My research is in Borel equivalence relations, an area of descriptive set theory. A great reference for this topic is Su Gao's monograph *Invariant Descriptive Set Theory*. The subject begins with the observation that often a classification problem can be identified with an equivalence relation on a standard Borel space (*i.e.*, a Polish space equipped just with its σ-algebra of Borel sets). For instance, each group with domain $\mathbb{N}$ is determined by its group operation, a subset of $\mathbb{N}^3$. Hence, the space of countable groups may be identified with a subset $X_{\mathcal{G}} \subset \mathcal{P}(\mathbb{N}^3)$. Studying the classification problem for countable groups now amounts to studying the isomorphism equivalence relation $\cong_{\mathcal{G}}$ on $X_{\mathcal{G}}$. More generally, we can consider arbitrary equivalence relations on standard Borel spaces.

The central notion is the following comparison of the complexity of equivalence relations, which was introduced by Friedman and Stanley in 1989. If E and F are equivalence relations on standard Borel spaces X and Y, then we say E is *Borel reducible* to F (written $E \leq_B F$) if there is a Borel function $f \colon X \to Y$ satisfying

$$x \; E \; x' \iff f(x) \; F \; f(x') \; .$$

When $E \leq_B F$, then the F-classes Y/F can be used as complete invariants for the classification problem for elements of X up to E. In this sense, $E \leq_B F$ signifies that the classification problem for elements of X up to E is *no harder than* the classification problem for elements of Y up to F.

For my dissertation I studied a classical problem: the classification of torsion-free abelian groups of finite rank. Recently, Hjorth and Thomas showed that $\cong_n \, <_B \, \cong_{n+1}$, where $\cong_n$ denotes the isomorphism relation on the collection of torsion-free abelian groups of rank n. Perhaps surprisingly, for $n \geq 2$ this result uses nontrivial techniques from the superrigidity theory for ergodic actions of lattices. In my thesis I considered the *quasi-isomorphism* relations $\sim_n$, and expanding on Thomas's techniques, showed for instance that $\cong_n$ and $\sim_n$ are *Borel incomparable* for $n \geq 3$.

More recently, I have become interested in many other topics in the field. For instance, I briefly studied the classification problem for various families of countable models of Peano arithmetic. I have also recently studied a family of combinatorial properties of countable Borel equivalence relations which have a close connection with the so-called *unions problem*. (This asks whether the increasing union of hyperfinite equivalence relations is again hyperfinite.) Finally, I am interested in broad generalizations of the subject—for instance, what happens if we allow reduction functions computable by an infinite time Turing machine?