

Logikseminar SoSe 2015

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# LOGIC, DISCRETE STRUCTURES, ALGORITHMIC METHODS

Among the many links that Mathematical Logic has with issues in discrete mathematics and algorithmic methods, we here concentrate on topics that illustrate model-theoretic techniques in applications to selected problems of a logical and/or combinatorial nature – these are problems ranging from classical logical decision problems, to decision problems in graph theory, to issues concerning expressiveness and model checking problems for logics relevant in knowledge representation or database theory.

Selected topics in the seminar may range from basic introductory presentations (with few technical pre-requisites beyond a basic understanding of mathematical logic) to more specific technical results that also involve more advanced material. It is hoped that participants with different interests and at various levels will profit from this exchange. Correspondingly, the seminar is available at Bachelor and Master levels. Besides the oral presentation, a handout and written summary are typically required.

Among potential topics we primarily envisage

- *classical decision problems*: e.g., undecidability proofs via model-theoretic interpretations, decidability proofs for fragments of first-order logic.
- *undecidability in logic and combinatorics*: e.g., the rôle of tiling problems, König's lemma and propositional compactness.
- *logic and automata theory*: e.g., decidability results of Büchi, Rabin.
- *model-theoretic games*: applicability and limitations, e.g., of fractional isomorphisms and pebble games as approximations to graph isomorphism.
- *FO and MSO model-checking*: e.g., results for bounded tree-width.
- *constraint satisfaction and homomorphism problems*: methods from logic and universal algebra, e.g., Schaeffer's classification, polymorphisms, existential pebble games.

For further planning of the seminar it is essential that, apart from registration in TUCaN, prospective participants contact me as soon as possible:  
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