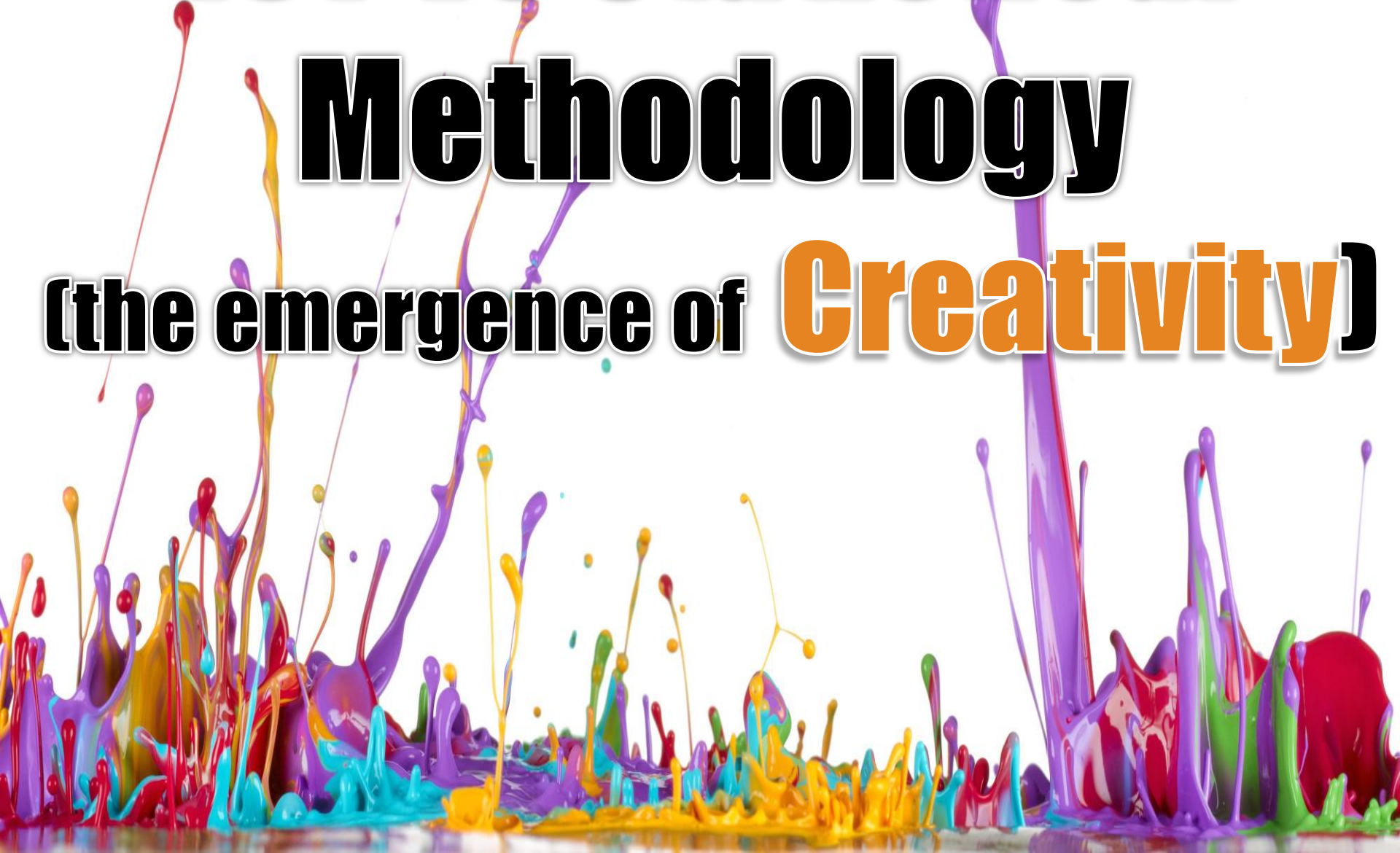


IoT vs Statistical Methodology

(the emergence of **Creativity**)



As software designer we are constatly searching new ways to produce software. Computers actually don't help a lot. They have a very simple conceptual basis whose potentiality was not completely exploited.

