



# Computational Creativity and Multi-Agent Systems

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# First lecture

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- Introduction to computational creativity
- Introduction to agent-based systems
- Learning objectives of the course
- Working methods of the course

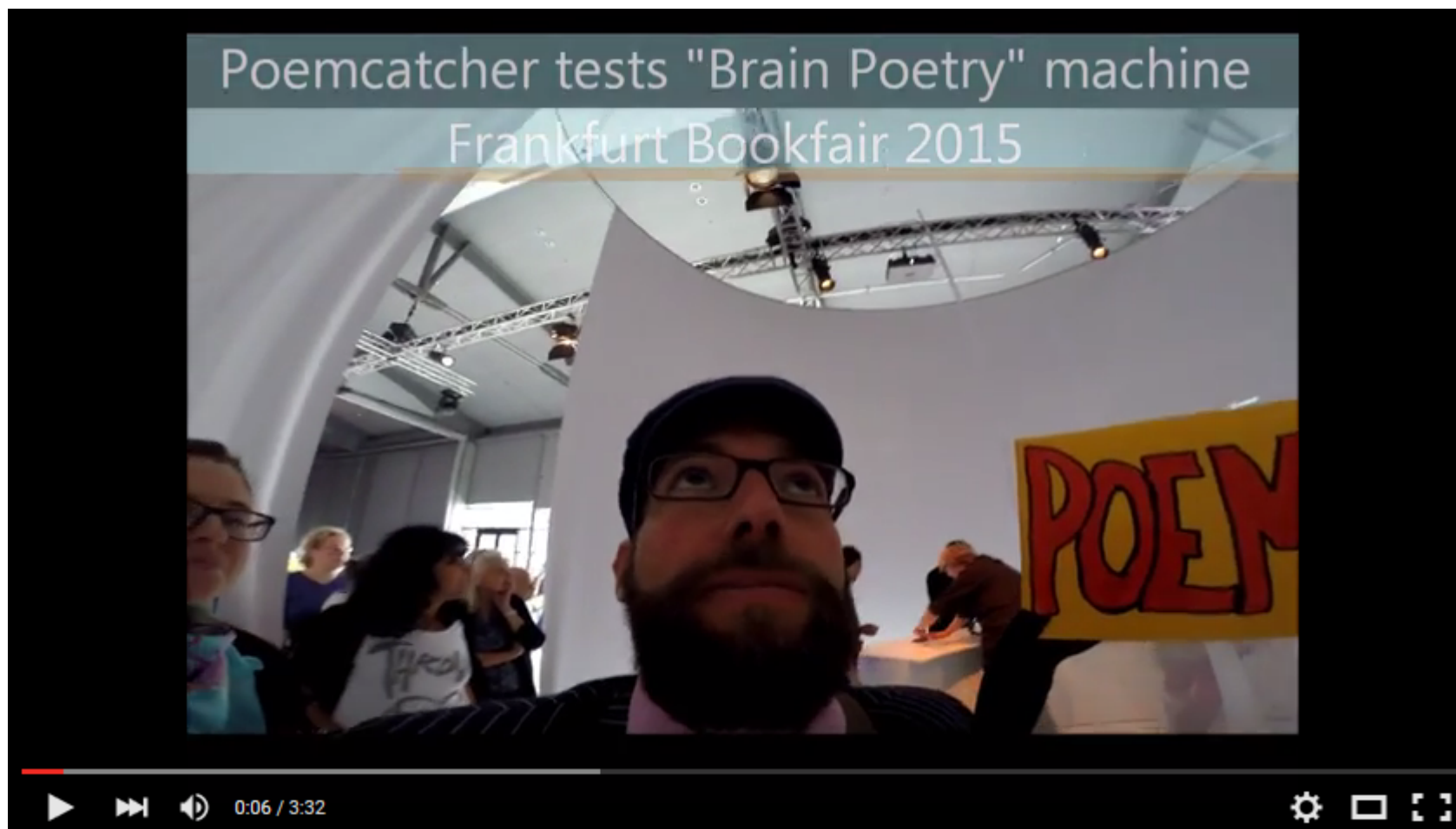
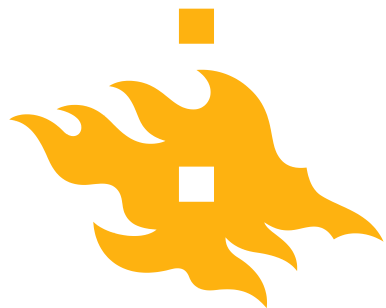


