UNIVERSITÄT DES SAARLANDES

Artifical Intelligence

About this Course

Prof. Dr. Jörg Hoffmann

Prof. Dr. habil. Jana Koehler

Summer 2021

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Artificial Intelligence Lecture at UdS in 2021

- Introduction into important subfields of AI, concepts and algorithms for various degree programs such as informatics, embedded systems, computer linguistics, media informatics …
  - Prerequisite knowledge is different, the lecture is self-contained and some basics may be known to some of you, but not everybody
- 2 lectures per week
- Approx. weekly theoretical and bi-weekly practical exercise sheets
  - Discussed in tutorial sessions
  - No programming required, but modeling!

Learning Objectives

- Know
  - Basic ideas and assumptions underlying AI research
  - Various subfields of AI, their potential and limitations
  - Foundational algorithms and techniques
- Be able to
  - Discuss metaphors, assumptions, goals and methods of AI research
  - Position technology wrt. the AI fields, evaluate potential and limitations
  - Apply AI techniques to solve problems of interest
  - Further pursue the study of the field in courses or work

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Course Outline

Exact times see CMS!

Week	Topic	Lecturer
April	Introduction	Koehler
April	Intelligent Agents	Koehler
April	Search Algorithms	Koehler
April/May	Adversarial Search	Hoffmann
May	Constraint Satisfaction	Hoffmann
May	Propositional Logic	Koehler
May/June	Predicate Logic	Hoffmann
June	Clause Learning and CP-SAT Solver	Saller
June	Knowledge Representation and Reasoning	Koehler
June	Machine Learning Basics	Koehler
June/July	AI Planning	Höller
July	Probabilistic Reasoning	Höller
July	Examen Preparation	Tutors

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The Lecturer Team

Prof. Jörg Hoffmann
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Prof. Jana Koehler
https://jana-koehler.dfki.de/
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Daniel Höller
hoeller@cs.uni-saarland.de

Dr. Sophia Saller
sophia.saller@dfki.de

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The Tutoring Team

Chief Tutors

Daniel Fiser
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Annika Engel
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Tutors

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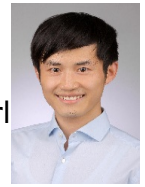


Wenhao Lu
wenhao.lu@dfki.de

Katharina Hengel
katharina.hengel@dfki.de

Times & Locations (Tentative, Subject to Change)

- Lecture
  - Mondays 16:15 to 17:45 via Zoom (Prof Jörg Hoffmann and Daniel Höller) and MS Teams (Prof Jana Koehler and Dr. Sophia Saller)
  - Thursdays 16:15 to 17:45 via Zoom and MS Teams
- Tutorial Groups via Teams
  - Mondays 14:15 to 15:45 Tim Göttlicher
  - Tuesdays 10:15 to 11:45 Marcel Ullrich
  - Wednesday 10:15 to 11:45 Rachel Aimée Georg
  - Thursday
    - 8:15 to 9:45 Anika Fuchs
    - 10:15 to 11:45 Anika Fuchs
    - 14:15 to 15:45 Navdeeppal Singh

- **Changes will be published as News and Calendar updates in the CMS and MS Teams!**

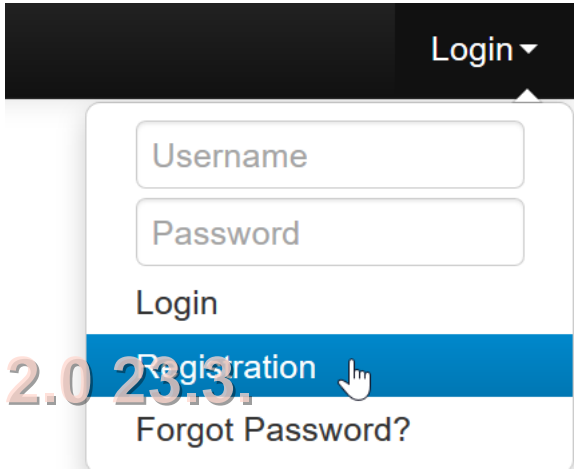
Course Web Page and Resources (CMS/MOODLE)