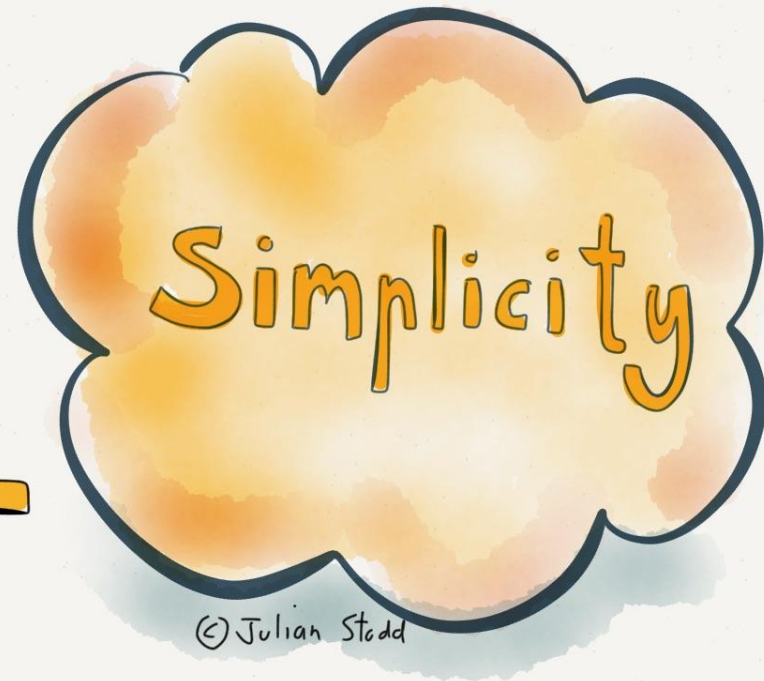
***We need disruption and new creations:
evolutive algorithms.***

DISRUPTIVE INNOVATION



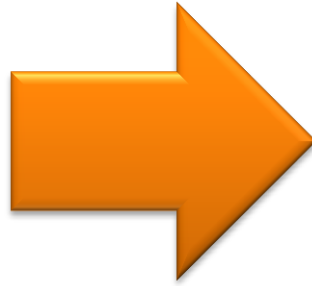


Computers are simple (Von Neuman architecture).



We need complex systems and emergent behavior

**Emergent
behaviour in
a complex
environment**



**Emergent behaviour
cannot be simply inferred
from behaviour of the
components**





May **creativity**
derive from
emergence?

cre·a·tiv·i·ty

noun

the use of the imagination or original ideas.

