# 해외석학 키노트 강연

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**장소_ 라한셀렉트 경주 컨벤션A**

## 강연 소개

### Integrated Sensing and Communication Toolbox: Information Theory, Communication Theory, and Machine Learning

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Giuseppe Caire was born in Torino in 1965. He received a B.Sc. in Electrical Engineering from Politecnico di Torino in 1990, an M.Sc. in Electrical Engineering from Princeton University in 1992, and a Ph.D. from Politecnico di Torino in 1994. He has been a post-doctoral research fellow with the European Space Agency (ESTEC, Noordwijk, The Netherlands) in 1994-1995, Assistant Professor in Telecommunications at the Politecnico di Torino, Associate Professor at the University of Parma, Italy, Professor with the Department of Mobile Communications at the Eurecom Institute, Sophia-Antipolis, France, a Professor of Electrical Engineering with the Viterbi School of Engineering, University of Southern California, Los Angeles, and he is currently an Alexander von Humboldt Professor with the Faculty of Electrical Engineering and Computer Science at the Technical University of Berlin, Germany.

He received the Jack Neubauer Best System Paper Award from the IEEE Vehicular Technology Society in 2003, the IEEE Communications Society and Information Theory Society Joint Paper Award in 2004 and in 2011, the Okawa Research Award in 2006, the Alexander von Humboldt Professorship in 2014, the Vodafone Innovation Prize in 2015, an ERC Advanced Grant in 2018, the Leonard G. Abraham Prize for best IEEE JSAC paper in 2019, the IEEE Communications Society Edwin Howard Armstrong Achievement Award in 2020, and he is a recipient of the 2021 Leibniz Prize of the German National Science Foundation (DFG). Giuseppe Caire is a Fellow of IEEE since 2005. He has served in the Board of Governors of the IEEE Information Theory Society from 2004 to 2007, and as officer from 2008 to 2013. He was President of the IEEE Information Theory Society in 2011. His main research interests are in the field of communications theory, information theory, channel and source coding with particular focus on wireless communications.

Integrated Sensing and Communications (ISAC) is one of the new features of future wireless networks (in short, 6G). The scope and variety of problems and scenarios in ISAC is vast, and there are many ways to formulate and solve relevant problems. In this talk, we shall review some of these problem formulations and approaches spanning information theory, statistical signal processing & communication theory, and deep learning. Some beautiful recent results in information theory show that, in certain idealized scenarios, the fundamental tradeoff between communication and estimation an be characterized exactly or approximately. This characterization reveals certain fundamental aspects of ISAC system design. Then, we shall consider the problem of radar parameter estimation in monostatic and multistatic scenarios using communication waveforms (notably, OFDM and OTFS) instead of traditional radar waveforms. Finally, for the case of the estimation of extended targets, we shall show how the problem formulated in terms of classical Maximum-Likelihood detection and parameter estimation may be ill-posed, while schemes based on deep learning can yield very attractive results.