

2016



**COMMUNICATIONS SYSTEMS**  
**INTEGRATION AND MODELING**  
**TECHNICAL COMMITTEE (CSIM-TC)**

***NEWSLETTER***

**Christos Verikoukis (Chair)**  
**Dzmitry Kliazovich (Vice-chair)**  
**Burak Kantarci (Secretary)**

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## **ABOUT CSIM**

The Communications Systems Integration and Modeling technical committee focus its activities on simulation, analytical tools and measurement of communications links and networks. CSIM has been sponsoring activities on traffic modeling, performance and integration of next generation wireless and wireline networks.

CSIM sponsors its traditional bi-annual workshop CAMAD, as well as special issues in the IEEE Communications Magazine and in the IEEE Journal on Selected Areas in Communications. CSIM is very active in ICC and in GLOBECOM and was one of the co-founders of MILCOM. CSIM has its roots on the Communications Systems Engineering Technical committee and its past chairs are:

2015-now – Christos Verikoukis

2013-2015 – Stefano Giordano

2011-2013 – Harry Skianis

2009-2011 – Fabrizio Granelli

2007-2009 – Pascal Lorenz

2005-2007 – Nelson L.S. da Fonseca

2002-2005 – Mike Devetsikiotis

2000-2002 – Mohammad Ilyas

1999-2000 – Hussein Mouftah

1996-1999 – Guy Omydar

1994-1996 – Bill Tranter

**For more information : <http://sites.ieee.org/tc-csim/>**

## 1. Short Courses / Tutorials / Summer Schools by CSIM Members

### **The Second IEEE Communications Society Summer School**

**Trento, Italy, June 20-23, 2016**

**By Prof. Fabrizio Granelli, DISI - University of Trento**

Held June 20-23, the second IEEE ComSoc Summer School provided participants with top-level lectures on hot topics in communications as well as a myriad of networking opportunities. Targeting IEEE ComSoc PhD student members, the event was originally conceived by IEEE ComSoc President Prof. Sergio Benedetto as well as Prof. Khaled Letaief, Vice-President of Technical Activities; Prof. Stefano Bregni, Vice-President of Member Relations; and Prof. Michele Zorzi, Director of Education. The first edition of the Summer School was extremely successful, attracting more than 100 applications worldwide and enabling 43 attendees to meet the top level experts in communications that gave lectures at the event.

The city of Trento, the educational, scientific, financial and political centre of Northern Italy, served as the ideal launching and consolidating spot for the IEEE Communications Society (ComSoc) Summer School. The University of Trento is one of the youngest Italian universities (funded in the 1960s) and the hosting department of the event is the Dept. of Information Engineering and Computer Science, the 2nd highest ranked ICT department in Italy.



The topics selected for the second edition of the ComSoc Summer School were the Green Internet and future and smart networks. The following seminars were invited:

“Network Coding and Compressed Sensing enabling the Tactile Internet” by Prof. Frank Fitzek of the University of Dresden, Germany;

“Recent Advances in TCP” by Prof. Reuven Cohen from Technion, Israel;

“Data Center Networking” by Prof. Suresh Subramaniam, from George Washington University, Washington DC, USA;

“Design and Performance of a Smarter Infrastructure: Smart Energy, Smart Buildings and Electric Vehicles” by Prof. Michael Devetsikiotis from North Carolina State University, NC, USA;

“Energy Efficiency in Cloud Networks” by Prof. Jafaar Elmirghani from University of Leeds, UK.

The Summer School was attended by a total of 41 students.

The programme started on June 20 with the seminar on “Network Coding and Compressed Sensing enabling the Tactile Internet” by Prof. Frank Fitzek.

Focus of the seminar was the tactile Internet and 5G is expected to be the first generation of mobile communication systems that will enable the tactile Internet. The course addressed the need for the tactile Internet and described the need for new technologies such as network coding and compressed sensing to break with the commonly accepted trade-offs between throughput, latency, resilience, and security. The course also highlighted the main enabling technologies such as network coding and compressed sensing.

On the same day, Prof. Reuven Cohen discussed about “Recent Advances in TCP”. As well-known, TCP, the Internet's Transport Protocol, plays a critical role in the evolution of the Internet, and in the last 20 years, more than 100 RFCs have offered ways to improve its performance. This seminar analyzed the most recent advances in TCP, including the new congestion control scheme used by Android (TCP CUBIC) and the new MPTCP extension used by iPhone devices, which allows a client to establish multiple connections to the same server over different network adapters. QUIC -- a new Transport protocol which may replace TCP in the near future, developed by Google, was also introduced.