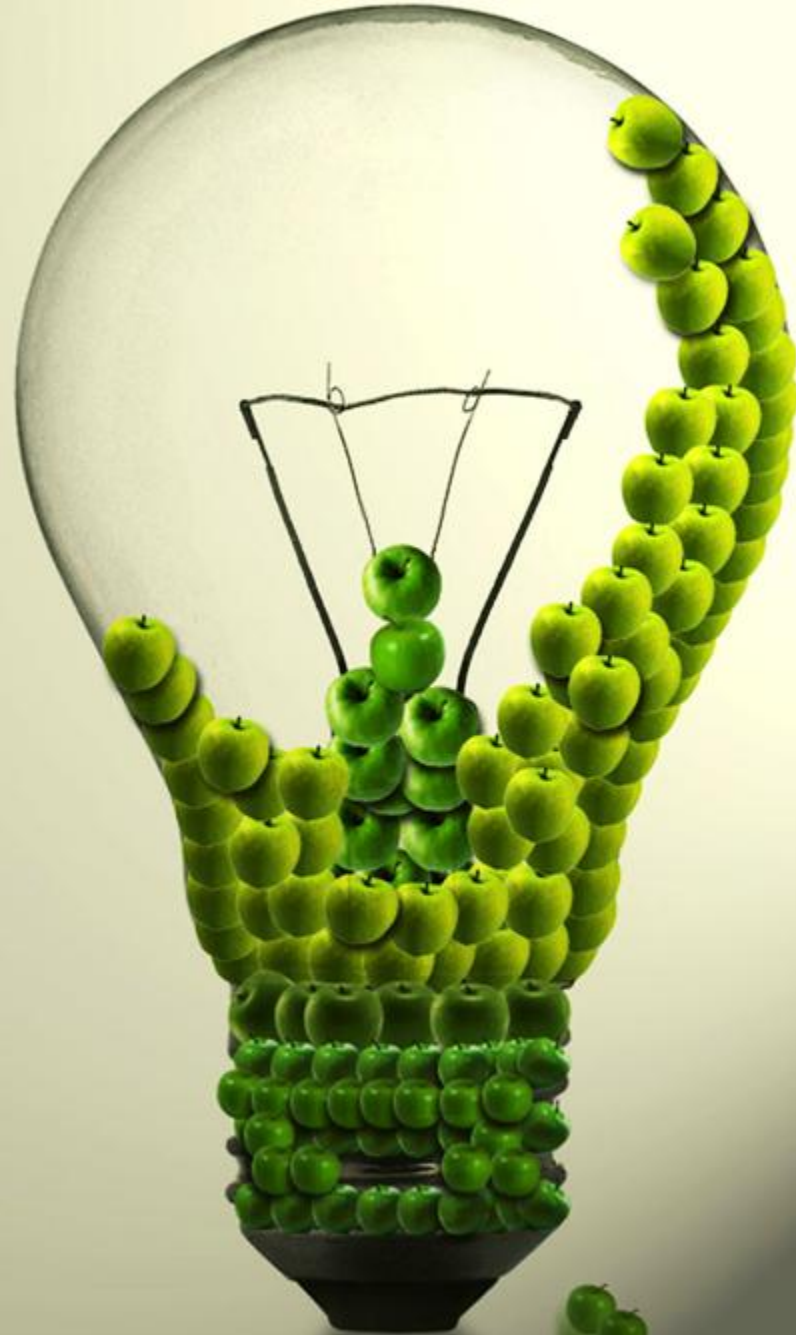
**Probably this
is a Wrong
Question!!!**



Contemporary Eliminative Materialism

Modern versions of eliminative materialism claim that our common-sense understanding of psychological states and processes is deeply mistaken and that some or all of our ordinary notions of mental states will have no home, at any level of analysis, in a sophisticated and accurate account of the mind. In other words, it is the view that certain common-sense mental states, such as beliefs and desires, do not exist.

Churchland, P. M., 1981, “Eliminative Materialism and the Propositional Attitudes,” *Journal of Philosophy* 78: 67–90.



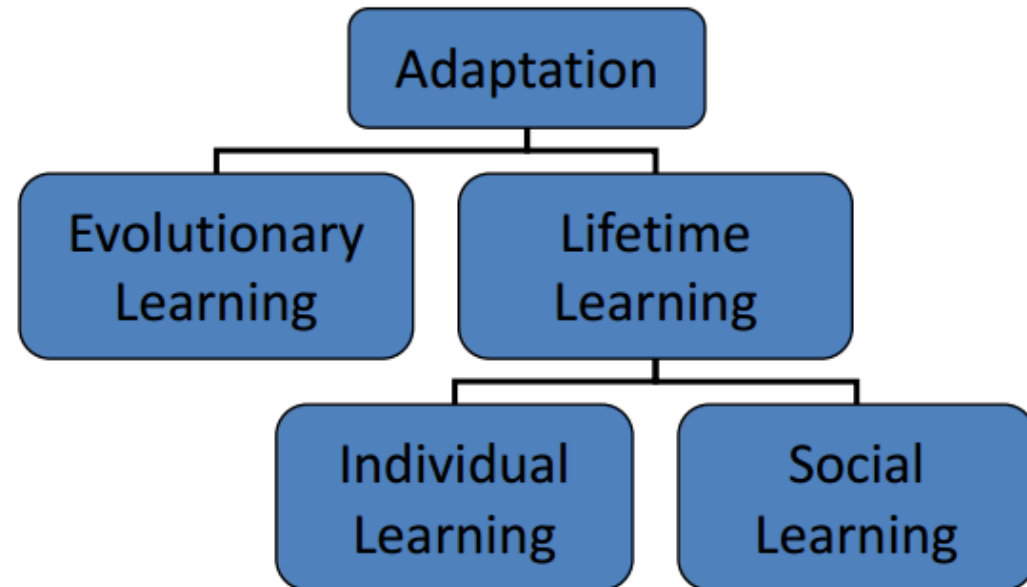
From:



