



Welcome to *Cognitive Systems @ UUl*m

Winter Semester 2023/24

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Cognitive Systems ... what is it & why **UUl**m?

Where you are ... Germany / Ulm

What are *Cognitive Systems*? – some examples – interdisciplinary

Why *Cognitive Systems @ UUl*m?

... after successful completion of a *Cognitive Systems Master*

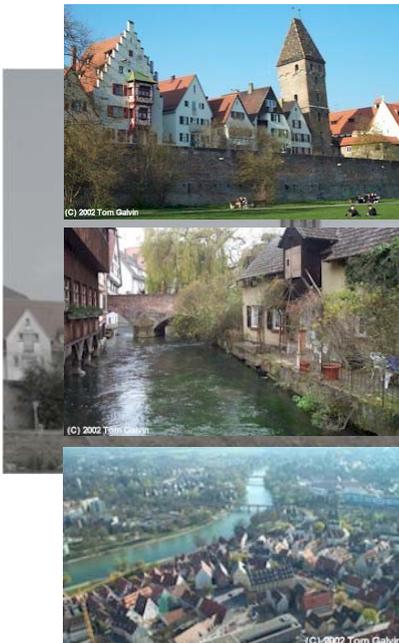
Where you are ... Germany ... in the heart of Europe

Southern stretch of Germany ...



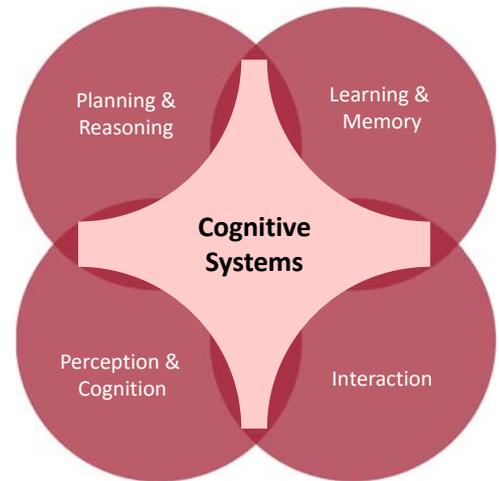
Where you are ... Ulm

Located at the border of states of Baden-Württemberg & Bavaria ...



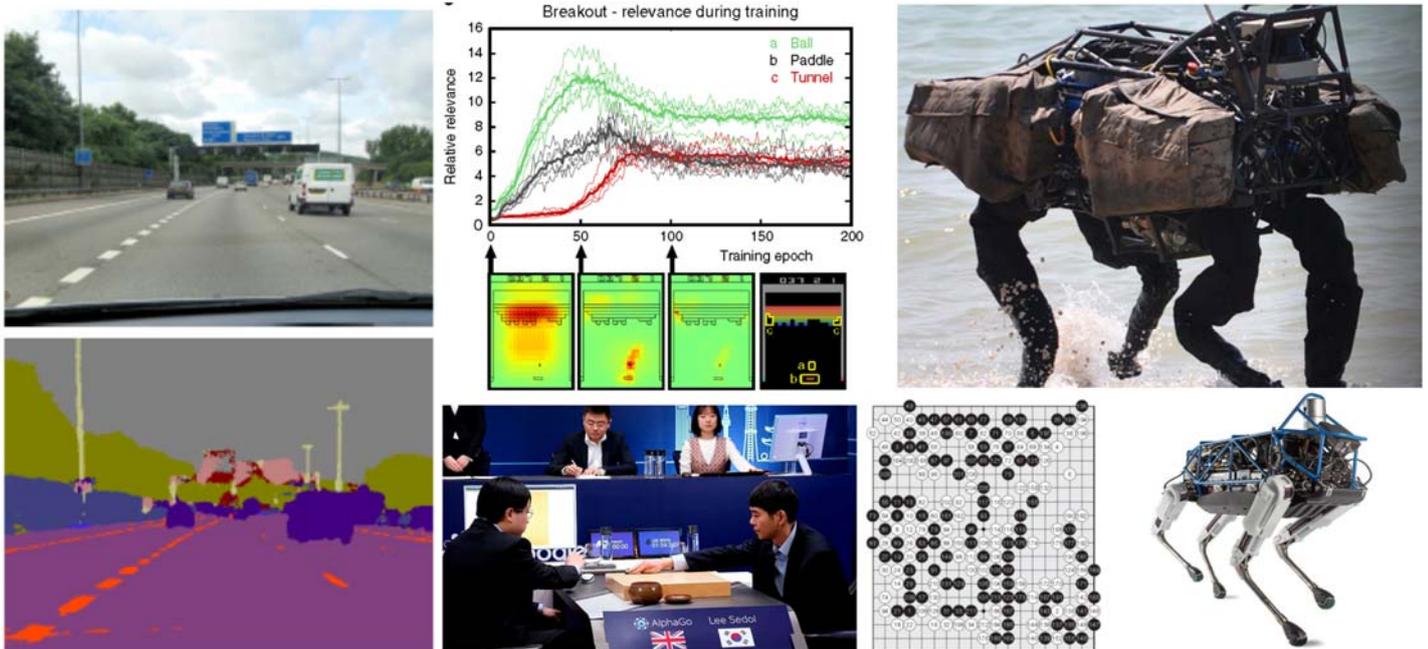
What are *Cognitive Systems*?

