

Research Group Artificial Intelligence  
Bachelor Theses

Malte Helmert

University of Basel

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# AI Research Group

# Research Group Artificial Intelligence



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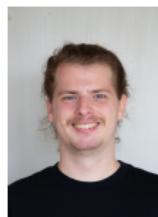
Gabi Röger



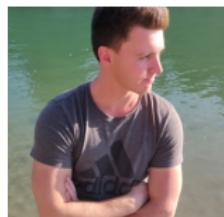
Florian Pommerening



Clemens Büchner



Remo Christen



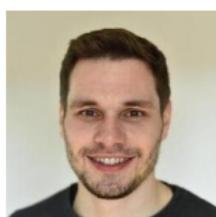
Simon Dold



Claudia Grundke



Tanja Schindler



David Speck



Travis Rivera Petit



Esther Mugdan



Gustavo Delazeri

# Research Focus

our main research areas:

- classical action planning
- heuristic search

# Teaching

# Teaching

autumn semester 2025:

- Discrete Mathematics in CS (Bachelor, 1st semester)
- Planning and Optimization (Master, 1st semester)

spring semester 2026:

- Algorithms and Data Structures (Bachelor, 2nd semester)
- Theory of Computer Science (Bachelor, 4th semester)
- Foundations of Artificial Intelligence (Bachelor, 6th semester)
- Seminar Knowledge, Reasoning and Planning  
(Master, 2nd semester)

# Lecture: Foundations of Artificial Intelligence (Spring 2026)

- lecture, Bachelor, 8 CP
- lecturers: Malte Helmert
- 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

AI Research Group  
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Teaching  
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Theses  
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The End  
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# Theses

# Bachelor and Master's Theses

- completed: 85 Bachelor theses, 44 Master's theses  
~~~ <https://ai.dmi.unibas.ch/theses.html>
- ongoing: 2 Bachelor theses
- interested? **get in touch!**  
~~~ email to `malte.helmert@unibas.ch` or talk to me

# 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
- $\sim 2$  weeks later: thesis presentation
  - you are done, congratulations!

# 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

# Bachelor's Thesis Example

Benedikt Heuser (2024)

## Solving the Sliding Tile Puzzle with Post-Hoc Optimization

(supervised by Florian Pommerening)

- Adapting a general idea for state-space search heuristics to a specific problem
- Implementation in HOG2 codebase (University of Alberta)
- Evaluation of different algorithm variants and parameters

# Bachelor's Thesis Example

Maria Desteffani (2025)

Encoding Delete-Free Planning Tasks in Domain-Independent  
Dynamic Programming

(supervised by Florian Pommerening)

- Encode a standard AI problem in a new optimization framework (collaboration with University of Toronto)
- Compare efficiency to traditional solvers

The End