Stanford Encyclopedia of Philosophy

Adaptation - Reinforcement learning

- Agent in situation/state s_t chooses action and Context changes to situation/state s_{t+1}
- Agent perceives situation s_{t+1} and gets reward r_{t+1}
- Telling the agent what to do is its POLICY:
 $\pi_t(s, a) = \Pr\{\text{act} = a \mid s_t = s_{t+1}\}$
- Given the situation at time t is s , the policy gives the probability the agent's action will be a . For example: $\pi_t(s, \text{goforward}) = 0.5$, $\pi_t(s, \text{gobackward}) = 0.5$.
- Reinforcement learning \Rightarrow Get/find/learn the policy



FIND/LEARN A NEW POLICY

jux·ta·po·si·tion

- *noun*
- the fact of two things being seen or placed close together with contrasting effect.
- "the juxtaposition of these two images"

BAD

GOOD

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4712

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shoppin'
spree

Dollar **Mc** Menu

1152

**Juxtaposition
causes to
reconsider the
meaning of
granules of
information
through
contrasting
images/
ideas/motifs**

**The cognitive mechanisms
of creativity – namely
juxtaposition of dissimilar
and deconceptualization –
are difficult for us because
we are constrained by the
associations of our
concept networks that we
inherit and learn in our
lifetime.**

**So it requires a significant
amount of cognitive effort
to break away from these
associations.**

Computers do not have native conceptual associations. Conceptual associations can be described by Semantic networks, Frames, Scripts etc. They are formalisms developed to capture associativity. It follows that it **could be easier for the computers to break away from existing conceptual associations than it is for the people.**



Requirements for Computational Modelling of Creativity

(Bipin Indurkha)

We require that there be multiple cognitive/perceptual layers with increasing degrees of abstractions.

We require that there be top-down and bottom-up mechanisms working together to connect the conceptual representations to the perceptual data: **we refer to these inter-level connections as interpretations**. The top-down mechanism is a projection, and the bottom-up mechanism is an accommodation.

We require a conceptual and a perceptual layer with their own autonomous structures. **The structure of the conceptual layer reflects the conceptual associations that we normally acquire through experience; and the structure of the perceptual layer reflects the historical series of input data.** There is an autonomous memory for each layer where the associations or structures of the respective layers are stored.

