



# Current Topics in Computer Science

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<https://tcs-informatik.uibk.ac.at>



## Organisation

## Schedule

week 1	October 3	week 8	November 21
week 2	October 10	week 9	November 28
week 3	October 17	week 10	December 5
week 4	October 24	week 11	December 12
week 5	October 31	week 12	January 9
week 6	November 7	week 13	January 16
week 7	November 14	final presentations	January 23
		first exam	January 30

## Times and Places

Lecture/Lab	Thursday, 11:00–11:45/11:45–12:30, HS 10
Lab (“Proseminar”), Group 1	Thursday, 13:45–15:15, HSB 6
Lab (“Proseminar”), Group 2	Thursday, 13:45–15:15, SR 2 (ICT)

# Organisation

## Lecture (VO1)

- more precisely a lecture series, where the Department's groups will present current research topics
- these lectures will take place weekly on Thursday, **11:00–11:45, HS 10**

## Lab (PS3)

- in the lab you will work in small groups on one of nine topics
- for the start of term, we use the available time and places (Thursday, **11:00–12:30, HS 10** and **13:45–15:15, SR 2 (ICT)** to provide overview on the topics
- later, we typically use these time slots as meeting times of the teams or make individual arrangements

# Beginning of Term Schedule (in HS 10/SR 2)

<b>October 3</b>	11:00–12:30	Welcome, Organisation & Streams	
<b>October 10</b>	11:00–12:30 13:45–15:15	Sustainability in ... ... Embedded Systems	JB (NES)
<b>October 17</b>	11:00–12:30 13:45–15.15	Sustainability in ... ... Programming	GM (TCS)
<b>October 24</b>	11:00–12:30 13:45–15:15	Sustainability with ... ... Large Language Models	AJ (DS)
<b>October 31</b>	<i>Intelligent and Interactive Systems</i>	finalisation of student groups	

# Lecture Series of Department Groups

(titles will be finalised later)

<b>October 31</b>	<i>Intelligent and Interactive Systems</i>	Justus Piater
<b>November 7</b>		skipped
<b>November 14</b>	<i>Interactive Graphics and Simulation</i>	Matthias Harders ∨ Pascal Knierim
<b>November 21</b>	<i>Distributed and Parallel Systems</i>	Thomas Fahringer
<b>November 28</b>		skipped
<b>December 5</b>	<i>Quality Engineering</i>	tba
<b>December 12</b>	<i>Security and Privacy Lab</i>	Rainer Böhme
<b>January 9</b>	<i>Computational Logic</i>	Aart Middeldorp ∨ René Thiemann
<b>January 16</b>	<i>Databases and Information Systems</i>	Eva Zangerle

# Evaluation

the module “Current Topics in Computer Science” consists of two parts:

(i) **lecture** and (ii) **lab** with separate evaluations

## Lecture

- first exam on January 30, 2025
- multiple choice questions per group

## Lab (theme “Sustainability”)

- we split the participants into 9 small groups of 4–5 students, each
- your task will then be to work together on this topic throughout the term
- your team project will require
  - 1 small prototype implementation (typically)
  - 2 final presentation
  - 3 short report



Questions?





Streams (aka officially “Specialisations”)

# Electives

- the curriculum offers many electives, but the elective modules 1–6 are special
- you must complete at least three out of these six modules

①	Automata and Logic	■ 7.5 ECTS
②	Constraint-Solving	■ 7.5 ECTS
③	Cryptography	■ 7.5 ECTS
④	High-Performance Computing	■ 7.5 ECTS
⑤	Optimisation and Numerical Computing	■ 7.5 ECTS
⑥	Signal Processing and Algorithmic Geometry	■ 7.5 ECTS

# Streams

option to choose one of three specialisations

be free, don't stream ... 30 ECTS

■ Logic and Learning 30 ECTS

... completion of electives marked by ■ strongly recommended

■ Secure and Distributed Computing 30 ECTS

... completion of electives marked by ■ strongly recommended

■ Perception, Interaction and Robotics 30 ECTS

... completion of electives marked by ■ strongly recommended

# Specialization: Logic and Learning

Specialization  
**Logic and Learning**  
(EM 7-9)

- Understand the Limitations of Computation
- Reason Inductively and Deductively
- Verify the Correctness of Hardware, Software and Networks

## Suggested Base Elective Modules:

Automata and Logic

Constraint Solving



# Specialization: Secure and Distributed Computing

Specialization  
**Secure and Distributed  
Computing**  
(EM 10-12)

Learn how to

- design and develop highly distributed, scalable and reliable applications
- monitor, manage, and optimize resource usage for massive scaling across heterogeneous resources
- make systems trustworthy by not having to trust any one of the parties
- protect privacy and freedom with efficient secure computation

for IoT-Edge-Cloud infrastructures.

