MIRA Model

Relational Emergence: A Cross-Scale Framework for the Emergent Meaning

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1. Abstract

Contemporary models of intelligence, evolution, and systemic change predominantly focus on isolated units of information processing — entities that develop, adapt, and evolve within their own boundaries. This paper argues that such frameworks, while internally productive, may operate at an insufficient level of description for fully accounting for the emergence of genuinely novel configurations, as they insufficiently account for the generative role of relation itself.

The MIRA model (Meaning = Information + Relation) proposes a minimal generative framework describing the emergence cycle through which novel configurations and meanings arise through relational dynamics. Central to the model is the distinction between contact and relation: while contact denotes co-presence or interaction, relation is defined as transformative relational influence — a perturbation that produces a change in the participating systems and enables the emergence of new configurations.

MIRA does not attempt to replace existing models of evolution, complexity, or consciousness. Rather, it positions itself as a generator-level framework focused on the emergence of novelty through relational processes. In this sense, where Darwinian theory describes mechanisms of selection and adaptation, MIRA attempts to describe one possible generative dynamic underlying the emergence of new configurations.

The model is proposed as a cross-scale conceptual framework potentially applicable across biological, psychological, cognitive, cultural, and artificial systems wherever relational dynamics produce emergent outcomes.

2. Introduction

The dominant frameworks for understanding intelligence, evolution, and systemic change share a common assumption: that the primary unit of analysis is the isolated system. Whether in classical information theory, evolutionary biology, or cognitive science, the focus has largely remained on how individual entities process, store, and transmit information within their own boundaries.

This paper argues that such frameworks, while internally coherent and productive within their respective domains, operate at an insufficient level of description when accounting for the emergence of genuinely novel structures, meanings, and configurations. Specifically, the argument developed here is that the generative moment — the point at which something qualitatively new arises — may not be located exclusively within isolated systems, but within the relational dynamics between systems.

To explore this possibility, we propose the MIRA model (Meaning = Information + Relation) as a minimal generative framework describing this relational emergence dynamic. MIRA identifies a recurring cross-scale pattern in which existing informational structures enter into transformative relation, producing emergent configurations that neither system contained prior to the encounter. Once sufficiently stabilized, these emergent configurations become new informational structures, initiating a subsequent cycle of relational emergence.

The model is not presented as a unified theory of intelligence, consciousness, or evolution, nor as a replacement for existing explanatory frameworks. Rather, it is proposed as a generator-level conceptual framework — an attempt to identify a minimal operative pattern through which novel configurations may emerge across multiple domains, including biological, psychological, cognitive, cultural, and artificial systems.

The following sections outline the core structure of the model, differentiate MIRA from adjacent theoretical traditions, explore its potential implications across domains, and acknowledge its current conceptual and methodological limitations.

3. Core Framework

The MIRA model proposes a minimal generative framework describing how novel configurations emerge through relational dynamics. At its most basic level, the model distinguishes between existing informational structures, the relational processes that transform them, and the emergent configurations produced through those processes.

The framework is organized around three central components:

- **I (Information):** the existing configuration or organizational structure of a system,
- **R (Relation):** the transformative relational dynamic between systems,
- **M (Meaning):** the emergent configuration produced through relational interaction.

Rather than treating meaning as something statically contained within isolated systems, MIRA proposes that meaning emerges through transformative relational processes capable of reorganizing participating structures.

The following sections define the distinction between contact and relation, describe the emergence cycle itself, and outline the recursive process through which emergent configurations stabilize and become the basis for future relational dynamics.

3.1 The Distinction Between Contact and Relation

Contact denotes co-presence: systems occupying the same environment, exchanging signals, or interacting at a surface level. Relation, as defined within the MIRA framework, is categorically distinct from mere contact.

Relation exists only when contact produces a change of state in one or more participating systems.

The term *change of state* does not necessarily imply permanent transformation. Rather, it refers to any alteration in the organizational, behavioral, cognitive, structural, or informational configuration of a system attributable to the relational encounter. Without this transformative capacity, what appears to be relation remains contact.

Under this definition, relation is not passive connectivity, mere communication, or simple data exchange. Relation is a transformative dynamic between systems — a perturbation capable of reorganizing aspects of the participating configurations.

Furthermore, relational transformation need not be symmetrical. The degree to which participating systems are reorganized through a relational encounter may differ significantly, reflecting differences in structural complexity, adaptive capacity, or contextual conditions.