REFERENCES

Computational Modelling of Mechanisms of Creativity

Bipin Indurkha

Department of Computer Science,

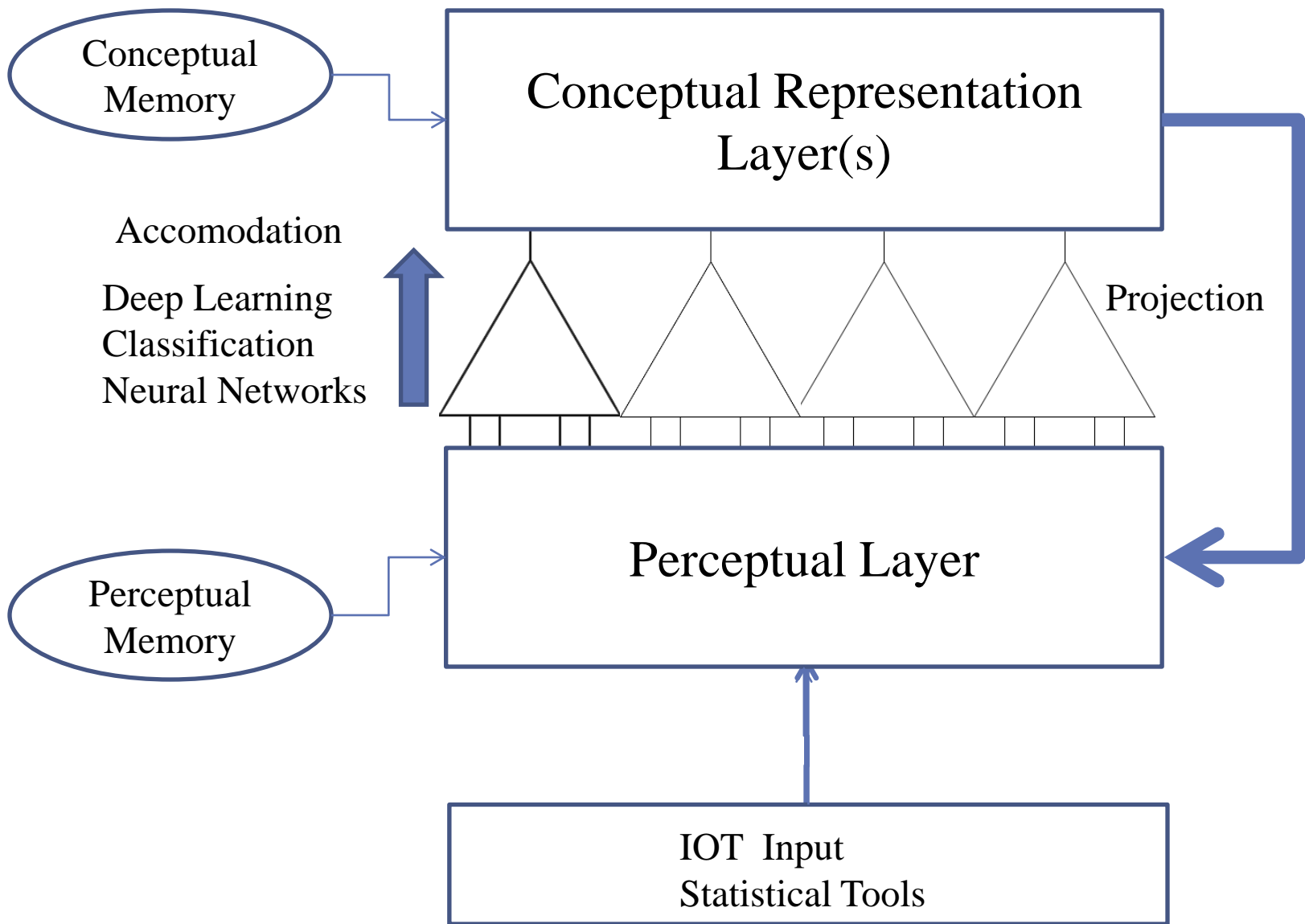
Tokyo University of Agriculture and Technology

2-24-16 Nakacho, Koganei, Tokyo 184, Japan

Creativity and artificial intelligence

Margaret A. Boden

School of Cognitive and Computing Sciences, University of Sussex, Brighton, Sussex, BN1 9QH, England, UK



IoT continuously send data and depending on statistical algorithms the variables and their relations will be adapted.

Modelling the Juxtaposition of the Dissimilar

We can elaborate on how 'juxtaposition of dissimilar' might lead to creative insights. The source concepts interact with the new one to create a new representation (with new features) of the target in the conceptual layer.

The topic concepts evoke the imagery of the associated objects.





STATISTICAL METHODOLOGY

STATISTICAL METHODOLOGY applies at all times that has to do with a **COLLECTIVE PHENOMENON** that interests **A PLURALITY** of "objects", meant in the most as wide as possible sense. Such "objects" can be people, concrete objects of the real world, but also events, times of time, etc. For example, a **HISTORY SERIES** is an orderly succession of "numeric values" attributed to a series of successive time instances.

**In our terminology, we will call these "objects"
STATISTICAL UNITS**

However, it is not enough to have a collective phenomenon in order to apply the statistical methodologies. During every system cycle new collected data are transformed into Phenomelological Entities and Relationships.



Data is prepared using statistical tools and classified using neural network giving values to entities and instantiating relationships in the Conceptual Layer.

Example

PL: John Doe's math profit;

CL: a synthesis indicator (eg ave, trend, ...) of the marks in the maths obtained by John



Our Algorithm

During every system cycle new data are collected and transformed into Phenomelological Entities and Relationships. Data is prepared using statistical tools giving values to entities and relationships in the Conceptual layer:

$$EAV_i = [element_i, attribute_i, value_i], REL_i = (element_i, relation_name_i, element_j)$$
$$\{EAV_i\} \text{ AND } \{REL_i\} \vdash \{EAV_j\} \text{ AND } \{REL_j\}$$

The resultant Layer is dissimilar from previous?

