Beijing Logic Meeting 2023

July 24 - 28, 2023

Titles and abstracts

Speaker: Artem Chernikov (UCLA, USA)

Title: Regularity lemma for slice-wise stable hypergraphs.

Abstract: We discuss various strengthenings of Szemerédi's regularity lemma for hypergraphs that are tame from the model-theoretic point of view. Generalizing the case of stable graphs due to Malliaris and Shelah, we have shown the following in a joint work with Starchenko: if a 3-hypergraph $E(x, y, z)$ on $X \times Y \times Z$ is stable when viewed as a binary relation under any partition of its variables in two groups, then there are partitions X_i of X, Y_j or Y and Z_k of Z so that the density of E on any box $X_i \times Y_j \times Z_k$ is either 0 or 1. Terry and Wolf raised the question if the assumption can be relaxed to slice-wise stability, i.e. for any z in Z, the corresponding fiber E_z is a stable relation on $X \times Y$, and similarly for any permutation of the variables (analogous slice-wise assumption is known to be correct in the NIP case). We provide an example of a slice-wise stable 3-hypergraph which does not satisfy the stable regularity lemma above, and establish an optimal weaker partition result for slice-wise stable hypergraphs. Joint work with Henry Towsner.

Speaker: Longyun Ding (Nankai University, China)

Title: On equivalence relations induced by Polish groups.

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.

Speaker: Yun Fan (Southeast University, China)

Title: There are no cl-maximal left-c.e. reals.

Abstract: We say β is computably Lipschitz reducible to α, written as $\beta \leq_{cl} \alpha$, if there is a Turing reduction Φ such that $\beta = \Phi^{\alpha}$ and its use function $\phi(x)$ is bounded by $x + c$ for some constant c. In this talk, we prove that there are no cl-maximal left-c.e. reals. The proving method can be applied to analyze more properties of cl-reducibility.

Speaker: James Freitag (University of Illinois at Chicago, USA)

Title: TBA

Abstract: TBA

Speaker: Kyle Gannon (UCLA, USA)

Title: Randomizations and generic stability.

Abstract: It was first observed by Ben Yaacov that measures over a structure correspond to types over a particular model of the randomization. Ben Yaacov gives a process for transferring measures to types (over particular models) which preserve some basic properties (e.g. definable measures are transferred to definable types). In this talk we will prove that FIM measures are transferred to generically stable types. This is joint work with Gabriel Conant and James Hanson.

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Speaker: Su Gao (Nankai University, China)

Title: The Scott rank of computable structures and the isomorphism relation.

Abstract: I will give a survey of results around building computable structures with Scott rank ω_1^{CK}. Several conjectures have been proposed about how difficult it is to construct such structures. Here I will prove one statement which testifies to this difficulty. Suppose there is a hyperarithmetic reduction f from the equivalence relation $\omega_1^x = \omega_1^y$ to the isomorphism relation of countable structures, then for every x, $f(x)$ has Scott rank $\omega_1^x + 1$. This answers a question of Chan, Harrison-Trainor and Marks.

Speaker: Jialiang He (Sichuan University, China)

Title: $\mathcal{I}$-maximal eventually different family.

Abstract: Let $\mathcal{I}$ be an ideal on N and $\mathcal{E} \subseteq \mathbb{N}^{\mathbb{N}}$. We call $\mathcal{E}$ is $\mathcal{I}$-Maximal eventually different family if the following conditions holds:

1. For each $f \neq g \in \mathcal{E}$, we have $\{n \in \mathbb{N} : f(n) = g(n)\} \in \mathcal{I}$.

2. For each $f \in \mathbb{N}^{\mathbb{N}}$, there exists $g \in \mathcal{E}$ such that $\{n \in N : f(n) = g(n)\} \in I$.

In this talk, we will show there are closed $\mathcal{I}$-Maximal eventually different family for some Borel ideals, such as, $Fin \times Fin$, $\widetilde{\mathcal{ED}}_{fin}$, $\mathcal{ED}_{fin}$. This is a joint work with Jintao Luo and Hang Zhang.

Speaker: Will Johnson (Fudan University, China)

Title: A strategy for resolving the P-minimal group conjectures of Onshuus and Pillay.

