Models and Groups, İstanbul 3

16-18 october 2014

Time	**Thursday**	**Friday**	**Saturday**
9.45-11.00	Evans	Evans	Evans
11.15-12.30	Ghadernezhad	Baudisch	Benli
Lunch			
15.00-16.15	Uludağ	Tuvay	Point
16.30-17.45	Khélif	Tent	Krupinski
Contributed talks			
18.00-19.15	Turbo	Müller	

Talks

Andreas Baudisch
Free amalgamation and automorphism groups

Abstract. In an earlier paper the Fraisse Limit G^* of the class of finite c-nilpotent groups of exponent $p > c$ is constructed. The results of this talk imply that the automorphism group $\mathrm{Aut}(G)$ of every countable c-nilpotent group G of exponent p can be embedded into $\mathrm{Aut}(G^*)$. We develop a framework that produces such results, using ideas of K.Tent and M.Ziegler and the work of I.Müller.

Anatole Khélif
Questions about biinterpretability

Abstract. We say that two structures are biinterpretable if they interpret each other and the composition of these interpretabilities is the identity. Biinterpretability was especially studied by Oleg Belegradek. Interpretability of two structures each other does not necessarily means biinterpretabilty. For example $\mathbb{Z}$ and $\mathrm{UT}_3(\mathbb{Z})$ are not biinterpretable. In a recent joint with Scanlon and Aschenbrenner, we have proved that a commutative finitely generated infinite integral domain is biinterpretable with the first order arithmetic. More generally the non biinterpretability can be proved by an analysis of automorphisms of models. If we have time we will present the link with classifying toposes for geometric theories and sketches for infinitary logic.

Krzysztof Krupinski
Profinite groups and rings from some model-theoretic perspectives

Abstract. One can consider profinite groups and profinite rings as profinite structures in the sense of Newelski, or, more generally, as Polish structures (the notion introduced by myself). This enables us to use model-theoretic ideas to study these classical algebraic structures. I will give a survey of results and conjectures concerning profinite groups and rings from this point of view, focusing mainly on their algebraic structure.

Recall a few main definitions. Instead of the general definitions of profinite and Polish structures, we will give them in the particular case of profinite groups and rings. A profinite group [ring] regarded as profinite structure is a pair (R, G), where R is a profinite group [ring] and G is a compact (equivalently, profinite) group acting on R faithfully, continuously and by automorphisms. The definition of a profinite group [ring] regarded as Polish structure differs only in that instead of assuming that G is compact we assume that it is a Polish group. The main assumption under which one can develop a counterpart of basic stability theory in the context of profinite or Polish structures is smallness which says that for every n there are only countably many orbits under the action of G on the Cartesian power R^n. It is an easy fact that smallness implies that the group [or ring] R is locally finite. During the lecture, we will be interested in the algebraic structure of small (in the sense defined above) profinite groups and rings.

Françoise Point
Alternatives for pseudofinite groups

Abstract. With Abderezak Ould Houcine, we investigated alternatives for pseudofinite groups of the same character as the Tits alternative for linear groups. In this talk we will first recall various notions of approximability of a group by a class of finite groups and definability results in the class of pseudofinite groups, applying recent results of N. Nikolov and D. Segal. Then, we will show that an $\aleph_0$-saturated pseudofinite group either contains a subsemigroup of rank 2 or is nilpotent-by-uniformly locally finite. We will show some relations between these kind of alternatives and amenability. Finally, we will reformulate former results of S. Black in the class of pseudofinite groups and study the existence of free subgroups in pseudofinite groups under strong hypotheses, like bounded Prufer rank or bounded c-dimension.

Katrin Tent
Sharply 2-transitive groups

Abstract. Finite sharply 2-transitive groups were classified by Zassenhaus in the 1930s. The question whether any sharply 2-transitive group contains a regular normal subgroup remained open for infinite groups. We answer this question.

İpek Tuvay
First step towards Clifford theory of fusion systems: the Fong-Reynolds reduction

Abstract. Clifford theory (named after Alfred Clifford, 20th century) is a technique which reduces representations of a finite group to representations of the central extensions of its quotient subgroups. The first step in this technique is reduction to the inertial group, called Fong-Reynolds reduction. In this talk, we will describe the behaviour of fusion systems of blocks under the Fong-Reynolds reduction. This is a joint work with Laurence Barker.

Muhammed Uludağ
Çark Groupoids and Thompson's Groups

Abstract. (on-going work with Ayberk Zeytin) We introduce and study an analogue of Thompson's group T. This group appears as the fundamental group of the so-called çark groupoid, whose objects are certain infinite ribbon graphs called çarks. These graphs can be naturally identified with the set of narrow ideal classes in real quadratic number fields. They are canonically embedded in conformal annuli, with a unique cycle, with a finite number of Farey tree components attached to this cycle. Morphisms of the çark groupoid are generated by flips. They can be identified with the set of indefinite binary quadratic forms. Objects of this groupoid can be naturally identified with classes of indefinite binary quadratic forms. We aim to show that the group associated to the çark groupoid is an infinite extension of Thompson's group. Along the way we also study three simpler analogues leading to Thompson's group F and to some finite extensions of T. An open question is: what kind of arithmetic information can one extract out of this group?

Tutorials

Mustafa Gökhan Benli

Space of finitely generated groups

Abstract. In the first part of my talk I will talk about the space of finitely generated groups, its properties and open problems.In the second part I will talk about results related to self-similar groups and groups of intermediate growth and their interpretations in the space of finitely generated groups.

