RESEARCH STATEMENT

PHILIPP SCHLICHT

My research area is descriptive set theory and especially applications of inner model theory and large cardinals to descriptive set theory. My doctoral thesis under the supervision of Ralf Schindler is concerned with projective equivalence relations and equivalence relations in $L(\mathbb{R})$ under determinacy.

An equivalence relation on Baire space is called thin if there is no perfect set of pairwise inequivalent reals. For example any $\undertilde{\Sigma}^1_{2n}$ norm defines a $\undertilde{\Pi}^1_{2n}$ equivalence relation and this is thin if $\undertilde{\Delta}^1_{2n}$ determinacy holds. Thin projective equivalence relations are closely connected with the projective ordinals, for instance it follows from a classical result of Harrington and Shelah that the maximal number of equivalence classes of thin $\undertilde{\Pi}^1_{2n}$ equivalence relations is $\undertilde{\delta}^1_{2n-1}$ assuming $AD^{L(\mathbb{R})}$.

A natural goal is to characterize those inner models which have representatives for all equivalence classes of thin equivalence relations of a given complexity. In my thesis I study the property for an inner model M: M has representatives for all equivalence classes of all thin $\undertilde{\Pi}^1_{2n}$ equivalence relations defined from a parameter in M. Greg Hjorth proved that an inner model M has this property for $n = 1$ if and only if M is Σ^1_3-correct in V and $\omega_1^M = \omega_1^V$, assuming all reals have sharps. I generalized this result to $n \geq 1$ with a different proof technique using iterable premice with Woodin cardinals. On higher levels one has to use the corresponding level of correctness and consider the tree from a canonical Π^1_{2n-1} scale instead of ω_1. Currently I am trying to extend this result to higher scaled pointclasses in $L(\mathbb{R})$.

I am also interested in the Wadge order for Polish spaces. For many Polish spaces the Wadge order (given by the continuous maps) is more complicated than for Baire space under AD. For spaces with a nontrivial connected subset I proved that there is an antichain of size continuum. Another result is that the Wadge order for the real line contains a copy of $(\mathcal{P}(\omega), \subseteq_{fin})$ and an antichain of size $\theta^{L(\mathbb{R})}$ in $L(\mathbb{R})$. There are many interesting open questions on this topic.