Abstract: Pillay's o-minimal group conjectures, which are now proven, were an important motivation for research in NIP groups and definable amenability. These conjectures say that if G is a definably compact definable group in an o-minimal theory, then G/G^{00} has the structure of a compact real Lie group, among other things. Onshuus and Pillay subsequently formulated analogous conjectures for groups definable in P-minimal theories, such as p-adically

closed fields and their expansions by restricted analytic functions. In this talk, I will discuss a plausible strategy for proving these P-minimal conjectures, and why it works (or doesn't!). Assuming everything works, the P-minimal group conjectures hold because of a technical loophole, matching the letter but not the spirit of the original conjectures. Over pure p-adically closed fields, I can probably prove a stronger statement which is closer to the spirit of the original conjectures.

Speaker: Olga Kharlampovich (City University of New York, USA)

Title: First-order sentences in random groups.

Abstract: We prove that a random group, in Gromov's density model with $d < 1/16$ satisfies with overwhelming probability a universal-existential first-order sentence σ (in the language of groups) if and only if σ is true in a non-abelian free group. We deduce this from our result that all solutions of a system of equations in a random group are almost surely obtained by substitutions from solutions in a free group. We will also discuss equations in other classes of groups. These are joint results with Rizos Sklinos.

Speaker: Bakh Khoussainov (U. Electronic Science & Tech, China)

Title: Reasoning about statistical knowledge in algebraic structures.

Abstract: We study algebraic structures equipped with probability distributions. Probability distributions represent the base statistical knowledge in the structures. Two classes of such structures are introduced: the class of smooth probability structures and the class of probability structures. Both of these classes provide a frame- work for probability logic semantics that extend probability structures introduced by Halpern. For instance, we introduce the LSPS, - the logic for smooth probability structures, investigate axiomatizability of the LSPS, and address decidability and undecidability questions of valid formulas.

Speaker: Junguk Lee (Changwon National University, South Korea)

Title: Preservation of non-antichain tree property.

Abstract: The antichain tree property (in short, ATP), which implies both SOP1 and TP2, was introduced by Jinhoo Ahn and Joonhee Kim in their study of relationship between SOP1 and SOP2.

In this talk, first, we will see ATP satisfies some useful properties enjoyed by previous dividing lines, for example, witness in one-variable and equivalence of k-ATP and ATP. Based on these properties, we will give some criteria for a first order theory to have ATP or non-ATP (in short, NATP). Second, we will give several examples having NATP and having SOP1 and TP2 and so they do not fit into previous dividing lines. For example, a Hahn field of a Frobenius field of characteristic 0, the random parametrization of DLO, ACFO, and so on.

This talk is based on joint work with Jinhoo Ahn, Joonhee Kim, and Hyoyoon Lee.

Speaker: Yong Liu (Nanjing Xiaozhuang University, China)

Title: Splitting property in 3-c.e. degrees.

Abstract: Computably enumerable (c.e.) degrees and its generalization n-c.e. degrees have been extensively studied in the history. Among all the interesting properties, the splitting property is the very basic one. An n-c.e. degree is splittable if it is a join of two other n-c.e. degrees. It is known that a noncomputable c.e. degree is splittable (Sacks) and a proper 2-c.e. degree is splittable (Cooper, Yamaleev). In this talk, we will discuss the splitting property in 3-c.e. degrees. This is a joint work with Ng Keng Meng.

Speaker: Gianluca Paolini (University of Torino, Italy)

Title: Classification problems in torsion-free abelian groups.

Abstract: We will survey our recent work on various classification problems in the space of countable torsion-free abelian groups from the perspective of invariant descriptive set theory. Specifically, we will talk about: - the isomorphism problem;
- the rigidity problem;
- the Hopfian problem;
- the co-Hopfian problem.
This is joint work with S. Shelah.

Speaker: Katrin Tent (University of Münster, Germany)

Title: Burnside groups of odd exponent.

Abstract: In 1902 Burnside asked whether any finitely generated torsion group is necessarily finite. By now there is a long line of negative answers, albeit not necessarily accessible. I will explain the basics of small cancellation theory and our approach to the Burnside problem. Joint work with A. Atkarskaya and E. Rips.

