Welcome to Cognitive Systems @ UUlm

Winter Semester 2023/24

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Academic Dean in Cognitive Systems

Cognitive Systems …
what is it & why UUlm?

Where you are … Germany / Ulm
What are Cognitive Systems? – some examples – interdisciplinary
Why Cognitive Systems @ UUlm?
… after successful completion of a Cognitive Systems Master
Where you are … Germany … in the heart of Europe

Southern stretch of Germany …

Where you are … Ulm

Located at the border of states of Baden-Württemberg & Bavaria …
What are Cognitive Systems?

- **Cognition** and **cognitive science** – investigate processes by which systems generate effective intelligent and reasonable behavior

- Implementation or realization of the associated processes & functions within a system (biological or technical) is a **cognitive system** – cognitive technical systems for realizations in a technical domain

- Some **basic functions** of cognitive systems
  - Perception, sensory data acquisition, data fusion
  - Knowledge, building upon experiences
  - Plasticity, learning, and memory
  - Action and articulation
  - Anticipatory planning, reasoning, prognosis
  - Interaction and communication

Some example Cognitive Systems …

Perceiving systems, games, robotics, … some recent examples
Healthcare & mobility …

• Hyundai MOBIS 'Smart Cabin Controller' – monitors driver's posture, heart rate, and brainwaves; vehicle will switch to autonomous driving when the driver is found
  ▪ to be falling unconscious,
  ▪ stressed or
  ▪ if the CO₂ level in the cabin is not optimum
• Extends Apple's health focus (Apple Watch) bringing health monitoring to future vehicles and/or CarPlay – as part of Apple's project Titan

On the scientific method …
You receive training on how to investigate scientific questions

- Make an observation
- Ask a scientific question
- Form a hypothesis
- Conduct an experiment
- Accept hypothesis
- Reject hypothesis

Why Cognitive Systems @ UUlm?

- Ulm University – since 1967; in “THE World University Ranking“ (2022) ranked 146
- Interdisciplinary program: Computer Science and Psychology within one faculty – “under one roof” or on one hill …
• Broad **scope** in both scientific fields

• Successful well-established research in both fields with intense **research collaborations**, e.g.,
  - Companion technology
  - Human-computer interaction
  - Robotics & neuromorphic systems

also in conjunction with local industries, related to, e.g.,
  - Automotive
  - Robotics (service, agriculture, etc.)
  - Internet and industry 4.0

• Various opportunities to further strengthening of your **education** and to boost your **career development**
… after successful completion of a Cognitive Systems Master

What are our CogSys alumni doing after graduation? … a selection

Apple Inc.
Jina AI, Berlin
https://deepsafety.ai
Mercedes-Benz AG
Fraunhofer IIS
Fraunhofer IPA
NXP
Bosch
Universität Zürich
Universität Hamburg
NYU Arts & Science

Notes on the Cognitive Systems program

Cognitive Systems website
Regulations, modules, program, rules
MSc course program and detailed structure
Basic Subject
Interdisciplinary Subject
Special Subject
Applied Subject
Schedule and timetable – further details & information
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Cognitive Systems website
https://www.uni-ulm.de/in/fakultaet/studium/studiengaenge/cognitive-systems/

Regulations, modules, program, rules

- “Study and exam regulations” (in German FSPO 2017)
  contain important description of regulations and determine how many credits have to be taken in which subject; also eligibility to start the MSc thesis are defined

- “Course program”
  further detailed description which modules belong to which Subjects with subdivision into Areas for the Special and Applied Subjects

- “Module Descriptions LSF” (Modulhandbuch aka MHB)
  all courses are listed in the MHB categorized according to the Subjects (Basic, Interdisciplinary, Special, Applied)

- “Plagiarism rules”
  https://www.uni-ulm.de/in/fakultaet/institute-und-einrichtungen/pruefungsausschuesse/eb-coqsys/plagiarism/
MSc course program and detailed structure

