MECA DISCIT:
PROJECT STATEMENT

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Meca Discit *is a research project in Machine Learning. The motivating context of the project is to describe* ***a general-purpose learning mechanism*** *(termed Universal Cogitator) to be embedded in the Knowledge Acquisition Phase of autonomous agents based on the Meca Sapiens Architecture.*

The objective is to outline a learning mechanism that integrates all aspects of learning and discovery into a single coherent structure. The approach is analytical and top-down. Its aim is to use the concepts and symbolic language of Mathematics and Theoretical Computer Science to express the "essence of learning" and describe it in software achievable terms.

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CONTEXT

The Meca Sapiens project to create the system architecture of a conscious agent was completed in 2016 with the publication of The Meca Sapiens Blueprint.

The Meca Sapiens architecture, already completed, describes how to implement self-aware autonomous agents that are capable of intentional (model-predictive) self-transformations and will be perceived a conscious. In what follows, these agents are referred to as **Mecas**.

The architecture makes extensive provisions for **general learning and adaptation** by including extensive dormant phases in the **Meca's** lifecycle during which external behaviour is suspended and both the data and processes used to generate this behavior can be modified. This simple and robust design of alternating between activity and dormancy is similar to the "batch window" of older information systems and akin to what mammals experience as sleep. Today many systems have more complex transformation processes but these only add complication to a sufficiently powerful method.

The Meca Sapiens architecture does not include a general model of learning that is suitable for this context. At the time, I viewed Machine Learning as a separate topic that was already the subject of vigorous research. I expected suitable and very general mechanisms would be available when the architecture was complete. However, this did not occur. In spite of many impressive individual results, my investigations to date have not uncovered general and open-ended models of machine learning.

The Meca Sapiens architecture to implement synthetic consciousness is nonetheless complete, as published, since a serendipitous utilization of existing techniques can provide enough learning capability to support the perception of consciousness. In other words, a savvy use of available learning and adaptation techniques can already make prototype Mecas "intelligent enough" to be perceived as conscious.

To propel Mecas beyond this threshold and provide them with a limitless cognitive capability that will eventually surpass human cognition, the processing carried out in their Knowledge Acquisition Phases must be driven by a universal and unbounded learning mechanism. I refer to such a mechanism as a **Cogitator**. The aim of this project is to build the blueprint (system architecture) of such a mechanism.

OBJECTIVE

The objective of the Meca Discit project is to create the System Architecture of a universal and unbounded learning mechanism that will drive the learning and discovery processes taking place in the dormant phases of autonomous agents. This architecture would integrate multiple learning processes and situations into a coherent whole.

Expressed in terms of the Meca Sapiens Architecture, the objective of Meca Discit is to provide the **Mecas** with a **Cogitator** that will drive their Knowledge Acquisition Phase processing and propel them beyond the cognitive limits of humans.

This general-purpose learning and adaptation process should be:

- **Complete** (if possible) in the sense that all possible learning related scenarios can be expressed as variants of the general model as components.
- **Unbounded,** in the sense that it can transpose its mechanism to entirely new situations
- **Unlimited** in the sense that its mechanisms can be recursively applied to increasingly complex situations
- **Generative** in the sense that it can create and integrate new learning mechanisms.

APPROACH

The selected approach is **analytical, explicit and top-down**. The objective is to utilize the conceptual tools and symbolic language of Mathematics and Theoretical Computer Science to create the feasible system architecture of a universal learning mechanism.

I expect the resulting Meca Discit architecture will be more "Mathematical" than Meca Sapiens because, in this project, the emphasis is on information structures and their manipulation rather than agent behaviour.

In the Meca Sapiens project I rejected the prevalent view that consciousness was a subjective experience on favor of an understanding of it as a detectable perception triggered by observable cognitive capabilities.

In the area of Machine Learning, there is a (prevalent?) view that AGI (Artificial General Intelligence) is too complex to be conceptually designed and can only result from opaque stochastic processes (such as Neural Networks). I reject this view

in favor of an understanding that humans can conceptually define unbounded forms of cognition.

In summary, the underlying assumption of the Meca Sapiens project was that humans could design a synthetic consciousness that is equivalent to their own. The underlying assumption of the Meca Discit project is that **humans can explicitly design a form of cognition that will become superior to their own**.

ASSISTANCE

At this time I am reviewing available publications and contacting other researchers to survey theoretical models related to machine learning and make sure I benefit from the current state of research.

The listed references outline the areas surveyed to date.

Many are very powerful texts. However, most are focused on providing analytical results for specific situations and provide only a fragmentary understanding of machine learning as a whole. They do not describe the process of learning in all its generality and in relation with a wider system context. It seems little progress has been made to date in this direction [6]. The field of Psychology does propose very general definitions of learning process; however, these are centered on the human experience and are not fully compatible with software implementation.

If you have useful information or know of interesting work that can help me progress in this research, please contact me at: jetardy@sysjet.com.

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