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<https://maximeguillaud.github.io>

Wireless Channel Charting for Next-Generation Radio Access Networks

Channel charting consists in the application of dimensionality reduction and manifold learning (both methods stemming from the field of machine learning) to the channel state information (CSI) signals of wireless communication transceivers. It is an emerging framework rooted in machine learning. It enables pseudo-positioning of the transmitting devices in the abstract, low-dimensional space of the channel chart, thus enabling the infrastructure base stations or wireless access points to perform tasks relevant to emerging wireless networks (which are typically location-dependent) without requiring access to the actual user location information. Prominent application examples are localization relative to points-of-interest, user equipment (UE) grouping, cell handover, UE path prediction, predictive rate control, assisted beam-finding, etc. In this talk I will give an overview of the burgeoning research field of channel charting, keeping the discussion at the intersection of machine learning, numerical optimization, channel modeling, and communication theory. I will cover the basics of dimensionality reduction (including algorithmic approaches and performance metrics), and its application to CSI, in an intuitive and widely accessible manner. Examples of channel charting applied to measured data will be presented. The potential applications to radio access networks (5G, 6G) will be discussed, considering practical aspects such as continuous and online (real-time) learning, and distributed implementation.

About the speaker:

Dr. Maxime Guillaud is a senior researcher at Inria, the French national research institute for digital science and technology, in the MARACAS team in Lyon. He received the PhD from EURECOM in 2005. Before joining Inria in 2023, Dr. Guillaud has held research positions in both academia and industry, with Lucent Bell Laboratories (now Nokia) in the USA, the FTW research center and Vienna University of Technology in Austria, and Huawei Technologies in France. He is an expert on the physical layer of radio access networks, including transceiver algorithms, channel modeling, machine learning, and modulation design for non-coherent and multiple access communications. He has authored over 90 research papers and holds 18 patents.

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