CS502: Automated Reasoning

About the course

Time and place: Monday 16:40-17:30, Tuesday 14:40–16:30

Instructor: Esra Erdem (esraerdem@sabanciuniv.edu)

Office hour: By appointment

Automated reasoning

▶ Formal principles, and algorithms for reasoning about knowledge represented in logic
(e.g., algorithms for satisfiability, logical entailment, equivalence checking, model counting, knowledge compilation),

▶ algorithms for reasoning about knowledge represented as probabilistic graphical models
(e.g., algorithms for exact/approximate probabilistic inference),

▶ and their applications
(e.g., query answering, prediction, diagnosis, planning, explainability, counterfactuals, epistemic reasoning, belief revision, ontology reasoning, model checking, automated theorem proving, constraint satisfaction, machine learning, database theory, distributed computing, security, biology, medicine, law, linguistics, operations research).

Course description
Lectures

- ▶ Review of propositional logic
- ▶ Satisfiability
- ▶ Model counting
- ▶ Knowledge compilation
- ▶ Model-based diagnosis
- ▶ Explanation generation
- ▶ Review of Bayesian networks
- ▶ Exact/approximate inferences
- ▶ Automated reasoning for learning

Textbook

There is no textbook; the necessary materials (e.g., homework problems, research papers) will be posted at SU Course+.

You are expected to...

- ▶ volunteer to present your own solutions to homework problems, and to participate in discussions about the solutions presented by others;

- ▶ read and evaluate the research papers studied in the class, present one of them, and lead a discussion on the paper you present;

- ▶ work on a research problem, using existing software, and write a short report about your own solution.

Grading (tentative)

Grades will be determined by

- ▶ class participation and homeworks (15%),
- ▶ paper evaluations/presentations/discussions (15%),
- ▶ exam (30%), and
- ▶ the project (40%).

There is no final exam.