# **An introduction to Computational Creativity**

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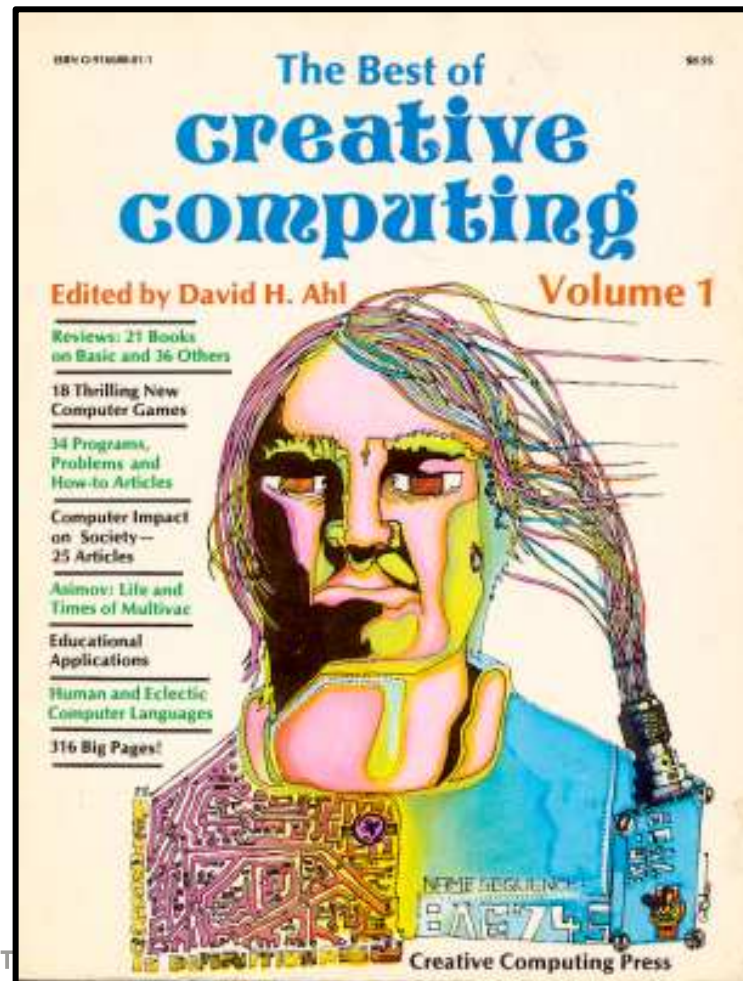
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# Computational creativity



- Creative computers, machine creativity
- Computers supporting human creativity
- Studies of creative computational processes



– Turing et al, 1950s: generation of music





- How to express visually the idea that “electricity is green (ecological)”?





From Ping Xiao and Simo Linkola: Vismantic: Meaning-making with Images, ICCV 2015





A punning riddle:

- What do you call a murderer with fibre?
- A cereal killer.



# What is (computational) creativity?



# Defining creativity

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- Many definitions. A representative one:

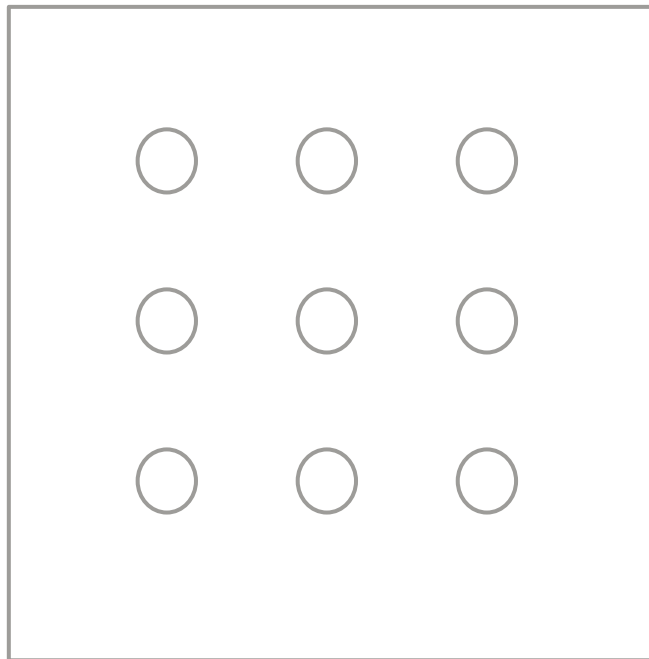
“Creativity is the ability to come up with ideas or artefacts that are new, surprising, and valuable.”

- Boden 1992

- Note: Human creativity is typically defined by the audience, based on the creativity of the output
- Tests like Torrance (below) are used in practical settings



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- Connect the nine dots with four straight lines, without lifting the pen





# Measuring creativity in humans

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E.g., Torrance test of creative thinking:

- *Fluency*: ability to produce of *many* ideas
- *Flexibility*: ability to produce *different* ideas
- *Originality*: ability to produce *unusual* ideas
- *Elaboration*: ability to *explain* ideas

Note: in this course, “idea”  $\approx$  “artefact”  $\approx$  “concept” = the product of creation



# Three types of creativity (Boden 1992)

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1. *Combinational*: new combinations of familiar ideas
2. *Exploratory*: generation of new ideas by exploration of a space of concepts
3. *Transformational*: involves a transformation of the search space so new kinds of ideas can be generated.





# P-creativity vs. H-creativity (Boden 1992)

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A different distinction between creations:

- *P-creativity* or psychological (or personal) creativity: novel just to the agent that produces it
- *H-creativity* or historical creativity: creativity that is recognized as novel by society
- In machine creativity research, emphasis is on p-creativity, i.e., the system be able to produce something novel to itself.
- H-creativity can then, in principle, be achieved with a database of existing artefacts



# What is computational creativity?

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Computational creativity is the philosophy, science and engineering of computational systems which, by taking on particular responsibilities, exhibit behaviours that unbiased observers would deem to be creative.

- Colton and Wiggins 2012



# Computational creativity – why on earth?

- An ultimate AI challenge
- A test bed for AI methods
- Applications
  - Games
  - User interfaces, usability
  - Applications where human creativity is not feasible, e.g., instant creativity
  - Support of human creativity
- An intellectual challenge