- **CMS**:
  - All slides
  - Additional material (audios,…)
  - Calendar with up-to-date information
  - Announcements, tutorial groups
  - Discussion forum for technical questions,…

- Exercise sheets partly in **CMS** and **Moodle**
  - Theoretical and practical sheets accessible via CMS
  - Parts of theoretical sheets as quizzes in Moodle
    - If the exercise sheet contains a part in Moodle, this is noted on the exercise sheet uploaded in the CMS and a corresponding link will be available

Access Web Page CMS / MOODLE

- You must first register in the **CMS**
  - https://cms.sic.saarland/ai_21
  - Use your UdS account
  - If you do not have one yet or have difficulties with registration, write an email to Daniel Höller (hoeller@cs.uni-saarland.de)



- For **Moodle**
  - Use your UdS account
  - Enroll for the course on the course webpage in Moodle: https://lms.sulb.uni-saarland.de/moodle/course/view.php?id=4836
  - Use the password: AI-Quiz
  - If you have difficulties with the enrollment, write an email to Katharina Hengel (katharina.hengel@dfki.de)

A Note on Copyright Law

- All material made available on the CMS/Moodle is for your personal use and subject to copyright protection
  - Copy and distribution of the material to external sites constitutes a copyright infringement
- Recording of streamed lectures or tutorials is not permitted unless you obtained the prior written consent of all involved participants
- We provide recorded lectures for you - strictly personal use only

Organization of Tutorials and Student Groups

- Define your preferences in the CMS until **Sunday, April 18th midnight**
- You will be assigned to the group that best fits your preferences modulo available seats until Tuesday, April 20th (visible in CMS)
- Participation in the tutorials is not mandatory, but highly recommended
  - However, you must submit enough sheets to qualify for the exam
- Student Groups:
  - For the assignments in the CMS, you can work in groups of up to 3 students
    - Find group members based on your assigned tutorial group
    - Groups must remain stable for the entire semester
  - For the Quizzes in Moodle, **each student must submit** her/his own solution

Theoretical Exercise Sheets

- All submissions are in electronic form
  - via CMS as **one** PDF file per student group
  - via Moodle as **one** quiz submission per individual student
    - If you **save** your answers, you can always return to the quiz and change them
    - Saved answers are **automatically submitted** when the deadline expires
    - If you submit your answers earlier (by clicking on the appropriate button) you will not be able to make any changes no matter how far away the deadline is
- 1-week intervals for hand-out/submission
  - Hand-out: week n (Thursdays after the lecture), submission: week n+1 (Sundays at midnight), tutorial week n+3
  - Detailed information on submission deadline is available on each sheet (and may vary)
- Points earned vary from sheet to sheet
- Learning objectives:
  - Understand concepts and algorithms from the course
  - Apply concepts and algorithms to examples, do simple proofs

Practical Exercise Sheets

- All submissions are in electronic form
- Submit via CMS in format as described on sheet
- 2-week intervals for hand-out/submission:
  - Handout: week n (Thursdays after the lecture), submission week n+2 (Sundays at midnight), feedback by email
  - Detailed information on submission deadline is available on each sheet (and may vary)
- Points earned vary from sheet to sheet
- Learning objectives: experience with AI modeling languages and tools
  - Model given problems in AI formalisms, solve with off-the-shelf tools
  - Models checked by tutors, graded based on correctness and completeness

Duplicate Solutions Policy on Practical Exercices

- We will check for identical solutions across student groups
- All teams involved (provider and copier of solution) will get no points!
- This can lead to exclusion from the exam
- Do not copy/paste models!!!