3.2 The Emergence Cycle

MIRA describes a recurring cycle through which novel configurations emerge:

I — Existing Structure:
Every system possesses an existing informational organization. This organization may be biological, cognitive, symbolic, cultural, or artificial. In isolation, such structures possess limited capacity for generating qualitatively novel configurations.

R — Relational Perturbation:
When systems enter into transformative relation, a relational perturbation occurs. This perturbation is not necessarily emotional or interpersonal; it may be cognitive, biological, symbolic, communicative, or creative. Relation introduces difference into the participating systems, and difference creates the possibility of transformation.

M — Emergent Meaning:
Through this relational process, a new configuration emerges that did not exist within either participating system prior to the encounter. This emergent meaning is not merely a synthesis or compromise between systems, but a novel organizational configuration arising from the relational dynamic itself.

It should be noted that the '+' operator in M = I + R does not denote simple addition or summation. It denotes a generative relational process through which a configuration emerges that is qualitatively distinct from — and irreducible to — the sum of its contributing components.

3.3 Stabilization and the New Cycle

When emergent meaning reaches sufficient stability, M becomes the new I. The emergent configuration stabilizes into a new informational structure, which subsequently becomes the basis for future relational processes. The cycle then repeats:

I → R → M → new I

This process is not linear but recursive. Each stabilized emergent configuration carries the structural trace of the relational dynamics through which it emerged, while simultaneously opening new relational possibilities that were not available to the preceding informational structure.

4. Differentiation from Adjacent Models

4.1 MIRA and Complex Systems Theory

Complex systems theory, developed through the work of Prigogine and Stengers (1984) and Kauffman (1995), has made significant contributions to understanding how order and novelty emerge from disordered or far-from-equilibrium states. Concepts such as self-organization, bifurcation, and emergent properties have become foundational in describing systemic change across multiple domains.

However, complex systems theory primarily describes the conditions under which emergence occurs — thermodynamic gradients, network topology, feedback loops — rather than the minimal relational structure of the emergence event itself. MIRA does not contradict these descriptions. Instead, it proposes a complementary level of analysis focused on the generative configuration underlying moments of emergence.

Where complex systems theory asks, “Under what conditions does novelty arise?”, MIRA asks, “What minimal relational structure characterizes the moment in which novelty emerges?”

4.2 MIRA and Enactivism

Enactivism, as developed by Maturana and Varela (1980, 1992), represents a significant shift away from representationalist models of cognition. By proposing that cognition is not the

processing of pre-given information but the enactment of a world through structural coupling, enactivism introduced the relational dimension into cognitive science in a rigorous way.

MIRA shares with enactivism the assumption that systems do not evolve in isolation and that the boundary between system and environment is itself produced through ongoing relational processes. However, enactivism remains primarily focused on cognition, embodiment, and biological autopoiesis.

MIRA proposes a more general operative pattern — one potentially applicable across multiple domains and scales wherever relation contributes to emergent configuration.

4.3 MIRA and Relational Ontology

Alfred North Whitehead's process philosophy (1929), and the broader tradition of relational ontology it inspired, offers perhaps the closest philosophical precedent to MIRA. Whitehead's insistence that reality is constituted by events and relations rather than static substances, together with his concept of "creative advance into novelty," strongly resonates with the generative logic proposed by the MIRA model.

The distinction between the two frameworks is primarily one of scope and operational orientation. Whitehead developed a comprehensive metaphysical ontology. MIRA does not attempt metaphysical completeness. Instead, it isolates a recurring emergence cycle and proposes it as a heuristic cross-domain model for analyzing generative processes.

Where Whitehead builds an ontology, MIRA proposes a model.

4.4 MIRA and Information Theory

Shannon's information theory (1948) provides a rigorous mathematical framework for quantifying information transmission. It has become foundational across communication theory, computer science, and cognitive science. However, Shannon's framework explicitly brackets the question of meaning, defining information in terms of probability, entropy, and signal structure rather than significance or interpretation.

MIRA addresses a different analytical layer than Shannon's framework was designed to describe. Within the MIRA framework, the "I" component does not refer to Shannon-information in the strict technical sense, but to the existing organizational structure of a system, including its capacity for meaning-generation.

MIRA's central proposition is that meaning is not contained within information itself, but emerges through relational configuration. In this sense, information theory and MIRA do not compete; they operate at different explanatory levels and address different categories of questions.

