The Limited-Precision Universal Coherence Scale: A Universal Structural Metric for Heterogeneous Phenomena

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Note:
This essay follows the conceptual line initiated in Elocuencia: La Emoción De Coherencia Universal.

Abstract:
This essay presents the Limited-Precision Universal Coherence Scale (UC Scale) as the first operational module of the Universal Coherence Project, proposing a universal structural metric for comparing heterogeneous phenomena (physical, biological, social, symbolic, and philosophical) without imposing disciplinary reductionisms. The UC Scale is defined as a heuristic tool: it does not seek to replace specialized metrics, but to complement them through a cross-disciplinary reading aimed at reducing interpretive noise and validated by the criterion of “fruit” (clarity and stability without violence). Its distinctive principle is relational measurement with respect to an ideal and unattainable asymptotic center, used as a structural reference rather than as an operable datum. The essay describes the scale’s architecture, its Coherent Scaling Law, and basic modes of use, including applied examples in physical and complex phenomena. Finally, it develops immediate practical applications based on a reproducible conversion of magnitudes into UC values within an operational range of fixed precision, incorporating fractal/self-nested reading and calculation tools to support procedural consistency and interdisciplinary collaboration. It concludes with future lines of work oriented toward mathematical formalizations and quantitative simulations, along with an open invitation to community-based refinement.

Keywords:
Universal Coherence; UC Scale; limited precision; asymptotic center; structural metric; relational measurement; fractal scaling; self-organization; UC conversion (normalization); interdisciplinarity; reproducibility; “fruit” criterion.

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1. Introduction

The Limited-Precision Universal Coherence Scale (UC Scale) represents the first operational module of the Universal Coherence Project, introduced in previous essays such as "*The Source and the Container*" (Calvo Espinosa, 2025, DOI: 10.5281/zenodo.17219671) and developed in its theoretical foundations in "*Ontological and Epistemological Foundations of Universal Coherence (UC)*" (Calvo Espinosa, 2026, DOI: 10.5281/zenodo.18702121).

This heuristic tool(1) seeks to move from the conceptual to the applicable, offering a structural metric that enables the measurement and analysis of observable phenomena from a unified perspective, always with a humble and non-totalizing approach.

1.1. Contextualization within the Universal Coherence Project

As detailed in the cited works, the Universal Coherence Project is based on relational principles(2) that identify patterns of coherence across heterogeneous dimensions without reductionist collapse(3). The UC Scale emerges as an operational extension of these foundations, enabling the quantification of the degree of alignment—or "phase"—in complex phenomena.

It does not aim to replace specialized metrics (e.g., in physics or psychology), but to complement them with a cross-disciplinary reading that reduces noise and generates shareable meaning, aligned with the pragmatic-ethical criterion of "fruit" (clarity, stability without violence). Future modules, such as the model of structural functions or the calculation algorithm, will deepen more quantitative applications.

1.2. Purpose of the UC Scale

The main purpose of the UC Scale is to redefine the way we observe and quantify reality by establishing a universal structural metric applicable to any observable phenomenon. Its essence lies in measuring with respect to an ideal and unattainable structural point—an asymptotic center(4)—which acts as a heuristic reference for evaluating dynamic expansion and internal coherence.

This makes it possible to analyze phenomena ranging from simple physical cases (such as planetary velocities) to complex ones (such as historical accumulations or structural projections), facilitating a meaningful integration of elements that, in isolation, appear disconnected. Limited precision(5) is intentional: it acknowledges that all measurement is relative and contextual, avoiding claims of absolute exactness.

(1) Lammin (2017) proposes non-totalizing heuristic approaches in non-philosophy, avoiding the hypostatization of identities and allowing open relational articulation. Lammin, H. E. (2017). *Staging community: A non-philosophical presentation of immanent social experience* [Doctoral dissertation]. University of Greenwich. https://gala.gre.ac.uk/id/eprint/23409/1/Hannah%20Lammin%202017.pdf

(2) Wildman (2006) argues that in relational ontologies, relations are more fundamental than entities, aligning with principles that emerge from interactions. Wildman, W. J. (2006). *An introduction to relational ontology*. Boston University. https://people.bu.edu/wwildman/media/docs/Wildman_2009_Relational_Ontology.pdf

(3) Capra (1996) critiques reductionism in systems theory, proposing holistic approaches that preserve complexity without collapsing it to a single level. Capra, F. (1996). *The web of life: A new scientific understanding of living systems*. Anchor Books.

