

**SEMINARIO**  
**OPTIMIZACIÓN Y EQUILIBRIO**  
**EXPOSITOR**  
**Prof. Roger Wets**  
**Department of Mathematics**  
**University of California, Davis**

**TITLE**

**EPI-SPLINES AND EXPONENTIAL EPI-SPLINES: PLIABLE APPROXIMATION TOOLS**

**Abstract:**

Approximation theory for functions was, at the outset, mostly concerned with finding best approximating functions that can be (totally) described by a finite number of parameters. This question took another dimension when the information about the function was limited, say its value at some points, but also included some knowledge of its global properties, typically smoothness level, which should be replicated in the approximating one. This gave rise to the theory of splines and its manifold implementations. But in an evolving range of applications, the function is only defined implicitly by a rather complex system with many side conditions. In this lecture, we consider such function identification problems that usually lead to constrained infinite-dimensional optimization problems and we rely on a new approximating class of functions, epi-splines, to build approximate solutions. We present a broad framework for identifying a function that according to some criterion best represents a given data set and satisfies constraints derived from the data as well as external information. These function identification problems lead to constrained infinite-dimensional optimization that includes as special cases most of the classical fitting, estimation, and regression problems. The framework allows any constraints, for example related to shape restrictions, enables studies of information growth such as from a larger sample, and facilitates the usually unavoidable approximations needed to make a procedure computationally tractable. The central components of the framework are epi-splines: the piecewise polynomial functions that are structurally related to standard splines, but are more flexible and arise more broadly.

The theoretical foundations of the framework relies heavily on variational analysis. As much as time allows, a few illustrative examples coming from curve fitting, uncertainty quantification, variogram construction (rock components analysis), commodity price and electricity demand forecasting will be sketched out.

Miércoles 23 de Octubre a las 17 : 00 hrs, Sala Multimedia del Sexto Piso.