- **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

SMART CABIN CONTROLLER

Sensors: 3D Camera, ECG Sensor, Earset Sensor, Air conditioning Sensor

Vital Signs: 89bpm Heart Rate, Brainwave, Low Stress Level, 400ppm CO₂ Level, Stable Posture Status, 97.7°F Temperature

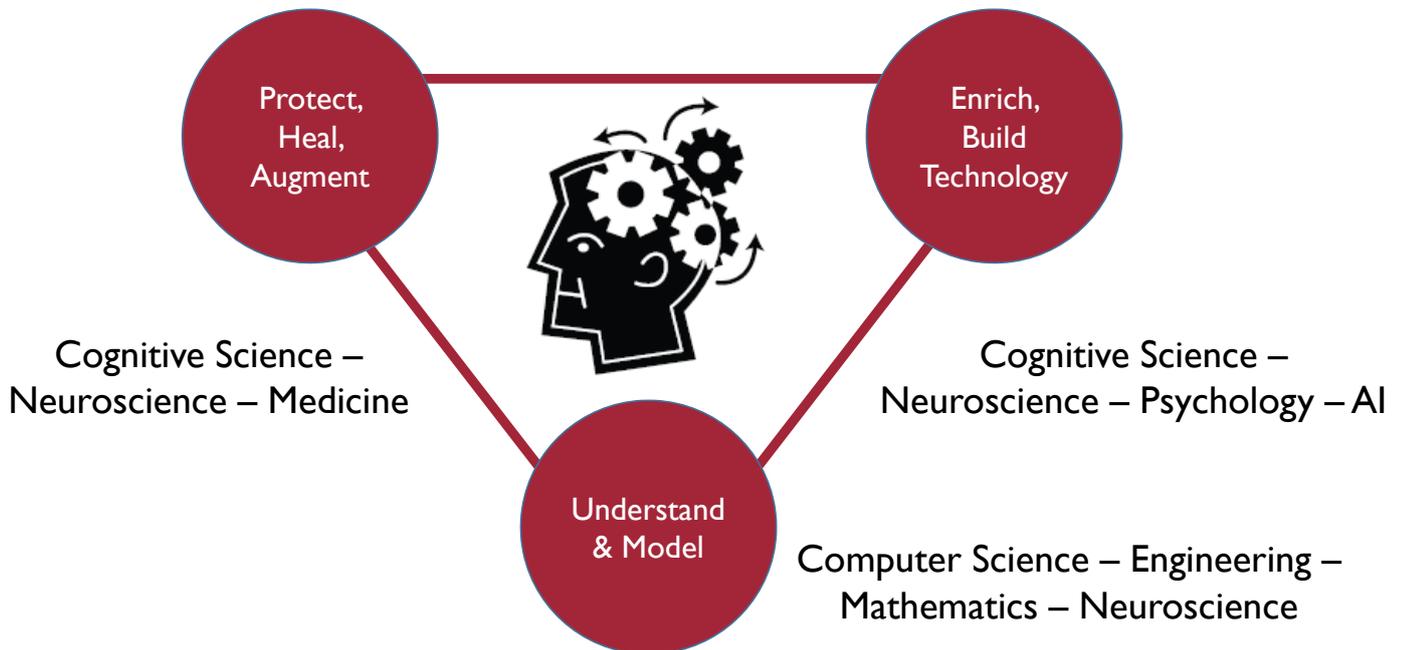
Hyundai MOBIS Vital Sign Analyzing

- The new healthcare tech 'Smart Cabin' controller that analyzes vital signs, such as posture, heart rate, and brainwaves, to help with safe driving.
- Switches to autonomous driving when the driver is found to be stressed and manages the CO₂ level in the cabin
- Embedded technology that applies biotech to mobility ... to enable the vehicle to play a role as a 'moving health check-up center.'

<https://www.patentlyapple.com/2022/09/apple-has-hired-the-former-vp-of-autonomous-vehicles-lab-at-hyundai-mobis-to-be-the-sense-architecture-lead-on-project-tita.html>

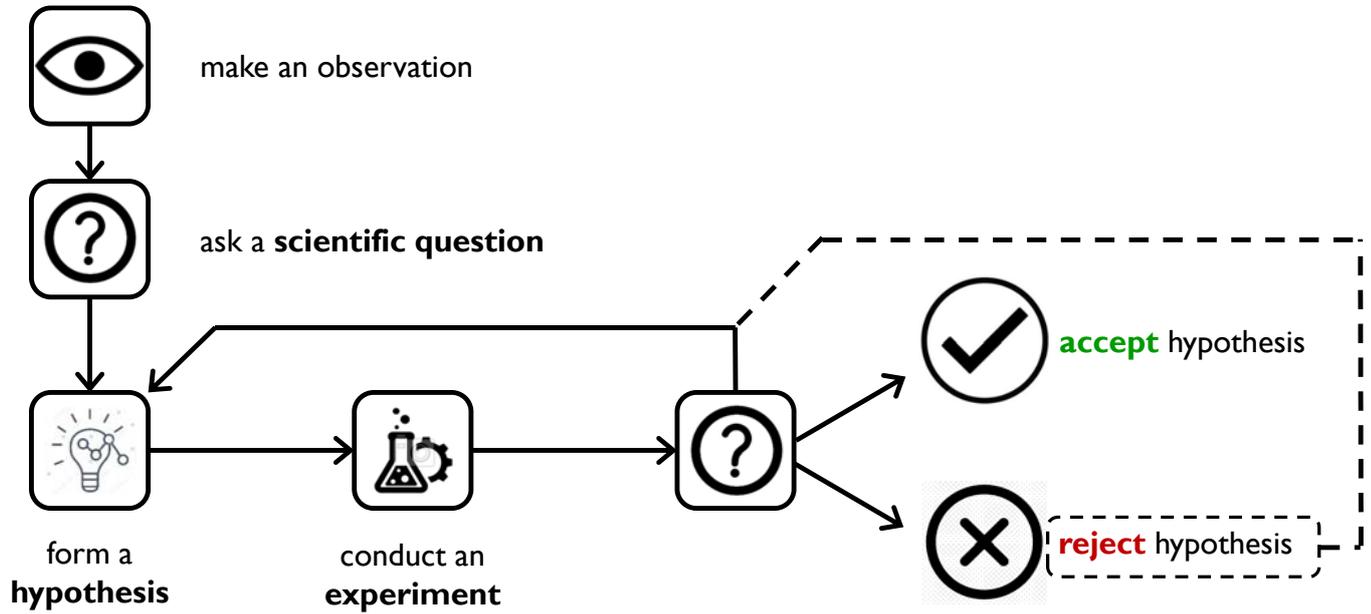
Cognitive Systems as an intersection of innovative research fields

