Intelligent Systems Research Seminar
Spring 2007

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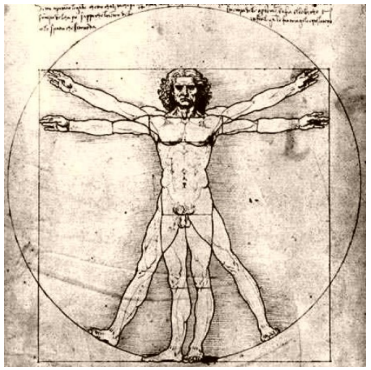
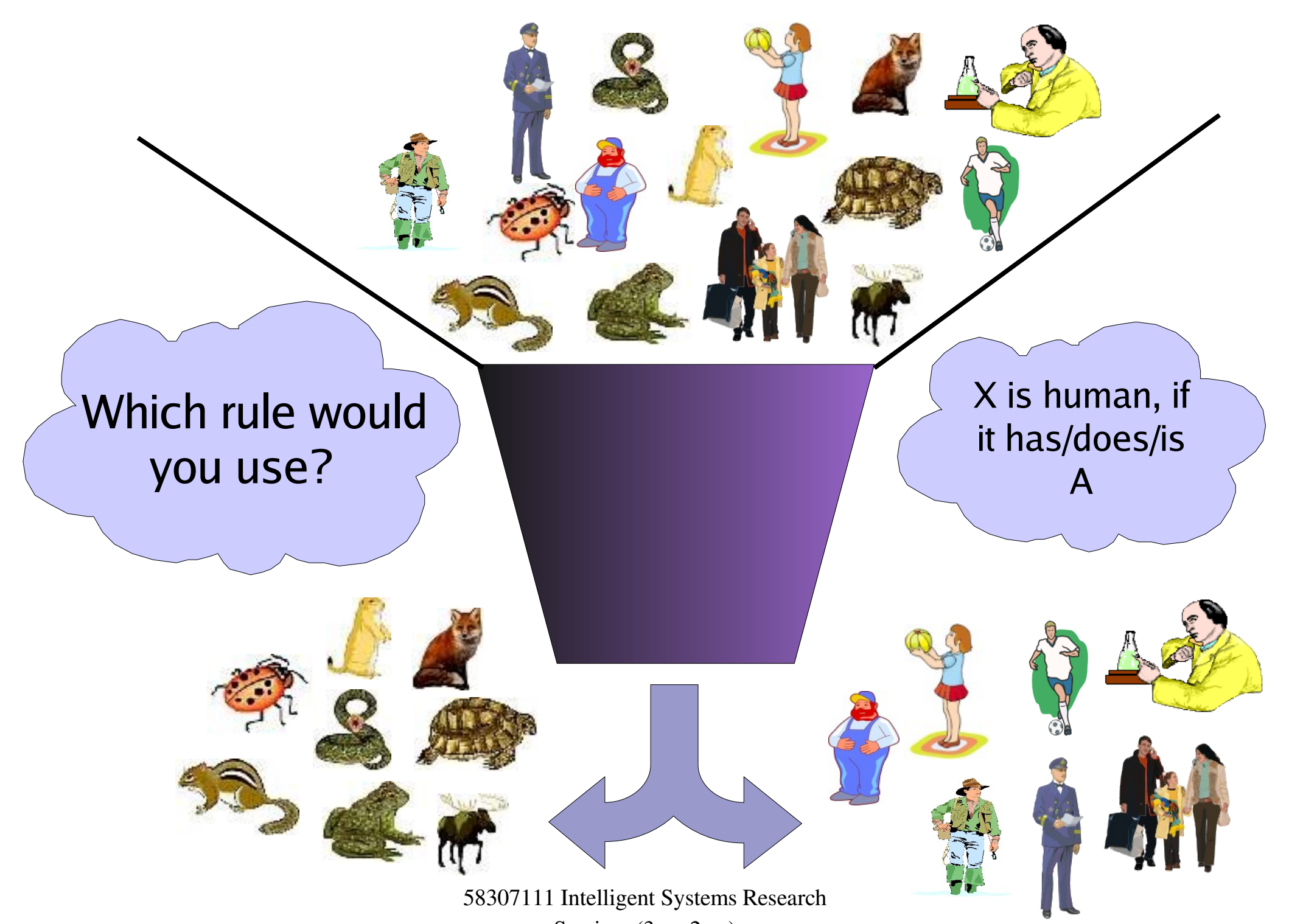


1. Thought experiment

What is the most basic issue that distinguishes human beings from other animals?

