Machine Knowledge

The Operating System for Artificial General Intelligence

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The Ultimate Machine

- Humans build machines to amplify our natural powers
- Human's ultimate natural power is our intelligence, but it is the product of intelligence - knowledge - that confers that power
- Everyone agrees that knowledge is an internal *model* of the external world, but the nature of models has been somewhat elusive and how to achieve them in machines has baffled the experts

"None of the AI techniques we have can build representations of the world, whether through structure or through learning, that are anywhere near what we observe in animals and humans... The crucial piece of science and technology we don't have is how we get machines to build models of the world..."

Yann LeCun, Director of AI at Facebook

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The New Sapience Thesis

The greatest part of person's practical knowledge is acquired by reasoning about new information (mostly in the form of language) based on what they already know.

For machines to learn in this way you must first give them a core "boot-strap" model similar in scope to the knowledge a human child possesses when they have mastered their native language and begin to apply it.

New Sapience has succeeding a building such a *cognitive core* in software.

It is the result of an extraordinary multi-disciplinary journey of discovery and invention inside and outside of mainstream AI through fields as complex and practical as launching and operating spacecraft to those as abstract and theoretical as the study of the hidden structures of knowledge and reality.

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The power of Machine Knowledge derives from our Cognitive Core. A single, richly interconnected, modular structure whose elements are designed and assembled not by algorithms, but by humans.

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The Cognitive Core: A Concept Factory

- Serves the same function for machines that human knowledge does for people: to predict reality
- Provides the core structure and elements to create unlimited new concepts

- Does not *represent* things
- Not composed of symbols
- Devoid of semantics and syntax
- Does not require "training" on datasets.

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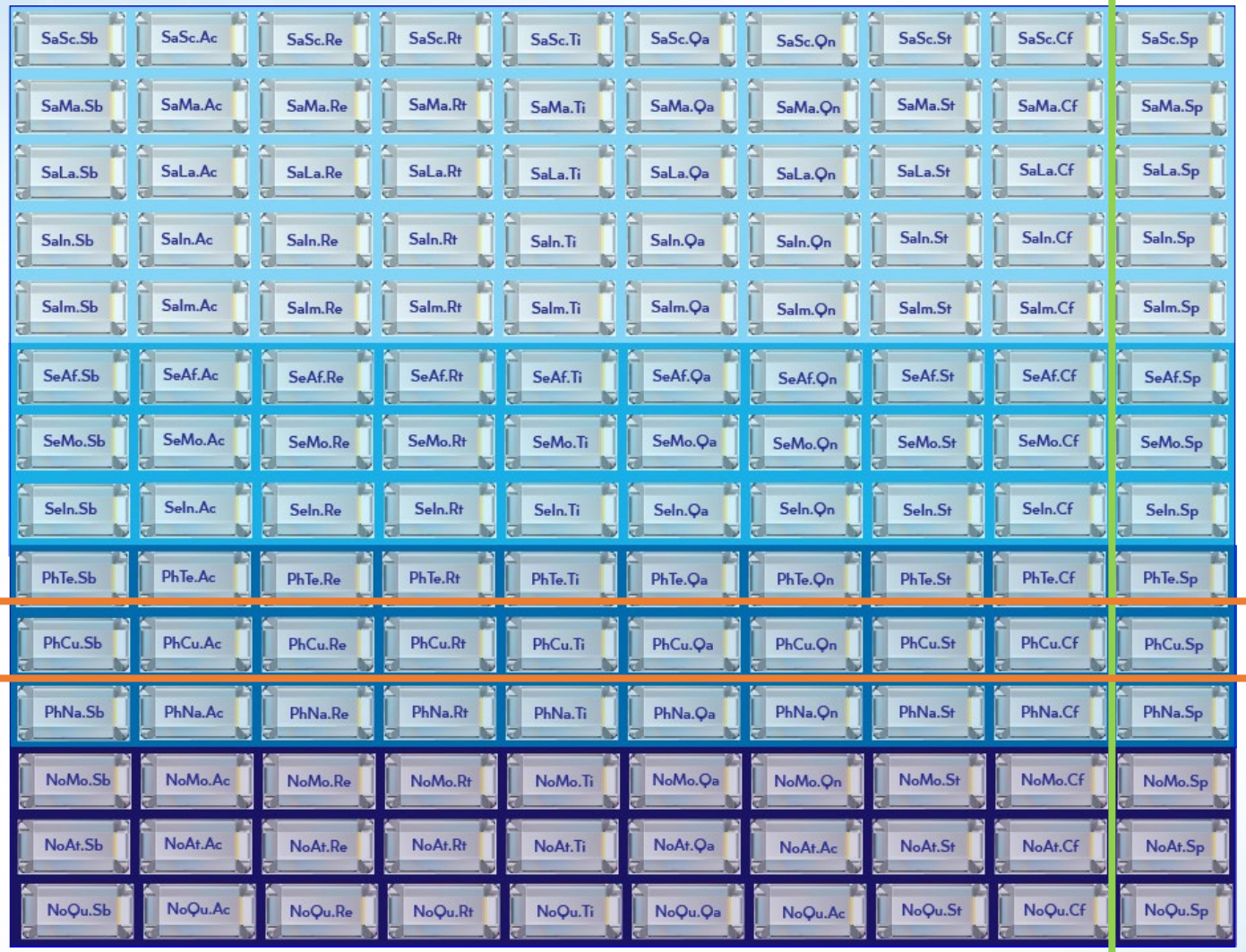
Revealing The Hidden Structure

Although language and grammar give no hint of it, knowledge - and the reality it models - have hidden structures. These are implemented in the 140 modules of the Cognitive Core



The vertical dimensions (category) reveal the structure of knowledge and consist of categories such as qualities and quantities, actions and results, and the things that have these as properties. Each has rules for combination. For example, we can combine black with cat but not cat with dog (and still make sense).