Cognitive psychology, neuroscience, artificial intelligence, ...



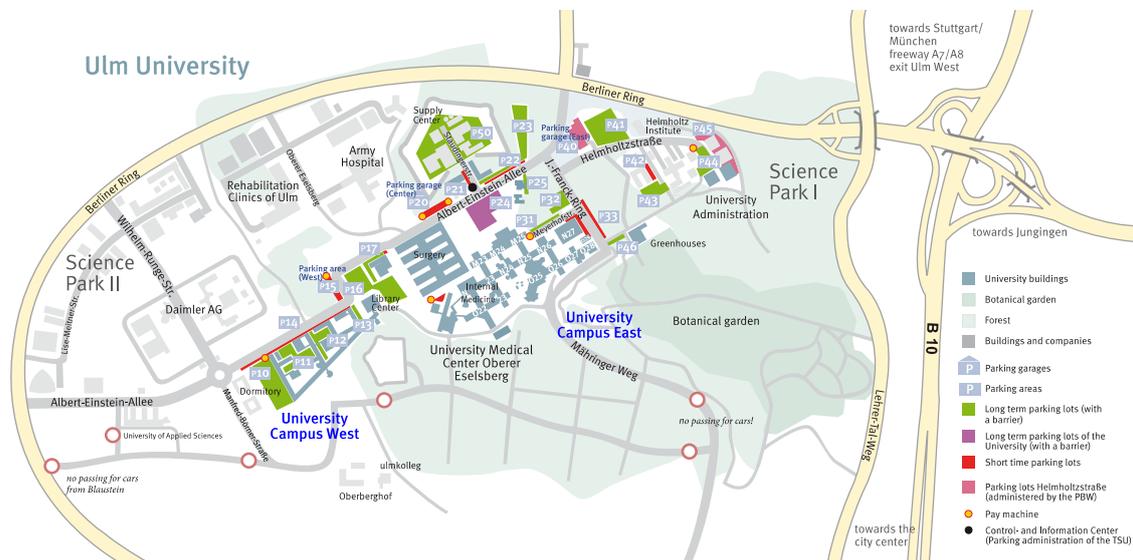
On the scientific method ...

