Quantitative Logics and Automata

DFG Research Training Group 1763

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Logics and Automata

- important modelling formalisms in Computer Science
- complement each other synergetically

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- Recognizable Languages $=$ MSO-definable Languages (Büchi, Elgot, 1960)
- Automata-theoretic approach to automated verification (Vardi, Wolper, 1986)

Quantitative Formalisms

- Classical logics and automata are **qualitative**
  (logics: true or false; automata: accept or reject)
- Need to represent **quantitative** properties
  - Probability, uncertainty, vagueness
  - Temporal and spatial information
  - Resource consumption (energy, money, . . .)

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Quantitative logics and automata

- Weighted logics and weighted automata
- Probabilistic automata
- Real-time systems and logics
- . . .

Quantitative Logics and Automata

Goal of Investigation: Connection

quantitative logics $\leftrightarrow$ **quantitative automata**

using methods of Theoretical Computer Science

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Applications

- Verification
- Knowledge Representation
- Constraint Solving

Group Members

Principal Investigators

- Franz Baader (Automata Theory, Logic, KR)
- Christel Baier (Probabilistic Model Checking)
- Manuel Bodirsky (Constraint Systems, Logic, Algebra)
- Gerd Brewka (KR, AI)
- Manfred Droste (Automata Theory, Logic, Algebra)
- Andreas Maletti (Automata Theory, ML, NLP)
- Karin Quaas (Verification of Infinite-State Systems)
- Sebastian Rudolph (Logic, Answer Set Programming, AI)
- Anni-Yasmin Turhan (KR, Reasoning, Ontologies)
- Heiko Vogler (Automata Theory, NLP)

Group Members

Doctoral Students

- Shima Asaadi: *Extraction of Matrix-based Language Models*
- Sven Dziadek (3rd gen): *Extended Quantitative Tree Automata*
- Luisa Herrmann: *Weighted Automata with Storage*
- Pavlos Marantidis: *Quantitative Language Equations*
- Antoine Mottet: *The Complexity of Arithmetic CSPs*
- Erik Paul: *The Structure of Weighted Tree Automata*
- Maximilian Pensel: *Quantitative Reasoning in Defeasible DLs*
- Jakob Piribauer (3rd gen): *Stochastic Shortest Path Problems*
- Markus Ulbricht: *Answer Set Optimization*
- Caterina Viola: *Valued Semi-Linear CSPs*

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