The horizontal dimensions (lamina) reflect the hidden structure of reality. Here we have the difference between perceptions and the thing perceived, between the intrinsic and extrinsic properties, between what we think about the world and how we feel about it. Again, each has rules for combination.

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Applying The Hidden Structure

The Cognitive Core modules remove the contextual ambiguity of natural language

"The Empire State Building is an awesome skyscraper with beautiful Art Deco details."

Module	Laminae	Category	Model Elements	Connects to
PhTe.Sb	Technology	Substance	skyscraper (inst.)	Skyscraper (class)
PhTe.Sb	Technology	Substance	details (set)	skyscraper (inst.)
SeAF.Qu	Affect	Quality	awe (inst.)	speaker
SeMo.Qu	Motivation	Quality	beauty (inst.)	speaker
PhCu.Qu	Culture	Quality	ArtDeco (class)	details

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Extendable Platform Architecture for MK Applications

Specific Natural Languages

Common Sense World Model

Application Model

Natural Language Model

Device Models

Sapiens Spec. Model

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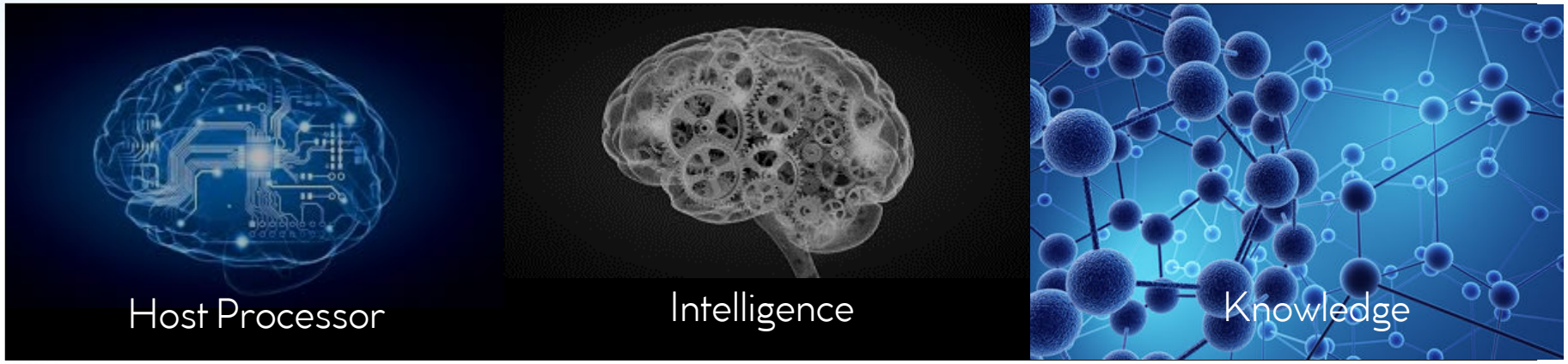
MIKOS: The Operating System for AGI Applications



A software engine that interprets our proprietary MICA language

The MICA routines that extend the core model based on incoming information

The Core Model provides the templates for new knowledge

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Insights about Models

Knowledge is a *model* of the world not a collection of symbols.

Models *resemble* their prototypes they do not *represent* them. They are *not* composed of symbols.

Models cannot be true or false, only more or less useful.

The basic utility of knowledge is to be able to predict the behavior of reality on the basis of your model of it.

To build a useful model:

- Select and categorize the parts (epistemology)
- Assemble the parts into a structure that resembles reality (ontology)

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Insights about Language

Q: Is knowledge possible without language?

A: Knowledge exists independently from language but without language it cannot be effectively shared.

Language consists of *instructions* for information processors, they do *not* contain knowledge.

To process (comprehend) natural language in a machine:

- Cross-compile the instruction into the machine's native language (translation)
- Process the new instruction to extend or modify the existing model (transcription)

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New Sapience Glossary

Symbol: A sign or signifier that *represents* a different kind of thing either as an identifier or placeholder.

Data: A single fact like your age or "the sky is blue," or a symbol - like the number "42".

Information: Organized data as in a relational database or an ordered data stream such as telemetry coming down from a spacecraft or this sentence.

Instruction: An information structure consisting of symbols executed by an information processor.

Semantics: A specification relating to how the symbols in an instruction relate to the things they represent.

Syntax: A specification relating to how the symbols in an instruction relate to each other.

Language: A collection of symbols together with semantic and syntactical rules designed to support instructions for processing in a specified processor.

Model: A created thing that resembles or reflects key attributes of something else (the prototype) for the sake of some utility.

Intelligence: The capacity of an information processor to create useful models of things.

Knowledge: A functional model existing within a biological mind or a computer.

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