
Barcelona Analysis Seminar **2022–2023**

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Smooth functions in de Branges-Rovnyak spaces and invariant subspaces

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According to the theory of Sz.-Nagy and Foias, a wide range of contractive completely non-isometric linear operators on separable Hilbert spaces can be modeled by the backward shift operator restricted to some Branges-Rovnyak space in the unit disc. These functional models include the model spaces, which are the only closed backward shift invariant subspaces in the classical Hardy spaces. Besides their intrinsic operator theoretical nature, the class of de Branges-Rovnyak spaces also enjoy some very subtle function theoretical properties. For instance, it was recently proved that any de Branges-Rovnyak space contains a dense subset of functions which extend continuously to the unit circle, despite the fact that in many instances (even in model spaces), it is very difficult to construct even a single such function. In this talk, we shall investigate which de Branges-Rovnyak spaces contain functions enjoying certain smoothness properties and demonstrate that questions of these kind have some deep connections to the theory of subnormal operators and to some types of uncertainty principles in Harmonic analysis. This talk is based on a series of recent collaborative work together with Bartosz Malman, affiliated with the Royal Institute of Technology, Stockholm, Sweden.