You receive training on how to investigate scientific questions

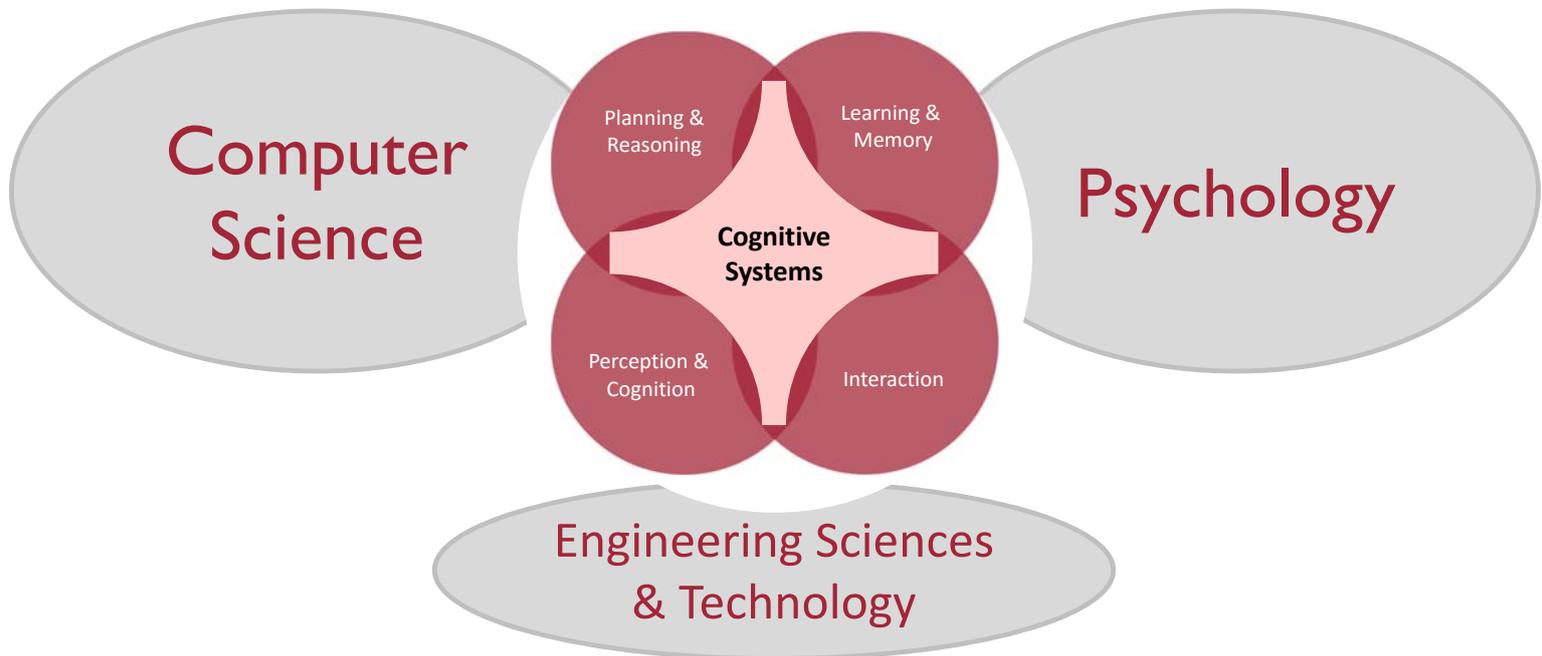


Why Cognitive Systems @ UUlM?

- 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 ...



Interdisciplinary implementation under one roof



- **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 systemsalso 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



