Seminari Informal
de Matemàtiques de Barcelona

Speaker:	Alejandro Martínez Sánchez.
University:	Universitat de Barcelona.
Date:	Wednesday, March 12th, 2025.
Schedule:	13:00 talk.
Place:	UB (FMI aula IA) and Zoom.
Language:	English.

Title: Characterising exchange of stability in scalar reaction-diffusion equations via geometric blow-up.

Abstract: We study the exchange of stability in scalar reaction-diffusion equations which feature a slow passage through a pitchfork type singularity in the reaction term, using a novel adaptation of the geometric blow-up method. Our results are consistent with known results on bounded spatial domains which were obtained using comparison principles like upper and lower solutions. However, from a methodological point of view, our approach is motivated by the analysis of a closely related ODE problem which was analyzed using geometric blow-up techniques by Krupa and Szmolyan in 2001. After applying the blow-up transformation, we obtain a system of PDEs which can be studied in local coordinate charts. Importantly, the blow-up procedure resolves a spectral degeneracy in which the spectrum is 'pushed back' so as to create a spectral gap in the linearization about particular steady states. This makes it possible to extend slow-type invariant manifolds into and out of a neighbourhood of the singular point using center manifold theory, in a manner which is conceptually analogous to the approach adopted by Krupa and Szmolyan in their analysis of the aforementioned ODE problem. We expect that the approach can be adapted and applied to the study of dynamic bifurcations in PDEs in a wide variety of different contexts.

About us: *SIMBa* is a mathematics seminar organized by graduate students in the Barcelona area. It is aimed towards graduate and last–year undergraduate students. Our goals are disseminating knowledge from different branches of mathematics for those interested and promoting networking between the attendants.

This seminar is backed by the Faculty of Mathematics and Computer Science at Universitat de Barcelona, Faculty of Mathematics and Statistics at Universitat Politècnica de Catalunya, the Department of Mathematics at Universitat Autònoma de Barcelona, CRM, IMUB and BGSMath.

Fore more information, visit seminari-simba.github.io/en. You may contact us by sending an email to **_seminari.simba@gmail.com_**.