Ph.D. in Information Technology
Thesis Defense

January 23, 2023
at 11:00
Room Conferenze "Emilio Gatti"

Antonino FAVANO – XXXV Cycle

THE CAPACITY OF AMPLITUDE-CONSTRAINED VECTOR GAUSSIAN CHANNELS

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Abstract:

Energy efficiency is one of the most important features of modern wireless communication systems. The components having a stronger impact on the power consumption of wireless systems are radio frequency chains. To improve their energy efficiency and reduce the associated costs, it is useful to limit the peak power of the transmitted signals. Therefore, power constraints are used to accurately model the limitations imposed on such communication systems and provide a reliable information theoretic baseline to efficiently maximize the achievable mutual information.

In this work, it is investigated the capacity of both nonfading and fading vector Gaussian channels subject to input power constraints. The considered transmitter configurations are those employing either one or several concurrent power constraints. Results on the capacity-achieving distribution are presented for nonfading channels. Moreover, accurate estimates of the optimal input distribution and of the resulting channel capacity are derived.

Two families of capacity upper bounds are proposed for fading channels. The first family relies on a sphere packing argument and can be applied to any convex input constraint. The second family of upper bounds is specifically devised for multiple parallel power constraints.

PhD Committee

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