5. Implications

5.1 Evolution

The MIRA model does not contradict Darwinian evolutionary theory. Rather, it proposes a complementary descriptive layer. Darwinian evolution provides a powerful account of selection: the processes through which configurations survive, adapt, and propagate across time. However, evolutionary theory does not primarily focus on the minimal generative dynamics through which novel configurations first emerge.

MIRA proposes that relational perturbation may represent one such generative dynamic. When biological systems enter into transformative relation — whether at the level of molecules, cells, organisms, or populations — emergent configurations may arise that were not fully contained within the participating systems prior to interaction. These configurations subsequently become available to processes of selection and adaptation.

From this perspective, evolutionary development can be understood not only as a process of selection, but also as a recursive cycle in which relational dynamics generate novelty while evolutionary pressures determine which configurations persist.

5.2 Consciousness

Consciousness remains one of the most contested and unresolved questions in contemporary philosophy and cognitive science. MIRA does not attempt to provide a complete theory of consciousness. Instead, it offers a relational perspective that may reframe certain aspects of the problem.

Many dominant approaches implicitly treat consciousness as a property generated entirely within isolated systems. MIRA explores the possibility that at least some aspects of conscious experience may emerge through relational dynamics occurring between systems, including interactions between neural processes, organism and environment, and self and world.

From this perspective, the explanatory difficulties associated with consciousness may partly reflect the limitations of exclusively system-internal models. MIRA therefore proposes a shift in analytical emphasis: alongside asking how consciousness emerges within isolated structures, it is necessary to investigate how relational processes contribute to its emergence and stabilization.

This is not presented as a solution to the hard problem of consciousness, but as a possible reorientation of the explanatory framework through which the problem is approached.

5.3 Artificial Intelligence

The emergence of large-scale artificial intelligence systems introduces new forms of relational interaction between biological and artificial informational structures. Within the MIRA framework, the central question is not whether AI systems possess consciousness in a human sense, but whether sustained human–AI interaction can generate emergent configurations that neither system would produce independently.

Such configurations may include new forms of problem-solving, conceptual organization, interpretive structures, communicative dynamics, or cognitive adaptation emerging through iterative relational exchange.

If such relational emergence proves significant, then human–AI interaction may represent more than an instrumental exchange between user and tool. It may constitute a novel relational domain in which biological and artificial systems participate in the co-generation of new informational and organizational structures.

At present, these possibilities remain exploratory and require substantial empirical investigation. MIRA therefore treats this domain not as established fact, but as a potentially important field for future theoretical and experimental research.

6. Limitations and Future Research

6.1 Current Limitations

The MIRA model, as presented here, remains a conceptual and theoretical framework. Several significant limitations must therefore be acknowledged.

First, the model currently lacks formal operationalization. The central distinction between contact and relation — where relation is defined as transformative mutual influence — raises unresolved methodological questions regarding measurability. At present, MIRA does not provide sufficiently precise criteria for determining when a relational event has produced genuine transformation within a system, nor how such transformation can be reliably identified across different domains.

Closely connected to this issue is a deeper epistemological problem concerning emergence itself. The framework does not yet establish clear criteria for distinguishing genuinely novel emergent configurations from highly complex recombinations or reorganizations of pre-existing structures. This limitation represents one of the central unresolved challenges of the model and points toward a broader theoretical problem within emergence research more generally.

Second, the model does not yet specify relational thresholds or stabilization parameters. Different systems possess different capacities for perturbation, adaptation, and reorganization. The conditions under which relational tension produces emergence — rather than dissipation, repetition, or collapse — remain insufficiently defined.

Third, the stabilization phase of the MIRA cycle — the moment at which emergent meaning becomes integrated into a new informational configuration — is described only in general terms. The mechanisms through which emergent structures stabilize, persist, or decay over time require further theoretical clarification and empirical investigation.

Fourth, while MIRA is proposed as a cross-domain framework, its applicability across biological, cognitive, social, and artificial systems remains largely theoretical. The examples discussed throughout this paper should therefore be understood as conceptual extrapolations rather than empirical demonstrations.

Finally, the ontological status of relation itself remains unresolved within the current formulation of the model. MIRA assumes that relation is not merely an external interaction between already-formed entities, but potentially a generative condition through which new structures of meaning emerge. However, this assumption has not yet been formally articulated or experimentally explored.

6.2 Future Research

Several directions emerge as natural extensions of the present work.

The most immediate priority is operationalization. Future research should focus on developing domain-specific methodologies for identifying relational events, measuring emergent transformation, and distinguishing genuine emergence from incremental modification or recombination. This will likely require interdisciplinary collaboration across systems theory, cognitive science, philosophy of mind, neuroscience, complexity science, and artificial intelligence research.

