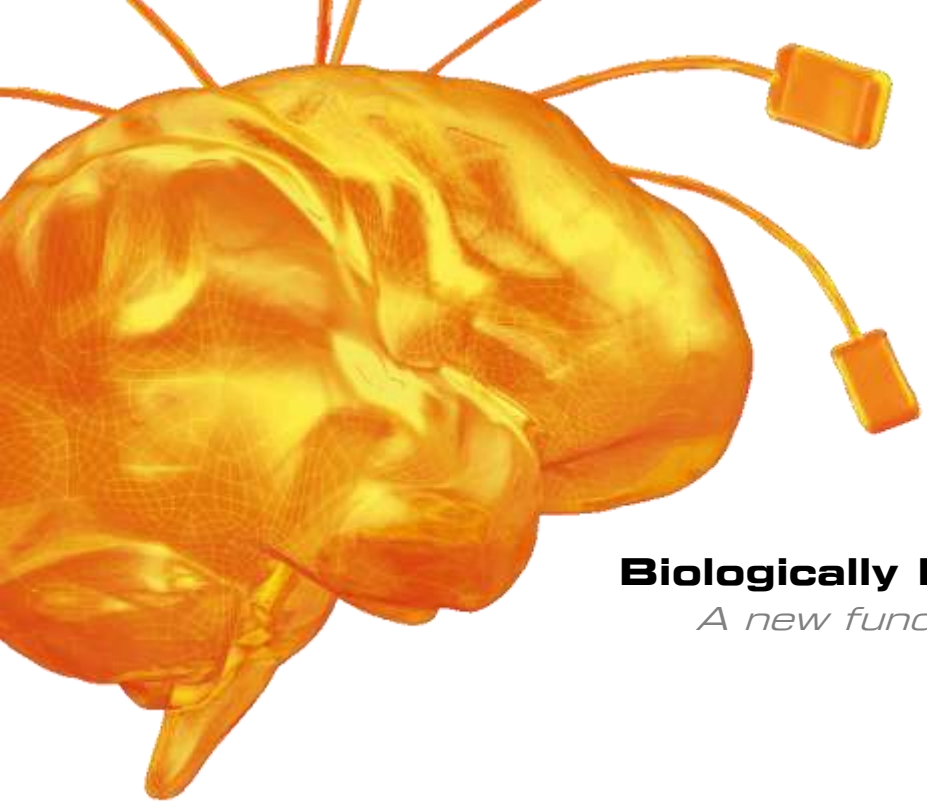


# Biologically Inspired Intelligence

*A new fundamental concept for AI*

## Smart Machines

***Biologically inspired intelligence is the fundamental concept for the generalization of the rules required to facilitate intelligence in information processing. It is the basis for smart machines which can acquire knowledge and skills, in one word – learn, just as we do.***

### The challenge

In principle, handling data, any kind of data such as images, text, data-values which can be static or dynamically, can be categorized in the following three steps:

| | | |
|---|---|---|
| **1.** | Capturing | *scanning, recording, typing, etc.* (recognition and input) |
| **2.** | **Analysis/understanding** | *intelligence for decisions and classifications* |
| **3.** | Matching/processing | *matching, post-processing, etc.* |

The first and the third step are basically solved. **The main challenge however, is the second step**.

### **First** and **third** step: **capturing and matching**

Several brilliant systems are already available, which can capture data of various sources and under different conditions and match the data. Of course, these systems can still be improved. However, improving the first and third step, does not make a smart system:

- What if the original has small variations, which humans can anticipate and still consider being similar, even if it bears no objective similarity. This happens all the time. For us, an open-top convertible is a car; a van is a car; a stretch limousine is a car…
- What if the original could not be captured completely or was itself incomplete or even deformed? We still know that the object behind the tree is a car, even if it is partially obscured by the tree.

### **Second** step: **analysis**

Robust general intelligence required for the second step can only be achieved by a software system with a powerful reflective capability – the capability to creatively analyze and improve its own performance, with a view toward more optimally achieving its goals.

A multitude of solutions for the second step is also available. However, these solutions still have to be trained and focused on each new task. These systems require a great time effort for learning and are not really dynamic. Moreover, these systems require complex and extensive environmental mod-

els (ontology, taxonomy, pattern samples etc.) and do not have a singular generalized fundamental mathematic base. In consequence, these solutions can not generalize and thus can not be used for any purpose. The concepts of Goertze, Goldberg, Haikonen and others, describe very accurately the problematic, but they do not offer the solution.

