Nexus-Momentum-Atempus (NMA) Framework

Benefits for Science and Industry

Author and Inventor: Carlos Daniel Borrego Romero, MBA, BSc Computer Systems, CISA, CRISC, CDPSE, ISO 27001, CASE .NET

The NMA proposes that any bounded system — a region of space, a biological network, a cognitive process, a data structure, or a simulated domain — possesses not a fundamental, externally given time but an emergent temporality (Atempus) reconstructed from its own internal state: a relational structure (Nexus), a transformative dynamics (Momentum), and an informational representation. It unifies the relational origin of time, dissipative gradient-flow evolution, bounded and priced information, and causal/state-identity verification into one reproducible, falsifiable framework. The genuinely new contribution of Borrego is the emergent-temporality construction itself — not present in prior art — expressing observable time as a functional reconstruction of three coupled fields (Nexus, Momentum, Information) while cleanly separating a purely auxiliary background ordering parameter from the emergent temporal observable, which removes the circularity that affects earlier relational-time programs and recovers time strictly as a derived quantity.

Benefits for Science

Circularity-free emergent-temporality law	Introduces a previously non-existent construction in which time is a functional of three coupled fields, with the auxiliary ordering parameter separated from the emergent observable — removing the circularity of prior relational-time approaches and unifying structure, dynamics, and information under one law.
Foundations of physics & quantum gravity	Provides a circularity-free, falsifiable account of time as a derived observable, connecting relational time, causal-set ordering, and spin-network structure within one effective theory.
Complex systems & nonequilibrium thermodynamics	Casts emergent temporality as Onsager gradient flow on a Lyapunov free energy, giving a rigorous tool for analyzing relaxation, stability, and equilibrium across dissipative systems.

Theoretical neuroscience & cognition	Models subjective and biological time as emerging from coupled structure, dynamics, and information, offering a quantitative framework for temporal perception and neural sequence dynamics.
Systems biology	Describes biological timing — circadian, developmental, and network rhythms — as emergent temporality of coupled relational and informational fields rather than an external clock.
Information physics & reproducible science	Bounds displayed information by Bekenstein/holographic ceilings and binds each state to a deterministic identity descriptor, enabling reproducible, auditable verification of model states across labs.

Benefits for Industry

AI & temporal modeling	A principled model of emergent time can improve sequence models, forecasting, and event-based AI by grounding temporal representation in relational and informational structure.
Digital twins & simulation	Reconstructing temporality from internal state lets digital twins represent system time consistently across scales and instruments, with deterministic identity for verification.
Network & infrastructure monitoring	Treating networks as relational-structure fields enables detection of dynamical regime shifts and instabilities via Lyapunov stability criteria, supporting predictive operations.
Energy-efficient & reversible computing	Pricing irreversible information change at the Landauer limit guides low-dissipation architectures and informs energy budgeting for large-scale temporal computation.
Healthcare & biosignal analytics	Emergent-temporality descriptors of biological networks can sharpen analysis of physiological rhythms and timing disorders, with reproducible state-identity verification for clinical auditing.

Benefits in 10 Years and Beyond — with AI and Emerging Technologies

AI that models time itself	AI systems built on emergent-temporality principles could reason natively about causal order and multi-scale time, advancing prediction in climate, finance, and complex biological systems.
Quantum-simulated emergent time	Quantum simulators could realize the NMA's coupled fields directly, testing how temporality emerges from relational and informational structure and turning a foundational idea into measured physics.

Brain-inspired temporal computing	Neuromorphic and brain-inspired hardware could implement Atempus-style emergent timing, enabling ultra-efficient event-driven computation that mirrors biological temporality.
Self-verifying autonomous systems	Deterministic state-identity descriptors with causal-consistency checks could give autonomous systems tamper-evident, auditable temporal records — a trust layer for robotics and critical infrastructure.
Unified cross-domain time analytics	A mature NMA-plus-AI platform could model physical, biological, cognitive, and informational time in one framework, powering early-warning and resilience tools for complex, time-critical systems.