Fudan Conference on Mathematical Logic

August 4-8, 2025

Provisional schedule

All talks will be in Room 2301 of the west Guanghua Tower.

	Mon. 8/4	Tue. 8/5	Wed. 8/6	Thurs. 8/7	Fri. 8/8
10-11	Jinhe Ye	Daniel Hoffmann		Shichang Song	Erik Walsberg*
11-12	Yì N. Wáng	Kyle Gannon		Masato Fujita	Yinhe Peng
12-2	**Lunch**	**Lunch**	**Excursion**	**Lunch**	**Lunch**
2-3	Wei Li	Assaf Hasson*		Linus Richter	Haosui Duanmu
3-4	Minh Tran*	Wenjuan Li		Alf Onshuus	Jan Dobrowolski

* *Online talks.*

Monday August 4

10-11 am	Revisiting Zilber's Trichotomy	Jinhe Ye

Abstract. Zilber's Trichotomy Conjecture remains a central theme in model theory, offering a powerful lens through which to understand the geometry of definable sets in well-behaved contexts. Although numerous counterexamples exist, the conjecture continues to inspire fruitful investigation. In this talk, I will introduce a new axiomatic framework—Hausdorff Geometric Structures—that captures a broad range of contexts where the Trichotomy holds. This framework provides a unified approach to studying the trichotomy in such structures. Using this, we fully resolve the restricted trichotomy conjecture in the theory of algebraically closed fields. The talk is based on joint work with Ben Castle and Assaf Hasson.

11-12 am	Weighted Modal Logic and Its Applications	Yì N. Wáng

Abstract. We extend classical modal logic by incorporating weighted structures into Kripke semantics for epistemic and doxastic applications. Weights represent agents' epistemic skills, such as expertise or resources, which influence their ability to distinguish possible worlds. This redefines the traditional indiscernibility relation as a weighted similarity relation, enabling reasoning about complex knowledge concepts like group knowledge, its dynamics, knowability, and forgetability. The framework also allows inference of epistemic skills from an agent's knowledge or ignorance.

Building on prior work, this study advances modal logic's theoretical foundations and offers practical tools for analyzing epistemic and social phenomena. For instance, it connects to rough set theory, broadening its interdisciplinary applications. The framework also extends to temporal, deontic, and preference logics.

2-3 pm	Minimality of Difference-differential Equations	Wei Li

Abstract. We analyze the behavior of systems of algebraic differential equations when considered as systems of difference-differential equations, with special emphasis on systems which define strongly minimal sets relative to the theory $\mathrm{DCF}_{0,n}$ of differentially closed fields of characteristic zero with n distinguished commuting derivations. We show that if X is a strongly minimal set relative to $\mathrm{DCF}_{0,n}$ defined by a finite system of algebraic partial differential equations and the forking geometry on X is trivial (also called "disintegrated"), then X remains minimal when regarded as definable set relative to the theory $\mathrm{DCFA}_{0,n}$ of difference-differentially closed fields of characteristic zero with n commuting derivations. We illustrate this theorem by describing the possible difference-differential equations consistent with differential equations of the form $y' = f(y)$ where f is a monic cubic polyomial over differential constants. This is a report on joint work with Thomas Scanlon.

3-4 pm	Toward a nonabelian Brunn-Minkowski theory	Chieu-Minh Tran

(Online.)
Abstract. The Brunn-Minkowski theorem tells us that if λ is the Lebesgue measure on $\mathbb{R}^d$ and $A, B \subseteq \mathbb{R}^d$ are compact with positive measure, then

$$\lambda(A+B)^{1/d} \geq \lambda(A)^{1/d} + \lambda(B)^{1/d},$$

and the equality holds if and only if A and B are homothetic convex sets.

In this talk I will discuss how this result can be seen through the lens of model theory, which is helpful towards generalizing it to locally compact groups. I will also explain the motivation from additive combinatorics, namely, part of the long quest to obtain the nonabelian counterpart of the Polynomial Freiman-Ruzsa Conjecture.