Notes on the *Cognitive Systems* program

Cognitive Systems website

Regulations, modules, program, rules

MSc course program and detailed structure

Basic Subject

Interdisciplinary Subject

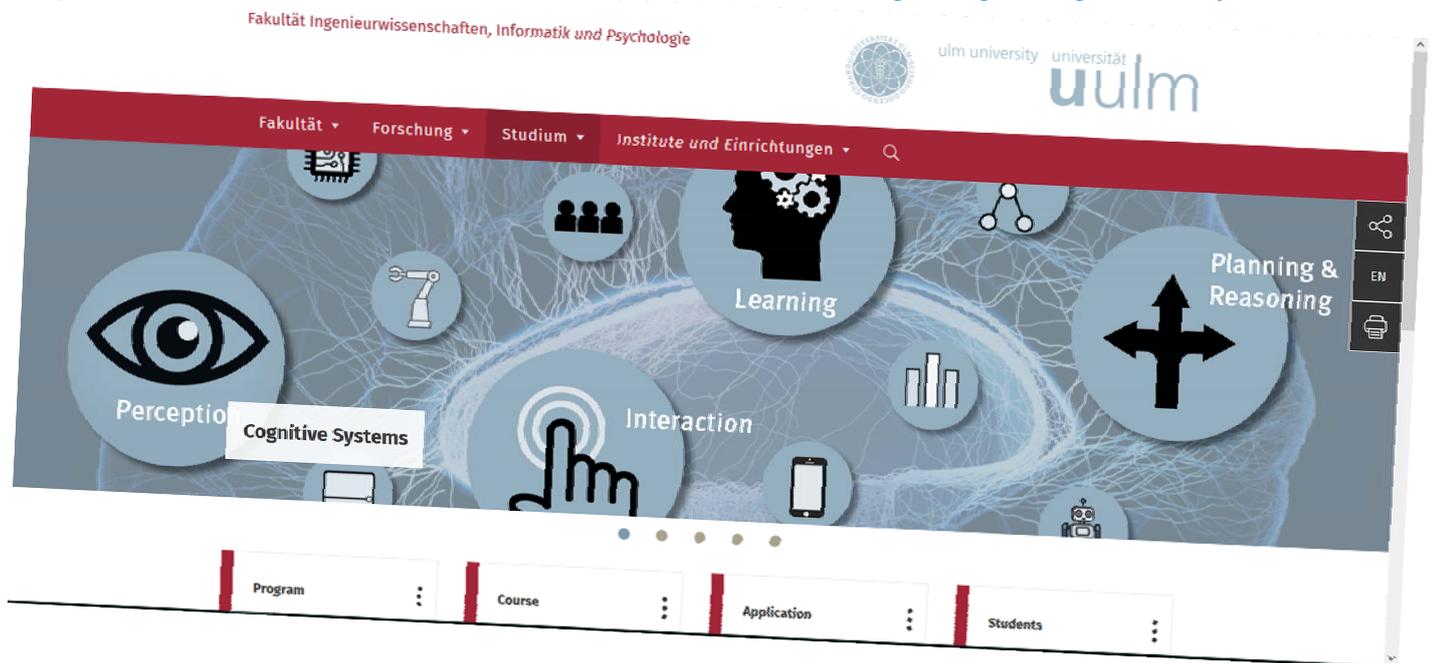
Special Subject

Applied Subject

Schedule and timetable – further details & information

Cognitive Systems website

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



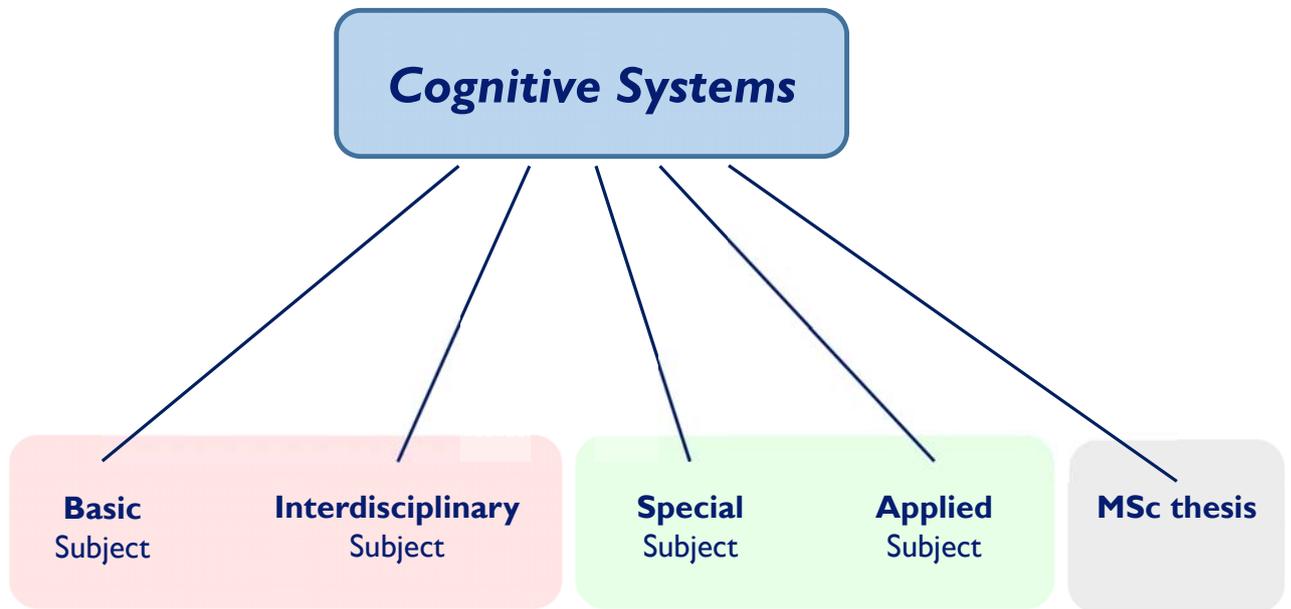
Regulations, modules, program, rules

- **“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”**

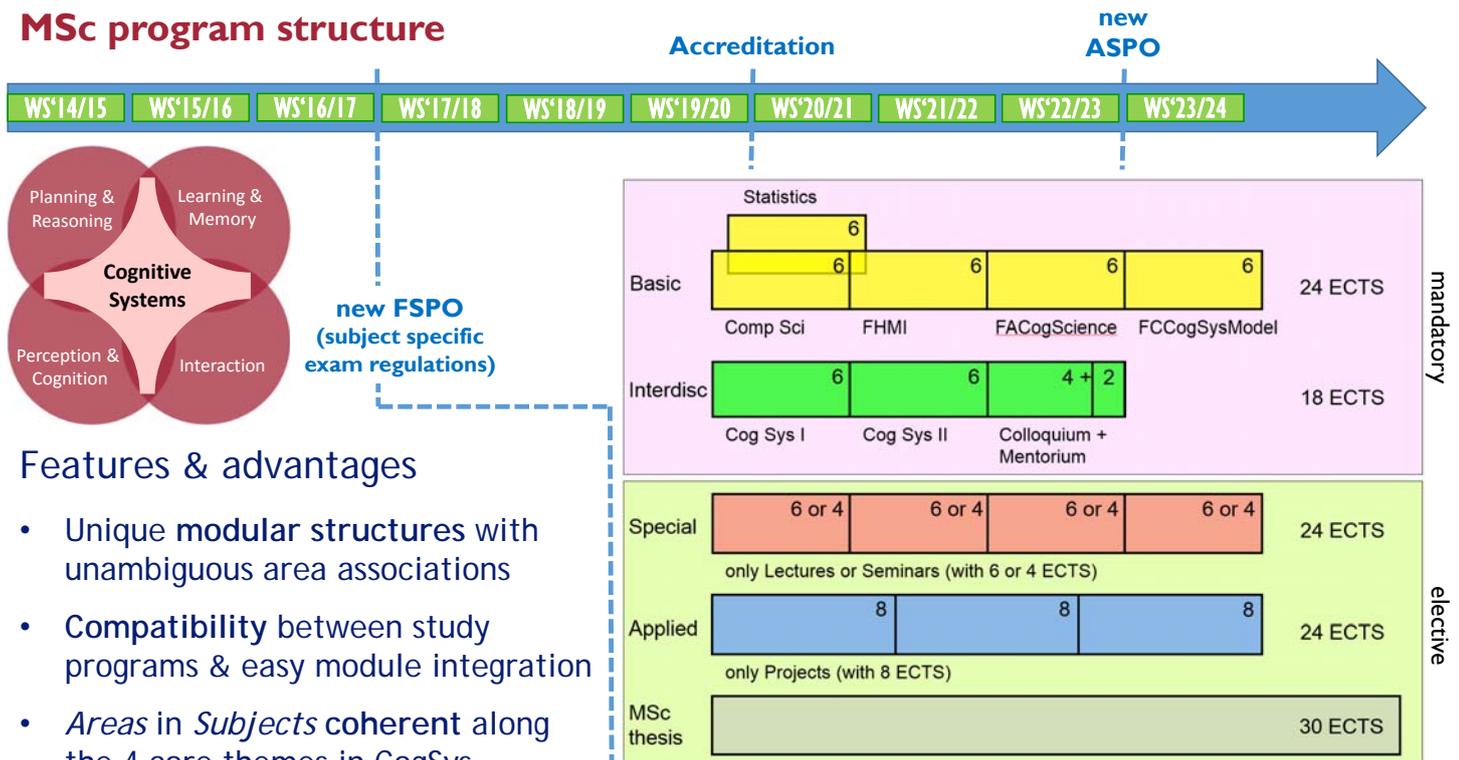
<https://www.uni-ulm.de/in/fakultaet/institute-und-einrichtungen/pruefungsausschuesse/eb-cogsys/plagiarism/>

