Research Group Artificial Intelligence
Bachelor Theses

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University of Basel

December 20, 2022

AI Research Group
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Teaching
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Theses
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The End
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AI Research Group

Research Group Artificial Intelligence

Malte Helmert

Gabi Röger

Florian Pommerening

Silvan Sievers

Salomé Eriksson
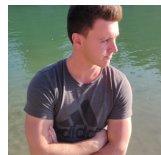

Thomas Keller

Liat Cohen

Patrick Ferber

Augusto Blaas Corrêa

Clemens Büchner

Remo Christen

Simon Dold

Research Focus

our main research areas:

- classical action planning
- probabilistic action planning
- heuristic search

Teaching

Teaching

autumn semester 2022:

- Discrete Mathematics in CS (Bachelor, 3rd semester)
- Seminar "Algorithm Engineering" (Bachelor, 5th semester)
- Planning and Optimization (Master, 1st semester)

spring semester 2023:

- Algorithmen und Datenstrukturen (Bachelor, 2nd semester)
- Theory of Computer Science (Bachelor, 4th semester)
- Foundations of Artificial Intelligence (Bachelor, 6th semester)

Lecture: Foundations of Artificial Intelligence (spring 2023)

- lecture, Bachelor, 8 CP
- lecturers: Thomas Keller, Florian Pommerening
- target audience: Bachelor students in 6th semester

contents:

- introduction and historical development of AI
- rational agents
- problem solving and search
- constraint satisfaction problems
- formal logic
- automated planning
- board games

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Theses

Bachelor and Master's Theses

- completed: 62 Bachelor theses, 36 Master's theses
  ↝ `https://ai.dmi.unibas.ch/theses.html`
- planned and ongoing: 1 Bachelor thesis, 3 Master's theses
- interested? get in touch!
  - ↝ email to `malte.helmert@unibas.ch` or talk to me
  - ↝ spring semester 2023: contact Gabriele Röger
    (`gabriele.roeger@unibas.ch`) instead

Thesis Life Cycle

- T_0: you contact me about interest in B.Sc. thesis
- $T_0 + 1$ week: initial meeting
    - you, me and potential supervisor
    - we suggest 3 topics to choose from
    - discuss possible starting date for thesis
- $T_0 + 3$ weeks: topic decision
    - you select a topic (or decline)
    - set up learning contract with official starting date T_1
- $[T_1, T_1 + 3$ months]: work on thesis
    - 4 months possible if other commitments exist
    - weekly meetings with supervisor
    - ends with submission of thesis
- ~ 2 weeks later: thesis presentation
    - you are done, congratulations!

Bachelor's Thesis Example

Sebastian Schlachter (2022)

Encoding Diverse Sudoku Variants as SAT Problems

(supervised by Augusto Blaas Corrêa)

- Study Sudoku variants from YouTube channel "Cracking the Cryptic"
- Model complex problem constraints as logical formulas
- Compare efficiency of solvers on resulting models

Bachelor's Thesis Example

Raphael Kreft (2022)

Generation of Domain Abstractions using
Counterexample-Guided Abstraction Refinement

(supervised by Clemens Büchner)

- Adaptation of CEGAR framework to a heuristic design problem
- Implementation in the Fast Downward planner
- Evaluation of different algorithm variants and parameters

Bachelor's Thesis Example

Esther Mugdan (2022)

Optimality Certificates for Classical Planning

(supervised by Salomé Eriksson and Remo Christen)

- Theoretical framework for computer-verifiable proofs
  of optimality for solutions to shortest-path problems
- Integration with classical planning algorithms
- Implementation in the Fast Downward planner
- Evaluation of different algorithm variants and parameters

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