Program Committee:

Longyun Ding – Nankai University, China
Su Gao – Nankai University, China
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Local Organizing Committee:

Longyun Ding – Nankai University, China
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Qihao Zhao – Nankai University, China
Ming Xiao – Nankai University, China
Victor Hugo Yañez Salazar – Nankai University, China

Overview

Beijing Time		Jun. 17	Jun. 18	Jun. 19	Jun. 20	Jun. 21
AM	9:00-9:50	Opening ceremony & Marcin Sabok	Aleksandra Kwiatkowska	Free Discussions	Ming Xiao	Filippo Calderoni
	9:50-10:20	Photo & Tea Break	Tea Break		Tea Break	
	10:20-11:10	Dominik Kwietniak	Maciej Malicki		Joshua Frisch	Gianluca Paolini
	11:15-12:05	Longyun Ding	Friedrich Martin Schneider		Steve Jackson	Tianhao Wang
Noon						Feng Li
PM	14:30-15:20	Márton Elekes	Riley Thornton	Free Discussions	Krzysztof Krupiński	Free Discussions
	15:20-15:50	Tea Break			Tea Break	
	15:50-16:40	Felipe Garcia-Ramos	Xu Wang		Yonatan Gutman	
	16:45-17:35	Ruiwen Li	Dominique Lecomte		Todor Tsankov	
	18:00-20:00	Buffet	/	/	Conference Dinner	/
Room: 2F. JI						

Detailed Schedule

Jun. 17			
Beijing Time		Room	Title
AM	9:00-9:50	2F JI	Opening ceremony
			Marcin Sabok: Conjugacy of transitive systems and Bowen's Problem 32
	9:50-10:20	Photo & Tea Break	
	10:20-11:10	2F JI	Dominik Kwietniak: An anti-classification theorem for the topological conjugacy problem for Cantor minimal systems
	11:15-12:05	2F JI	Longyun Ding: On equivalence relations induced by Polish groups
Noon			
PM	14:30-15:20	2F JI	Márton Elekes: Generic groups
	15:20-15:50	Tea Break	
	15:50-16:40	2F JI	Felipe Garcia-Ramos: Borel complexity of normal numbers of Hurwitz continued fractions
	16:45-17:35	2F JI	Ruiwen Li: Equivalence Relations Inspired by the Conjugacy on Minimal Systems
	18:00-20:00	18F Diamond	Buffet

Jun. 18			
Beijing Time		Room	Title
AM	9:00-9:50	2F JI	Aleksandra Kwiatkowska: Dendroids and projective Fraïssé limits
	9:50-10:20	Tea Break	
	10:20-11:10	2F JI	Maciej Malicki: Compacta and their homeomorphism groups from posets
	11:15-12:05	2F JI	Friedrich Martin Schneider: Groups without unitary representations, submeasures, and the escape property
Noon			
PM	14:30-15:20	2F JI	Riley Thornton: Differential equations and greedy algorithms
	15:20-15:50	Tea Break	
	15:50-16:40	2F JI	Xu Wang: A hierarchy on non-archimedean CLI Polish groups
	16:45-17:35	2F JI	Dominique Lecomte: Countable continuous colorings on compact spaces

Jun. 20			
Beijing Time		Room	Title
AM	9:00-9:50	2F JI	Ming Xiao: A special case of hyperfinite-over-hyperfinite equivalence relations
	9:50-10:20	Photo & Tea Break	
	10:20-11:10	2F JI	Joshua Frisch: TBA
	11:15-12:05	2F JI	Steve Jackson: Treeings and regulated partitons for $\mathbb{Z}^n$ actions
Noon			
PM	14:30-15:20	2F JI	Krzysztof Krupiński: Generalized locally compact models of approximate subgroups via topological dynamics
	15:20-15:50	Tea Break	
	15:50-16:40	2F JI	Yonatan Gutman: A Tale on Dimension in Dynamics
	16:45-17:35	2F JI	Todor Tsankov: Affine logic and integral decomposition
	18:00-20:00	2F JI	Conference Dinner

Jun. 21			
Beijing Time		Room	Title
AM	9:00-9:50	2F JI	Filippo Calderoni: Condensation and countable Borel equivalence relations
	9:50-10:20	Photo & Tea Break	
	10:20-11:10	2F JI	Gianluca Paolini: The Isomorphism Problem for Oligomorphic Groups
	11:15-12:05	2F JI	Tianhao Wang: Continuous Edge Chromatic Numbers of Abelian Group Actions
	12:10-13:00	2F JI	Feng Li: Extremely amenable automorphism groups of countable structures
	Noon		