Generic structure of MSc program

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Features & advantages

- Unique modular structures with unambiguous area associations
- Compatibility between study programs & easy module integration
- Areas in Subjects coherent along the 4 core themes in CogSys
Example course plan and structure over 4 semesters
(4 subjects + MSc thesis = different colors)

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<th>Semester 1</th>
<th>Semester 2</th>
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Basic Subject

Mandatory component of the Master’s program; aims to communicate the basic level knowledge in Cognitive Systems – contains cross-disciplinary training depending in part on your BSc degree.
• Short-arm Y-model: **One introduction** module depends on the kind of bachelor's degree students have as entrance qualification
  - with BSc degree in **Psychology** take module  
    *Introduction to Computer Science (for non-computer scientists)*
  - with BSc degree in **Computer Science** take module  
    *Introduction to Psychological Methods and Statistics (for non-psychologists)*

**Note:** you sign a “contract” which module you are assigned to; especially students with different background decide with Dr. Markus Maucher which selection fits best (Markus’ office: O27/548)

• The **other** mandatory modules
  - **Foundations and Concepts of Cognitive Systems Modelling**
  - **Fundamentals of Human-Machine Interaction**
  - **Fundamental Approaches to Cognitive Science** (summer)

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**Interdisciplinary Subject**

**Mandatory** components of the master's program; aims to transfer the theoretical knowledge (**Basic Subject**) to the various areas in **Cognitive Systems**

![Diagram of Interdisciplinary Subject](image-url)
• Modules within the Basic Subject introduce to the foundations of Cognitive Systems – now, what defines the field? … as interdisciplinary topic

• Specific functionalities
  - Perception & Cognition
  - Learning & Memory
  - Planning & Reasoning
  - Interaction

• Modules Cognitive Systems I & II (2 semesters)
  - Introduction to topics, history, methods, modeling & technology
  - Cognitive Systems I: perception & cognition, learning & memory
  - Cognitive Systems II: planning & reasoning, interaction & communication (summer)

• Colloquium Recent Developments in Cognitive Systems Research
  - Colloquium with invited speakers (each semester) – every 2nd week (NEW)
    Students actively participate by
    (i) regularly attending talks (min. 12 talks, participation list) and
    (ii) asking questions (written report of questions and protocol of responses from speaker together with the student’s opinion) – of min. 5 questions and answers to different speakers will be submitted and evaluated (graded)

  - Integral part of the colloquium is a mentorium
    - Supported (and conducted in winter) by mentors
    - Introduces incoming students to campus facilities (planning a semester, registering for exams, etc.)
    - Searching and analyzing literature
    - Literature citation, citation styles, plagiarism
    - LaTeX for scientific writing
    - Presenting scientific work
    - Strategies to preparation for exams; group activities / social life
Special Subject

Students specialize by selecting modules from different topics of the 4 basic functionalities Perception, Learning & Memory, Planning & Reasoning, Interaction and from the area Methods, general Concepts & Tools.

- Modules within the Special Subject are courses that allow students to further specialize in their program (form: lectures, seminars).
- The course program is subdivided in different areas:
  - Perception
  - Learning & Memory
  - Planning & Reasoning
  - Interaction
  - Methods, general Concepts & Tools
- Students select at least 24 ECTS out of at least 2 areas.
- Take a look into the Course book (for the general structure and offers with their assignment to areas) and the Module handbook for details (content, assessment, …)
Applied Subject

Students select modules of particular **project related work**; modules are of the 4 basic themes *Perception, Learning & Memory, Planning & Reasoning, Interaction* and from the area *Applied methods and concepts in Cognitive Systems*

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- Modules within the **Applied Subject** are courses more closely related to applications and experimental work for **further specialization** (form: projects)
- The course program is subdivided in different **areas**
  - Perception
  - Learning & Memory
  - Planning & Reasoning
  - Interaction
  - Applied Methods and Concepts in Cognitive Systems
- Students select at least **24 ECTS** out of **at least 2 areas**
- Take a look into the **Course book** (for the general structure and offers with their assignment to areas) and the **Module handbook** for details (content, assessment, …)
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Schedule and timetable – further details & information