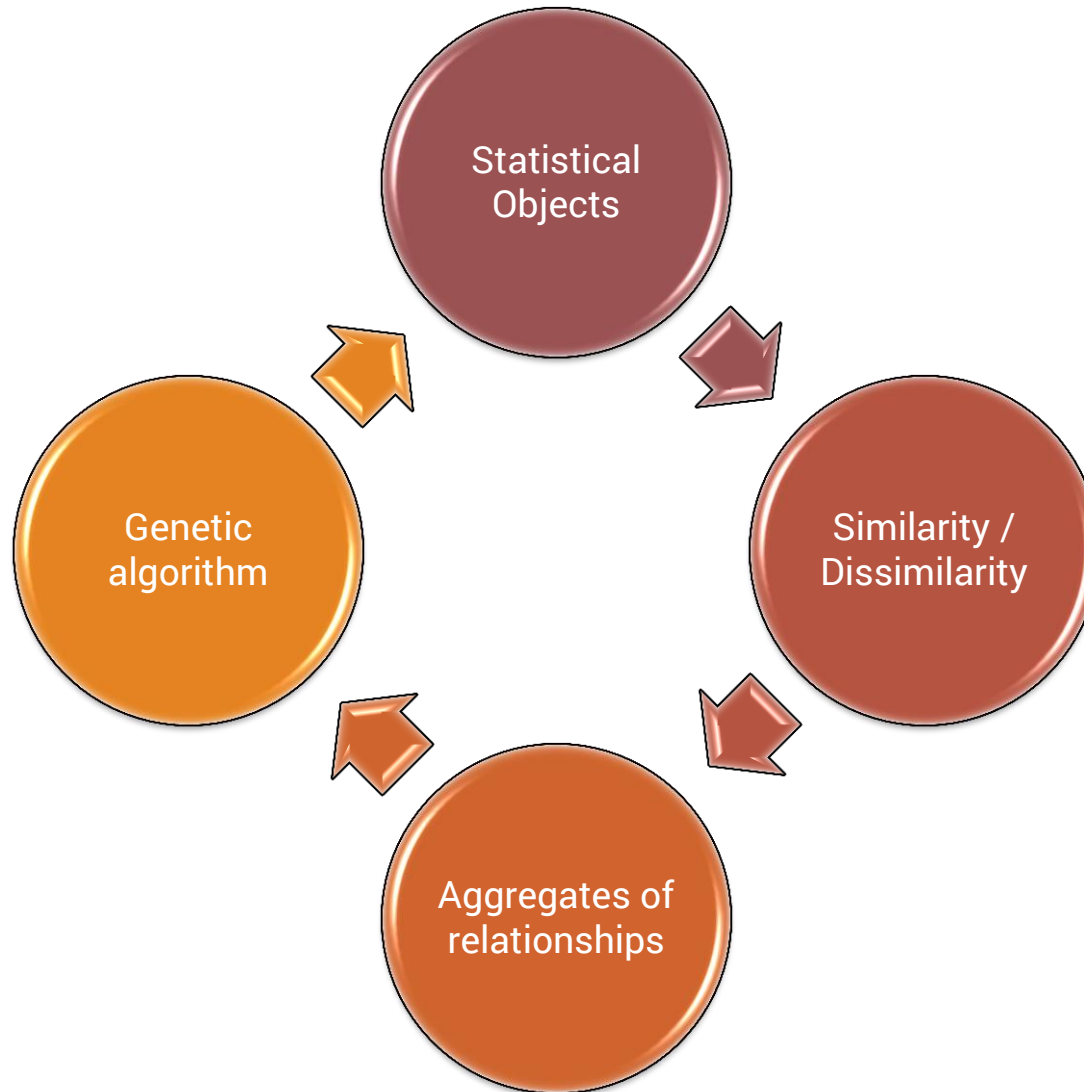
If it is very dissimilar we code a chromosome depending on a standard.

Dissimilarity is measured using an algorithm.

