UNIVERSIDAD DE GRANADA

Departamento de
Estadística e
Investigación Operativa

CICLO DE CONFERENCIAS ESTADÍSTICA Y CIENCIA DE DATOS PATRICIA ROMÁN

06/05/2024



Título: Mathematical modelling of brain arousal systems using functional data approaches based on ICA.

Fecha y hora: 10 de MAYO del 2024 (12.00 horas).

Lugar: Seminario II del IMAG, UGR.

Conferenciante: Marc Vidal (Investigador en el Instituto Max Planck de Ciencias Cognitivas y Cerebrales Humanas).

Resumen:

Neurotransmitters play a critical role in regulating brain arousal function, which is crucial for coordinating motor responses and behavioral actions in humans. The study of neurotransmitters, particularly in the context of axonal diffusion, is of interest from both experimental and theoretical perspectives. The latter often involves mathematical modeling to replicate their dynamic activity, offering insights into physiological questions that are challenging to investigate through experimental methods alone. In this talk, I will discuss a data-driven approach to brain arousal systems using non-invasive neurophysiological monitoring techniques that rely on infinite-dimensional statistical models. In particular, I will elaborate on functional independent component analysis (ICA) techniques that utilize Sobolev norms and inner products in multivariate functional settings for modeling neuromodulatory activity. I will go through the notions of separability, identifiability, and irreducibility, among other theoretical precepts that define the essence of functional ICA models. Furthermore, I will discuss the theoretical properties of operators beyond second

Copyright© 2026 Universidad de Granada

order moments under the Cameron-Martin space geometry. Finally, I will showcase several applications, including our latest research for modeling turbulent-like dynamics on the cortical field aiming to reflect neuromodulatory activity during states of emotional motor control.

Reseña del autor:

Marc Vidal holds a Master's degree in Statistics from the University of Granada. He is pursuing a joint PhD at Ghent University and the University of Granada, under the supervision of Prof. A. M. Aguilera and Prof. M. Leman, supported by a PhD fellowship from both universities. Currently, he is also a visiting researcher at the Max Planck Institute for Human Cognitive and Brain Sciences, where he conducts part of his investigations in the Department of Neurology. His research revolves around modeling brain data using infinite-dimensional statistical approaches. In particular, he specialized in functional independent component analysis integrating multiple probabilistic dimensions (experimental, longitudinal, repeated measurements) together with other indicators.

Copyright© 2026 Universidad de Granada