DONDERS INSTITUTE

BKI134

Cognitive Psychology

Introduction: What is cognitive psychology?

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What is cognitive psychology?

- The study of mental processes that allow us to perceive, learn, remember, think and act
- Information processing
  - Metaphor: The mind as a computer
- Human cognition is mostly not accessible to introspection
  - Experimental approaches
    - Behavioural experiments
    - Neuropsychology
    - Neuroscience experiments
    - Computational modelling

Main functions of the human cognitive system

- We continually take up information from the external world through five senses and recognise objects and events: *Perception*
- We are continually exposed to more information than we can possibly process: *Attention*
- We store and retrieve information: *Learning and memory*
- We use (old and new) information for solving problems, making inferences, making decisions etc.: *Thinking and reasoning; category formation*
- We use information for action: *Motor behaviour*
- We communicate: *Language processes*

Cognitive Psychology and Artificial Intelligence

- Human-machine interaction:
  - Human information processing as a blue-print for artificial intelligent systems
  - Artificial intelligent systems as hypotheses about human information processing (e.g., the computer metaphor)

Why is Cognitive Psychology important to create Artificial Intelligence?

- Humans are most likely the smartest and most intelligent organisms around

- Knowing how the human mind perceives, memorizes, thinks and acts can thus give important clues to building intelligent machines such as computers and robots

- As you learn about features of human cognition, keep asking yourself: **If you were building an AI, which of those features would you include, and why?**

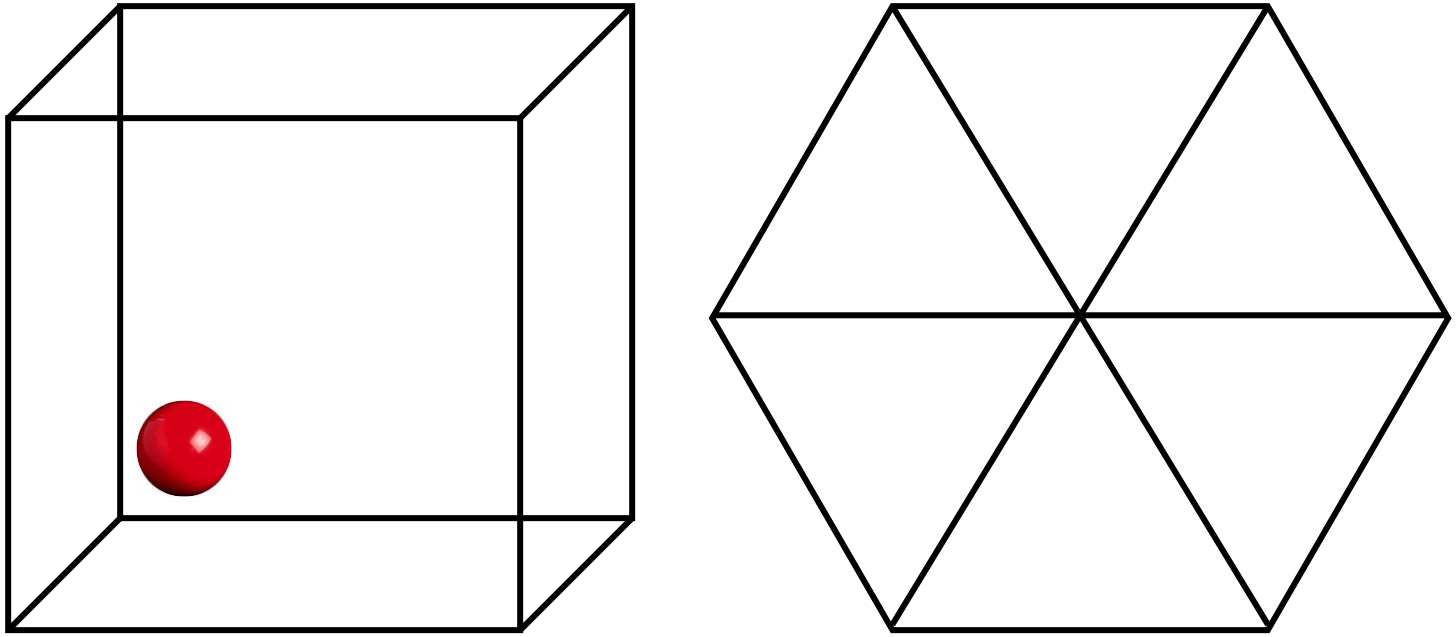
Structure of introductory lectures

- Rest of this lecture:
  - Some demonstrations and examples
  - Get a feeling for what cognitive psychology is about and what the complexities are
- Next lecture:
  - Approaches to human cognition (Chapter 1)