(Based on joint work with Yifan Jing, Simon Machado, and Ruixiang Zhang)

Tuesday August 5

10-11 am	Convolution of Keisler measures and subgroups of $\mathrm{Aut}(M)$	Daniel Hoffmann

Abstract. In the talk, I plan to explain the main goals and results from my project with Kyle Gannon and Krzysztof Krupiński. We introduce a new product of types and Keisler measures, which is closely related to the action of $\mathrm{Aut}(M)$ on the space of types. In fact, our idea for the product comes from an isomorphism theorem which we obtained at the beginning of the project. In the theorem, we shift the structure of an Ellis semigroup to some space of

Keisler measures (i.e. regular Borel probability measures on a space of types). After that, we generalize the definition of the product and call it $*$-product. The semigroup of types equipped with $*$-product is interesting on its own and encodes important properties of the theory, but in my talk I will focus more on the main conjecture from our project, which—roughly speaking—states that there is a bijective correspondence between idempotent Keisler measures (idempotent with respect to the $*$-product) and closed subgroups of $\mathrm{Aut}(M)$. We already know that this conjecture holds in all stable theories, in NIP theories with an additional KP-invariance assumption on the measures, and for types in all rosy theories.

This talk will be continued in Kyle Gannon's talk.

11-12 am	Convolution dynamics and random automorphism	Kyle Gannon

Abstract. Around 15 years ago, Newelski first observed a fundamental link between the model theory and dynamics. Since then many researchers have studied this connection is some form or another. Much of this research can be divided into studying two distinct group actions on certain spaces of types: (1) definable group actions or (2) automorphism group actions. We remark that while these settings are distinct and use different techniques, they also enjoy a kind of symmetry. Results on one side can inspire one to prove analogues results on the other.

Over the last 5 years, Chernikov and myself (and later also with Krupiński) have studied a random variant of definable group actions. In this context, points are replaced with probability measures and multiplication is replaced with (definable) convolution. In the NIP setting, the theory is quite pleasant and there are many structure theorems. A priori, it is unclear how to define an anologue of definable convolution in the automorphism setting. In recent work with Krupiński and Hoffmann, we have developed an automorphism group analogue, completing the picture.

This talk is a continuation of Daniel Hoffman's talk.

2-3 pm	Topologically 1-based structures	Assaf Hasson

(Online.)

Abstract. We define the notion of a topologically 1-based structure, adapting the analogous stability theoretic concept in the setting of t-minimal structures with the independent neighbourhood property. For geometric t-minimal structures, topological 1-basedness coincides with weak 1-basedness (studied by Bernstein and Vassiliev). We prove that non-trivial topologically 1-based structures admit a type-definable topological group that is locally linear (in an appropriate sense) and locally abelian. These results apply, in particular, to dense C-minimal structures, and to densely ordered weakly o-minimal theories.

Joint work with Ben Castle.

3-4 pm	The weak alternation hierarchy in the modal μ-calculus	Wenjuan Li

Abstract. The modal μ-calculus extends propositional modal logic by adding least and greatest fixed-point operators. The alternation hierarchy classifies modal μ-formulas based on the

nesting of mutually dependent least and greatest fixed-point operators in formulas. To capture its alternation-free fragment, we introduce the notion of the weak alternation hierarchy, which is closely related to weak parity games, weak tree automata, and the one-variable fragment of the modal μ-calculus. We show that, over infinite binary trees, the weak alternation hierarchy up to transfinite levels exhausts the class $\Delta_2^\mu = \Sigma_2^\mu \cap \Pi_2^\mu$ within the modal μ-calculus. This an ongoing joint work with Prof. K. Tanaka.

Wednesday August 6

There will be an optional sight-seeing excursion in Shanghai on this day. More information will follow.

Thursday August 7

10-11 am	Projective Fraisse limits and profinite groups	Shichang Song

Abstract. We show that the projective Fraisse limit of the class of finite groups is the free profinite group on a countably infinite set converging to 1. Then we will discuss the automorphism groups of such profinite groups. Joint work with Sulin Hu.

11-12 am	Several topics on $*$-local weak o-minimality	Masato Fujita

Abstract. Definably complete locally o-minimal structures enjoy several tame properties such as a local version of monotonicity theorem and several simple formulas for dimension function. However, locally o-minimal structures without definable completeness are possibly wild.

