Juhász80 Workshop

Program and Abstracts

Aug 8–9, 2023

Talks

Zoom Talks

- Aleksander Błaszczyk: *Topologies on the set of finite sequences*
- Alan Dow: *Frechet-Urysohn property and π-character*
- Mirna Dzamonja: *Capturing converegence through changing the logic*
- Klaas Piter Hart: *Many subalgebras of $\mathcal{P}(\omega)/fin$*
- Michael Hrusak: *The bounded topology on filters and ideals*
- Márk Poór: *A Shelah group in ZFC*
- Saharon Shelah: *TBA*
- William Weiss: *Cardinal Functions in Topology - Fifty Years Later*

In Person Talks

- Nathan Carlston: *Some recent cardinality bounds*
- Márton Elekes: *Universally Baire sets and the reflection of non-Baire property in compact sets*
- Menachem Kojman: *TBA*
- Péter Komjáth: *Davies's theorem and the coloring number of graphs*
- Miloš Kurilić: *Vaught's Conjecture for Some Classes of Partial Orders*
- Juan Carlos Martinez: *On tall LCS spaces with small bottoms*
- Gábor Sági: *Homogeneous structures and automorphism invariant measures*
- Lajos Soukup: *Countable netweight revisited*
- Santi Spadaro: *Infinite games and cardinal functions*
- Jan van Mill: *Closed copies of $\mathbb{N}$ in $\mathbb{R}^{\omega_1}$*
- Boban Velickovic: *On indestructible strongly guessing models*
- Zoltán Vidnyánszky: *The Axiom of Choice and the CSP Dichotomy*
- Ljubomir Zdomskyy: *Concentrated sets in the Miller model*

Program

Tuesday

	Main Lecture Hall
9.00-9.30	Opening
9.30-9.55	Saharon Shelah: *TBA*, Zoom
10.00-10.25	Márton Elekes: *Universally Baire sets and the reflection of non-Baire property in compact sets*
10.30-10.55	Menachem Kojman: *TBA*
11.00–11.30	Coffee Break
11.30-11.55	Klaas Piter Hart: *Many subalgebras of $\mathcal{P}(\omega)/fin$*, Zoom
12.00-12.25	Péter Komjáth: *Davies's theorem and the coloring number of graphs*
12.30-12.55	Miloš Kurilić: *Vaught's Conjecture for Some Classes of Partial Orders*

Lunch break: 13.00-15.00

	Main Lecture Hall
15.00-15.25	Alan Dow: *Frechet-Urysohn property and π-character*, Zoom
15.30-15.55	William Weiss: *Cardinal Functions in Topology - Fifty Years Later*, Zoom
16.00-16.25	Márk Poór: *A Shelah group in ZFC*, Zoom
16.30-16.55	Coffee Break
17.00-17.25	Mirna Dzamonja: *Capturing converegence through changing the logic*, Zoom
17.30-17.55	Michael Hrusak: *The bounded topology on filters and ideals*, Zoom

Wine and cheese party: 18.00–

Wednesday

Wednesday 9.00-11.10

	Main Lecture Hall
9.00-9.25	Gábor Sági: *Homogeneous structures and automorphism invariant measures*
9.30-9.55	Santi Spadaro: *Infinite games and cardinal functions*
10.00-10.25	Jan van Mill: *Closed copies of* $\mathbb{N}$ *in* $\mathbb{R}^{\omega_1}$
10.30-11.00	Coffee Break
11.00-11.25	Boban Velickovic: *On indestructible strongly guessing models*
11.30-11.55	Lajos Soukup: *Countable netweight revisited*
12.00-12.25	Nathan Carlston: *Some recent cardinality bounds*

Lunch Break 12.30-14.00

	Main Lecture Hall
14.00-14.25	Zoltán Vidnyánszky: *The Axiom of Choice and the CSP Dichotomy*
14.30-14.55	Juan Carlos Martinez: *On tall LCS spaces with small bottoms*
15.00-15.30	Coffee Break
15.30-15.55	Aleksander Błaszczyk: *Topologies on the set of finite sequences*, Zoom
16.00-16.25	Ljubomir Zdomskyy: *Concentrated sets in the Miller model*

