Descriptive Set Theory
Théorie descriptive des ensembles
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A reflection principle for co-anaalytic sets

The First Reflection Theorem says that for any Π^1-on-Σ^1_1 property Φ, if an analytic set A satisfies Φ then there is a Borel set $B \supseteq A$ which satisfies Φ. We say that Φ satisfies Bounded Reflection if the previous set B can be found of a fixed Borel rank, and Φ satisfies Π^1_1-Reflection if this holds for co-analytic sets A as well. We show that for a suitable class of properties Φ, the statement that every Φ satisfying Bounded Reflection also satisfies Π^1_1-Reflection is equivalent to the Perfect Set Property for Π^1_1-sets. This is joint work with Jindra Zapletal.

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Big Ramsey degrees and posets of ages in infinitely-constrained binary free amalgamation classes

For a finite binary relational language L and a family $\mathcal{F}$ of finite irreducible L-structures, $\mathrm{Forb}(\mathcal{F})$ is the Fraïssé class of finite $\mathcal{F}$-free L-structures. Generalizing methods of Dobrinen, Zucker showed that $\mathrm{Forb}(\mathcal{F})$ has finite big Ramsey degrees when $\mathcal{F}$ is finite, while Sauer showed that there are infinite families $\mathcal{F}$ for which vertices have infinite big Ramsey degree. We study the possible structure of the associated partial orders known as posets of ages, and construct an infinitely-constrained binary free amalgamation class with finite big Ramsey degrees, providing a counterexample to a conjecture of Balko, Chodounský, Dobrinen, Hubička, Konečný, Vena, and Zucker. This is joint work with Andy Zucker.

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Anti-classification results in ergodic theory

Joint work with Philipp Kunde, some progress in anti-classification theory.

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Projections between Ramsey quasi-orders

A Ramsey quasi-order is a Polish space equipped with a definable quasi-order in which analytic subsets satisfy a natural Ramsey property with respect to the ordering. There are many natural such orders, for example: infinite subsets of natural numbers under containment, block sequences from FIN_k under reduction, strong subtrees of the complete binary tree under containment and sequences of variable words under substitution and concatenation. We introduce a framework for comparing

these Ramsey quasi-orders and show that under natural assumptions, monotone maps between these quasi-orders transfer their Ramsey properties if and only if they map generic filters to generic filters. In this case we say that there is a "weak projection" between the Ramsey quasi-orders. Applying this definition to a large collection of Ramsey quasi-orders from the literature, we are able to give a fairly complete picture of which of them do and do not weakly project to each other. This is joint work with Clement Yung.

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