MSc course program and detailed structure

Generic structure of MSc program



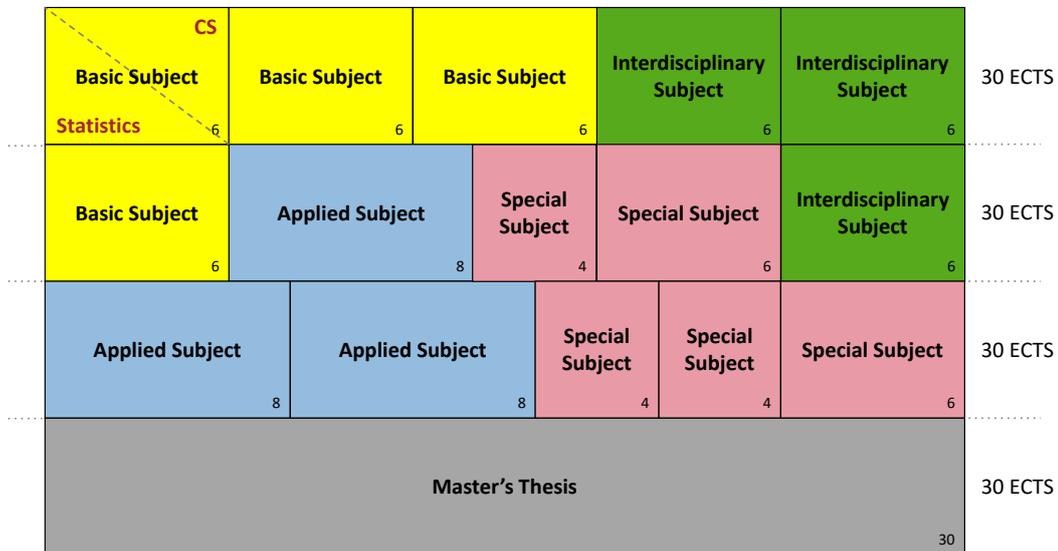
MSc program structure



Features & advantages

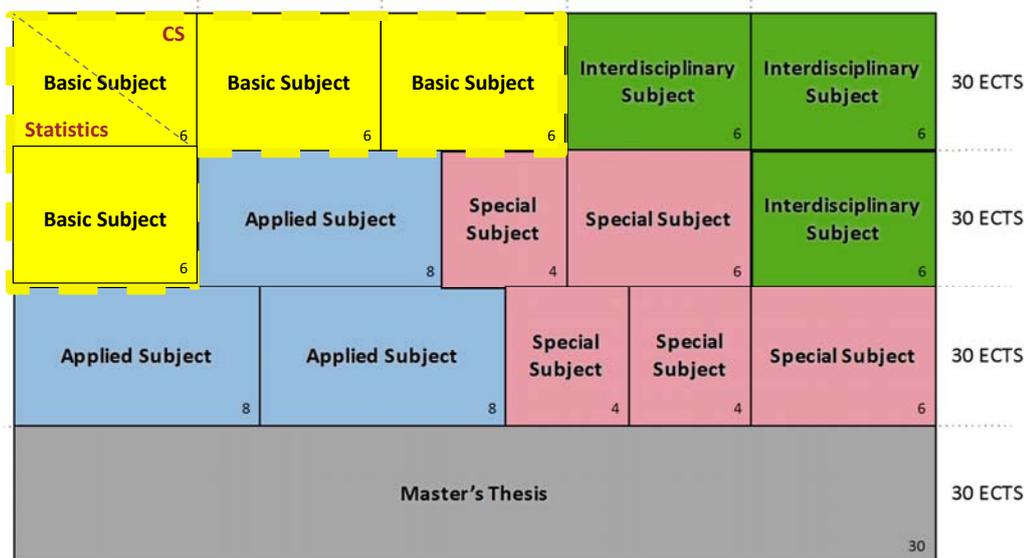
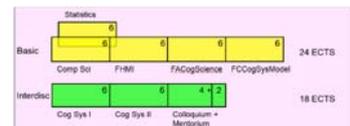
- Unique modular structures with unambiguous area associations
- Compatibility between study programs & easy module integration
- *Areas in Subjects coherent along the 4 core themes in CogSys*

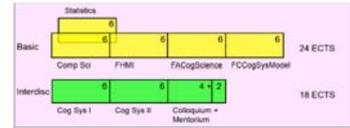
Example course plan and structure over 4 semesters (4 subjects + MSc thesis = different colors)



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)



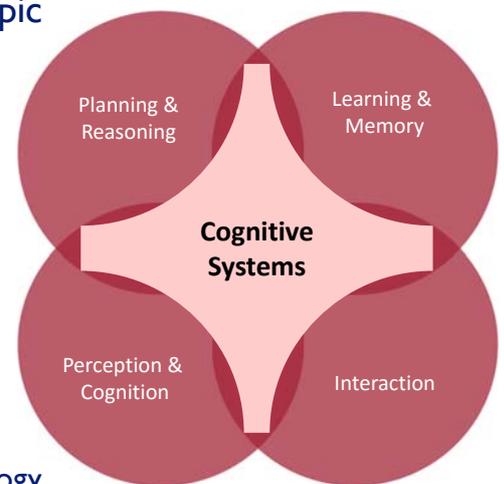
Interdisciplinary Subject

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

CS Basic Subject Statistics	Basic Subject	Basic Subject	Interdisciplinary Subject	Interdisciplinary Subject	30 ECTS
Basic Subject	Applied Subject	Special Subject	Special Subject	Interdisciplinary Subject	30 ECTS
Applied Subject	Applied Subject	Special Subject	Special Subject	Special Subject	30 ECTS
Master's Thesis					30 ECTS
					30

