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Representing and Quantifying Complexity in Functional Observations and Parameters

Roughness-penalized functional data analyses, including smoothing, use a roughness penalty defined by a linear differential operator L to impose smoothness on functional parameter estimates. Finite element methods use the stiffness matrix for the same purpose. The matrix R, consisting of the possible inner products of basis functions transformed by L, defines the complexity of a functional parameter or functional data. The talk will show how the eigenanalysis of R can be used to quantify complexity in existing functions, stabilize functional estimates and show the consequences of choosing L, especially when it is determined by data-defined parameter values.