Illustrating cognitive psychology

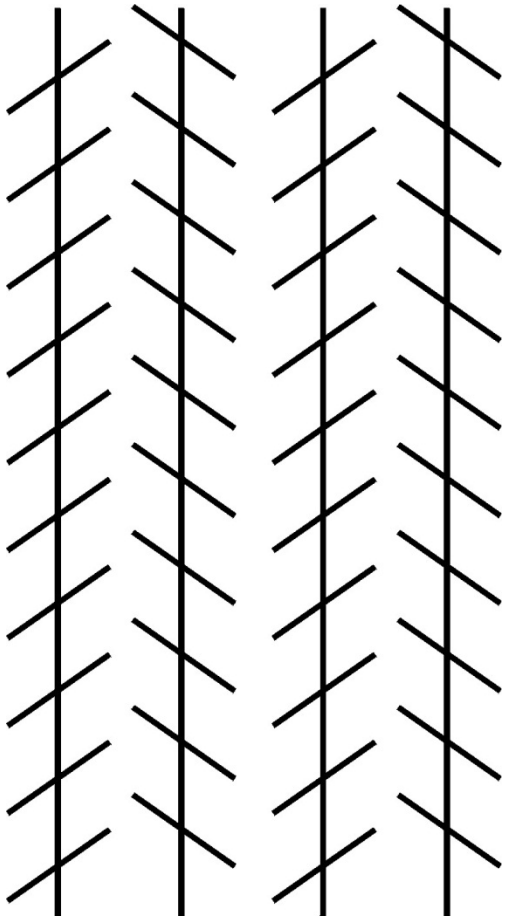
- Visual illusions

Necker cube

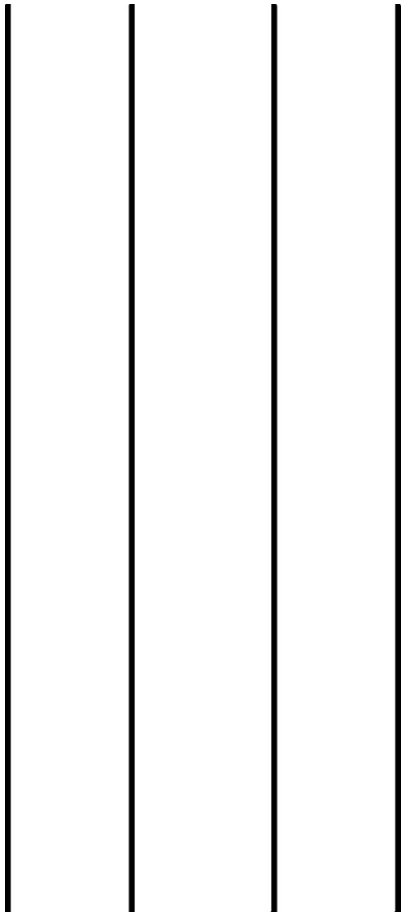


You can’t see both “interpretations” simultaneously

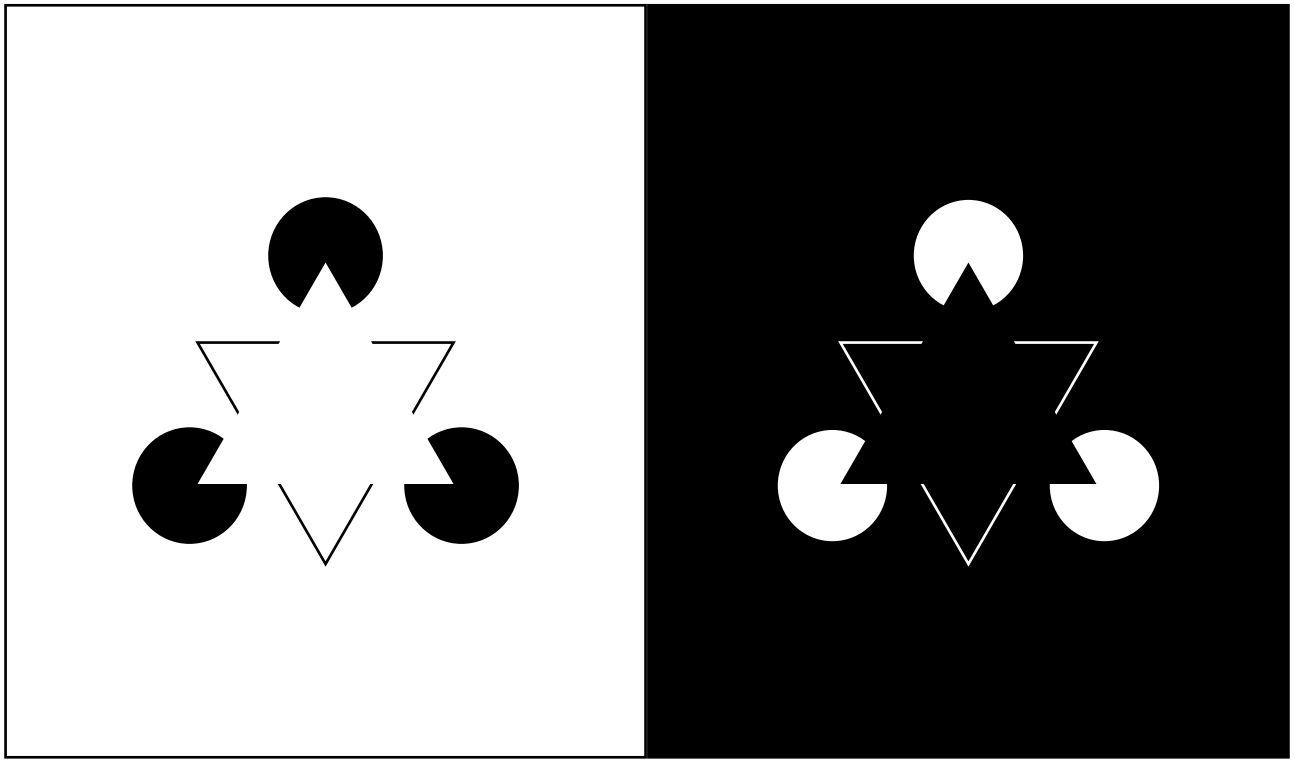
Zöllner illusion



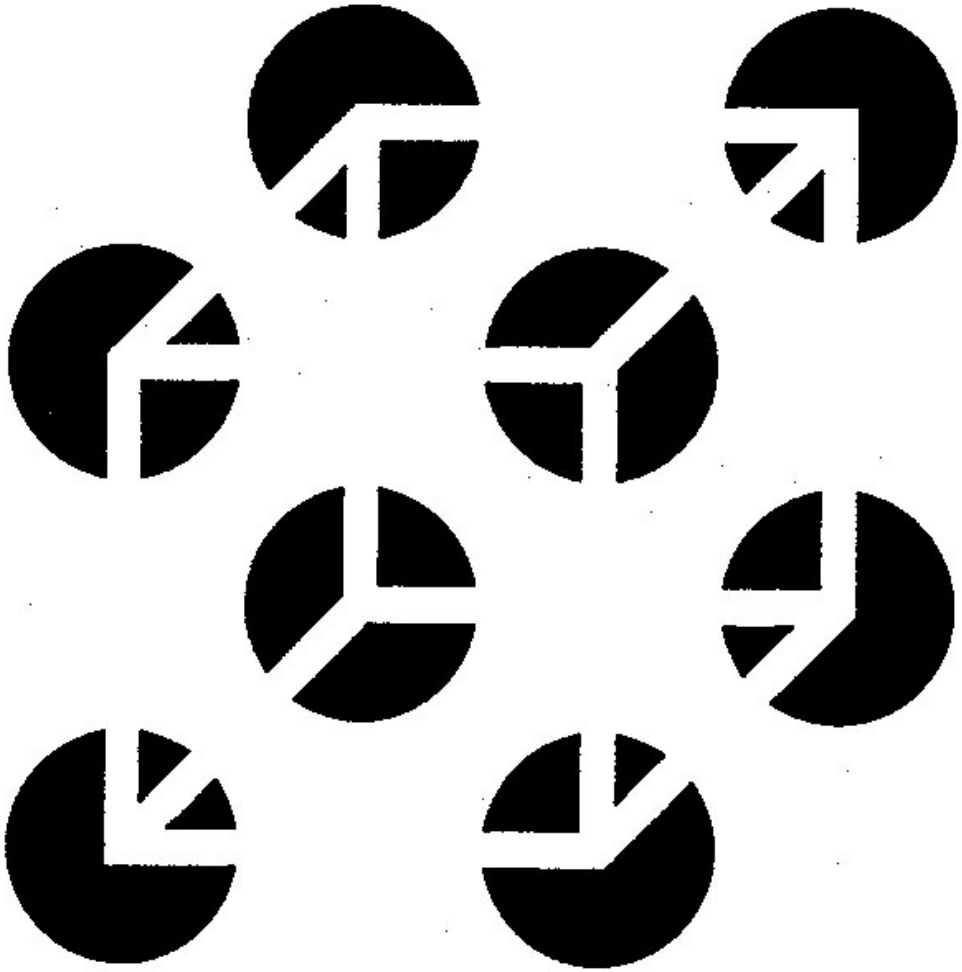
Zöllner illusion



Kanizsa triangles



Kanizsa version of Necker cube

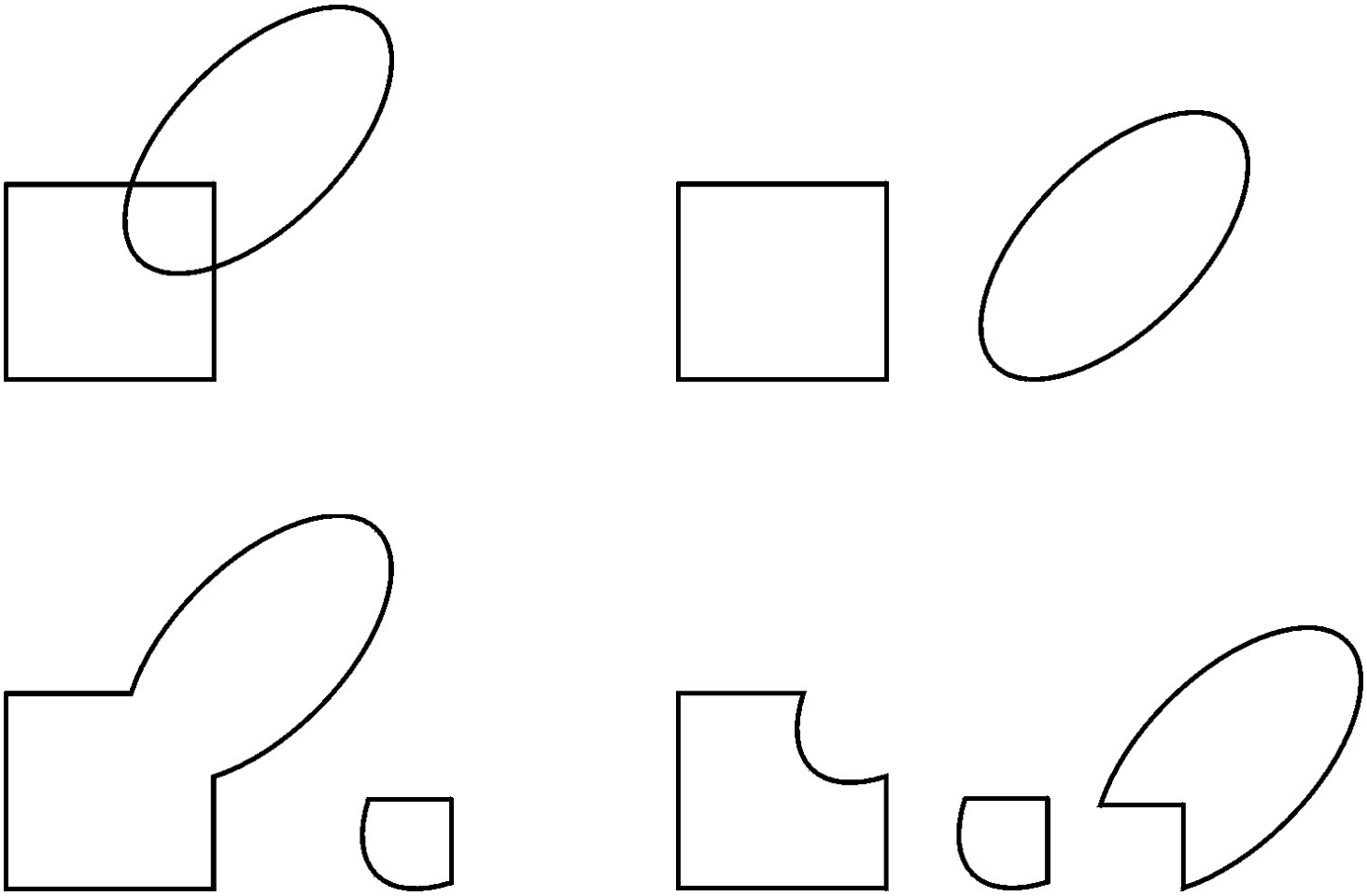


Illustrating cognitive psychology

- Visual illusions
  - Perception is not veridical; it is a constructive process
  - Knowing that an illusion is an illusion does not take away the illusion: no influence of knowledge on perceptual processes (no “top-down” effects)
  - Later we will see that in other cases, such top-down influences do exist

- Visual perception requires dissecting a visual scene into coherent parts

What do you see?



- An example of top-down influences

A

12 13 14

C

McGurk effect

- https://www.youtube.com/watch?v=G-lN8vWm3m0

- Audio signal: “ba”
- Video signal: facial movements for “fa”
- Listening while watching: “fa”
- Listening with eyes shut: “ba”

Illustrating cognitive psychology

- Perceptual illusions
  - Perception is not veridical; it is a constructive process
  - Knowledge and context shape perceptual experience ("top-down" effects; not strictly "bottom-up" processing)
  - Perception is multi-modal
- Human memory

How large is your memory?

- Immediate serial recall

Illustrating cognitive psychology

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  - Perception is multi-modal
- Human memory
  - Severely limited in capacity