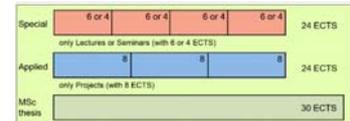
Statistics	0				
Basic	6	6	6	6	6
	Comp Sci	Fr/Ml	FACogScience	FCogSysModel	
Interdisc	0	0	0	4	2
	Cog Sys I	Cog Sys II	Colloquium + Mentorium		
					24 ECTS
					18 ECTS

- 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**)



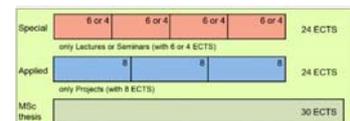
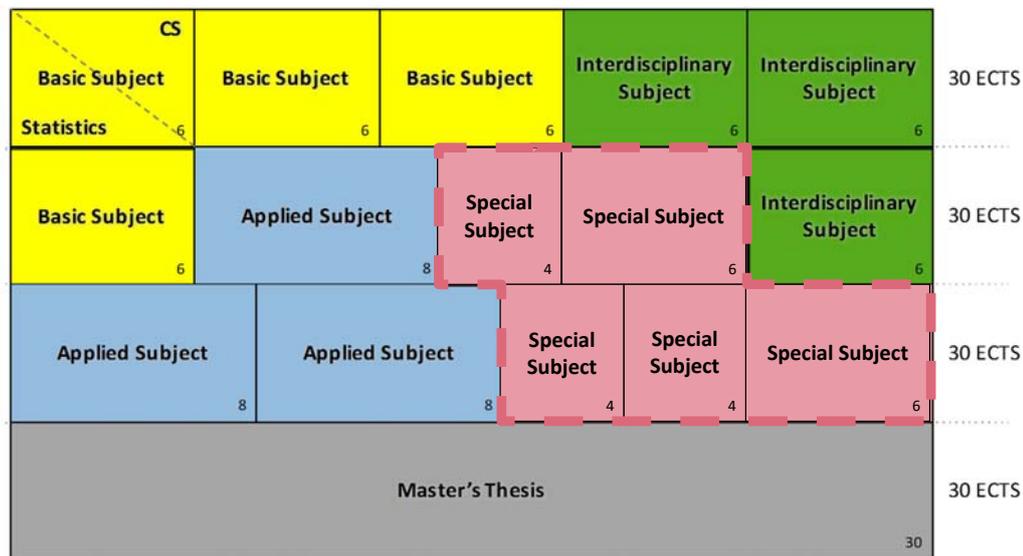
Statistics	0				
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Interdisc	0	0	0	4	2
	Cog Sys I	Cog Sys II	Colloquium + Mentorium		
					24 ECTS
					18 ECTS

- **Colloquium *Recent Developments in Cognitive Systems Research***
 - Colloquium with **invited speakers** (each semester) – every 2nd week (NEW)
Students actively participate by
 - regularly **attending talks** (min. 12 talks, participation list) and
 - 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

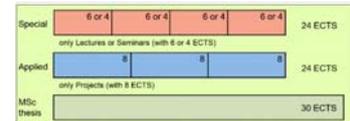


Special Subject

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*

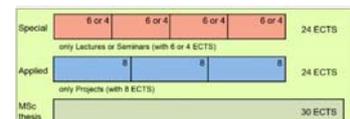
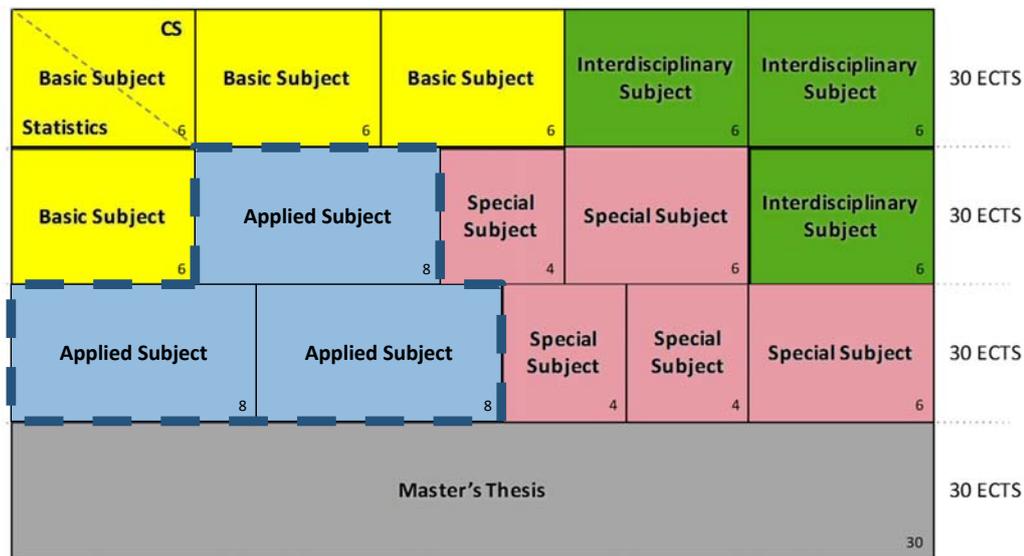


- Modules within the **Special Subject** are courses that allow students to **further specialize** in their program (form: **lectures, seminars**)
- The course program is subdivided in different **areas**
 - *Perception*
 - *Learning & Memory*
 - *Planning & Reasoning*
 - *Interaction*
 - *Methods, general 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*



- 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, ...)