(4) Bar-Yam (2004) describes asymptotic points in multiscale complexity, where patterns emerge from critical thresholds. Bar-Yam, Y. (2004). *A mathematical theory of strong emergence using multiscale variety. Complexity,* 9(6), 15–24. https://doi.org/10.1002/cplx.20029

(5) Sivakumar & Boon (2024) emphasize limited precision within epistemic humility for interdisciplinary integration. Sivakumar, K., & Boon, M. (2024). *The role of intellectual humility in promoting epistemic fluency for interdisciplinary engineering education. Frontiers in Education, 9*, Article 1395265. https://doi.org/10.3389/feduc.2024.1395265

1.3. Scope and limits

The scope of the UC Scale is strictly heuristic: it serves as an interpretive architecture[6] for identifying cross-cutting patterns in interdisciplinary domains, promoting collaboration among physics, philosophy, mathematics, and the social sciences.

Its explicit limits include: it does not replace empirical evidence in rigorously quantitative domains; its metaphors (e.g., "asymptotic point") are pedagogical, not literal; and it is not a closed predictive tool, but one open to contextual refinement. This humble positioning makes it complementary to existing approaches, inviting its use without epistemological hegemony.

(6) Korzybski (1933) proposes relational reading architectures, distinguishing map (description) from territory (reality). Korzybski, A. (1933). *Science and sanity: An introduction to non-Aristotelian systems and general semantics*. Institute of General Semantics.

2. Conceptual Foundations of the UC Scale

The conceptual foundations of the Universal Coherence Scale (UC Scale) are anchored in the relational principles established in the Universal Coherence Project, extending the theoretical heuristic[(7)] into an operational application. This section reviews the key concepts of Universal Coherence (UC) and describes the transition toward its quantifiable form, highlighting the innovation of the ideal structural point as a heuristic reference.

2.1. Central principle

Universal Coherence (UC), as detailed in *Ontological and Epistemological Foundations of Universal Coherence (UC)* (Calvo Espinosa, 2026, DOI: 10.5281/zenodo.18702121), is defined as a structural and dynamic principle that organizes heterogeneous phenomena—physical, cognitive, emotional, symbolic, ethical, and spiritual—without disciplinary reductionisms.

It is neither a substance nor an external agent, but an underlying condition that emerges from internal relations, reducing noise[(8)] and generating shareable meaning. Core constructs such as the Emotion of Universal Coherence (EUC)—a lived structuring dynamism[(9)]—and the criterion of "fruit" (clarity, stability without violence) provide the basis for the UC Scale, which operationalizes these principles into a universal metric.

2.2. Essence of the scale

The transition from conceptual to operational UC takes form in the UC Scale as a measurement tool that quantifies the degree of relational alignment. Inspired by a relational reading prioritized over the accumulation of signs (avoiding the "container error"), this scale enables a shift from the qualitative to the quantifiable. Its multiscale[(10)] approach—from the micro (vibrational) to the macro (structural)—reflects the fractality[(11)] inherent in coherent phenomena, allowing dynamic expansions to be analyzed from an ideal central point. This operationalization does not seek hegemony, but rather complements existing metrics with a unified perspective.

2.3. Differentiation from traditional scales

The UC Scale's main innovation lies in its reference to an ideal and unattainable structural point, termed the asymptotic center[(12)]. This point acts as a critical heuristic threshold (S9 in teasers for future modules), from which simultaneous expansion is measured toward a fundamental vibrational base (S1) and a maximal structural expression (S16).

It is not an absolute value, but a relational reference that captures the dynamics of coherence, making it possible to evaluate phenomena in terms of shared phase and reduced internal friction.