Timetable for winter semester 2023/24

See Cognitive Systems website:

https://www.uni-ulm.de/in/fakultaet/studium/studiengaenge/cognitive-systems/

Go to
→ “Students”
  → “Current Semester”
    → “Weekly Course Plan”

• The weekly schedule (with the timetable) shows which lectures – but NOT seminars and projects – happen to take place where

• For the other module offers – not lectures … – please check the professors’/lecturer’s website or the teaching website of the particular institute

• Some Special and Applied subjects require an email notification to the lecturer to register for the subject – check deadlines

• Further details and information
  ▪ Cognitive Systems website – http://www.uni-ulm.de/cognitive-systems
  ▪ Course book (Course program) and Module handbook are available from the Cognitive Systems webpage
  ▪ Univ Ulm Moodle eLearning – http://moodle.uni-ulm.de/
  ▪ Univ Ulm LSF (portal | services | study & teaching) – http://campusonline.uni-ulm.de/ for course registrations, exams, …
Course list for the current semester

- Basic – Interdisciplinary – Special – Applied Subject … in the upcoming semester
- Last column: **Pre-registration required?** (yes/no)

See Cognitive Systems website:

https://www.uni-ulm.de/in/fakultaet/studium/studiengaenge/cognitive-systems/

Go to
→ “Students“
→ “Current Semester“
→ “Courses in current semester and exam info”

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Notes about faculty & academic structure

- **UUlm – main campus area**
- **Faculties @ UUlm – programs in Computer Science & Psychology**
- **Academic presentation**
- **Student union in Cognitive Systems**
- **General information …**
- **Last, but not least … academics teaching Cognitive Systems**
Ulm – main campus area

Main Campus on the 'Eselsberg'

main campus western section  
main campus eastern section

Colloquium  
Studiensekretariat (office of the registrar)  
Welcome & CogSys I

Faculties@Ulm – programs in Computer Science & Psychology

- List of faculties
  - Medicine
  - Natural Sciences (Physics, Biology, Chemistry)
  - Mathematics and Economics
  - Engineering, Computer Science, and Psychology

- Programs in Computer Science and Psychology
  - Computer Science (Informatik; BSc, MSc)
  - Mediainformatics (Medieninformatik; BSc, MSc)
  - Software Engineering (BSc, MSc)
  - Cognitive Systems (MSc – English)
  - Artificial Intelligence (MSc – German)
  - Psychology (BSc, MSc)
  - Clinical Psychology & Psychotherapy (BSc, MSc)
Academic presentation

• Faculty board

• Study commission *Cognitive Systems*
  - Develops and discusses elements of the study and exam regulations, incl. structure of the program
  - Discusses and approves structure of program and module assignment to subjects
  - Organizes and approves semester-wise course program, timetable, and course list
  - Members – professors, academic staff, student members

• Board of examiners in *Cognitive Systems*
  - Approval of all program related exam conditions
  - Registration of MSc thesis and approval of academic supervisors
  - Members – professors, academic staff, student member

Student union in *Cognitive Systems*

• Students in *Cognitive Systems* have founded a student union (*Fachschaft*) – organized as sub-division of Computer Science student union (FIN)

• The student union consists of a group of students active in the program to discuss program related issues, registers shortcomings, suggests improvements, etc. and serves as a communication interface with the student members in the study commission

Contact E-Mail: fin@uni-ulm.de
General information ...

- Once again: please visit the program website at https://www.uni-ulm.de/in/fakultaet/studium/studiengaenge/cognitive-systems/ with several links to downloads and other documents, particularly a newsletter issued twice a year (one issue at the end of a semester).

- Finally: there exists a psychosocial counselling service (in German: PBS) which offers students advice and support in the form of
  - individual and
  - group consultations (in German or English)
  to help resolve psychosocial problems and questions.

Last, but not least ... great team of academics @ Cognitive Systems.
Thank you for your attention … !

Best of luck with your start into the program … see you in the 1st lectures …