Abstracts

Topologies on the set of finite sequences

We 15.30–15.55

Aleksander Błaszczyk
University of Silesia

We shall present some results concerning the topology $\mathrm{Seq}(\omega,\mathcal{U})$ defined on the set $\omega^{<\omega}$ of finite sequences. If $\mathcal{U} = (\mathcal{F}_s\colon s \in \omega^{<\omega})$ is a given collection of free filters on ω, then a set $U \subseteq \omega^{<\omega}$ is open in the space $\mathrm{Seq}(\omega,\mathcal{U})$ whenever $\{n \in \omega\colon s^\frown n \in U\} \in \mathcal{F}_s$ for every $s \in U$, where $s^\frown n$ denotes the extension of the sequence s by element $n \in \omega$. If X is a dense in itself separable, extremely disconnected compact Hausdorff space, then there exists a collection $\mathcal{U}$ of ultrafilters on ω such $\mathrm{Seq}(\omega,\mathcal{U})$ is a one-to-one continuous image of a dense subspace of X. Extending a result of [1], we prove that if ultrafilters in $\mathcal{U}$ are not nowhere dense, then $\beta\,\mathrm{Seq}(\omega,\mathcal{U})$ admits a semi-open map onto the Cantor set. We also obtain a topological proof of the theorem stating that there exists a complete atomless σ-centered Boolean algebra not containing a free Boolean algebra as a regular subalgebra whenever there exist nowhere dense ultrafilters; see [2].

The presented results are going to be included in the joint paper with A. Szymanski entitled "New applications of the space $\mathrm{Seq}(\omega)$".

References:

[1] Błaszczyk A., Shelah S., *Regular subalgebras of complete Boolean algebras*, J. Symbolic Logic 66 (2001), no. 2, 792–800.

[2] Błaszczyk A., Szymański A., *Concerning Parovičenko's theorem*, Bull. Acad. Polon. Sci. Sér. Sci. Math. 28(1980), no. 7-8, 311—314.

Some recent cardinality bounds

We 12.00–12.25

Nathan Carlston
California Lutheran University

We discuss several new bounds for the cardinality of a topological space. Bella, Carlson, and Spadaro have shown $|X| \leq 2^{pwL_c(X)H\psi(X)}$ for a Hausdorff space X, where $pwL_c(X) \leq \min L(X), c(X)$ and $\psi_c(X) \leq H\psi(X) \leq \chi(X)$. This unifies results of Hajnal-Juhász, Arhangel'skii, Bella-Spadaro, and Hodel. Carlson has shown a variety of "double exponent" cardinality bounds, including $|X| \leq 2^{c(X)^{\pi\chi(X)}}$ if X is regular, and $|X| \leq 2^{d(X)^{\pi\chi(X)}}$ if X is Hausdorff. These are obtained by replacing the pseudocharacter and its variants with weaker versions in results of Sapirovskii and Sun. Compact examples show that the pseudocharacter cannot be replaced with these weaker versions in Gryzlov's inequality for the cardinality of a compact T_1 space. Gotchev has shown $|X| \leq \pi w(X)^{dot(X)\psi_c(X)}$ if X is Hausdorff, where Other recent results might be discussed if there is time.

Frechet-Urysohn property and π-character

Tu 15.00–15.25

Alan Dow
UNC Charlotte

Capturing converegence through changing the logic

Tu 17.00–17.25

Mirna Dzamonja
CNRS et Université de Paris-Cité

In recent years we have witnessed an unprecedented confluence of methods from discrete and continuous mathematics, especially in subjects having to do with logic and topology. One can cite fields such as continuous model theory, homotopy type theory and, most relevant to this talk, combinatorial limits. The latter have started from the notion of graphons and have been generalised to other objects, including the very general Stone pairings. In this subject one looks at uncountable limits of a countable sequence of finite objects, with various logical properties that carry through. In the context of first order logic, one can think of Los's theorem for ultraproducts, but various other transfer theorems have been obtained in this other contexts. In this talk we shall review some of these notions, including a Ramsey theorem about ultraproducts, and then connect them with the study of abstract logics through new satisfaction relations.