(7) Gigerenzer (2008) describes heuristics as theoretical tools for simplifying complex decisions under uncertainty. Gigerenzer, G. (2008). *Rationality for mortals: How people cope with uncertainty*. Oxford University Press.

(8) Kahneman et al. (2021) analyze noise in judgment as unwanted variability, proposing methods for its reduction in complex systems. Kahneman, D., Sibony, O., & Sunstein, C. R. (2021). *Noise: A flaw in human judgment*. Little, Brown Spark.

(9) Damasio (1994) conceptualizes emotions as structuring dynamisms that organize cognition and behavior. Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. Putnam.

(10) Salthe (1993) proposes multiscale hierarchies in systems theory, where levels interact without collapse. Salthe, S. N. (1993). *Development and evolution: Complexity and change in biology*. MIT Press.

(11) West (2017) explores fractality in biological and physical scaling laws, reflecting inherent self-similar patterns. West, G. B. (2017). *Scale: The universal laws of growth, innovation, sustainability, and the pace of life in organisms, cities, economies, and companies*. Penguin Press.

(12) Crutchfield (1994) describes asymptotic centers in the emergence of computational complexity. Crutchfield, J. P. (1994). *The calculi of emergence: Computation, dynamics and induction. Physica D: Nonlinear Phenomena, 75*(1–3), 11–54. https://doi.org/10.1016/0167-2789(94)90073-6

This asymptotic approach emphasizes limited precision, recognizing that measurement is always contextual and open to refinement.

3. Structural Description of the UC Scale

The structural description of the Universal Coherence Scale (UC Scale) details its architecture as a limited-precision heuristic metric(13), designed to capture the relational dynamics of observable phenomena. This section explores its main components, the Coherent Scaling Law, and basic modes of use, maintaining a conceptual approach without entering advanced mathematical formalisms, which are reserved for future modules.

3.1. Key components

The overall structure of the UC Scale is based on a universal metric that evaluates phenomena with respect to an asymptotic central point, from which simultaneous expansion(14) toward multiple scales is measured. It is not a traditional linear scale, but rather a relative heuristic that assigns values based on the degree of relational alignment(15) (or "shared phase") across heterogeneous dimensions.

Its limited precision is deliberate: it recognizes that all quantification is approximate and contextual, avoiding claims of absolute exactness. The scale operates within a conceptual range from a vibrational base (fundamental level, close to S1 in teasers for structural models) to maximal expression (complex level, close to S16), allowing analysis from microscopic events to macro-structural ones.

3.2. Coherent Scaling Law

The Coherent Scaling Law is the operational principle that guides measurement in the UC Scale. This law posits that coherence emerges from fractal and multidimensional scaling(16), where each level of complexity relates asymptotically to the ideal central point. In heuristic terms, scaling is not uniform: it increases in clarity and stability as the phenomenon "enters phase(17)" with its internal relations, reducing friction and noise.

For example, in a physical phenomenon, scaling might measure alignment between vibrational and structural variables; in a social one, the integration of emotional and ethical dimensions. This law ensures the metric is transversal, applicable without reductionist collapse, and validated by the criterion of "fruit" (observable effects of integration without violence).

3.3. Basic modes of use

The basic modes of use of the UC Scale allow for qualitative and semi-quantitative application, adaptable to diverse contexts. In descriptive mode, relative values (e.g., low, medium, high) are assigned to the degree of proximity to the asymptotic point, based on relational observation. In comparative mode, multiple phenomena are evaluated in parallel to identify cross-cutting patterns.

(13) Lakatos (1970) describes heuristics as progressive methods for measuring and resolving complex problems in mathematics. Lakatos, I. (1970). *Proofs and refutations*. Cambridge University Press.

(14) Holland (1995) analyzes simultaneous expansions in complex adaptive systems, emerging from parallel interactions. Holland, J. H. (1995). *Hidden order: How adaptation builds complexity*. Addison-Wesley.

(15) Latour (2005) conceptualizes relational alignment in actor-network theory, where heterogeneous entities align without reductions. Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford University Press.

(16) Schroeder (1991) explores fractal scaling as a principle of self-similarity in chaos and complexity. Schroeder, M. (1991). *Fractals, chaos, power laws: Minutes from an infinite paradise*. W. H. Freeman.

