





### **Exercises:** Procedure



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- Exercises will be handed out and posted on the web page the day of the monday lecture.
- You work in groups of size 2–4.
- Each group hands in one solution (in English or in German).
- Solutions to previous week's exercises have to be handed in until monday 10 a.m.
  - to Thorsten Engesser, engesser@informatik.uni-freiburg.de

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# Agents: Examples



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Which of these entities qualify as agents:

- Human beings
- Animals
- Plants
- (Non-)Self-driving cars
- Light switches
- Tables

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## Shoham, Layton-Brown, 2009

Multiagent systems are those systems that include multiple autonomous entities with either diverging information or diverging interests, or both.



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### Connection to other areas



- Distributed/Concurrent Systems
  - Similarity: Agents too are autonomous systems capable of making independent decisions → need for mechanisms to synchronize and coordinate at run time
- Artificial Intelligence
  - MAS often seen as a sub-field of AI
  - Historically, MAS stresses the social aspect of agency more than classical AI does
- Economics/Game Theory
  - Game theory is heavily used in MAS, but
  - MAS is more concerned with computational aspects in context of resource-bounded agents
  - Some assumptions (such as rational agency) may not entirely match with requirements of some kinds of artificial agents

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# Agent-Based Simulation

Agent-Based (Individual-Based) modeling and simulation of emergent phenomena in

- Ecology: Animal populations, Butterfly behavior
- Economy: Prices and consumer behavior
- Sociology: Neighborhoods, Traffic jams
- Epidemiology: Spread of diseases





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# Beliefs, Desires, Intentions



- The GOAL Agent Programming Framework (Koen Hindriks, TU Delft https://goalapl.atlassian.net/wiki/)
- Modal logics for Beliefs, Desires, Intentions

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Communications and Argumentation



Argumentation Frameworks: Modeling disputes and persuation