- Assume you are given a set of samples:
  - Descriptions of human beings.
  - Descriptions of non-human animals.
- Your task is to come up with a single rule that classifies the samples to respective classes correctly and perfectly.


Which rule would you use?
X is human, if it has/does/is A

2. Human evolution

- Charles Darwin (1871), *The Descent of Man*.
  - "There is no fundamental difference between man and the higher mammals in their mental faculties."
  - Individuals differ greatly in every mental characteristic.
  - Humans have, perhaps, fewer and more basic instincts than their closest relatives.
  - Animals with more sophisticated instincts are higher in intelligence.

2.1 Traits shared by humans and animals

- Lower instincts:
  - Pleasure and pain, happiness and misery
  - Terror, suspicion
  - Courage and timidity
  - Rage
  - Revenge, jealousy, and deceit
  - Agony of death, maternal affection
  - Shame, pride
- More intellectual emotions and faculties:
  - Ennui, excitement
  - Wonder, curiosity
  - Imitation
  - Attention
  - Memories of things
  - Imagination (and dreams)
  - Reasoning, association of ideas

2.2 Traits that may not be shared

- Abstraction vs. general conceptions, self-consciousness
  - Hard to know what is in another being's mind.
  - No consensus what these concepts mean.
- Language
- Sense of beauty
- Religion, superstition

2.3 Minds and manners

- Hornaday, William (1922)
  - Study animals in their natural environment doing what they are inclined to do.
  - Animal intelligent can be estimated by
    - General knowledge of their surroundings
    - Independent observations and reasoning
    - Memory
    - Comprehension under tuition
    - Accuracy in exectution of orders
    - Various moral qualities (amiability, patience, courage, ...)

2.4 Animal cognition

- In studying animal cognition, it is important to understand (Hauser, 2000)
  - findings in neurosciences, particularly the anatomy of brain.
  - human infant development.
- Questions we shouldn't ask:
  - Do animals think?, Are animals conscious?, Are some animals more intelligent than others?
  - These are vague.
  - Rely on what humans do.

- Questions we should ask are more specific:
  - What is animals' capacity to
    - use tools?
    - solve problems in symbolic format?
    - find its way home?
    - understand its beliefs and those of others?
    - learn by imitation?
  - Do animals have emotions?
  - Do animals communicate?
  - Are animals guided by instinct?
  - Do they have rules they abide to, and sometimes break?
- The goal to keep in mind:
  - What can we learn from animals to advance artificial intelligence research and applications?

2.5 Tentative topics

1. Introduction
2. Anthropomorphism and comparative analysis
3. Brain and neurophysiology
4. Learning and adaptive specialization
5. Memory and time binding
6. Imitation and social learning
7. Self-awareness and consciousness
8. Theory of mind
9. Language
10. Perception and face recognition
11. Mental tool kits
12. Paper reports

2.6 Animals

- Humans
- Apes and monkeys
- Various birds (crows, pigeons, parrots, jays, ...)
- Spiders, lizards
- Fish and dolphins

3. Seminar policies

- Instructor and office hours:
  - Tei Laine, Mon, Wed 12-12.30 @A213
- Meetings
  - Thu 10-12, @B119
- For each meeting
  - Read one or more articles given in the reading list.
  - Be prepared to discuss the topics introduced in the articles.
  - Write a one-page essay in which you either
    - Discuss questions raised by the reading,
    - address the articles' points of relevance and interest,
    - relate the readings to something you already know, or
    - propose future lines of studies.
  - Submit the essay on paper (remember to write your name)

3.1 Important notice!

- You don't have to read everything from start to finish, but you should read something!
  - That's why you have choice.
- Beware, most of the readings are non-computer science texts:
  - They use terminology you may not be familiar with.
  - They introduce methods that you've not encountered before.
  - Come to the meetings with questions!

3.2 Term paper

- A research article on the topic of your choice
  - Each student is asked to schedule a short meeting with me to discuss the paper topic.
  - Preliminary outline of the article due by the break.
  - Either in Finnish or in English — same rules apply regarding
    - Correct and complete sentences
    - Grammar
    - Nice formatting
    - Proper citations
  - At the end of the semester everyone gives a short(!) presentation on their paper.