(17) Pikovsky et al. (2001) describe "entering phase" as synchronization in oscillator systems. Pikovsky, A., Rosenblum, M., & Kurths, J. (2001). *Synchronization: A universal concept in nonlinear sciences*. Cambridge University Press.

For instance, a simple mode could involve evaluating an observable phenomenon through a heuristic rubric[(18)]:

(1) Identify relational layers.

(2) Estimate approximate alignment.

(3) Validate through noise reduction.

These modes are flexible, inviting collaborative refinement, and serve as a foundation for future extensions in fractal simulations or self-organized analyses.

(18) Simon (1996) proposes heuristic rubrics within bounded rationality for approximate and adaptable evaluation. Simon, H. A. (1996). *The sciences of the artificial* (3rd ed.). MIT Press.

4. Interdisciplinary Comparison

Interdisciplinary comparison[19] highlights the usefulness of the UC Scale by unifying analysis across domains. For instance, by comparing a physical phenomenon[20] (planetary velocity) with a philosophical one (ethical accumulation in moral decisions): a heuristic mode evaluates both with respect to the asymptotic point, measuring the degree of shared phase[21].

In the former, it focuses on vibrational–structural alignment; in the latter, on emotional–ethical integration. The comparison reveals cross-cutting patterns (e.g., a common reduction of friction), facilitating bridges between physics and philosophy without reductionist collapse, always validated by observable effects of clarity and stability.

4.1. Physical phenomena

In physical phenomena, the UC Scale measures the structural coherence of observable variables, such as planetary velocities. For example, when evaluating Earth's orbital velocity (approximately 30 km/s) with respect to the ideal asymptotic point, a heuristic mode assigns a low relative value if the phenomenon is considered in isolation (e.g., without gravitational context), but the value increases as relationships with the Sun and other bodies are integrated (reducing kinetic "noise"[22]). This reveals cross-cutting patterns, such as alignment between fundamental vibration (e.g., gravitational waves) and structural expression (e.g., stable orbits), validated by "fruit" (stability without violence, as in balanced dynamical systems).

4.2. Complex phenomena

For complex phenomena such as historical accumulation, the UC Scale quantifies relational expansion[23] over time. Consider the accumulation of knowledge within a civilization: a basic mode measures alignment between emotional layers (e.g., collective motivations) and symbolic layers (e.g., cultural narratives) with respect to the asymptotic center.

If the accumulation generates internal friction (e.g., ideological conflicts), the value is low; if it reduces noise and fosters shareable meaning (e.g., integrated scientific advances), it increases. This makes it possible to analyze structural projections, such as the evolution of societies, without imposing uniformity, and with limited precision[24] in order to acknowledge variable cultural contexts.

4.3. Applied Examples

The applied examples illustrate how the Universal Coherence Scale (UC Scale) is used as a heuristic tool to measure and analyze heterogeneous phenomena, highlighting its versatility without claims of exhaustiveness. These cases demonstrate the metric in action, evaluating relational

(19) Graff (2015) explores interdisciplinary comparisons as the unification of domains without loss of specificity. Graff, H. J. (2015). *Undisciplining knowledge: Interdisciplinarity in the twentieth century*. Johns Hopkins University Press.
(20) Feynman (1963) describes physical phenomena as observable variables in relational contexts. Feynman, R. P. (1963). *The Feynman lectures on physics*. Addison-Wesley.
(21) Acevedo (2000) analyzes shared phase in collective synchronization of systems. Acevedo, M. F. (2000). *Interdisciplinary models of ecosystems*. CRC Press.
(22) Wiener (1948) conceptualizes kinetic noise as variability in cybernetic dynamics. Wiener, N. (1948). *Cybernetics: Or control and communication in the animal and the machine*. MIT Press.
(23) Crossley (2006) proposes relational expansion in social networks over time. Crossley, N. (2006). *Reflexive embodiment in contemporary society*. Open University Press.
(24) Feyerabend (1975) emphasizes limited precision in anarchist epistemology, acknowledging variable contexts. Feyerabend, P. (1975). *Against method: Outline of an anarchistic theory of knowledge*. New Left Books.

alignment with respect to the central asymptotic point, with an emphasis on reducing noise and generating shareable meaning.

