Artificial Intelligence

0. About this Course

Who Will Do What, How, When, and What For

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SAARLAND UNIVERSITY
COMPUTER SCIENCE

Summer Term 2019

Thanks to Prof. Hoffmann for slide sources

Agenda

1. About Us
2. About the Organization
3. About the Exercises and Exam
4. About the Content
5. About the Lectures

Foundations of Artificial Intelligence (FAI) Group

- **What?** Basic research in AI.
  - Automatic Planning & related areas.
  - Combinatorial search, heuristic function design and analysis, declarative problem description languages (logics), ...
  - Basic research. Algorithm design and analysis.
- **Who?**
  - Prof. Jörg Hoffmann (lead): hoffmann@cs.uni-saarland.de
  - Dr. Cosmina Croitoru (postdoc): cosmina@mpi-inf.mpg.de
  - Dr. Álvaro Torralba (postdoc): torralba@cs.uni-saarland.de
  - Rebecca Eifler (PhD student): eifler@cs.uni-saarland.de
  - Maximilian Fickert (PhD student): fickert@cs.uni-saarland.de
  - Daniel Gnad (PhD student): gnad@cs.uni-saarland.de
  - Patrick Speicher (PhD student): speicher@uni-saarland.de
  - Marcel Steinmetz (PhD student): steinmetz@cs.uni-saarland.de
  - Julia Wichlacz (PhD student): wichlacz@cs.uni-saarland.de
  - Angelika Scholl-Danopoulos (secretary): scholl@cs.uni-saarland.de
- **Where?** E1 1, 3rd floor.

`http://fai.cs.uni-saarland.de/`

Who Does What in This Course: FAI Group & DFKI

- Jana Koehler and Álvaro Torralba: Lectures.
- Daniel Gnad, Marcel Steinmetz: Overall course organization, tutorials supervision of Torralba's part.
- Marcel Köster, Gian-Luca Kiefer: Tutorials supervision Koehler's part.

Who Does What in This Course: Our Tutors

- Sören Bund-Becker: s9sobund@stud.uni-saarland.de
- Cosmina Croitoru: s9cocroi@stud.uni-saarland.de
- Thorsten Klößner: s9tnkloe@stud.uni-saarland.de
- Anna Oláh : s8anolah@stud.uni-saarland.de
- Doreen Osmelak: s9doosme@stud.uni-saarland.de
- Hanan Othman: s8haothm@stud.uni-saarland.de
- Aleena Thomas: aleenathomas203@gmail.com
- Marcel Lukas Vinzent: s8mavinc@stud.uni-saarland.de

About Me:

- PhD in Universidad Carlos III de Madrid in 2015
- Came to Saarland as a post-doc in 2014
- Main Research Interests: General Problem Solving (Automated Planning, Heuristic Search)

Who Does What in This Course: You

. . . and who are you?

More precisely: Which course of studies (Studiengang) do you follow?

- Informatics BSc? Informatics MSc?
- Bioinformatics? Cybersecurity? Embedded Systems? Mathematics & Informatics? Media Informatics? Visual Computing? Economy Informatics?
- Computational Linguistics?
- Mathematics?
- Other? (Which?)

Where, What, When: Lectures

Where?

- Lecture Hall I (E2 5) on Mondays
- Günter-Hotz-Hörsaal (E2 2) on Tuesdays

What? (*rough* classification!!)

- Basics/Principles
- Applications

When?

- Mondays 14:15–15:45, Tuesdays 16:15–17:45. Some exceptions.
- See the overview on the course web page.

Web Resources

Course Web Page:

`https://cms.sic.saarland/ai_19/`

- Basic facts about the course.
- Lecture slides hand-outs.
- Registration (see also next section).
- Announcements, tutorial groups, exercise sheets, discussion forum for technical questions, ...

Your Questions

Technical questions about course content/exercises:

- Forum. (Read by everybody: All students, the whole AI'19 team.)
- Also, of course: Your tutor, if it's about the exercises.

Other questions:

- Álvaro Torralba.
- Come to the front directly after the lecture.
- Or write an email.

You Must Register!

You must register for the tutorials!

- Register to the webpage using your uni-saarland email address.
  → Attention: If you have issues with the login, contact Daniel Gnad.
- Go to "Artificial Intelligence"
- Go to "Tutorial groups" and choose an available tutorial group.
  → Size limit is 30, assignment based on your preferences.
- Once registration is closed, you can switch between tutorial groups only if you find an exchange partner in the respective other group. In such case, contact the tutors of both groups involved.
- Registering for the *exam* ($\neq$ tutorials): HISPOS.

You Must Register! Ctd.

Tutorial groups:

- The time slot, place, and tutor for each group will be listed in the webpage.

Registration Timing:

- Registration is already open.
- We expect to close registration next week. But that may be subject to changes. Pay attention to the announcements in the webpage.

Student groups:

- You may solve the exercises in groups of up to 3 students.
- All authors must be from the same tutorial group.
- The same group must address both, the paper and the practical exercises.

Exercises

TWO different kinds of exercises:

- Paper: Understand and apply concepts from the course.
- Practical: Experience with AI modeling languages and tools.

Paper Exercises:

- Apply concepts and algorithms to examples, lead simple proofs.
- 1-week intervals for hand-out/submission.

Practical exercises:

- Model given problems in AI formalisms, solve with off-the-shelf tools.
- Models checked by the tutors, graded based on correctness.
- 2-week intervals for hand-out/submission.

Duplicate Solutions Policy:

- We will check for identical solutions across student groups.
- Such solutions will get no points.

Exercises: Organization

Hand-out: Webpage, Tuesday week **X**

- Paper exercises: 10 exercise sheets, each 10 points. First on 23/04.
- Practical exercises: 5 exercise sheets, each 20 points. First on 30/04.

