COLOQUIO JUNIOR

Martes 24 de marzo, 17:00h (coffee break a las 18:00)

Aula Gris 1, ICMAT

Isabel María Moreno Cuadrado

UCM

Bohnenblust–Hille inequality and applications in learning theory

Boolean functions, defined on the hypercube $\{-1,1\}^n$, play a central role in many areas of mathematics and theoretical computer science. However, in many relevant situations, the governing function is unknown: we do not have direct access to it, but only to a limited number of examples. This raises the fundamental problem of how to reconstruct or approximate an unknown function from partial information. This is precisely one of the central questions addressed in learning theory.

In this talk, we will discuss some analytical tools used to tackle this problem, such as hypercontractivity and Blei's inequality. Building on these, we establish a discrete version of the Bohnenblust–Hille inequality, a classical result in the analysis of Dirichlet series which, in this context, provides precise control over the $\ell^{\frac{2d}{d+1}}$ norm of the Fourier coefficients of any function defined on the cube, and hence over its spectral behavior.

Finally, we explore possible connections with open problems in quantum information theory; in particular, with the Aaronson–Ambainis conjecture, a deep proposal that sets fundamental limits on quantum advantage.

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