“Data Center Networking” was the topic of the seminar of the second day of the event, presented by Prof. Suresh Subramaniam. The tutorial focused on data center networking by introducing data centers and their requirements. Then, a detailed presentation of several data center network architectures and their relative merits was provided. Conventional electrical switching architectures such as fat tree, flattened butterfly, and VL2 were presented and compared. Subsequently, the tutorial examined several recent research proposals on incorporating optical switching in the data center network. The presentation was concluded with a discussion of protocol and performance issues and some emerging topics.

On June 22, the Summer School hosted Prof. Michael Devetsikiotis for his seminar on “Design and Performance of a Smarter Infrastructure: Smart Energy, Smart Buildings and Electric Vehicles”.

The seminar was focused on designing a larger and smarter infrastructure. This includes the modeling of smart buildings, interactive spaces and smart cities, enabled by the internet-of-things. The presentation adopted a “cyber-physical” viewpoint for designing, analyzing and simulating smart building communications, energy and transportation systems, focusing the attention on the performance evaluation of socio-technical systems of multi-layered scope, such as virtual collaboration and indoor localization settings, as well as to smart grid communications, intelligent buildings and electric vehicles. The seminar included some specific quantitative models, including queueing models for EV charging stations; performance modeling of indoor-localization smart spaces; IoT and high performance cloud systems; joint optimization of communications and energy flows in smart buildings; energy storage in campus buildings; and strategies for intelligent EV's on wirelessly-charging highways.

The last seminar of the programme was held on June 23, 2016, by Prof. Jafaar Elmirghani on the topic “Energy Efficiency in Cloud Networks”.

The tutorial introduced and discussed a number of measures that can be used to reduce the power consumption of cloud networks. Then, network optimisation was presented through the use of mixed integer linear programming (MILP), giving a short tutorial on MILP and build on this and heuristics inspired by it to explore a number of energy and carbon footprint reduction measures including (i) Optimum use of time varying renewable energy in cloud networks (ii) Physical topology design considering operational and embodied energies (iii) Elastic optical networks using mixed line rates and optical OFDM, (iv) Optimum resource allocation and green network design with data centres (v) Dynamic energy-efficient content caching (vi) Energy-efficiency through data compression (vii) Energy-efficient peer-to-peer content distribution (viii) Energy-efficient distributed clouds (ix) Energy-efficient network virtualisation.

During the course of the four-day event, the IEEE ComSoc Summer School included specific sessions enabling participants to understand the actual problems and technology in the field of communications. To this aim, practical sessions were held on Tuesday and Wednesday and included visits to the datacenter of the University of Trento and to the local network provider, Trentino Network and its Network Operation Center.

Currently, the next edition of the IEEE ComSoc Summer School is under organization by the University of New Mexico, coordinated by Prof. Michael Devetsikiotis.

For additional information on IEEE ComSoc Summer School, please visit <http://www.comsoc.org/summer-school>

Or check the following recent paper with an extended description of the two last summer schools: F. Granelli, "Training and Networking for Young Society Members: The ComSoc Summer School Program" IEEE Communications Magazine, Vol. 54, No. 11, Nov. 2016.

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### **5G Event in Qatar (by Prof. Nizar Zorba, Qatar University)**

The CSIM team within Qatar University (+20 members) has organized a workshop on the 5G technology and the challenges and advantages for its implementation. Nokia Networks was invited to the event to showcase their perspective on 5G with special attention to the IoT use cases. A lot of students within the IEEE students' branch attended the workshop and showed high interest in the presented topics.

The workshop started with an introduction about Mobile networks current status together with the motivation for the introduction of the 5G technology for cellular communications. Then the 5G technical aspects, 5G standardization status and 5G use cases were tackled and compared to 4G current systems. Finally, early 5G field tests and future 5G business considerations were presented together with the current status in Qatar.



Nokia press release can be found [here](#)

<http://www.cnmeonline.com/news/nokia-qatar-university-host-5g-best-practices-workshop/>

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**Random Graphs and Wireless Communication Networks**  
(short course organized by Prof. J. P. Coon and Prof. C. P. Dettmann)

Studying networked systems of high complexity has been central to a wide range of engineering and scientific problems. An extensive set of tools, from probability theory to graph theory, is required to understand and characterize such networks. This diversity in the subject motivated Prof. Justin P. Coon (University of Oxford) and Prof. Carl P. Dettmann (University of Bristol) to develop a two-day course with a focus on network science and theory to educate students and researchers from various backgrounds, ranging from communication system engineers to biologists, about this fast growing area of knowledge.