Admission to Exam and Re-Exam

- Exam qualification: ≥ 50% points on each sheet for 75% of the published theoretical exercise sheets AND for 75% of the published practical exercise sheets (rounded to next integer)
  - This year: 8 out of 10 theoretical and 4 out of 5 practical sheets
  - Theoretical Sheet 11 is optional
    - Only in case someone has reached 50% on 7 sheets after the 10 theoretical sheets, s/he can hand in Sheet 11 and it will be included in the calculation of the exam admission

Registration to Exam and Re-Exam

- **Double Registration Policy** for both exams
  - Registration in HISPOS for the exam is mandatory until 2 weeks before the exam date!
  - You must also register for the exam in the CMS
- Non-computer-science students
  - Must register in the examination office of your study program and register in the CMS, but not HISPOS
  - Pay attention to the news in the weeks before the exam, we may need further information from you

Exam vs. Re-Exam

- Each exam is a separate attempt to pass this course
- Both exams taken → better score counts
- ATTENTION! Once you pass the course, you CANNOT improve your grade in later years
- The re-exam within the same year is your only chance to improve your grade

Exam Open Book Policy

- Written Exam 120 Minutes
- Allowed to bring entire course material on paper
  - Highly not recommended
- You will receive a negative list on what is NOT-exam-relevant in the lectures by Prof Hoffmann and Daniel Höller. Everything not on this list, is relevant
- Relevant slides in the lectures by Prof Koehler and Sophia Saller are marked with a  (recommendation only, make your own choice)
- No laptops or mobile phones

Exam and Re-Exam Dates (Tentative)

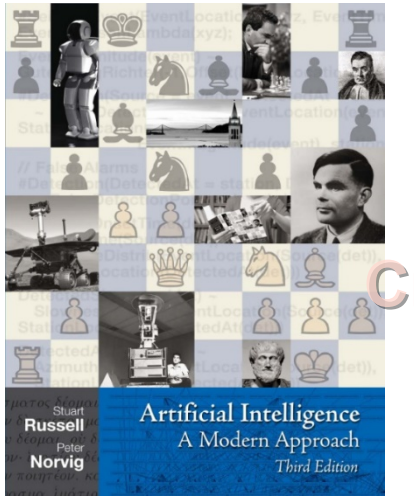
- 30.07.2021, 2-4 pm
  - GHH, HS I, HS II, HS III in E2.5,
  - HS 001, HS002 and HS 003 in E1.3

- 23.08.2021, 2-4 pm
  - GHH, HS I, HS II, HS III in E2.5,
  - HS002 in E1.3

- Exam inspections:
  - 06.08.2021
  - 30.08.2021
  - The exact time and room will be announced.

Textbook – The Famous AIMA Book

§ http://aima.cs.berkeley.edu

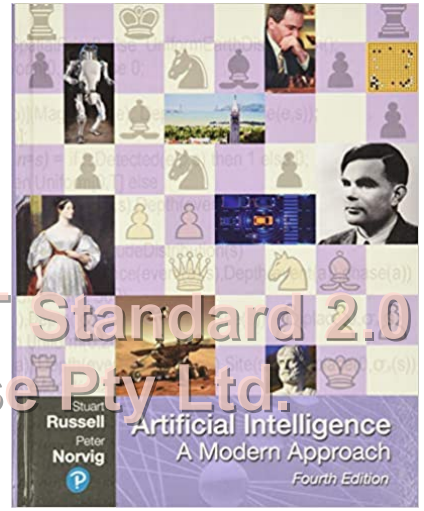


Stuart Russell, Peter Norvig

Artificial Intelligence – A Modern Approach

PRENTICE HALL SERIES IN AI

3rd Edition, 2019 (4th Edition 2020)



§ All our chapter numbers and references for recommended reading in the slides are based on the 3rd edition from Prentice Hall!
  – Note that editions differ in numbering!

