DECIDABILITY AND UNDECIDABILITY IN LOGIC

Satisfiabilty and validity questions in specific axiomatic or semantic scenarios provide key examples of problems for which one would desire algorithmic solutions. They also are among the salient classical examples for the borderlines between decidability, semi-decidability and undecidability. (Positive cases also provide natural examples for various complexity levels, just as negative cases show different degrees of undecidability.) In the seminar we want to treat on one hand classical methods for far-reaching undecidability results for first-order theories (especially reductions through logical interpretations); on the other hand we aim to explore different classical avenues towards decidability results (e.g. through finite model properties, quantifier elimination, or automata-theoretic methods) for interesting fragments of first-order logic as well as stronger logics in restricted scenarios that are at the root of current methods.

Typical background references include:

– Tarski–Mostowski–Robinson: Undecidable Theories

– Börger–Grädel–Gurevich: The Classsical Decision Problem

– Hodges: A Shorter Model Theory

– Flum–Grädel–Wilke: Logic and Automata

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. Correspondingly, the seminar is available at Bachelor and Master levels. Besides the oral presentation, a handout and written summary are typically required.

For further planning of the seminar it is essential that, apart from registration in TUCaN, prospective participants contact the organisers as soon as possible: `otto@mathematik.tu-darmstadt.de`;