The course in 2016 was held at Oriel College, Oxford, during September 5-6. The first part of the course covered the foundations of network science:

- An introduction to random graph theory and complex networks (Erdős-Rényi graphs, small world networks, temporal networks, random geometric networks, percolation theory, connectivity, reachability/accessibility, spectral analysis of graphs);
- Mobility models from more abstract models such as random walks to more realistic models including human mobility patterns;
- Stochastic geometry and point processes.

In the second part of the course, the foundations were applied to spatio-temporal wireless networks. This included the following topics:

- Pair connection functions for different types of channels and wireless communication systems;
- Random graph models for studying ad-hoc networks;
- Stochastic geometry and random geometric graph theory for analysing wireless cellular networks, modelling interference and evaluating their performance;
- Secrecy and trust in device-to-device communication networks using abstract random graph models with spatial and temporal considerations.

## 2. Distinguished Lecturer Tours

**DL: Prof. Nelson Fonseca**

**April 24th to April 29th, 2016**

Nelson Fonseca's DL tour involved three cities with tradition in communication education and for hosting communications events: Popayán, Bogota and Cartagena de India. The tour was organized by Carlos Lozano, ComSoc Director for Latin America and Carlos Eduardo Velásquez, DLT Coordinator for the Latin America Region. The topic of the lectures was Networking in the Big Data Era and they covered how networks can support Big Data and how Big Data can be used network management and monitoring.

On May 25, Nelson landed in Popayan where he was hosted by Prof Pablo Emilio Jojoa Gómez and Prof Oscar Mauricio Caicedo Rendon, Dean of the University of Cauca. The Telecommunications Course in Cauca was the first in the country and was created to be a center of excellence for telecommunication courses. The local Student Branch is very active and promoted a Lecturer with high attendance. The lecture was held at the University of Cauca and was attended by over 120 people, including students, professors and researchers. The lecture raised great interest from the audience. Following the Question and Answers session, attendees stayed in the auditorium for an informal talk with Nelson Fonseca and asked several questions related to the lecture as well as to their research projects. Nelson Fonseca visited the historical Center of the city of Popayán, hosted by Pablo and Oscar. Popayán is well known for its colonial architecture and its contributions to Colombian cultural and political life. It is also known as the "white city" due to the color of the most of colonial houses and places in the city downtown, where several churches. Popayán has been home to seventeen Colombian presidents, as well as noted poets, painters, and composers. Although much of the city's original splendor was destroyed on 31 March 1983, when an earthquake toppled many buildings, many buildings still compose a beautiful historical center. Among these buildings, the University of Cauca Central administration remains. In 2005, Popayán was declared by the UNESCO as the first city of gastronomy because of its variety and meaning to the intangible patrimony of Colombian culture.[3] The culinary history of the Cauca Department was chosen because of their maintaining of traditional methods of food preparation which has been passed over through different generations orally. In 2009, UNESCO also declared the processions of the Easter Week processions as a Masterpiece of the Oral and Intangible Patrimony of Humanity.

After visiting Popyán, Nelson visited Bogotá and lectured at the University of Los Andes. Nelson was hosted by Prof Yezid Enrique Donoso Meisel and Prof Nestor Peña Traslaviña as well as by the DLT Coordinator Carlos Velasquez. ComSoc Chapter in Bogota is certainly the most active chapter in Latin America and is responsible for most of ComSoc Conferences held in Colombia.. The lecture was held at the University of Los Andes, a university with impressive

modern buildings. The University of Los Andes play a major role in Colombia Academia and Colombia economic and political life. Several Colombia Ministry of Economy and Presidents were educated in this university. Question and Answer involved questions about Big Data security due to local interest of the group led by Prof Yezid. Bogota is a metropolitan city and one of its main attraction is the Museum of Gold which host pieces in gold from pre-colombian civilizations dating thousands of year before the discovery of America by Colombos.

Nelson then flew to Cartagena de India and gave a lecture during the IEEE Colombian Conference on Communications (COLCOM), organized by Carlos Lozano and Jose-David Cely. The lecture was held for over 100 people and there were not enough room for everybody in the room. The audience was very participative and asked many questions. Nelson stayed after the lecture in the hotel hall talking to the conference attendees and continued answering questions related to the lecture. Cartage de India is the most touristic city of Colombia. It is a Caribbean city also know for emerald trade. The port of Cartagena was the port from which the gold taken from Spain was shipped to Europe and it was the scenario for several battles between Spain and England. Many of what we know from the Pirate of Caribe happened in the city of Cartagena. Cartagena was the home of Literature Nobel Prize winner Gabriel José García Márquez and the the city was background scenario for several of his novels.

