SEMINÁRIO DE ÁLGEBRA
UFSCAR E USP

TÍTULO: BALL SPACES: A GENERIC APPROACH TO MEASURING THE STRENGTH OF COMPLETENESS/COMPACTNESS OF VARIOUS TYPES OF SPACES AND ORDERED STRUCTURES

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Auditório do DM-UFSCar

Resumo: With a simple generic approach, we develop a classification that encodes and measures the strength of completeness (or compactness) properties in various types of spaces and ordered structures. The approach also allows us to encode notions of functions being contractive in these spaces and structures. A sample of possible applications includes metric spaces, ultrametric spaces, ordered groups and fields, topological spaces, partially ordered sets, and lattices. We describe several notions of completeness in these spaces and structures and determine their respective strengths. In order to illustrate some consequences of the levels of strength, we give examples of generic fixed point theorems which then can be specialized to theorems in various applications which work with contracting functions and some completeness property of the underlying space.
Ball spaces are nonempty sets of nonempty subsets of a given set. They are called spherically complete if every chain of balls has a nonempty intersection. This is all that is needed for the encoding of completeness notions. We discuss operations on the sets of balls to determine when they lead to larger sets of balls; if so, then the properties of the so obtained new ball spaces are determined. The operations can lead to an increased level of strength, or to ball spaces of newly constructed structures, such as products. Further, the general framework makes it possible to transfer concepts and approaches from one application to the other; as examples we discuss theorems analogous to the Knaster-Tarski Fixed Point Theorem for lattices and theorems analogous to the Tychonoff Theorem for topological spaces.

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