§ E-book access out of university VPN

§ URL: https://www.pearson-studium.de/drm/reader/nu/code/t92ffgjfzg33xt6c9rhulc53vyhvar5w

AIMA Book Topics Deepened by Other Lectures

- **AI Planning by Prof. J. Hoffmann**
- **Architectural Thinking for Intelligent Systems by Prof. J. Koehler**
- **Analysing and Understanding Images**
  - Image Processing and Computer Vision
  - High Level Computer Vision
- **Understanding Natural Language**
  - Statistical Natural Language Processing
  - Text-to-Speech Synthesis
  - Inferences in Artificial Intelligence and Computational Linguistics
- **Machine Learning**
  - Machine Learning / Machine Learning in Cybersecurity
  - Neural Networks: Theory & Implementation/Implementation & Application
- **Ethical Aspects of AI**
  - Ethics for Nerds
- Many more … see LSF ..

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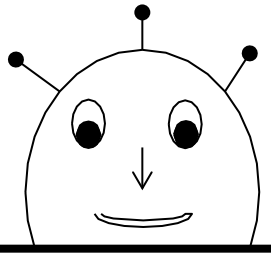
Chatbot Alden: Use AI to Learn AI

- Alden supports you in faster locating lecture slides when you ask it where you can find information on topics discussed in this lecture
- Alden can hold the lecture (not read the slides!) in English and German
- Currently available content: lectures 1-5, more is added step by step



Exercise 2: Normal Forms 6 Points

Transform the following predicate logic formulas into Clausal Normal Form. Write down the results of all intermediate steps, specifying which steps you are applying and giving the intermediate results.

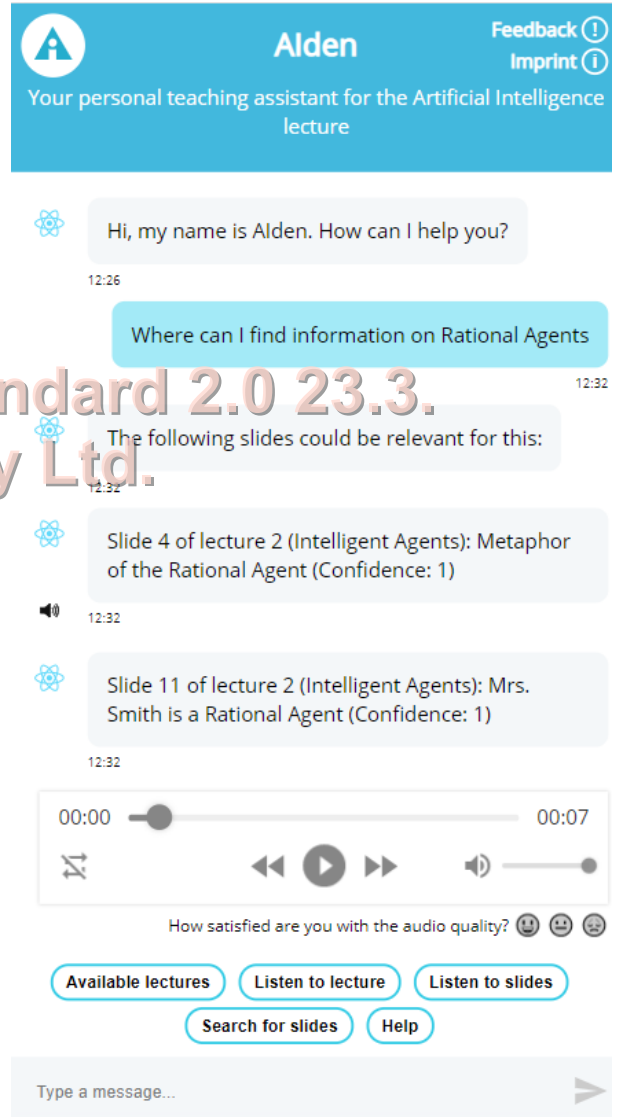
Note: Simplify the formulas where possible.

