# On open problems of theory of knowledge, based on Luciano Floridi's theory of semantic information
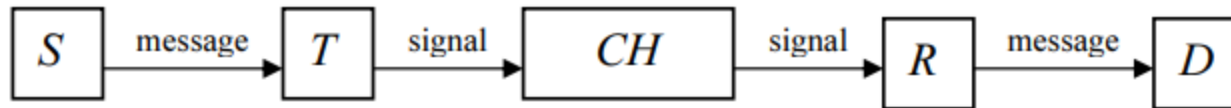
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# Information theory (theories)

Shannon/Weaver information theory (mathematical theory of communication MTC)

$$S \xrightarrow{\text{message}} T \xrightarrow{\text{signal}} CH \xrightarrow{\text{signal}} R \xrightarrow{\text{message}} D$$

$$I(s_i) = \log(1/p(s_i)) = -\log p(s_i)$$

$$H(S) = \sum_{i=1}^{n} p(s_i) \log(1/p(s_i)) = -\sum_{i=1}^{n} p(s_i) \log p(s_i)$$

$$H = -\sum_{i} p_i \log_2(p_i)$$

# Quantitive theories of information

- Hartley function

- Fisher information

- Nyguist function

- Kołmogorow complexity

- Algorytmic theory of information

- Carnap and Bar-Hillel information

# Qualitative theories of information

- Jumarie's relative information concept

- Information as reduction of uncertainty

- Cybernetic theory of information

- Psychological and cognitive theories of information

# Floridi's theory of semantic information
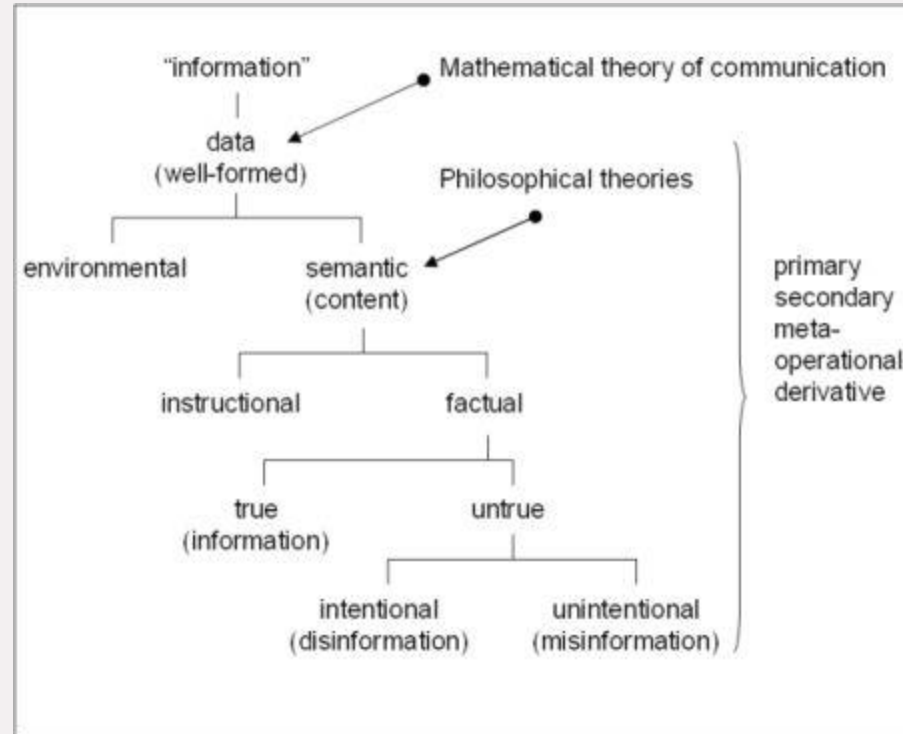
# Types of data

- Primary data

- Metadata

- Operational data

- Derivative data

# Data vs Information

*Our current computers, of any architecture, generation and physical making, analogue or digital, Newtonian or quantum, sequential, distributed or parallel, with any number of processors, any amount of RAM, any size of memory, whether embodied, situated, simulated or just theoretical, never deal with information only with data* (Floridi L., *From the Philosophy of AI to the Philosophy of Information*, 2004)

# Symbol Grounding Problem

The Zero Semantical Commitment Condition:

- no form of innatism is allowed

- no form of externalism is allowed either

- the AA should have its own capacities and resources  to be able to ground its symbols

# Data/information processing systems

*There is a semantic threshold between us and our machines and we do not know how to make the latter overcome it. Indeed, we know very little about how we ourselves build the cohesive and successful informational narratives that we inhabit. If this is true, then artificial and human agents belong to different worlds and one may expect them not only to have different skills but also to make different sort of mistakes* (Floridi L., *From the Philosophy of AI to the Philosophy of Information*, 2004).

# From data to information process in Natural Behaviour System (NIB)

1. A young NIB system goes through a process in which it experiences only data, not information.

2. An adult NIB system may behave as if it is experiencing only data. Such a system, in Searl's Chinese room, would have responded without knowing Chinese.

3. A cognitively, psychologically or mentally developed NIB system may also behave "like a child" without experiencing information when exposed to the data.

4. There is a certain neurochemical level at which the NIB processes data that is not yet information.

5. The semantic constraints of AIB may be, at some level of abstraction, comparable or even casually related to the syntactic constraints of AIB (Floridi, 2004).

# Philosophical analyses of information

- Dretske's theory of information

*A signal r carries the information that s is F = The conditional probability of s's being F, given r (and k), is 1 (but given k alone, less than 1) [Dretske, p64]*
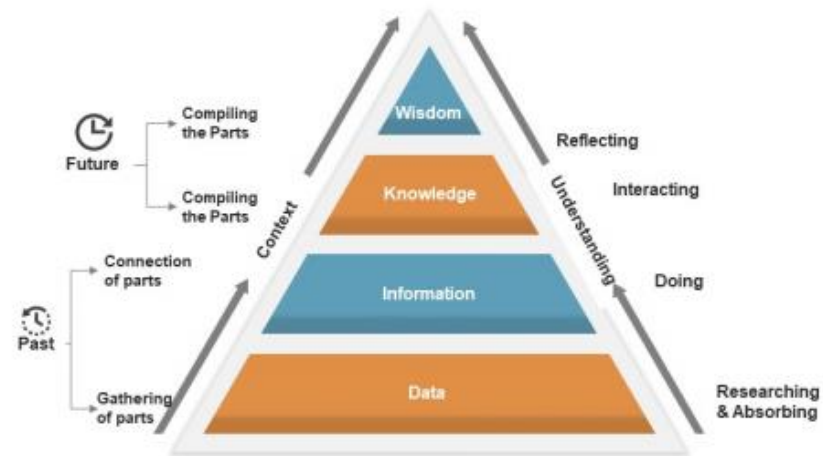
# Philosophical analyses of information

- Epistemology of information

# Knowledge Representation

# Open questions

- Definining knowledge produced by AI systems (and how it's different from human knowledge)

- Place it in a semantic information context

- Make it consistent with SOTA

# Thank you for your attention

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