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“

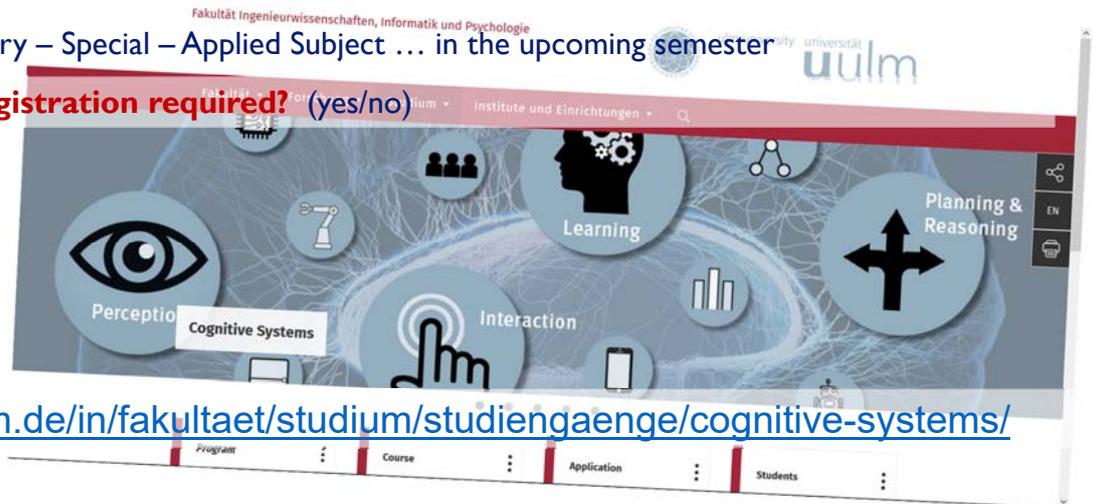
→ “Weekly Course Plan”

- 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”

Notes about faculty & academic structure

UUm – main campus area

Faculties @ UUm – programs in Computer Science & Psychology

Academic presentation

Student union in *Cognitive Systems*

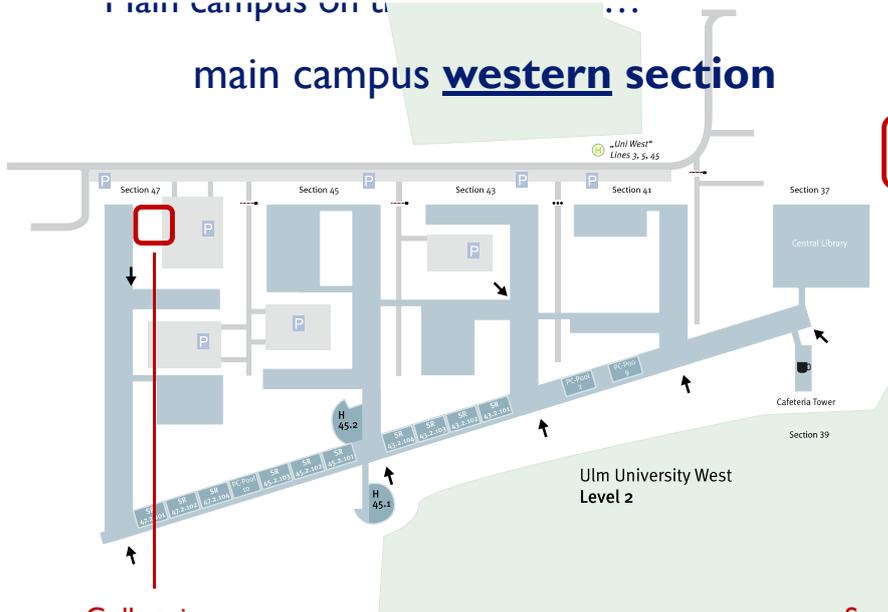
General information ...

Last, but not least ... academics teaching *Cognitive Systems*

UUm – main campus area

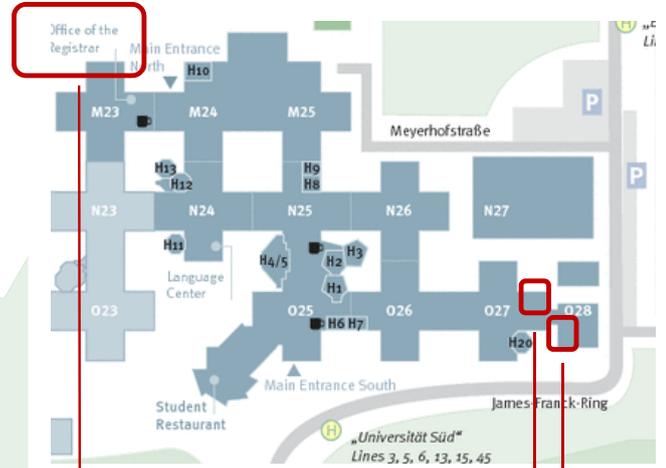
main campus on U

main campus western section



Colloquium

main campus eastern section



Studiensekretariat
(office of the registrar)

Welcome &
CogSys I

Faculties@UUm – 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





ulm university universität
uulm

Thank you for your
attention ... !



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