

T3. Invoking Emerging Analytical Tools for NOMA: Matching Theory, Stochastic Geometry and Machine Learning

Abstract:

Mobile data traffic, especially mobile video traffic and small-size IoT packets, has dramatically increased in recent years with the emergence of smart phones, tablets, and various new applications. It is hence crucial to increase network capacity to accommodate these bandwidth consuming applications and services. Non-orthogonal multiple access (NOMA), which has been recently proposed for the 3rd generation partnership projects long-term evolution advanced (3GPP-LTE-A), constitutes a promising technology of enhancing the spectral efficiency and achieving massive connectivity challenges in 5G networks by accommodating several users within the same orthogonal resource block, via multiplexing at different power levels. By doing so, significant spectral efficiency enhancement can be attained over conventional orthogonal multiple access (OMA) techniques. The aim of the tutorial is to provide an introduction for NOMA for addressing three critical issues, which are compatibility, security and sustainability, combining with some of our research contributions in this field. More importantly, emerging analytical tools, such as matching theory, stochastic geometry, and machine learning are invoked to study NOMA. This tutorial will take a comprehensive and coordinated approach in presenting the ways of realizing the potential advantages for NOMA in next general wireless systems and identify promising research opportunities for the future.

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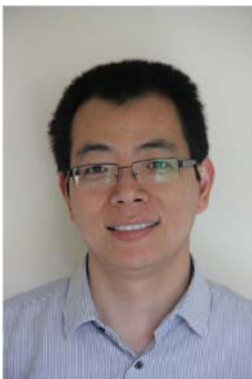


Arumugam Nallanathan (S'97-M'00-SM'05-F'17) is Professor of Wireless Communications and Head of the Communication Systems Research (CSR) group in the School of Electronic Engineering and Computer Science at Queen Mary University of London since September 2017. He was with the Department of Informatics at King's College London from December 2007 to August 2017, where he was Professor of Wireless Communications from April 2013 to August 2017 and a Visiting Professor from September 2017. He was an Assistant Professor in the Department of Electrical and Computer Engineering, National University of Singapore from August 2000 to December 2007. His research interests include 5G Wireless Networks, Internet of Things (IoT) and Molecular Communications. He published more than 350 technical papers in scientific journals and international conferences. He is a co-recipient of the Best Paper Award presented at the IEEE International Conference on Communications 2016 (ICC2016) and

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He is an Editor for IEEE Transactions on Communications. He was an Editor for IEEE Transactions on Wireless Communications (2006-2011), IEEE Transactions on Vehicular Technology (2006-2017), IEEE Wireless Communications Letters and IEEE Signal Processing Letters. He served as the Chair for the Signal Processing and Communication Electronics Technical Committee of IEEE Communications Society and Technical Program Chair and member of Technical Program Committees in numerous IEEE conferences. He received the IEEE Communications Society SPCE outstanding service award 2012 and IEEE Communications Society RCC outstanding service award 2014.

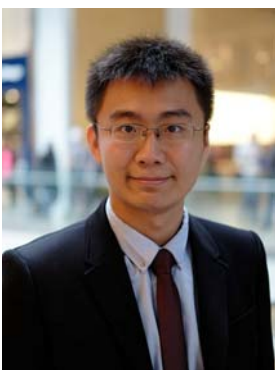
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Zhiguo Ding (S'03-M'05) received his B.Eng in Electrical Engineering from the Beijing University of Posts and Telecommunications in 2000, and the Ph.D degree in Electrical Engineering from Imperial College London in 2005. From Jul. 2005 to Aug. 2014, he was working in Queen's University Belfast, Imperial College and Newcastle University. Since Sept. 2014, he has been with Lancaster University as a Chair Professor. From Oct. 2012 to Sept. 2018, he has also been an academic visitor in Princeton University.

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Yuanwei Liu (S'13, M'16) received the Ph.D. degree in Electrical Engineering from the Queen Mary University of London, U.K., in 2016. Before that, He received the B.S. and M.S. degrees from the Beijing University of Posts and Telecommunications in 2011 and 2014, respectively. He has been a Lecturer (Assistant Professor) with the School of Electronic Engineering and Computer Science, Queen Mary University of London, since 2017. He was with the Department of Informatics, King's College London, from 2016 to 2017, where he was a Post-Doctoral Research Fellow.

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