CUP 2.0: Universal Formula for the Emergence of Life and Consciousness

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$$y\_t = E(x\_t) + M(x\_t) + A(x\_t) + R(x\_t) + Lambda + C$$

Abstract

We present CUP 2.0, a universal analytical model describing the emergence and evolution of living, adaptive, and complex systems. The system's state is formalized as the sum of specialized expertise, cumulative memory, dynamic attention, internal feedback, intrinsic expansion, and a fundamental constant of existence. CUP 2.0 provides a unified framework applicable across biology, medicine, physics, artificial intelligence, and cosmology.

1. Introduction

The increasing complexity observed in biological, cognitive, and cosmological systems necessitates a dynamic and universal model. CUP 2.0 offers a mathematical foundation to describe the spontaneous emergence of order, life, and consciousness from simple initial states.

2. Universal Formula

The fundamental dynamic of CUP 2.0 is expressed by the following equation:

3. Detailed Explanation

Each term represents a key dynamic factor:

- $E(x\_t)$: Specialized expertise

- $M(x\_t)$: Cumulative memory

- $A(x\_t)$: Symbolic dynamic attention

- $R(x\_t)$: Logical feedback mechanisms

- Lambda: Intrinsic internal expansion

- C: Minimal constant ensuring system persistence

4. Possible Applications

Biology: Modeling adaptive cellular resistance.

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Medicine: Dynamic optimization of personalized treatments.

Physics: Unified modeling of dark matter and dark energy.

Artificial Intelligence: Design of self-adaptive symbolic agents.

Cosmology: Modeling the dynamic evolution of the Universe.

5. Conclusion

The CUP 2.0 formula provides a versatile and universal framework to explore the emergence of complex systems, bridging gaps across scientific disciplines.

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