Conjugacy of transitive systems and Bowen's Problem 32

Marcin Sabok
McGill University

Abstract: The talk will be focused on the complexity of the conjugacy problems of various transitive systems. I will discuss a recent result saying that the topological conjugacy relation of symbolic systems with specification is not amenable, and in particular not smooth. This shows that the classification asked for in Rufus Bowen's Problem 32 is impossible with concrete invariants. I will also discuss the complexity of the conjugacy of pointed transitive systems. Along the way, we will see an answer to a question of Bruin and Vejnar by establishing that topological conjugacy relation of pointed transitive Hilbert cube systems is bi-reducible with a turbulent group action. This is joint work with K. Deka, D. Kwietniak and B. Peng.

An anti-classification theorem for the topological conjugacy problem for Cantor minimal systems

Dominik Kwietniak
Jagiellonian University in Kraków

Abstract: The isomorphism problem in dynamics dates back to a question of von Neumann from 1932: Is it possible to classify the ergodic measure-preserving diffeomorphisms of a compact manifold up to isomorphism? Foreman, Rudolph and Weiss proved an *anti-classification theorem* that rigorously explains why, in a certain sense, such a classification is impossible [1]. We study a topological analogue of von Neumann's problem. Let $\mathrm{Min}(C)$ stand for the Polish space of all minimal homeomorphisms of the Cantor set C. Recall that a homeomorphism $T\colon C \to C$ is minimal if every orbit of T is dense in C. We say that S and T in $\mathrm{Min}(C)$ are topologically conjugate if there is a homeomorphism

$h\colon C \to C$ such that $S \circ h = h \circ T$. We will discuss an anti-classification result, saying that it is impossible to tell if two minimal Cantor set homeomorphisms are topologically conjugate using only a countable amount of information and computation. We will explain, how to understand such an anti-classification result and why it suffices to show that the topological conjugacy relation of Cantor minimal systems treated as a subset of $\mathrm{Min}(C) \times \mathrm{Min}(C)$ is complete analytic, so a non-Borel subset of $\mathrm{Min}(C) \times \mathrm{Min}(C)$.

This is joint work with Konrad Deka, Felipe García-Ramos, Kosma Kasprzak, Philipp Kunde (all from the Jagiellonian University in Kraków).

[1] Matthew Foreman, Daniel J. Rudolph, Benjamin Weiss, *The conjugacy problem in ergodic theory.* Ann. of Math. (2) **173** (2011), no. 3, 1529–1586.

On equivalence relations induced by Polish groups

Longyun Ding
Nankai University

Abstract: In this talk, we recall Borel reducibility among equivalence relations first. Then we introduce equivalence relations $E(G)$ induced by Polish groups G. Main part of this talk is to precent many rigid results concerning various kinds of Polish groups: non-archimedean, TSI, CLI, α-unbalanced, abelian, locally compact, Lie groups, and Banach spaces (as additive groups) and so on. This is joint work with Yang Zheng.

Generic groups

Márton Elekes
Rényi Institute and Eötvös Loránd University

Abstract: We study generic properties of groups in the sense of Baire category.

First we investigate countably infinite (discrete) groups. Goldbring, Kunnawalkam and Lodha proved that every isomorphism class is meager among countably infinite groups. In contrast, we show that there is a comeager isomorphism class among countably infinite *abelian* groups. We also show that the generic countably infinite *torsion-free* abelian group is the additive group of the rationals. Along the way, we extend a classical result of B. H. Neumann, H. Simmons and A. Macintyre on algebraically closed groups and the word problem.

Then we turn to compact metrizable abelian groups. We use Pontryagin duality to show that there is a comeager isomorphism class among compact metrizable abelian groups, namely the countable power of the so-called universal odometer. We then prove that the generic *connected* compact metrizable abelian group is the so-called universal solenoid. We also prove partial results in the non-abelian case.

Various parts of the talk are joint work with U. B. Darji, B. Gehér, T. Kátay, T. Keleti, A. Kocsis and M. Pálfy.

Borel complexity of normal numbers of Hurwitz continued fractions

Felipe Garcia-Ramos
Jagiellonian University and UASLP

Abstract: We say a number is normal with respect to a symbolic representation, if every digit is uniformly distributed along the sequence of the representation. Normal numbers form a Borel subset in general. The complexity of such subset has been studied in different contexts. In this presentation we will talk about Hurwitz continued fractions, which is one of the natural representations of complex numbers as continued fractionns. Joint work with Gonzalez-Robert and Hussain.

