

INVITATION

IKTrace Seminar (IMAT–CCM)

Coffee, discussion, and academic exchange

SECOND SEMINAR TALK

When Equations meet Data: Inverse Problems and Hybrid-Cooperative Learning

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Abstract

Mathematical models are essential tools for describing, understanding, and predicting real-world phenomena. Many of these models are written in terms of differential equations, which express how physical, biological, or technological systems evolve in time and space. However, in many applications, the model is only partially known: some parameters, sources, boundary conditions, or internal mechanisms must be recovered from indirect and often noisy observations. This leads naturally to the field of inverse problems.

In this talk, we will introduce the basic ideas behind mathematical modelling with differential equations and discuss how data-driven methods, particularly neural networks, can be used as flexible tools for function approximation. We will then explain the difference between direct and inverse problems, highlighting why inverse problems are challenging and important in applications such as heat transfer, medical imaging, geophysics, and scientific machine learning.

Finally, we will present the main idea behind Hybrid-Cooperative Learning (HYCO), a framework that combines physics-based models with data-driven models through a cooperative interaction. The goal is to show how equations and data can work together to recover hidden information, improve predictions, and build more reliable models for applied problems. The talk is intended as an accessible introduction for students interested in applied mathematics, and the interaction between modelling, computation, and machine learning.

Seminar spirit

The IKTrace Seminar is conceived as a regular forum for exchange across research lines, teaching interests, and interdisciplinary initiatives. This first session opens a space for mathematical discussion, informal questions, and possible future collaborations.

Event details

WHEN

June 4, 2026, 16:00-18:00

WHERE

Logistar Room
DeustoTech, 4th floor

FORMAT

Coffee and discussion session

Keywords

- Mathematical Modelling
- Differential Equations
- Inverse Problems
- Neural Networks
- Scientific Machine Learning
- Hybrid-Cooperative Learning

Participation

Colleagues and students are warmly invited to attend, take part in the discussion, and share ideas related to their own research interests.