Speaker: Chieu Minh Tran (National University of Singapore, Singapore)

Title: Measure doubling of small sets in $SO(3, \mathbb{R})$.

Abstract: In a recent work, we show that if A is an open subset of SO(3,$\mathbb{R}$) with sufficiently small normalized Haar measure, then

$$\mu(A^2) > 3.99\mu(A)$$

Our result was conjectured by Breuillard and Green around 2010 in the context of finding continuous counterparts of product theorems for groups of Lie type by Helfgott, Pyber-Szabo, and Breuillard-Green-Tao. In less precise forms, the question traces back to much earlier works of Henstock and Macbeath in the 50s.

In this talk, I will discuss this result and its proof highlighting role of non-standard analysis and neostable group theory. Based on joint work with Yifan Jing and Ruixiang Zhang.

Speaker: Yue Yang (National University of Singapore, Singapore)

Title: Reverse Mathematics with Restricted Induction.

Abstract: Most of the results in reverse mathematics make use of the so-called "ω-models" whose first order part is ω. The fact that ω satisfies full induction often plays an important role. However, the base theory in reverse mathematics is RCA_0, which only has $I\Sigma_1^0$ (i.e., the induction schema for Σ_1^0-formulas). Occasionally, working inside a model with restricted induction (e.g., the induction

may fail for Σ_2^0-formulas) has some unexpected advantages. I will introduce some interesting examples to illustrate this point. One of the aims of this talk is to promote the research on nonstandard models of Peano Arithmetic.

Speaker: Ningyuan Yao (Fudan University, China)

Title: On minimal flows and definable amenability in some distal NIP theories.

Abstract: Let G be a group defined in a model M. Consider the action of G on its type space $S_G(M)$. We say that a type $p \in S_G(M)$ is weakly generic if every definable set X in p is weakly generic, namely, there is a non-generic definable set $Y \subseteq G$ such that $X \cup Y$ is generic. A type $p \in S_G(M)$ is almost periodic if the closure of its $G(M)$-orbit is a minimal subflow of $S_G(M)$. L. Newelski proved that the space of weakly generic types coincides with the closure of the space of almost periodic types, and when the generic types exist, almost periodics coincides with the weakly generics. Newielski give an example where the two classes differ, and he asked whether there exists an o-minimal or even just NIP example. Newelski's question is restated by A. Chernikov and P. Simon in the special case of definably amenable groups in NIP theories.

When M is an o-minimal expansion of a real closed field and G is a definably amenable group definable over M, we construct a counterexample when $G = S^1 \times (\mathbb{R}, +)^2$, to show that the set of weakly generic types properly contains the set of almost periodic types. The existence of a non-stationary weakly generic type plays a crucial role in the construction of the counter-example, where a weakly generic type is by definition stationary if it has a unique global weakly generic extension. In this talk, we will show that in some distal NIP theories, "almost periodics = weakly generics" is strongly connected to the sationarity of weakly generic types. For example, we can show that when G is commutative and definable in RCF or pCF, then "almost periodics = weakly generics" iff every weakly generic type is stationary. Joint work with Zhentao Zhang.

Speaker: Jinhe Ye (University of Oxford, UK)

Title: A finiteness result on tropical functions on skeletal.

Abstract: Skeleta are piecewise-linear subsets of Berkovich spaces that occur naturally in a number of contexts. We will present a general finiteness result, obtained in collaboration with A. Ducros and E. Hrushovski and F. Loeser,

about the ordered abelian group of tropical functions on skeleta of Berkovich analytifications of algebraic varieties. The proof uses the stable completion of an algebraic variety, a model theoretic version of analytification previously developed by Hrushovski and Loeser.

Speaker: Tingxiang Zou (University of Münster, Germany)

Title: The Elekes-Szabó's theorem and approximate subgroups.

Abstract: The Elekes-Szabó's theorem says very roughly that if a complex irreducible subvariety V of X*Y*Z has "too many" intersection with cartesian products of finite sets, then V is in correspondence with the graph of multiplication of an algebraic group G. In this talk, I will survey some results around the Elekes-Szabó's theorem and its relation with approximate subgroups.