Equivalence Relations Inspired by the Conjugacy on Minimal Systems

Ruiwen Li
Nankai University

Abstract: The complexity of the conjugacy relation on minimal systems under Borel reducibility is a well-known question in descriptive set theory. In this talk, by analyzing the conjugacy relation on Oxtoby systems, we introduce an equivalence relation named ”topological type”, this relation gives a lower bound for the conjugacy complexity of minimal systems and shows that the conjugacy relation on minimal systems cannot be classified by countable structures. Moreover, when considering the isomorphism relation of pointed minimal systems, the topological type relation describes its exact complexity.

Dendroids and projective Fraïssé limits

Aleksandra Kwiatkowska
University of Wrocław and University of Münster

Abstract: We discuss tree-like compact connected spaces such as dendrites and more generally dendroids, which are studied in continuum theory. We present how to construct many interesting examples (such as Ważewski dendrites or the Mohler-Nikiel universal dendroid) using projective Fraïssé limits of families of finite (rooted) trees. Moreover, we construct continua, which as far as we know has not been studied in the literature so far. It turns out that performing elementary operations on finite rooted trees such as splitting an edge, adding an edge, or doubling a component above a vertex, leads us to Fraïssé limits whose topological realizations are highly non-trivial. This is based on joint work with Charatonik, Roe, and Yang.

Compacta and their homeomorphism groups from posets

Maciej Malicki
Polish Academy of Sciences

Abstract: Very recently A. Bartoš, T. Bice and A. Vignati discovered a duality, resembling the Stone duality, between second countable T_1 compacta and graded omega-posets. Their approach allows for elementary combinatorial constructions, in the spirit of Fraïssé theory, of classical continua such as the Lelek fan or the pseudo-arc. We extend this framework to study homeomorphism groups of compacta. We characterize Hausdorff compacta such that their group of homeomorphisms has a dense or a comeager conjugacy class. We use this characterization to prove that there exists a comeager conjugacy class in the group of homeomorphisms of the Lelek fan. This sheds light on the dynamics on the

Lelek fan: a generic homeomorphism has no Lie-Yorke pair; in particular, its topological entropy is zero. We also show that the homeomorphism group of the pseudo-arc has a dense conjugacy class. This is joint work in progress with T.Bice.

Groups without unitary representations, submeasures, and the escape property

Friedrich Martin Schneider
TU Bergakademie Freiberg

Abstract: In the talk, I will present new examples of exotic groups, i.e., topological groups without any non-trivial continuous unitary representations. I will report on a recent joint work with Sławomir Solecki, in which we prove that all groups of the form $L^0(\phi, G)$, where ϕ is a pathological submeasure and G is a topological group, are exotic. This result extends, with a different proof, a theorem of Herer and Christensen on exoticness of $L^0(\phi, \mathbb{R})$ for ϕ pathological. It follows that every topological group embeds into an exotic one. In our arguments, we introduce the escape property, a geometric condition on a topological group, inspired by the solution to Hilbert's fifth problem and satisfied by all locally compact groups, all non-archimedean groups, and all Banach–Lie groups. Our key result involving the escape property asserts triviality of all continuous homomorphisms from $L^0(\phi, G)$ to $L^0(\mu, H)$, where ϕ is pathological, μ is a measure, G is a topological group, and H is a topological group with the escape property.

Differential equations and greedy algorithms

Riley Thornton
Carnegie Mellon University

Abstract: The differential equations method is a tool from probabilistic combinatorics for analyzing greedy algorithms. In this talk, I'll survey some recent work applying the method to problems in measurable combinatorics. In particular, I will compute the approximate chromatic number of F_2 and give improved bounds on the measurable chromatic number of F_3.

A hierarchy on non-archimedean CLI Polish groups

Xu Wang
Nankai University

Abstract: We introduce a hierarchy on the class of non-archimedean Polish groups that admit a compatible complete left-invariant metric. We denote this hierarchy by α-CLI and L-α-CLI, where α is a countable ordinal. We establish three results:

(1) G is 0-CLI iff $G = \{1_G\}$;
(2) G is 1-CLI iff G admits a compatible complete two-sided invariant metric; and
(3) G is L-α-CLI iff G is locally α-CLI, i.e., G contains an open subgroup that is α-CLI.

Next we prove this hierarchy is proper by constructing non-archimedean CLI Polish groups G_α and H_α for $\alpha < \omega_1$, such that

(1) H_α is α-CLI but not L-α-CLI for $\beta < \alpha$; and
(2) G_α is $(\alpha + 1)$-CLI but not L-α-CLI.

