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Invitation to the Defense

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"Linearization of Contractive Random Dynamical Systems"

S.0.05. Monday, 27 October 2025 3:30 p.m.

Abstract
This dissertation is devoted to the smooth linearization problem of random dynamical sys tems, focusing on both continuous- and discrete-time settings. The core objective is to es tablish sufficient conditions under which nonlinear random systems can be locally or globally smoothly conjugated to linear systems, with the conjugating transformations belonging to the class Cm. In general, the smooth conjugacy not only preserves the topological structure of the system but also allows control over its local behavior, such as stability, sensitivity to perturbations, and the geometry of trajectories near an equilibrium. The work begins by considering semilinear nonautonomous differential equations with random parameters, formulated within the framework of Carath'eodory functions. For such systems, conditions ensuring global and local Cm- linearization are derived using gener alized exponential dichotomies with trivial projection. These results are then applied to continuous-time RDS generated by random differential equations, extending previous works in the deterministic case to systems with randomness. After this, the methods are adapted to stochastic systems by establishing a rigorous con nection between stochastic differential equations (SDEs) and their corresponding random dynamical systems. This is achieved through

stationary coordinate transformations (coho mologies) that relate stochastic and random cocycles. Using this approach, local smooth linearization results are obtained for RDS generated by Stratonovich SDEs. The final part of the thesis addresses discrete-time systems. We study semilinear nonau tonomous difference equations with random parameters and derive global and local conditions for their Cm-linearization. These results are subsequently extended to discrete RDS, where a careful analysis allows us to preserve smooth structures despite the lack of differentiability in the time domain. The results obtained in the dissertation offer new theoretical tools for qualitative analysis of random and stochastic systems, allowing to transfer the properties of well-understood linear models to nonlinear systems. Potential practical areas of application of the obtained results can be control theory, biology, economics, etc.

Elena Resmerita and the Department of Mathematics look forward to seeing you at the talk!