

NTUA IEEE ComSoc Talk

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Title

Analysis and Design of Emerging Dense 5G Network Topologies

Abstract

With the increase in data traffic driven by a new generation of wireless devices, data is expected to overwhelm cellular network capacity in the future. Novel radio network topologies, taking into account the need for autonomy, enhanced data rate and uniform user experience, energy efficiency, high capacity backhaul, and smaller low power base stations, are proposed and several new communication techniques are envisaged for future 5G networks. In such emerging dense and heterogeneous network architectures, the spatial locations (network geometry) and the dynamic interactions of communication entities will drastically affect the overall network performance.

In the first part of this talk, we introduce basic notions of stochastic geometry and discuss how these mathematical tools can be used in order to model networks with spatial randomness, as well as to provide key insights on the design and performance (such as coverage, area spectral efficiency, average rate) of emerging 5G networks. In the second part, we highlight key results and insights obtained using stochastic geometry in heterogeneous cellular networks (HetNets), device-to-device (D2D) communication and caching-enabled networks. Finally, we briefly discuss emerging topics in 5G networks, such as anticipatory communication and proactive resource allocation.

Bio

Marios Kountouris (S'04–M'08) received the Diploma in Electrical and Computer Engineering from the National Technical University of Athens, Greece in 2002 and the M.S. and Ph.D. degrees in Electrical Engineering from the Ecole Nationale Supérieure des Télécommunications (Télécom ParisTech), France in 2004 and 2008, respectively. His doctoral research was carried out at Eurecom Institute, France, and it was funded by Orange Labs, France. From February 2008 to May 2009, he has been with the Department of ECE at The University of Texas at Austin as a research associate, working

on wireless ad hoc networks under DARPA's IT-MANET program. From June 2009 to December 2013, he has been an Assistant Professor at the Department of Telecommunications at Supélec (Ecole Supérieure d'Electricité), France, where he is currently an Associate Professor.

Dr. Kountouris has published several papers and patents all in the area of communications, wireless networks, and signal processing. He has served as technical program committee member for several top international conferences and has served as Workshop Chair for the IEEE Globecom 2010 Workshop on Femtocell Networks, the IEEE ICC 2011 Workshop on Heterogeneous Networks, and the IEEE Globecom 2012 Workshop on Heterogeneous and Small Cell Networks.

He is currently an Editor for the IEEE Transactions on Wireless Communications, the EURASIP Journal on Wireless Communications and Networking, the KSII Transactions on Internet and Information Systems, and the Journal of Communications and Networks (JCN). He is also a founding member and Vice Chair of IEEE SIG on Green Cellular Networks. He received the 2013 IEEE ComSoc Outstanding Young Researcher Award for the EMEA Region, the 2014 EURASIP Best Paper Award for EURASIP Journal on Advances in Signal Processing (JASP), the 2012 IEEE SPS Signal Processing Magazine Award, the IEEE SPAWC 2013 Best Student Paper Award, and the Best Paper Award in Communication Theory Symposium at IEEE Globecom 2009. He is a Member of the IEEE and a Professional Engineer of the Technical Chamber of Greece.