The DLT raised awareness of how big data and networking are related and it gave the opportunity to Nelson Fonseca to interact with numerous ComSoc members, students, researchers and those in industry. All the hosts were exemplary hosts and gave the best of themselves to make this DLT a success. I am very grateful to my host, their institutions, the IEEE Colombia Sector and ComSoc chapters and Student Branchs as well as to ComSoc for this great and fruitful experience. Next, pictures of the lectures can be found.



Lecture in Cartagena de India



Lecture in Popayán

### **Upcoming Distinguished Lecturer Tour: By Dr. Albert Banchs**

Dr. Banchs is planning a tour to Guatemala, Mexico and San Salvador for March 2017. Stay tuned for the details in the upcoming newsletter in May 2017!

### **3. Recently Accomplished Events**

#### **CSIM's Flagship Event: 21st IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (CAMAD)**



CSIM's flagship event IEEE CAMAD 2016 has been held as a stand-alone event on 23-25 October 2016, at Ryerson University in Toronto, Ontario, Canada. IEEE CAMAD focused on Communications for Smart Cities this year. IEEE CAMAD hosted the following special events:

- 1 - Wireless Technologies for Smart Cities

2 - Evolving Technologies for Smart Cities

3 - 5Gwireless: Innovative Architectures, Wireless Technologies and Tools for High Capacity and Sustainable 5G Ultra-Dense Cellular Networks

4- Demo Track



The event has brought together scientists, engineers, manufacturers and service providers to exchange and share their experiences and new ideas focusing on research and innovation results under wireless communications in smart cities. The technical program included 42 full papers and 5 demo presentations. In addition to contributed papers, the conference included two keynote speeches. **Prof. Alberto Leon-Garcia (University of Toronto)** delivered a speech on *Enabling Technologies for Smart City Platforms*, and **Prof. Hussein Mouftah (University of Ottawa)** delivered a speech on *Machine-to-Machine Communications in Smart Cities*.

The workshop has given a best paper and a best demo award to the authors of two selected papers.

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**1<sup>st</sup> Symposium on Spatial Networks**  
(organized by Prof. J. P. Coon and Prof. C. P. Dettmann)

Oxford University hosted a two-day symposium focused on spatial networks during September 7-8, 2016. The symposium, which was held at Oriol College, brought together experts from mathematics, physics and engineering communities working on elements of graph theory, complex networks, information theory and communication theory. Keynote talks were given by the following leading experts (in alphabetical order):

Marc Barthélemy, CEA Institut de Physique Theorique  
Bartek Błaszczyszyn, INRIA-ENS  
Anthony Bonato, Ryerson University  
Marco Di Renzo, CNRS-SUPÉLEC-University of Paris-Sud XI  
Mark Newman, University of Michigan



This was the first of a series of three multi-disciplinary symposia that will take place over the next three years. The particular symposium received an attendance of approximately 45 academic researchers and industry specialists.

#### 4. Upcoming Events

##### **CSIM's Flagship Event: 22nd IEEE International Workshop on Computer-Aided Modeling Analysis and Design of Communication Links and Networks (CAMAD)**



IEEE CAMAD 2017 will be held as a stand-alone event at Lund University, in Scania, Sweden. This year IEEE CAMAD will focus on communication aspects of 5G Networking and beyond. IEEE CAMAD will be hosting several Workshops and Special Sessions, bringing together a diverse group of scientists, engineers, manufacturers and providers to exchange and share their experiences and new ideas focusing on research and innovation

results under wireless communications in the 5G domain. In addition to contributed papers, the conference will also include keynote speeches, panel and demo sessions.

Paper submission: 12<sup>th</sup> February 2017

Author notification: 26<sup>th</sup> March 2017

Camera ready: 23<sup>rd</sup> April 2017

For more information, visit: <http://www.ieee-camad.org/>

**General Chairs**

Björn Landfeldt, Lund University, Sweden

Christos Verikoukis, CTTC, Spain

Björn Ekelund, Ericsson, Sweden

Peter C. Karlsson, Sony, Sweden

**Technical Program Chairs**

Di Yuan, Linköping University, Sweden

Petar Popovski, Aalborg University, Denmark

George Koudouridis, Huawei, Sweden

Charalabos Skianis, University of the Aegean, Greece

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