Model theory is a branch of mathematical logic focused on the study of models (in other words, structures) of an arbitrary theory (in the sense of mathematical logic), i.e. it investigates the structure of the models and tries to compare or even to classify them. A fundamental notion in model theory is the notion of a definable set (i.e. a set which can be "defined" using the language of the theory in question; more precisely, it is the set of realizations of some formula in this language).

An important part of model theory is algebraic model theory, where the point is to study algebraic structures from the model-theoretic point o view. This has applications both in algebra and in pure model theory (via identification of some algebraic structures inside abstract models). That is why model theory has been strongly connected with algebra for a long time. Also topological spaces appear naturally in model theory (e.g. as spaces of types), and topological methods have been used in model theory for many years, too. In recent years, topological dynamics has been introduced to model theory and opened new research perspectives.

Speaking very generally, this project is about developing, extending and applying topological and algebraic methods in model theory. On the one hand, we are going to attack several open problems in model theory. On the other hand, we hope to introduce to model theory new tools and methods which will be useful in the future.

For example, we plan to develop topological dynamics for topological groups definable in first order structures and to apply it to translate dynamical properties of groups of automorphisms of first order structures to model-theoretic properties of the theories of these structures. We also want to extend and apply some advanced algebraic methods (homology groups, higher category theory) to solve well-known problems in model theory. As to pure model theory, we have introduced a new class of hereditarily G-compact theories which is natural, and the project should show that it is useful and worth studying. We would also like to try to prove the Vaught conjecture (probably the most famous conjecture in model theory) for some classes of ordered structures, by further extending the technique of regular types outside the stable context (in which regular types are very well understood and proved to be useful). Finally, we have ideas on how to attack some open problems in algebraic model theory (e.g. via applications of some group-theoretic constructions and theorems).