Universally Baire sets and the reflection of non-Baire property in compact sets

Tu 10.00–10.25

Márton Elekes
Rényi Institute of Mathematics

Universally Baire sets play a crucial role in set theory, and they are also very interesting from the point of view of descriptive set theory. However, there are at least a dozen different definitions, and many of these are non-equivalent (at least consistently). The first goal of this talk is to clarify this situation, then, as a by-product, to show that non-Baire Property reflects in compact subspaces, and finally, to briefly give applications in the theory of so called Haar meagre sets. Joint work with Máté Pálfy

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Many subalgebras of $\mathcal{P}(\omega)/\mathit{fin}$

Tu 11.30–11.55

Klaas Piter Hart
Delft University of Technology

We construct a family of subalgebras of $\mathcal{P}(\omega)/\mathit{fin}$ that is isomorphic, under the embeddability relation, to the power set of the real line (ordered by inclusion). The proof is by Stone duality and yields a family of compact, separable and zero-dimensional spaces that behave similarly under the relation "continuous image of"

The bounded topology on filters and ideals

Tu 17.30–17.55

Michael Hrusak
National Autonomous University of Mexico

This is a joint work with Fernando Hernández and Norberto Rivas. We introduce and study the "bounded topology" on filters and ideals on countable sets, stronger than the usual metrizable one, defined by declaring convergent only the bounded convergent sequences. We present some basic facts and open problems concerning this notion.

TBA

Tu 10.30–10.55

Menachem Kojman
Ben Gurion University of the Negev

Davies's theorem and the coloring number of graphs

Tu 12.00–12.25

Péter Komjáth
Eötvös University, Budapest

Davies's theorem and the coloring number of graphs

We generalize Davies's famous example to a property of graphs: a graph (V, X) is *Davies* if for every $F : X \to \mathbb{R}$, there is a collection $\{g_v : v \in V\}$ of $\omega \to \mathbb{R}$ functions such that $F(v, w) = \sum_{n<\omega} g_v(n) g_w(n)$ for $\{v, w\} \in X$. We show that if $\mathrm{Col}(X) \leq \omega_1$ and $|X| \leq \mathfrak{c}$, then X is Davies. On the other hand, there is a non-Davies graph X with $|X| = \mathfrak{c}^+$, $\mathrm{Col}(X) = 3$. If $\mathrm{Chr}(X) > \mathfrak{c}$ or $\mathrm{Col}(X) > \mathfrak{c}^+$, then X is not Davies. If the existence of a supercompact cardinal is consistent, then so is that $\mathfrak{c} = \aleph_3$ and any graph X with $\mathrm{Col}(X) > \omega_1$ is not Davies.

Vaught's Conjecture for Some Classes of Partial Orders

Tu 12.30–12.55

Miloš Kurilić
University of Novi Sad

Matatyahu Rubin has shown that a sharp version of Vaught's conjecture, $I(\mathcal{T},\omega) \in \{0, 1, \mathfrak{c}\}$, holds for each complete theory $\mathcal{T}$ of linear order. We show that the same is true for each complete theory of partial order having a model in the the minimal closure of the class of linear orders under finite products and finite disjoint unions. The same holds for the extension of the class of rooted trees admitting a finite monomorphic decomposition, obtained in the same way. The sharp version of Vaught's conjecture also holds for the theories of trees which are infinite disjoint unions of linear orders.

Acknowledgement This research was supported by the Science Fund of the Republic of Serbia, Program IDEAS, Grant No. 7750027: *Set-theoretic, model-theoretic and Ramsey-theoretic phenomena in mathematical structures: similarity and diversity*–SMART.

On tall LCS spaces with small bottoms

We 14.30–14.55

Juan Carlos Martinez
Universitat de Barcelona

Recall that a topological space X is *scattered*, if every non-empty subspace of X has an isolated point. By an LCS space we mean a locally compact Hausdorff and scattered space. Suppose that X is an LCS space. For every ordinal α, we define the α-Cantor-Bendixson level of X as $I_{\ alpha}(X) =$ the set of isolated points of the subspace $X \setminus \cup\{I_{beta}(X) : \beta < \alpha\}$. Then, we define the height of X as

$ht(X) =$ the least ordinal α such that $I_\alpha(X) = \emptyset$

and we define the width of X as

$wd(X) = sup\{|I_\alpha(X)| : \alpha < ht(X)\}$.

The problem of the existence in ZFC of an LCS space of height ω_2 and width ω_1 is a long-standing open question. However, it was proved by Juhász, Shelah, Soukup and Szentmiklóssy that there exists an LCS space of height ω_2 with only ω_1 isolated points.

In this talk, we will prove that for every ordinal $\alpha < \omega_3$ there is an LCS space of height α with only ω_1 isolated points.