David Evans

Automorphism groups of countable structures

Abstract. Suppose M is a countable first-order structure with a 'rich' automorphism group $\mathrm{Aut}(M)$. We will study $\mathrm{Aut}(M)$ both as a group and as a topological group, where the topology is that of pointwise convergence. This involves a mixture of model theory, group theory, combinatorics, descriptive set theory and topological dynamics. Here, 'rich' is undefined and depends on the context, but examples which we are interested in include: homogeneous structures such as the random graph or the rational numbers as an ordered set; ω-categorical structures; the free group of rank ω. The plan for the lectures is:

Lecture 1: Background. The topology of the symmetric group; automorphism groups; Baire category arguments. Homogeneous structures; amalgamation classes; Fraïssé's theorem and generalisations.

Lecture 2: A quick tour through some major results. Time permitting, we will look at: The small index property (work of Hodges, Hodkinson, Lascar and Shelah and others); extreme amenability and the Ramsey property (work of Kechris, Pestov and Todorcevic); normal subgroup structure of automorphism groups (work of Lascar, Macpherson - Tent, and Tent - Ziegler).

Lecture 3: Some of the details of the proofs for one of the topics from Lecture 2, probably the work on normal subgroup structure.

General background on model theory can be found in standard texts such as [5] or [10]. Introductory material on ω-categoricity can be found in the introduction to [6] (and many other places), and the book [2] focuses on the connections with permutation groups. The notes [1] are a nice introduction to infinite permutation groups. Macpherson's MALOA lectures [8], and the paper [9], give an extensive survey of work on homogeneous structures and their automorphism groups, including much of what is covered in these talks. The introduction to [3] surveys work on classification of homogeneous structures; more recent work can be found amongst the papers on Cherlin's webpage. A slightly different perspective on the material, in terms of Polish group actions, can be found in Kechris' survey [7]. The notes [4] from a previous series of lectures cover a different selection of material.

References

[1] M Bhattacharjee, D Macpherson, R Moller, P M Neumann, Notes on Infinite Permutation Groups, Springer LNM 1698, Springer 1998.

[2] Peter J. Cameron, Oligomorphic Permutation Groups, London Mathematical Society Lecture Notes, Vol. 152 Cambridge University Press, 1990.

[3] Gregory Cherlin, The classification of countable homogeneous directed graphs and countable n-tournaments, Memoirs of the American Math. Soc. 131 (1998), 621.

[4] David Evans, Homogeneous structures, omega-categoricity and amalgamation constructions, notes from talks given at the Hausdorff Institute for Mathematics, Bonn, September 2013. Available at `https://www.uea.ac.uk/ h120/publications.html`

[5] Wilfrid Hodges, Model theory, Volume 42 of Encyclopedia of Mathematics and its Applications, Cambridge University Press, Cambridge, 1993.

[6] R. Kaye and D. Macpherson (eds), Automorphism Groups of First-order Structures, Oxford University Press, Oxford, 1994.

[7] Alexander S. Kechris, Dynamics of non-archimedean Polish groups, in Proceedings of the European Congress of Mathematics, Krakow, Poland, 2012.

[8] Dugald Macpherson, Homogeneous structures, MALOA Workshop, Fischbachau, September 2010 (lecture notes on MALOA website `http://www1.maths.leeds.ac.uk/maloa/lecturenotes.html`).

[9] H. Dugald Macpherson, A survey of homogeneous structures, Discrete Mathematics 311 (2011), 1599–1634.

[10] Katrin Tent and Martin Ziegler, A Course in Model Theory, ASL Lecture Notes in Logic, Cambridge University Press, Cambridge 2012.

Contributed Talks

Zaniar Ghadernezhad
Group reducts of the automorphism group of generic structures

Abstract. It is well-known that the automorphism group of a countable first-order structure is a closed subgroup of the symmetric group of its underlying set, with the pointwise convergence topology. Moreover, we can assign a canonical first-order language to any closed subgroup of the symmetric group. In the case of ω-categorical structures, the intermediate closed subgroups of the automorphism group and the symmetric group correspond to the proper reducts. In the general case, we call the intermediate closed subgroups group reducts. In this talk, we show that the automorphism group of a Hrushovski generic structure has infinitely many group reducts.

Turbo Ho
Random nilpotent groups

Abstract. We study random nilpotent groups in the well-established style of random groups. Whereas random groups are quotients of the free group by a random set of relators, random nilpotent groups are quotients of a free nilpotent group Np,m by a similarly chosen set of relators. We establish results about the distribution of rank and step for random nilpotent groups. We show that a random nilpotent group is almost never abelian but not cyclic. We also describe how to lift results about random nilpotent groups to obtain information about standard random groups. A random nilpotent group is trivial if and only if the corresponding random group is perfect, i.e., is equal to its commutator subgroup. Considering adding relators one by one in a stochastic process, we study the threshold number of relators required. This is joint work with Matt Cordes, Moon Duchin, Yen Duong, and Andrew Sanchez.

Isabel Müller
Fraïssé Structures with Universal Automorphism Groups

Abstract. The automorphism group of a Fraïssé structure M equipped with a notion of stationary independence is universal for the class of automorphism groups of substructures of M. We will introduce the notion of a stationary independence and present an outline of the proof. This gives a partial answer to a question posed by Eric Jaligot.