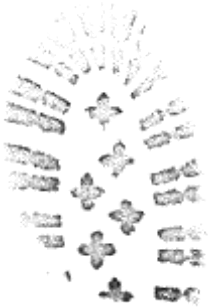
## ai-one™ - the central intelligence

is based upon biologically inspired intelligence, the fundamental concept for machine cognition. This concept facilitates general intelligence in computer systems. Computer systems based on ai-one™ are not programmed to do new tasks; they are simply instructed and taught by humans or can learn by themselves, even retrain themselves. Knowledge is assimilated in a generalized and abstract form, enabling the system to cope with similar tasks. The system utilizes relevant background information to specifically tailor its responses to any situation. Furthermore, ai-one™ systems realize when they have learned enough and can stop, which solves the problem of overlearning and overfitting.

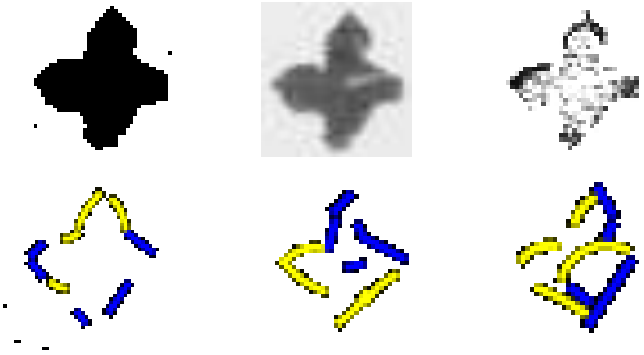
## An example with images

The following images originate all from the same shoe. However, the quality of the single elements in the shoe varies substantially





One attribute remains unchanged: the relation between the forms. Moreover, the overall distribution of the single forms of the different images remains stable, even if the single elements differ greatly. But, a match is only made, if the image matches perfectly with the reference image. In this specific example, the database contains over 250'000 images. In consequence, it is more likely to find similar forms, shoes or elements. For us, a shoe track might be made by a reference shoe, but it could also be a delusion. We see more than there is, because our brain is wired to see patterns everywhere (even if there is none).

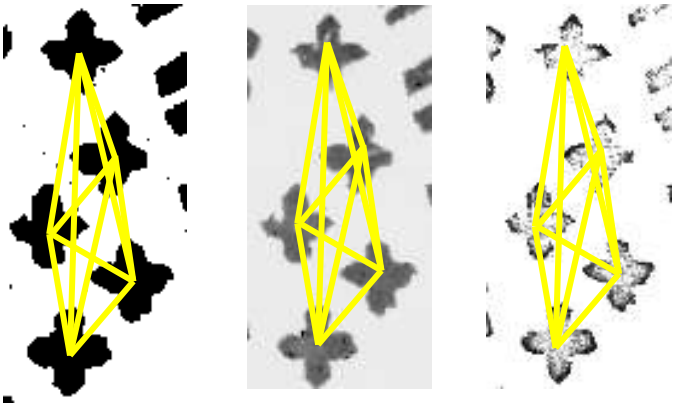


## Understanding the concept of a single form

The encoding of one specific form of the above illustrated shoe reveals the problem: Due to the fuzziness of the original the digital retina encodes this form as different objects. In many situations, the original leaves tracks with partial forms. The central intelligence: **ai-one™**, can learn concepts of forms spontaneously and on the fly. Furthermore, ai-one™ can be trained on concepts by showing samples or confirming the automatically learned forms. ai-one™ tries to find an answer by virtually complete the form. When matching a form, it presents all possible matches in descending order

### Understanding the concept of relations and associations between forms

Recognizing and understanding the concept of relations and associations between forms and groups of forms is essential for matching. As shown above, the forms might vary, but the relation between forms and its overall distribution remains stable. By recursively comparing the individual forms and the groupings of forms the systems finds the matching image.



Understanding the concepts of forms and groupings in any dimension and then generalizing this knowledge suitably is the key to biologically intelligence. Computer systems based on this technology can decide independently and content driven, based on a given knowledge base. Of course, the supervisor can set rules and limitations, so that the computer makes decisions only in a defined competence and liability frame.

## Summary

***Computer systems based on ai-one™ have the ability to learn that not only individual forms, but also the groupings of forms are relevant for matching images. They can learn from experience, deal with ambiguity and unknown situations, know when to ask for help, and recover from errors.***

## General statement

**Computer systems based on ai-one™ are general-purpose smart machines. Just as in the above illustrated example, these systems can also be used to analyze text in any language. The concepts here are words, sentences, paragraphs, pages and the relations between words, sentences.**