First, the presenter proved that a variant of local monotonicity theorem holds in every locally o-minimal structure in which univariant functions definable enjoy a strong continuity property called the univariate $*$-continuity property. Second, the presenter proposed a subclass of local o-minimality called $*$-local weak o-minimality. In this subclass, the univariate $*$-continuity property is equivalent to that dimension function satisfies a tame formula called addition formula, which is a generalization of a similar fact in weakly o-minimal structures.

The notion of $*$-local weak o-minimality is related to a combinatorial model theoretic notion "of finite burden". In fact, the presenter proved that a nonvaluational expansion of an ordered Abelian group of finite burden defining no nonempty subset which is dense and condense in a univariate definable open set is $*$-locally weakly o-minimal.

2-3 pm	Building Structures From Reals	Linus Richter

Abstract. I will outline recent applications of (higher) computability theory and definability in the context of geometric measure theory and set theory. These centre on constructing both classical (e.g. subsets of Euclidean space) and set-theoretical structures (e.g. sequences of elementary submodels) from real numbers, using their Turing-computability-theoretic properties.

3-4 pm	Groups definable in o-minimal expansions of the real field	Alf Onshuus

Abstract. We will give an account of groups definable in o-minimal expansions of the real field. We will refer to these groups, both in this abstract and in the talk, as *definable groups*. The talk will include an overview of the main o-minimal expansions of the real field together with the main open conjectures. We will then focus on the structure of groups definable in *some* o-minimal expansion of the real field, talking about the main properties, components and invariants. We will give necessary and sufficient conditions for a real Lie group to have a Lie-isomorphic to a definable group. And if there is time, we will give necessary and sufficient conditions for when one can add a continuous isomorphism between two definable groups to the theory preserving o-minimality.

Friday August 8

10-11 am	The model theory of large fields	Erik Walsberg

(Online.)
Abstract. I will introduce large fields, discuss examples, describe the topological approach to largeness, and outline the proof of a recent result on their model theory.

11-12 am	Strengthening the Knaster property induces the forcing axiom	Yinhe Peng

Abstract. A poset (partially ordered set) $\mathcal{P}$ has property K_n (K for Knaster), for $n \geq 2$, if every uncountable subset of $\mathcal{P}$ has an uncountable subset that is n-linked where a subset is n-linked if every n-element subset has a common lower bound. It is easy to see that K_{n+1} implies K_n.

We show that the reverse implication has the same strength as $\mathrm{MA}_{\omega_1}(\mathrm{K}_n)$, Martin's axiom for posets with property K_n. More precisely, for $n \geq 2$, if every poset with property K_n has property K_{n+1}, then $\mathrm{MA}_{\omega_1}(\mathrm{K}_n)$ holds.

Consequently, $\mathscr{K}_3$ implies MA_{ω_1}, i.e., MA_{ω_1} holds if every ccc poset has property K_3.

2-3 pm	An Infinite Lone Wolf Theorem	Haosui Duanmu

Abstract. Since Gale and Shapley, economists have studied stable outcomes in two-sided matching markets and the deferred acceptance (Gale-Shapley) algorithm, which finds a stable outcome. The Lone Wolf Theorem illustrates a desirable property of the set of stable outcomes, namely that the set of unmatched agents does not depend on the choice of stable outcome. Classical matching theory has assumed that the set of agents is finite. In this talk, we generalize the Lone Wolf Theorem to the infinite setting

3-4 pm	Fields with operators satisfying compatibility conditions	Jan Dobrowolski

Abstract. I will report on a recently-finalised work with O. Leon Sanchez in which we prove that if $\mathcal{D}$ is a local algebra, then the theory of fields with $\mathcal{D}$-operators satisfying a general compatibility condition is always companionable in characteristic zero, and is companionable in positive characteristic if the maximal ideal of $\mathcal{D}$ coincides with the kernel of the Frobenius homomorphism on $\mathcal{D}$. In characteristic zero, we prove some desirable properties of the model companion, such as stability, the Canonical Base Property, and Zilber's dichotomy for finite-dimensional types.

Examples falling into our framework include the theory of fields with commuting $\mathcal{D}$-operators, the theory of fields with Lie-commuting derivations, the theory of fields with iterative Hasse-Schmidt derivations, and, more generally, the theory of fields with finite group scheme actions.