Gerhard Luhn

Referee Report Subject: Hans Grassmann: Beyond Shannon is beyond AI

1. Overall Impression:

A Long-Overdue Breakthrough. This manuscript touches upon one of the most profound weaknesses in the current debate on technology. With refreshing clarity, the author exposes the unspoken dogma of modern AI research: the belief that a fundamental problem of understanding can be overcome through sheer quantity—by using more data, larger data centers, and gigawatts of electrical energy. The historical reflection on Claude Shannon is particularly compelling.

By demonstrating that the exclusion of semantics (meaning)—once a pragmatic necessity for analog radio technology—has been carried forward as an unquestioned foundation for an entire industry, the author precisely explains why statistical language models, despite their impressive rhetoric, remain "fake intelligence" at their core.

The fact that the author does not merely lament this blind spot, but instead proposes a constructive path forward—utilizing category theory and structure-preserving (isomorphic) mappings—sets this paper apart from typical critiques of AI in a highly welcome way.

2. The Blind Spot in Public Discourse: C. P. Snow's "Two Cultures"

The author raises a particularly persuasive question: why does the absurd energy disparity between the human brain (approx. 20 watts) and modern data centers (in the gigawatt range) meet with so little resistance in public debate?

This point could also serve as a starting point for continuing the central idea of the manuscript: by incorporating the concept of the "Two Cultures"—a divide first diagnosed by C. P. Snow in 1959.

The inability of society to articulate a response to the "gigawatt craze" is no accident; rather, it is the direct result of this very divide: engineering and tech culture view intelligence in purely mechanistic terms—as a computational problem—and consequently offer only one answer: "more scaling."

The humanities, meanwhile, engage in intense discussions about AI ethics and societal consequences, yet they accept the technical premise of the other side—that "intelligence simply requires vast amounts of computing power"—as an immutable law of nature, lacking the physical-mathematical tools to challenge this assumption.

By calling for a "physics of information," the manuscript proposes the very bridge needed to span what C.P. Snow termed the "gulf" [between the two cultures].

3. A potential contribution toward a physics of information: From passive isomorphism to an autonomous, self-active subject (Varela & Hüther)

The author brilliantly demonstrates how mathematical structure—as illustrated by the "tool wall" in section 6—can render massive lookup tables redundant, linking input and output in a structurally identical (isomorphic) way. Yet, pure isomorphism likely does not constitute "understanding." Even a perfect mirror or a lossless compression algorithm maps structures precisely, without any awareness of what it is doing. Why? Because they lack what distinguishes a biological system from a mere apparatus: primary, autonomous self-activity. To begin bridging the gap toward the human brain (and the aforementioned "Halle Berry neurons") in practical terms, one might incorporate concepts from modern biology and neuroscience—specifically:

1. Francisco Varela (autopoiesis & enactivism): Varela demonstrated that living systems are not passive information processors that merely map a pre-existing external world. An organism creates and sustains itself (autopoiesis) and generates meaning only through its active interaction with the environment (enactivism). Information has no meaning “in itself”—it only acquires significance for a subject for whom something is at stake.
2. Gerald Hüther (neurobiological coherence): Hüther is one of the rare neuroscientists, which do not follow a deterministic conception of neuroscience. He extends this concept directly into the energy balance of the brain. Our brain manages to function on just 20 watts—not because it is a highly efficient silicon chip, but because it is a self-organizing, living organ that does not store data indiscriminately; rather, it seeks coherence (congruence). It connects only that which is truly meaningful to the self-active subject—to their needs, their experiences, and their living relationship with the world.

4. Conclusion and recommendation for the author

A highly relevant, courageous piece of work that, by its very nature, calls for further steps.