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Title of the talk

Linear Dynamics: a walk through intriguing behaviors of composition operators on L^p spaces

Abstract

Linear Dynamics is an area of mathematics lying in the intersection of Operator Theory and Dynamical Systems and consisting in the study of the behavior of the iterates of linear operators. It has received a lot of attention in the last decades and a flurry of intriguing results have been produced. Simultaneously to the development of Linear Dynamics, another interesting field has been emerging as a part of it: the field of *composition operators*, the study of which consists in the comparison between the dynamical behaviors of a linear operator $T_f : \varphi \to \varphi \circ f$ and the properties of the transformation f itself. Because of their versatility in applications to several research areas, composition operators have had an explosion of interest in the last decades.

In the talk, in the setting of separable Banach spaces, I will briefly recall some fundamentals of Linear Dynamics, like hypercyclicity, topological mixing, Devaney and Li-Yorke chaos, frequent hypercyclicity, generalized hyperbolicity, expansivity and shadowing. These properties are completely

characterized for a significant class of operators, the *weighted shifts*, and they have also been recently investigated for composition operators on L^p spaces. In the first part of the talk, after an excursion on the state of the art of these topics, I will show a general technique which allows to lift up the characterizations given for weighted shifts to a broader class of operators on L^p spaces, the *shift-like operators*, which naturally appear as composition operators on L^p when the underlying space is dissipative. I will also prove that the notions of generalized hyperbolicity and shadowing coincide for such a large class of operators. In the second part of the talk, I will give a brief overview on basic properties of composition operators on various function spaces different from the L^p ones, providing necessary and sufficient conditions for T_f to map a certain function space into itself.

References

[1] E. D'Aniello, U.B. Darji, M. Maiuriello, *Generalized hyperbolicity and shadowing in L^p spaces*, Journal of Differential Equations, 298, pp. 68–94, 2021.

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[3] E. D'Aniello, M. Maiuriello, *A survey on composition operators on some function spaces*, Aequat. Math., 95, pp. 677–697, 2021.

[4] M. Maiuriello, *Expansivity and strong structural stability for composition operators on L^p spaces*, to appear in Banach J. Math. Anal., 2022.