SHORT RESEARCH STATEMENT

Michal Doucha

In my current research, I focus on theory of Borel equivalence relations with connection to various σ-ideals on Polish spaces. I am motivated by the recent work of Vladimir Kanovei, Marcin Sabok and my supervisor Jindřich Zapletal that will be presented in the book *Canonical Ramsey Theory on Polish Spaces*.

The general problem of that work can be stated as follows: let X be a Polish space, I a σ-ideal on X and $B \subseteq X$ an I-positive Borel subset, E a Borel (analytic) equivalence relation on X. Can we find an I-positive subset of B on which E is simpler, i.e. has a lower complexity?

So far I have investigated equivalence relations Borel bireducible to equivalence relations given by analytic P-ideals on ω (that includes relations such as E_2, E_{ℓ^p} for $p \in [1, \infty)$ and E_{c_0}), measure equivalence relation, with connection to σ-ideals such as Silver ideal or Laver ideal. Currently, I am trying to generalize the results for orbit equivalence relations given by actions of a sufficiently general class of Polish groups.

Let me state a sample theorem:

Theorem *Let E be an equivalence relation on ω^ω that is Borel reducible to an equivalence relation $E_{\mathcal{I}}$ on 2^ω given by some analytic P-ideal $\mathcal{I}$. Let $B \subseteq \omega^\omega$ be an analytic set positive in the Laver ideal, i.e. it contains all branches of some Laver tree T. Then there is a Laver subtree $S \subseteq T$ ($[S]$ is a positive subset of B) such that either $E \cap [S] \times [S] = [S] \times [S]$ or $E \cap [S] \times [S] = \mathrm{id}([S])$.*

More generally, I am interested in applications of mathematical logic, especially descriptive set theory to mathematical analysis.