

The Neosentient Model: A New Combinatorial N-dimensional Bio-algorithm

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• Two different approaches to Neosentience – One Top Down (Rössler), One Bottom up (Seaman)

Seaman and Rossler's book – *Neosentience, The Benevolence Engine* begins to discuss two different approaches to the arising of Neosentience [Synthetic Sentience] in an autonomous robotic system. In the book, Rössler discusses his "brain equation" as a top down approach and is skeptical of arriving at a bottom up approach without taking a vast amount of time. An analogue version of *The Insight Engine* is discussed in the book as functioning as a possible midwife to the ideas that might make up a new bottom-up approach. In a certain way, this paper is pointing to a set of potential research approaches. It by no means provides answers to the vast set of questions that are enfolded in our ultra-complex information-oriented problem set of problem sets. Yet, it seeks to set thought in productive motion!

• A New Combinatorial N-dimensional Bio-algorithm

Cognitive Behavior is approached through a series of information-oriented processes. Central is to define all of the entailment structures that inform the emergent arising of sentience in the human. This represents a vast incomplete territory at the moment, perhaps currently out of reach. Our current scanning technologies have limitations related to scale and time-based data acquisition, Researchers would seek to abstract many different mappings of sub-systems and form them into a continuously self-organizing, switching and shunting network of bio-mechanisms. The many different mappings would inform the bottom up model related to achieving the functionality of an autonomous robotic system. This would happen over time, by first chipping away each system's functionality and relationality to other systems in the human. Here clues are taken from the Embodied, Embedded, Enactive and Extended paradigm. These approaches are interrelated. Unlike historical approaches exploring the brain and its functionality as the center of AI research, this holistic approach becomes an active methodology for understanding how the body, focusing on multi-modal sensing systems working in conjunction with

the brain / mind, and differing forms of memory, form an ultracomplex dynamic system informing sentience production in an embodied, enactive manner. What are some of the areas of study that are necessitated by this shift? Can we abstract aspects of the nervous system into our new n-dimensional combinatoric bio-algorithm? What is the best way to accomplish this, starting initially via simplified forms of abstraction? Yet the rub is that sentience may only arise out of this deep complexity --- at what level of complexity will our self-aware neosentient techno-species begin to have a deep self-knowledge, always learning and applying new knowledge into the functioning of the intelligent system? Pragmatic benchmarks are used to define Neosentient robotic entities (as opposed to the Turing Test): the system could exhibit well defined functionalities: It learns (enactive approach and others like conversation theory); it intelligently navigates; it interacts via natural language; it generates simulations of behavior; it metaphorically "thinks" about potential behaviors before acting in physical space; it is creative in some manner; it comes to have a deep situated knowledge of context through multimodal sensing (the embodied, embedded approach); and it displays mirror competence. Synthetic emotions would also become operative within the system.

• Why n-dimensional?

If we think of the brain as a distributed system that brings partial systems into a distributed group dance where the brain enables different kinds of neurons [numerous different kinds of neurons each with specialities] to function together to support thought, language, action, introspection, feeling, emotion, etc., when shifting attention be it environmental or built out of the memories of experiences, calls for it. I think of this as an n-dimensional system functioning as an operational network being brought to life by a distributed, neuroplastic, electro-chemical code over time which is

abstracted biomimetically through a mixed system including neuromorphic chips, neural nets and code (or new forms arising out of this research). How can we re-understand what is operation in this ultra-complex environment, and translate this into a new bio-algorithmic form? Do we need to invent a new form of n-dimensional shunting mathematical system? Because this code is built out of a system of 100 billion neurons being configured and reconfigured over time, then along with the huge nature of the combinatorics at play, comes the notion of dynamic recombination *over time* --- this is why I call it n-dimensional – it of course has the living dimension of the interoperability of the brain/mind, but it also has time, sensual experience, and the internal experience of thinking about experience—self-reflection. It also has the similar but different repetition of experiences, thoughts, and the ongoing deepening of networks of associations between patterns (Hebb). Pattern flows of sense perturbations contribute in an enactive manner and in real time define the dynamic shunts of neuronal passages, playing out a living dimensional code structure that is forever being further articulated. How can we biomimetically attempt to model and re-embody such a code in a synthetic environment? Is this a singular substrate or a hybrid of many different substrates? Might this also be defined as a mixed analogue and discrete system given neurons and neural transmitters and the efficacy of synapses in touch with both varieties of signal?

• **The system will bring together a series of technologies from the research of diverse scientists and 2nd Order cyberneticists, as well as complex system theorists, to help map this time-based set of relationalities that bridge mind / brain / body — multi-modal sensing systems, and environment.**

It is clear that we will need new scanning technologies to accomplish this mapping. Additionally we will need new forms of intelligent databases [like the Insight Engine] to help keep information about our various systems organized in a meaningful manner. We will need transdisciplinary teams of scientists and seek to employ media researchers to help understand what is at operation in the human contribution to sentience production, and how many different systems must become intraoperative to achieve sentience.

• **No single discipline of science, the humanities and/or the arts can tackle such a difficult information-related problem set. A special transdisciplinary team of teams would need to arise out of the use of I_E.** Because we are discussing a holistic embodied approach, researchers will need to define bridging languages between research domains that may not have talked to each other in the past. Micro-peers [collaborative AIs] and a natural language API within the Insight Engine will help accomplish intelligent searches and suggestions about potential relevant approaches across domains of study.

• **This overarching research team (or set of teams) would potentially consist of groups of specialists from a series of fields that would also learn enough about the other member fields to be able to talk across disciplines.** An international listserv would be created to facilitate this intercommunication.

• **New approaches to the combinatorial shunting approach to Neural networks will be discussed.**

• **Neuromorphic chips may function in tandem with multiple systems emulating different aspects of conscious and unconscious thought.**

In order to create synthetic sentience modules (viz. the dimensional components relating to speech, cognition, emotion etc.), we will need inspiration from existing biological complex systems that incorporate these modules. The two fundamental questions here for philosophers of mind and consciousness, neuroscientists, and psychologists, are:

a) What is the correct ontology that bridges psychological concepts with real-world neurological entities? b) What are the neural correlates which map onto this ontology? c) How, in the distributed mind, do disparate sensing systems integrate information? (sensor fusion) Knowing at least approximate answers to these three questions is crucial to building sentience modules, since synthetic modules will simply be uniquely implemented but functionally equivalent versions of the biological modules (based on the concept of multiple realizability, due to Hilary Putnam in “Minds and Machines” (1960)) and the principle of the psychophysical parallelism discussed by von Neumann (1955) in the Mathematical foundations of quantum mechanics.

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