Countable continuous colorings on compact spaces

Dominique Lecomte
Université de Picardie and Sorbonne Université

Abstract: Our main goal is to understand when a graph has a countable continuous coloring. In order to study this, we compare the graphs with the quasi-order associated with injective continuous homomorphisms. We study the structure of this quasi-order on various classes of graphs. This is often related to dynamical systems. Some results were proved a few years ago, and some others, more recent, are in collaboration with Noé de Rancourt and Miroslav Zelený.

A special case of hyperfinite-over-hyperfinite equivalence relations

Ming Xiao
Nankai University

Abstract: It is well known that a countable Borel equivalence relation is hyperfinite if and only if there is a Borel way to assign to each class a linear order which is either finite or ismorphic to $\mathbb{Z}$. In this talk we study a generalisation of hyperfiniteness, called hyperfinite-over-hyperfinite by genralising such orders, and show that in some special cases such equivalence relations are in fact hyperfinite. This is a joint work with Su Gao.

TBA

Joshua Frisch
École Normale Supérieure

Abstract: TBA

Treeings and regulated partitons for $\mathbb{Z}^n$ actions

Steve Jackson
University of North Texas

Abstract: We present a recent solution to a problem concerning the existence of certain continuous structurings of the equivalence classes from continuous, free $\mathbb{Z}^n$ actions on 0-dimensional Polish spaces. We show that there does not exist a clopen $\leq k$ lining or treeing for such equivalence relations, but there does exist open such structurings. This part is joint with C. Olsen. We then consider the notion of regulated rectangular partitions of such equivalence relations. This notion arose independently, but is connected with the first topic. We present some results and questions about such partitions. This is joint work with S. Gao.

Generalized locally compact models of approximate subgroups via topological dynamics

Krzysztof Krupiński
University of Wrocław
(joint work with Anand Pillay)

Abstract: The notion of approximate subgroup is central in additive combinatorics. In a breakthrough paper, Hrushovski proved the existence of the so-called definable locally compact (and in consequence also Lie) models for pseudofinite approximate subgroups, where by a locally compact model we mean a homomorphism from the group generated by the approximate subgroup in question to a locally compact group with some good properties (so "model" in "locally compact model" is not a structure in the sense of logic). This paved the way for Breuillard, Green,

and Tao to give a full classification of all finite approximate subgroups. However, locally compact models need not exist for arbitrary approximate subgroups; a counter-example can be found in my joint paper with Hrushovski and Pillay (refuting Wagner's conjecture).

In another breakthrough paper, Hrushovski omitted this obstacle by constructing *generalized definable locally compact models for arbitrary approximate subgroups*, where a homomorphism is replaced by a suitable quasi-homomorphism. Using this, he found generalized Lie models and used them to classify approximate lattices in $SL_n(\mathbb{R})$ and $SL_n(\mathbb{Q}_p)$. Hrushovski's construction required his notions of "definability patterns structures" and "local logics".

In a joint paper with Anand Pillay, we have constructed a generalized definable locally compact model for an arbitrary approximate subgroup via an application of topological dynamics. For that we extended the fundamental theory from the context of (compact) flows to suitable "locally compact flows". Our construction is shorter and should be accessible to group theorists and specialists in topological dynamics. Moreover, we proved universality of the constructed generalized definable locally compact model in an appropriate category. During my talk, I will explain our construction, focusing mostly on the classical context rather than the general definable context (in other words, I will focus on the special case when all subsets are definable); in this context, the relevant locally compact flow is a certain "subflow" of the Stone-Čech compactification of the group generated by the approximate subgroup in question.

A Tale on Dimension in Dynamics

Yonatan Gutman
Polish Academy of Sciences

Based on joint works with Felipe García-Ramos; Krzysztof Barański and Adam Śpiewak; Michael Levin and Tom Meyerovitch.