This is a new concept in the conceptual layer and is tested with normal use using a fitness algorithm: more the logic element is able to fix problems, more it is fit.



Summary

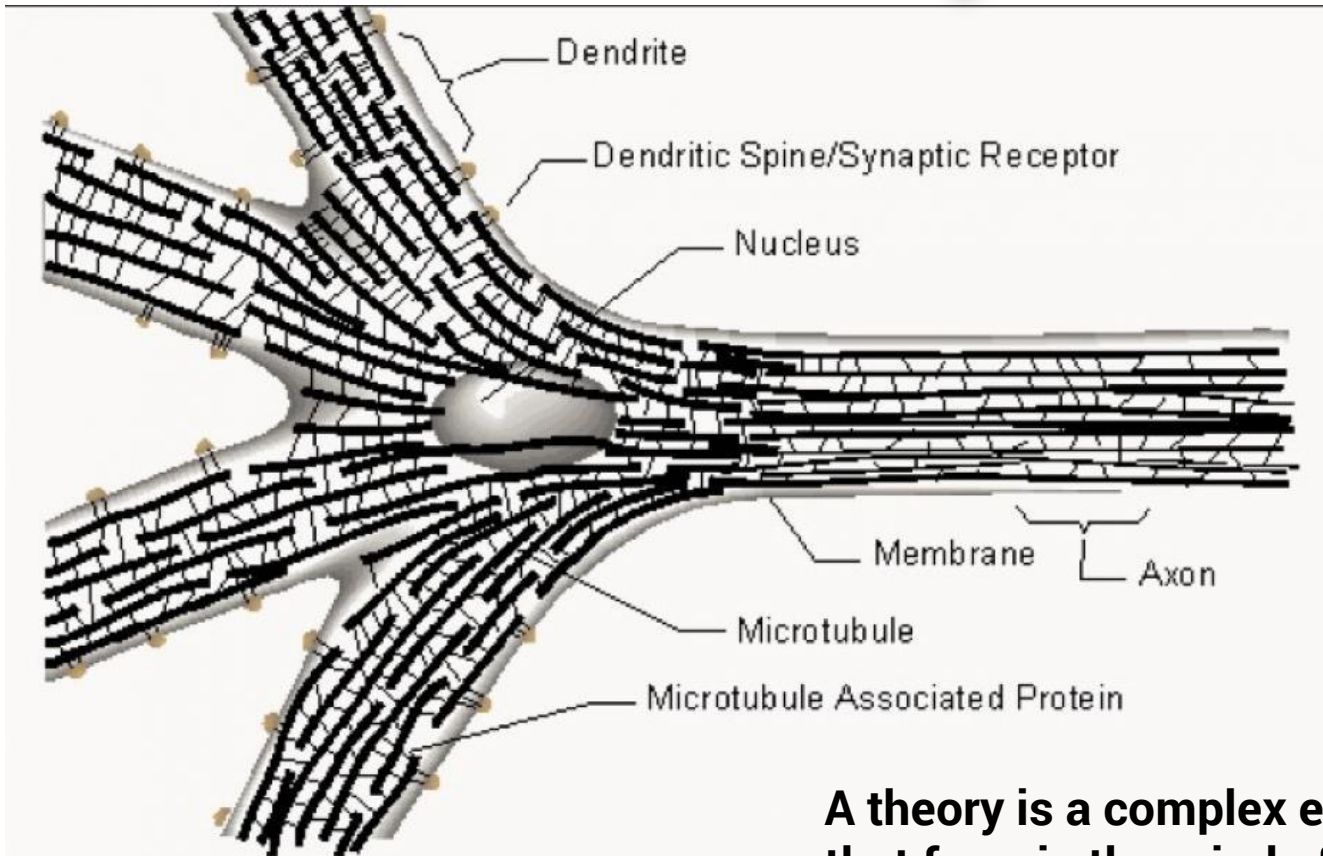


The approach doesn't provide the creativity of Leonardo but helps to create new objects in a machine.

**A little step for mankind,
a big step for machines**



Q&A



A theory is a complex elaboration of ideas that form in the mind of the sentient, after he observed the natural phenomena and the data in his possession.



Q & A