function preserves stationarity, in the sense that a sequence is tightly stationary if and only if it is mapped to a stationary subset.

Using this characterization, we explore the question of whether it is consistent that there exists a sequence of cardinals for which every stationary sequence (i.e., a sequence of subsets, each of which is stationary in the corresponding cardinal) is tightly stationary, and prove some results which give a negative answer in certain cases. We prove that adding Cohen reals introduces stationary sequences which are not tightly stationary, and in the extension by adding uncountably many Cohen reals, every sequence of cardinals has a stationary but not tightly stationary sequence. From a tree-like scale we construct a sequence of stationary sets that is not tightly stationary in a strong way, namely, its image under the transfer function is empty.

Investigating this question in the Prikry model, we define the notion of a forgetful sequence and prove that every forgetful sequence of cardinals has a stationary, not tightly stationary sequence. Along the way, we will analyze the scales which appear in the Prikry model.

Then we consider the question of Cummings, Foreman, and Magidor of whether it is consistent that there is a sequence of cardinals on which every mutually stationary sequence is tightly stationary. We prove that it is consistent that there is no such sequence of cardinals. This uses a supercompact version of a construction adapted from Koepke which ensures that every stationary sequence is mutually stationary, provided that there is enough space between successive cardinals of the underlying sequence. Furthermore, this property of the model is indestructible under further Prikry forcing, which suggests that it is difficult to obtain a positive answer to the CFM question. The results in this section were obtained jointly with Itay Neeman.

Finally, we explore the combinatorics of tight stationarity. This leads to the notion of a careful set, which is a strengthening of being in the range of the transfer function. We produce a model where there is a singular cardinal for which all subsets of the successor are careful, which suffices to prove a splitting result for tightly stationary sequences. Using a version of the diagonal supercompact Prikry forcing, we obtain such a model where the singular cardinal is strong limit. These results start from a model with a continuous tree-like scale on the singular cardinal.

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ZANYAR ANWER AMEEN, ***Finitely Additive Measures on Topological Spaces and Boolean Algebras***, University of East Anglia, UK, 2015. Supervised by Mirna Džamonja. MSC: Primary 28A05, Secondary 28A60, 28A12 and 28A75. Keywords: uniformly regular measure, separable measure, Jordan algebra, Jordan field, charge algebra and Maharam Theorem.

Abstract

The thesis studies some problems in measure theory. In particular, a possible generalization corresponding to Maharam Theorem for finitely additive measures (charges). In Chapter one, we give some definitions and results on different areas of Mathematics that will be used during this work.

In Chapter two, we recall the definitions of nonatomic, continuous and Darboux charges, and show their relations to each other. The relation between charges on Boolean algebras and the induced measures on their Stone spaces is mentioned in this chapter. We also show that for any charge algebra, there exists a compact zero-dimensional space such that its charge algebra is isomorphic to the given charge algebra.

In Chapter three, we give the definition of Jordan measure and some of its outcomes. We define another measure on an algebra of subsets of some sets called Jordanian measure, and investigate it. Then we define the Jordan algebras and Jordanian algebras and study some of their properties.

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Chapter four is mostly devoted to the investigation of uniformly regular measures and charges (on both Boolean algebras and topological spaces). We show how the properties of a charge on a Boolean algebra can be transferred to the induced measure on its Stone space. We give a different proof to a result by Mercourakis. In 2013, Borodulin-Nadzieja and Džamonja proved the countable version of Maharam Theorem for charges using uniform regularity. We show that this result can be proved under weaker assumption and further extended.

The final Chapter is concerned with the higher versions of uniform regularity which are called uniform κ-regularity. We study these types of measures and obtained several results and characterizations. The major contribution to this work is that we show we cannot hope for a higher analogue of Maharam Theorem for charges using uniform κ-regularity. We prove that a higher version of analogue of Maharam Theorem can be proved only for charges on free algebras on κ many generators (resp. measures on a product of compact metric spaces). We also generalize a result proved by Grekas and Mercourakis for Jordan algebras.

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MICHEAL PAWLIUK, ***Amenability and Unique Ergodicity of the Automorphism Groups of all Countable Homogeneous Directed Graphs***, University of Toronto, Canada, 2015. Supervised by Vladimir Pestov and Stevo Todorcevic. MSC: 43A07, 05C55, 54H20, 05C20. Keywords: amenable groups, directed graphs, tournaments, Fraïssé classes.

Abstract

We establish the amenability, unique ergodicity, and nonamenability of various automorphism groups from Cherlin's classification of countable homogeneous directed graphs. This marks a complete understanding of the amenability of the automorphism groups from this list, and except for the Semigeneric graph case, marks a complete understanding of the unique ergodicity of these groups.

Along the way we establish that a certain product of Fraïssé classes preserves amenability, unique ergodicity, and the Hrushovski property. We also establish the unique ergodicity of various other automorphism groups of Fraïssé structures that do not appear in this classification.

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PHILLIP WESOLEK, ***The Global Structure of Totally Disconnected Locally Compact Polish Groups***, The University of Illinois at Chicago, USA, 2014. Supervised by Christian Rosendal. MSC: 54H05. Keywords: totally disconnected locally compact groups, Polish groups.

Abstract

This thesis considers the class of totally disconnected locally compact (t.d.l.c.) Polish groups. These groups appear throughout mathematics, and moreover, they are particularly amenable to study via descriptive-set-theoretic methods. This work consists of two main threads of research. The first isolates and explores a natural dividing line in the class of t.d.l.c. Polish groups. The second is more group-theoretic in nature and considers the structure of t.d.l.c. Polish groups.

The elementary groups are first isolated; this class is motivated by a desire to capture the groups "built by hand" from profinite Polish groups and countable discrete groups. The class of elementary groups can be defined as the smallest class of t.d.l.c. Polish groups that contains the profinite Polish groups and the countable discrete groups and that is closed under taking closed subgroups, Hausdorff quotients, group extensions, and countable unions of open