the secondary network when the harvested energy is low and/or when the data transmission time is short. More recently, Ambient Backscatter Communications (ABC) has emerged as a new communication paradigm with low power and cost requirements. In a CR network, a CR transmitter can send data to a CR receiver by backscattering the PU signal when it is present. Clearly, the performance of ABC-based CR networks greatly depends on the availability of PU signal, which represents a key challenge, particularly, during the long idle periods. In this talk, we discuss the recent developments of ABC in the context of cognitive radio. We further discuss a new opportunistic hybrid ABC-HTT model for CR networks, coined as ABC-HTT-based CR networks. Finally, we analyze and evaluate the energy efficiency performance of the new scheme considering sensing errors under different scenarios.

Speaker 4: Pr. Zhiguo Ding, University of Manchester, UK

Title: *"Embracing Non-Orthogonal Multiple Access in Future Wireless Networks"*

Abstract: Non-orthogonal multiple access (NOMA) is an essential enabling technology for the fifth generation (5G) wireless networks to meet the heterogeneous demands on low latency, high reliability, massive connectivity, improved fairness, and high throughput. This talk is to provide a comprehensive survey of the impact of this emerging communication technique on future wireless networks. Particularly, how the NOMA principle affects the design of the generation multiple access techniques is introduced first, where various practical forms of NOMA developed by academia and industries are described. Then the applications of NOMA to other advanced communication techniques, such as wireless caching, mobile edge computing (MEC), multiple-input multiple-output (MIMO) techniques, millimeter-wave (mmWave) communications, and cooperative relaying, are discussed. The impact of NOMA on communication systems beyond cellular networks is also illustrated, through the examples of digital TV, satellite communications, vehicular networks, and visible light communications (VLC). Finally, the study is concluded with a discussion of important research challenges and promising future directions in NOMA.

Speaker 5: Pr. Julian Cheng, University of British Columbia (UBC), Canada

Title: *"80 Years of Research on Sum of Lognormal Random Variables: Recent Breakthroughs and Applications in Wireless Communications"*

Abstract: The distribution for the sum of lognormal random variables finds applications in many science and engineering disciplines, and it is particularly important for wireless communication engineers. However, the distribution for the simplistic sum of independent lognormal random variables is analytically intractable, and it is more so for a sum of correlated lognormal random variables with non-identical parameters. In 1934, Wilkinson from Bell Telephone Labs first studied this problem in an unpublished work. Since then, various approximations have been proposed in the literature. All these approximations fail to accurately quantify the left tail (or right tail) behavior of the distribution function of a sum of lognormal random variables. In this talk, in the context of diversity receptions over lognormal fading channels, we first present that the left tail distribution of the sum of independent lognormal random variables can be accurately represented by a Marcum Q-function. The proposed analytical result outperforms all existing well-known sum of lognormal approximations. Using a different approach, we then extend the problem to a sum of correlated and non-identically lognormal random variables, and show that its left-tail distribution can again be represented by another Marcum Q-function. Our study reveals a number of new and surprising engineering insights into the transmission characteristics over the lognormal fading channels. For example, for the dual-branch case, we show that the outage performance of negatively correlated lognormal channels is better than that of independent lognormal channels. We also show that under certain parameter conditions, one of the two lognormal channels can contribute no performance gain to the diversity reception systems. This implies that one link can be discarded without causing asymptotic performance loss. These new findings can guide the communication engineers to design better systems for transmission over the lognormal fading channels.