Submission: *Before* Tuesday lecture, week **Y**

- Paper exercises: Week **Y=X+1**. Paper solutions only! Collected at the front of lecture hall.

  Staple solutions, write names at top. (Otherwise, 3 points subtracted from sheet.)
- Practical exercises: Week **Y=X+2**. Submission in the webpage.

Tutorial groups: Week **Y+1**

- Participation not obligatory. But highly recommended!

  $\rightarrow$ If you have successfully presented $N \geq 1$ exercises, you get 3 extra points. (But no additional extra points for $N \geq 2$.)

Exams

The exams will consist of exercises similar to the paper exercises.

Exams rules:

- Exam qualification: ≥ 50 points in paper exercises, AND ≥ 50 points in practical exercises. ATTENTION! If you want to attempt the course again in later years, you must qualify anew.
- Open book. Any paper material allowed. No phones or computers.

Exam vs. re-Exam:

- Each is a separate attempt to pass this course.
- Both exams taken $\Longrightarrow$ better score counts. ATTENTION! Once you pass the course, you can NOT improve your grade in later years. The re-exam is your only chance to do so.

Exam preparation: (Instead of regular lecture on Tuesday, July 16)

- Lists exam-relevant parts of course; example exercises.
- Opportunity to ask questions.

Exams Dates & Locations

Exams Dates:

- Exam: Wednesday, July 24, 14:00-16:00, Günter-Hotz-Hörsaal AND LH1 (E2.5) AND HS002 (E2.1) (students distributed automatically).
- Re-Exam: Monday, September 23, 14:00-16:00, Günter-Hotz-Hörsaal AND LH1 in E2.5 (students distributed automatically).

Exams INSPECTION Dates:

- Exam Inspection: Wednesday, July 31, 14:00-16:00, E1 1 room 3.06.
- Re-Exam Inspection: Friday, September 27, 10:00-12:00, E1 1 room 3.06.

→ This is a big course. Individual inspection dates will NOT be arranged. You know the inspection date & time several months in advance. If you want to inspect your exams, mark your calendar.

Course Outline

Keyword?	Content?	Lecturer?
Introduction	Clarify the background	Koehler
Intelligent Agents	Establish some basic concepts	Koehler
Classical Search	How to find routes, solve puzzles, find bugs in software, . . . ?	Koehler
Propositional Reasoning	How to "think" rationally?	Koehler
First-Order Reasoning	A more powerful framework for "thinking"	Torralba
Adversarial Search	How to solve games?	Torralba
General Game Playing	How to describe and solve *all* games?	Torralba
Constraint Satisfaction Problems	How to schedule sports events, car manufacturing, . . . ?	Torralba
Planning	How to describe and solve *all* action-choice problems?	Torralba
Probabilistic Reasoning	How to deal with uncertainty	
Knowledge Representation	Practical & extended forms of reasoning	Koehler
Applications	Applications at DFKI	Koehler
Machine Learning Overview	How to learn from experience/data?	Koehler

Course Prerequisites and Aims

Prerequisites:

- Algorithms: Solid knowledge.
- Complexity theory: Basic knowledge (**NP**-hardness etc.)

Aims: At the end of the course, you should ...

- understand the basic principles underlying artificial intelligence research
- be able to position its various subfields and discuss their potential and limitations
- understand and be able to apply the foundational algorithms and techniques taught in this course
- learn the essential knowledge to further pursue the study of AI in other course at UdS $\rightarrow$ **BSc, HiWi jobs, MSc, PhD**

Questionnaire

Question!

How many scientific articles (6-page double-column "papers") were submitted to the 2019 International Joint Conference on Artificial Intelligence (IJCAI'19) in Macao?

(A): ca. 100 (B): ca. 1000

(C): ca. 2000 (D): ca. 4000

→ Answer (D) is correct (6131 abstracts, 4545 papers). (Previous year, IJCAI'18, ca. 3500 papers . . .)

Questionnaires:

- At end of section/at start of 5 min break.
- You get 2 minutes/5 minutes.
- You're free to make noise (e.g., discuss with your neighbors).

More Generally: Questions to You

When will they be asked?

- In questionnaires.
- At various points during the lectures.
- We'll do many examples together.

Why are they being asked?

- They give you the option to follow the lectures *actively*.
- They allow us to check whether or not you are able to follow.

How will we look for answers?

- "Streber syndrom": 3 students answer all the questions, $N-3$ sleep.
- If this happens, we may resort to picking students randomly.

  $\rightarrow$ There is nothing to be ashamed of when giving a wrong answer! You wouldn't believe the number of times we got something wrong myself (We do hope all bugs are removed now, but ...)

Slides Availability

"Gotcha! I'll just look up the answers on the hand-outs!"

→ It's not gonna be *that* easy:

Pre-Handouts:

- Without answers to questions.
- Without details for examples.

Availability:

- 1 day before chapter begins.
- 1 slide/page.
- 4 slides/page ("-4up").

Post-Handouts:

- With answers to questions and details for examples.
- Corrections, where applicable.

Availability:

- Day the chapter ended.
- 1 slide/page.
- 4 slides/page ("-4up").

Post-Handouts

→ The post-handouts contain full detail, including all examples.

To be absolutely clear:

- All that's relevant will be in the post-handouts.

  → All the technical details, as contained in my presentation slides but not the pre-handouts.
- Except of course illustrations to answer questions from the audience.
- Taking a few notes might be useful still ...

  → I'm not sure how useful it is to print the pre-handouts. I'm giving you the option to, but would recommend taking notes on plain paper. (The slide numbering is consistent across all versions of the slides, for easy reference.)

And Now . . .

That's It! Enjoy the course!