A Shelah group in ZFC

Tu 16.00-16.25

Márk Poór
Cornell University

n a paper from 1980, Shelah constructed a Jonsson group of size $\aleph_1$. Assuming CH, he moreover obtained what is now known as a "Shelah group" of size $\aleph_1$, i.e., a group of size $\aleph_1$ such that for some integer N, the collection of all N-sized words over the alphabet of any given uncountable subset of the group resurrects the whole group. In this talk, we shall present a ZFC construction of a Shelah group at the level of any successor of a regular cardinal. We shall also address the problem of constructing Shelah groups at successors of singulars and at inaccessibles. This is a joint work with Assaf Rinot.

Homogeneous structures and automorphism invariant measures

We 9.00–9.25

Gábor Sági
Rényi Institute of Mathematics

A countable relational structure $\mathcal{A}$ is defined to be homogeneous iff each finite elementary mapping of it can be extended to an automorphism. The automorphism group of a countable homogeneous structure is a Polish group (with respect to the pointwise convergence topology).

Motivated by questions originating from model theory and from finite combinatorics, we will discuss measures on subsets of $\mathcal{A}$, on certain subgroups of the automorphism group of $\mathcal{A}$ and on the Stone spaces of $\mathcal{A}$. We will present recently obtained existence and uniqueness results.

Related investigations may provide better understanding of how these structures are built up from their finite substructures.

TBA

Tu. 9.30–9.55

Saharon Shelah
Hebrew University, Jerusalem

TBA

Countable netweight revisited

We 11.30-11.55

Lajos Soukup
Rényi Institute of Mathematics

Infinite games and cardinal functions

We 9.30–9.55

Santi Spadaro

We will survey several results, obtained with various coauthors, showing the impact of infinite games on the theory of cardinal functions in topology.

Closed copies of $\mathbb{N}$ in $\mathbb{R}^{\omega_1}$

We 10.00–10.25

Jan van Mill
University of Amsterdam

(joint work with Alan Dow, Klaas Pieter Hart and Hans Vermeer)

We investigate closed copies of N in powers of $\mathbb{R}$ with respect to C^*- and C-embedding.

We show that $\mathbb{R}^{\omega_1}$ contains closed copies of N that are not C^*-embedded.

On indestructible strongly guessing models

We 11.00–11.25

Boban Velickovic
Université Paris Diderot

One of the driving themes of research in set theory in recent years has been the search for higher forcing axioms. Since most applications of strong forcing axioms such as the Proper Forcing Axiom (PFA) and Martin's Maximum (MM) can be factored through some simple, but powerful combinatorial principles, it is natural to look for higher cardinal versions of such principles. In a previous work we formulated the principle $GM^+(\omega_3, \omega_1)$ which implies that:

- the tree property holds at ω_2 and ω_3
- the failure of square principles $\square(\kappa)$, for regular $\kappa \geq \omega_2$
- the Singular Cardinal Hypothesis
- the approachability ideal on ω_2 coincides with the non stationary ideal restricted to ordinals of cofinality ω_1, etc.

We now further strengthen this principle to $SGM^+(\omega_3, \omega_1)$ which in addition implies that

- Souslin's Hypothesis
- there are no weak Kurepa trees
- any forcing adding a subset of ω_2 either adds a real or collapses a cardinal.

The Axiom of Choice and the CSP Dichotomy

We 14.00–14.25

Zoltán Vidnyánszky
Eötvös University, Budapest

I will discuss infinitary generalizations of the CSP dichotomy theorem of Bulatov and Zhuk, which states that homomorphism problems are either easy (in P) or hard (NP complete). I will show that in the infinite context, it is surprisingly easy to detect the same distinction between hard and easy problems.

Cardinal Functions in Topology - Fifty Years Later

Tu 15.30–15.55

William Weiss
University of Toronto

Concentrated sets in the Miller model

We 16.00–16.25

Ljubomir Zdomskyy
Kurt Gödel Research Center

Bartoszyński and Halbeisen conjectured in [1] that in the Miller model there exists an ω_1-concentrated set of reals of size ω_2. Let us recall that a set $X \subset \mathbb{R}$ is ω_1-concentrated if there exists a countable $Q \subset \mathbb{R}$ such that $|X \setminus U| \leq \omega$ for every open $U \supset Q$. In our talk we shall present the main ideas of the proof that this conjecture is false. This may be thought of as a step towards studying Hurewicz totally imperfect sets in this model.

The talk will be based on a recent joint work with V. Haberl and P. Szewczak.

[1] Bartoszyński, T.; Halbeisen, L., *On a theorem of Banach and Kuratowski and K-Lusin sets*, Rocky Mountain J. Math. **33** (2003), 1223–1231.
