

Algorithms and Deduction

Welcome Event Summer 19

Pascal Schweitzer


Algorithms & Complexity group

Disclaimer:

All information is

- ▶ subject to change and **tentative**,
- ▶ subject to being **incomplete**, and
- ▶ subject to being **wrong**.

Important basics

Bachelor theory courses taught at  TECHNISCHE UNIVERSITÄT
KAISERSLAUTERN:

- ▶ **Logic and Semantics of Programming Languages**
(f.k.a. Logic)
- ▶ **Formal Languages and Computability**
(f.k.a. Formal Foundations of Programming, FGDP)
- ▶ **Algorithms and Data Structures**
(f.k.a. Design and Analysis of Algorithms, EAA)

AG Automated Reasoning (Lin)

Courses AG Lin



- ▶ **Concurrency Theory** (WS19/20) 4V+2Ü
- ▶ **Automated Reasoning** (SS20) 4V+2Ü
- ▶ **Logic and Verification** (seminar) every semester 2S

Concurrency Theory

Topic:

Concurrent models of computation
(i.e., the theory of parallelism)



Some questions:

- ▶ Which concurrent models are decidable?
- ▶ How do you use concurrent models to reason about concurrent programs?

Contents:

- ▶ Multi-threaded programs and Petri nets
- ▶ Static networks and lossy channel systems (lcs)
- ▶ Reconfigurable networks and process algebras
- ▶ GPU Programs and Bulk synchronous model

Automated Reasoning

Topic: Automated Reasoning
(e.g. automated theorem proving)

Questions and contents:

- ▶ How to use formal logic to represent programs?
- ▶ How do we design the right logic to allow automated reasoning?
- ▶ Techniques used by modern Sat and SMT solvers
- ▶ First order theories, algorithmic model theory, and automata based algorithms

AG Algorithm Accountability (Zweig)



- ▶ **Data Science Literacy** WS19/20
- ▶ **Network Analysis** (Project)
- ▶ **Big Data Analytics** (tbd)

V3+3Ü

????

AG Embedded Systems (Schneider)



- ▶ **Verification of reactive systems**
- ▶ **Applied Verification** (project)

(always summer) 4V+2Ü

2P

AG Algorithms and Complexity (Schweitzer)

Lectures AG Schweitzer

- ▶ **Complexity Theory** (usually in winter) (WS19/20) 4V+2Ü
[sometimes taught by Prof. Majumdar]
- ▶ **Algorithms** (seminar) every semester 2S

Irregular courses

- ▶ Algorithms and Symmetry (next time pending) 4V+2Ü
- ▶ Algorithmic Group Theory (next time pending) 4V+2Ü

Max Planck Institute for
Software Systems MPI SWS

- ▶ Program Analysis (Christakis, Darulova, Neider) (WS19/20) 4V+2Ü
- ▶ Advanced automata theory (Neider/Majumdar?) (SS20?) 4V+2Ü
- ▶ Concurrency Theory (Lin, Neider, Zufferey) (WS19/20) 4V+2Ü

- ▶ Verification (project) (Neider, Schneider, Zufferey)
WS 2019/20 2P

- ▶ Research Topics in Software Reliability (seminar) (Christakis)
(WS19/20) 2P

Program Analysis



Topic:

Automatic analysis of programs

Contents:

- ▶ Term rewriting and programming languages
- ▶ Lattice theory and static analysis
- ▶ Tree automata and XML

Other lecturers

Further courses

- ▶ replication and consistency (Bieniusa) (WS19/20) 2V+1Ü

Numerous interesting lectures offered in the math department:

- ▶ Polyhedral Theory and Algorithms (Krumke/Ruzika) (WS19/20) 4V+2Ü
- ▶ Advanced Network Flows and Selfish Routing (Krumke MATH) (WS19/20) 4V+2Ü
- ▶ Probability and Algorithms (Küfer MATH) (WS19/20) 4V+2Ü
- ▶ Nonlinear optimization (??? MATH) (SS20) 4V+2Ü
- ▶ Theory of scheduling problems (?? MATH) (SS20) 4V+2Ü

Other courses sometimes taught:

Graphs and Algorithms, Online Optimization, Robust Optimization, Game Theory, Cryptography, (Advanced Algorithms), etc.