

Satisfiability Modulo Theories

Lecture 1: Introduction

Lydia Kondylidou

WS 2025/26

Learning Objectives

In this seminar you will be able to:

- Understand the **syntax**, **semantics**, and **properties** of different logical languages for encoding decision problems
- Understand and prove properties about popular automated reasoning methods and procedures
- Get hands-on experience using **SMT solvers**
- Understand the roles of automated reasoning in real-world applications such as **model checking**, **symbolic execution**, and **synthesis**
- Get exposure to formal methods literature and research

Instructors

Instructor: Lydia Kondylidou

Language: English (presentations may be in German or English)

Place and Time

Weekly seminar meetings: Thursday 10-12 c.t.

Location: Oettingenstr. 67, room U127

Start: 16.10.2025

End: 05.02.2026

Course Topics / Modules

Introduction	01-introduction
Abstract Proof Systems	01-abstract-proof-systems
SAT Solving	02-sat-solving
FOL Proof Systems	05-fol-proof-systems
First-Order Theories	06-first-order-theories
Theory Solvers I	07-theory-solvers-1
Theory Solvers II	08-theory-solvers-2
Theory Solvers III	09-theory-solvers-3
Theory Combination	10-theory-combination

Requirements and Grading

Active participation in discussions

One 30-minute presentation (including Q&A)

Written report (8-12 pages) on assigned topic

Grading: 50% presentation, 50% report

Material

All seminar materials (papers, slides, references) will be provided on https://www.tcs.ifi.lmu.de/lehre/ws-2025-26/smt_de.html as the course progresses

Register on Moodle using registration key: SMT2526

Zulip chat for organizational questions:

- Server: <https://chat.ifi.lmu.de/#narrow/channel/475-TCS-25W26-SMT>
- Stream: TCS-25W26-SMT

Credits

These slides are based on slides originally developed by:

- **Cesare Tinelli** at the University of Iowa
- **Andrei Voronkov** at the University of Manchester
- **Emina Torlak** at the University of Washington
- **Clark Barrett, Caroline Trippel, and Andrew (Haoze) Wu** at Stanford University

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