Abstract: We demonstrate the meaningfulness of three classical notions of dimension (Lebsegue covering dimension, mean dimension and Hausdorff dimension) for topological and measure dynamical systems (X,T). Mean dimension is well known to be tightly related to the question of when a generic continuous function $f : X \to [0,1]^r$ induces for a topological dynamical system (X,T) an (equivariant) embedding $f : (X,T) \to ([0,1]^r)^{\mathbb{Z}}-$ given by the (binfinite horizon) time-delay map $x \mapsto (..., f(T^{-1}x), f(x), f(Tx), ...)$. Despite embedding being a G_δ property we show that in a natural parametrization space of all ($\mathbb{Z}$-) topological dynamical systems the set of completely positive mean dimension systems (=all non-trivial factors have positive mean dimension) is a complete coanalytic set (in particular not Borel). Restricting to aperiodic systems (X,T) where T is a Lipschitz map on a compact set X in a Euclidean space, equipped with a Borel probability measure μ of Hausdorff dimension d, we show that for a typical function f, the (finite horizon) time-delay map $x \mapsto (f(x), f(Tx), ..., f(T^{s-1}x)$, is almost surely injective if $s > d$ and not almost surely injective if $s < d$. This is a strong probabilistic version of the celebrated Takens embedding theorem. Finally proving a generalized version of the topological Takens embedding theorem, we show that given a group action (G,X) where G is a finitely generated group, under sharp conditions on the periodic points in terms of Lebsegue covering dimension, there exists a finite (universal) subset $G' \subset G$ so that $x \mapsto (f(gx))_{g\in G'}$ is an embedding for a generic continuous map $f : X \to [0,1]^r$.

Affine logic and integral decomposition

Todor Tsankov
Université Claude Bernard Lyon 1

Abstract: Affine logic is a fragment of continuous logic introduced by Bagheri, where one only has affine connectives: sum, multiplication by real scalars, and the constant formula 1. This allows to endow the type spaces with the structure of compact convex sets and study the extremal models: the structures that realize only extreme types. Of particular interest are the simplicial theories, all of whose type spaces are Choquet simplices. I will discuss an integral decomposition result for models of simplicial theories into extremal models that generalizes both the ergodic decomposition theorem and the decomposition into factors of tracial von Neumann algebras. We do not make any separability assumptions and the non-separable case of the theorem is new even in these two classical settings. This is joint work with Itaï Ben Yaacov and Tomás Ibarlucía.

Condensation and countable Borel equivalence relations

Filippo Calderoni
Rutgers University

Abstract: In this talk I will discuss the notion of condensed points in Polish G-spaces. This notion is used to characterize those countable countable Borel equivalence relations (cbers) that are not smooth. Then I will present some new application of these techniques to show nonsmoothness for certain cbers arising in different contexts.

The Isomorphism Problem for Oligomorphic Groups

Gianluca Paolini
University of Torino

Abstract: In [1] Nies et al. proposed the problem of determination of the exact Borel complexity of the isomorphism problem for oligomorphic groups (groups of automorphisms of ω-categorical structures), where the coding is with respect to the space of closed subgroups of $\mathrm{Sym}(\omega)$. In [2] we showed that if we restrict to ω-categorical structures with weak elimination of imaginaries, then the isomorphism problem for the resulting collection of oligomorphic groups is smooth. In our talk we will present recent advancements on the problem which lead to a specific conjecture, which, if true, would imply smoothness for the entire collection of G-finite oligomorphic groups. Our methods also lead to an affirmative answer to one of the problems proposed in [1], i.e., whether we had smoothness for oligomorphism groups with finite language (up to interdefinability). This is joint work with A. Nies.

[1] A. Nies, P. Schlicht, and K. Tent *Coarse groups, and the isomorphism problem for oligomorphic groups.* J. Math. Log. **22** (2022), no. 01, 2150029.

[2] G. Paolini *The isomorphism problem for oligomorphic groups with weak elimination of imaginaries.* Bull. Lond. Math. Soc., accepted for publication.

Continuous Edge Chromatic Numbers of Abelian Group Actions

Tianhao Wang
Nankai University

Abstract: We prove that for any generating set S of $\Gamma = \mathbb{Z}^n$, the continuous edge chromatic number of the Schreier graph of the Bernoulli shift action $G = F(S, 2^\Gamma)$ is $\chi'_c(G) = \chi'(G) + 1$. In particular, for the standard generating set, the continuous edge chromatic number of $F(2^{\mathbb{Z}^n})$ is $2n + 1$.

Extremely amenable automorphism groups of countable structures

Feng Li
Nankai University

Abstract: In this talk, I am going to talk about some connection between closed subgroups of the permutation group of natural numbers and countable strucutes, especially the Kechris-Pestov-Todorcevic correspondence which reveals the relation between extremely amenability and the property of Fraïssé structures. I will give some results about the number of extremely amenable groups. Finally, I will talk about a programme started by Kechris, Nies and Tent in 2018 and introduce how our results work in the case of extremely amenablity and what I will be going to consider.