**Suggested Base Elective Modules:**



# Specialization: Perception, Interaction and Robotics

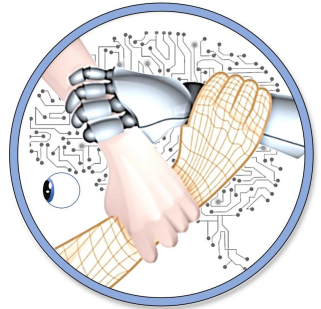
Specialization  
**Perception, Interaction  
and Robotics**  
(EM 13-15)

- Push the Limits of Interactive Systems in Real and Simulated Worlds
- Pursue Human Levels of Perception by Developing Novel Deep Learning Methods
- Advance Robot Intelligence Using Machine Learning
- Reach the Next Level in Virtual, Mixed, and Augmented Reality Systems

## Suggested Base Elective Modules:

Optimization and  
Numerical Computation

Signal Processing  
and Algorithmic Geometry



# Your Choices

<https://www.uibk.ac.at/informatik/master-computer-science/>

- ③ Cryptography ■ 7.5 ECTS
- ④ High-Performance Computing ■ 7.5 ECTS
- ⑤ Optimisation and Numerical Computing ■ 7.5 ECTS

ie. stream “Secure and Distributed Computing” or “no stream” wins 😊



Questions?





## Learning Outcome

# Why are you here?

*This module enables students to describe a selection of current research topics in computer science and to understand some of their fundamental research questions. In addition, the ability is acquired to classify new questions and problems as well as one's own interests in these topic complexes.*

in addition

- |   |  |  |
|---|--|--|
| ① | introduction of streams                    | done   |
| ② | community building                         | team projects  |
| ③ | present ongoing research at the Department | lecture series<br>curated research themes<br>from DS, NES, TCS |

# Sustainability in Embedded Systems & NES

See Jan Beutel's presentation

# Sustainability in Programming & TCS

## Topic ④: Intermittent Computing

- devices may operate **intermittently** only if energy is available
- such devices enable new applications, but also introduce problems in programmability and correctness

## Topic ⑤: Energy Aware Programming Models

- energy is increasingly a **first-order concern** in computer systems design
- howto expose energy considerations to high-level programming models?

## Topic ⑥: Static Analysis of Energy Consumption

- “energy” as a **resource** that is statically analysed
- how much energy is required to execute a sequence of instructions or evaluate a programming statement?

# Sustainability with Large Language Models & DS

## Topic ⑦

Investigating Text Preprocessing Strategies for Decreasing Token Size in LLM Inputs

## Topic ⑧

Narrative Classification of Climate Change Related Texts using LLMs

## Topic ⑨

Generation of Effective Hints for User Questions using LLMs

# Lab Research Themes and Topics

(changes will happen)

## Sustainability in Embedded Systems

JB

- ① GNSS Post Processing for Austrian Kinematics Sites
- ② Image Alignment and Feature Detection for Murtèl Rock Glacier (Engadin)
- ③ Real-time Detection of Local Seismic Events

## Sustainability in Programming

GM

- ④ Intermittent Computing
- ⑤ Energy Aware Programming Models
- ⑥ Static Analysis of Energy Consumption

## Sustainability with Large Language Models

AJ

- ⑦ Investigating Text Preprocessing Strategies for Decreasing Token Size in LLM Inputs
- ⑧ Narrative Classification of Climate Change Related Texts using LLMs
- ⑨ Generation of Effective Hints for User Questions using LLMs

## Selection of topics

- you submit a ranking of topics (1., 2., 3.) on OLAT by **October 27**
- based on the ranking, the teams will be formed; breaking ties randomly if necessary
- information on OLAT by **October 30**

## Times and Dates for Discussion

- regular meetings of teams will be arranged with us, separately
- we use the time slots of lecture and lab for these meeting

## Final Presentation and Report

- each team presents on January 23 in HS 10/SR 2
- **15' presentations, 5' questions**
- report due by February 0



Looking Forward to Work with You!