Research statement

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Im interested in applications of set theory to measure theory, topology and functional analysis. Below I list my current areas of interest.

Efimov and Grothendieck spaces in forcing extensions. Efimov space is a compact infinite space without converging sequences and without a copy of $\beta\omega$. It is not known if such spaces exist in ZFC but more and more is known about its existence in certain models of set theory. One can investigate a more complicated object: Grothendieck spaces (i.e. spaces without non-trivial sequences of measures) without copies of $\beta\omega$ (see e.g. [3]). In particular, I'm interested in existence of such monsters in certain forcing extensions (e.g. in random model).

Classification of measures on Boolean algebras. I'm interested in a classification of Boolean algebras supporting finitely additive measures. Contrary to the case of σ-additive measures, in which we have the unexpectedly simple classification given by celebrated Maharam's theorem, in the finitely additive case we cannot hope for a full classification. In [1] we showed that the isomorphism of measures on the Cantor algebra (so, the simplest non-atomic Boolean algebra) is already quite complicated from the point of view of descriptive set theory. However, there are many particular questions one can ask (and perhaps answer) here.

Other areas. I like combinatorics of $P(\omega)$: e.g. the theory of (analytic P-)ideals, gaps, cardinal coefficients, etc. particularly from the point of view of potential applications outside set theory (e.g. in [2]). Also, I'm interested in set theory of the real line.

References

[1] P. Borodulin-Nadzieja, M. Džamonja, *On isomorphism problem for measures on Boolean algebras*, preprint;

[2] P. Borodulin-Nadzieja, B. Farkas, *Cardinal coefficients associated to certain orders on ideals*, Archive for Mathematical Logic: Volume 51, Issue 1 (2012), Page 187-202;

[3] P. Koszmider, *A survey on Banach spaces $C(K)$ with few operators*, Rev. R. Acad. Cienc. Exactas Fs. Nat. Ser. A Math. RACSAM 104 (2010), no. 2, 309326.