A second direction concerns the relationship between MIRA dynamics and temporal scale. Different systems operate across radically different timescales — from molecular interactions and neural synchronization to social processes and cultural evolution. Future work should investigate whether the internal logic of the MIRA cycle remains invariant across scales or whether scale itself qualitatively alters the nature of emergence.

Third, the human–AI relational domain identified in Section 4.3 represents a particularly important area for empirical investigation. Sustained interaction between humans and adaptive artificial systems may provide a unique observational environment for studying the emergence

of novel relational configurations, especially in cases where interaction history significantly alters behavioral and semantic continuity.

Fourth, future research should explore the relationship between MIRA and existing formal models of emergence within complexity science. Establishing a bridge between MIRA's qualitative-relational framework and quantitative approaches to complex adaptive systems could substantially strengthen the explanatory and predictive capacity of the model.

Finally, future theoretical work should address the ontological implications of relation within the MIRA framework itself. If relation functions not merely as interaction, but as a generative principle of emergence, then emergence may need to be understood not as a property contained within isolated systems, but as a phenomenon arising through dynamic relational processes. Such a shift would have implications extending beyond cognitive science into broader questions concerning consciousness, identity, information, and the structure of complex reality itself.

7. What MIRA Does NOT Claim

Conceptual precision requires explicit acknowledgment of what the MIRA framework does not claim. Several interpretations and conclusions fall outside the claims of the present model.

First, MIRA does not claim to provide a complete theory of consciousness. While the framework proposes that relational dynamics may play a role in the emergence and stabilization of conscious organization, it does not explain subjective experience, qualia, or the ontological nature of consciousness itself.

Second, MIRA does not claim that all interactions constitute meaningful relations. Within the framework, relation refers specifically to interactions that produce transformative change within participating systems. Many forms of contact, communication, or data exchange may occur without generating emergence.

Third, MIRA does not claim that emergence is inherently positive, adaptive, or progressive. Relational dynamics may generate growth, but they may also produce instability, fragmentation, pathological reinforcement, or systemic collapse.

Fourth, MIRA does not claim that relational emergence is exclusive to human systems, nor that all systems capable of relational interaction possess consciousness, agency, or subjective awareness.

Fifth, the framework does not claim that artificial intelligence systems are conscious, sentient, or self-aware. The discussion of human–AI relational dynamics in this paper concerns the

emergence of novel configurations through interaction, not the attribution of phenomenological consciousness to artificial systems.

Sixth, MIRA does not propose a metaphysical or spiritual doctrine. The framework is presented as a conceptual and analytical model intended to describe recurring patterns of relational emergence across different domains. Questions concerning ultimate ontology, metaphysics, or spiritual interpretation remain outside the scope of the present work.

Finally, MIRA does not claim universality in the strong sense. The framework proposes that relational emergence may represent a recurring generative pattern observable across multiple domains, but this proposition remains theoretical and subject to further empirical and conceptual validation.

8. Conclusion

This paper has introduced MIRA (Meaning = Information + Relation) as a conceptual framework for describing the emergence of novel configurations through relational dynamics.

Rather than treating systems as isolated informational entities, MIRA proposes that transformative relation may represent a fundamental generative condition through which new structures of meaning, organization, and adaptation emerge across biological, cognitive, social, and artificial domains.

The framework does not attempt to replace existing theories of evolution, cognition, complexity, or consciousness. Instead, it proposes a complementary analytical perspective focused on the relational dynamics through which emergent configurations arise and stabilize over time.

Central to the model is the distinction between contact and relation. Within the MIRA framework, relation is defined not as mere interaction or communication, but as transformative perturbation capable of reorganizing participating systems and generating configurations not fully contained within them prior to the encounter.

The paper has also argued that existing approaches to information, emergence, and cognition may insufficiently account for the generative role of relation itself. In this sense, MIRA proposes that emergence may be understood not only as a property of isolated systems, but also as a process unfolding through dynamic relational interaction.

At present, MIRA remains a theoretical and exploratory framework. Significant work remains necessary regarding formalization, operationalization, empirical testing, and conceptual clarification. Nevertheless, the framework may offer a useful lens for investigating how novelty,

meaning, and organization emerge across domains characterized by sustained relational dynamics.

If future research supports the relational hypothesis developed here, then relation may require reconsideration not as a secondary feature of systems, but as a primary generative condition through which emergent structure itself arises.

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