1. $\forall x\,[A(x) \rightarrow \exists x \forall y\,[B(x,y) \rightarrow C(x)]]$
2. $\neg\forall x \exists y \forall z\,[(A(z) \leftrightarrow B(y,x)) \vee \forall x\,[C(x) \wedge D(y,z)]]$

"Where do I find information on clausal normal form?"

Alden – Your personal teaching assistant for the AI lecture

- Alden is a chatbot that helps you with the lecture material
  - Finds keywords on lecture slides
  - Reads out lectures to you
- Write your request at the bottom of the page and press the send button
- Use the quick buttons to get an idea of the possible requests



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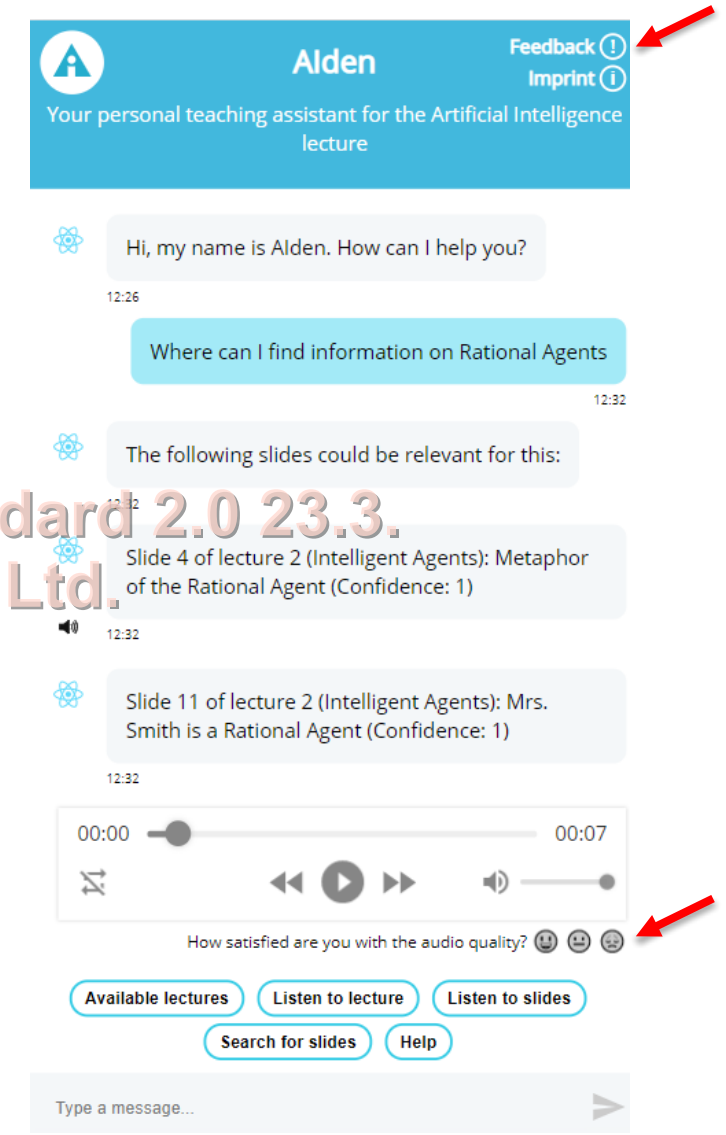
Alden – Your personal teaching assistant for the AI lecture

- **Experimental system**
  - Please submit your feedback
    - Audio feedback 😀 😐 ☹
    - General comments Feedback
  - Audio generation takes some time – please be patient

Accessible at https://aiden.cs.uni-saarland.de
Username: aiden
Password: ai-ch4tbot



- If you have any questions or problems with the chatbot, please contact Anna Kenter (s8ankent@stud.uni-saarland.de)

Take Away Messages

- § Register in CMS/Moodle and actively use these platforms
- § Regulary attend lecture and tutorials
- § Make use of online material provided
- § Ask questions
- § Work wit the text book
- § Find a good team
- § Do all exercises
- Ø Passing the exam should be well possible

Enjoy the Lecture!