5. Immediate Practical Applications

The immediate practical applications of the Limited-Precision Universal Coherence Scale (UC Scale) depend on a central operational point: the reproducible conversion of an observable magnitude into a comparable UC value. This conversion does not aim to “capture” the ideal center (0.000000000000000), but to use it as an asymptotic structural limit and, therefore, not operable as data.

Under this logic, the scale works with fixed precision and a (symmetric) expressible range defined by a resolution convention:

-Minimum observable value (non-zero): ±0.000000000000010

-Maximum observable value (operational limit): ±0.999999999999990

-Total operational range: −0.999999999999990 < value < +0.999999999999990

In practice, the UC Scale can be used through two complementary approaches:

Pure Structural Mode: the asymptotic center acts as an absolute reference; the reading prioritizes closeness/farness from the center and from the operational limit.

Reference-Normalized Mode: a real reference phenomenon is assigned the value 1.000000000000000 (e.g., a “standard” magnitude). From there, the rest is interpreted proportionally. If a value exceeds the reference, the reference can be redefined, or the value can be recorded at the operational limit (0.999999999999990) when working under a strictly bounded reading.

In both approaches, what enables comparative and interdisciplinary use is that the UC value is obtained through a simple formula and a stable precision convention (see 5.1–5.3).

5.1. Universal comparative structural analysis

Universal structural analysis uses the UC Scale to compare physical, biological, social, symbolic, or philosophical phenomena from a common reference: the relative position of an observed value within a defined range.

5.1.1. General UC conversion formula

To convert any magnitude into UC format[25]:

$$CU\ Value = \frac{Observed\ Value - Minimum\ Observed\ Value}{Maximum\ Observed\ Value - Minimum\ Observed\ Value} \times \pm 0.999999999999990$$

Where:

(25) Han et al. (2011) describe preprocessing and min–max normalization methods, useful for mapping observed values to a comparable bounded scale. Han, J., Kamber, M., & Pei, J. (2011). *Data Mining: Concepts and Techniques* (3rd ed.). Morgan Kaufmann.

- Observed Value: real magnitude measured for the phenomenon.

- Minimum / Maximum Observed Value: range defined within the analyzed phenomenon.

- ± 0.999999999999990: conversion factor that fixes the operational limit and defines the structural direction (positive = expansion / negative = contraction).

5.1.2. Input operational precision

For the conversion to be coherent and comparable (and to sustain "limited precision" as a stable convention), the submission of values follows this rule:

· All submitted values must contain exactly 16 digits(26) in total, combining digits before and after the decimal point.

· The last two decimals must be ≥ "10", avoiding endings "00–09" and guaranteeing a minimum operable non-zero.

Correct examples (16-digit total format):

7189.000000000010

10.89200000000010

6.520000000000010

With this convention, the UC Scale maintains a fixed (and therefore comparable) resolution without attributing to the tool an unjustifiable absolute exactness.

5.2. Fractal modeling and self-organization

Fractal modeling and the reading of self-organization(27) rely on a key property of the model: the UC Scale can be read as a decimal fractal structure.

5.2.1. Decimal fractal structure(28)

Each decimal digit of the UC Scale can be interpreted as a level of structural resolution. Between two consecutive values, an entire new UC Scale can be unfolded, making the metric self-nested:

· Each decimal digit = structural layer. · Each decimal level = can contain a 16-digit UC scale.

This allows very small differences to be treated not only as "noise," but as coherent microstructures (useful for multiscale readings and sensitive simulations).

(26) Goldberg (1991) explains precision limits, rounding, and floating-point arithmetic effects, relevant for justifying digit conventions and avoiding false numerical exactness. Goldberg, D. (1991). *What every computer scientist should know about floating-point arithmetic. ACM Computing Surveys, 23*(1), 5–48. https://doi.org/10.1145/103162.103163
(27) Mandelbrot (1982) formalizes fractality and self-similarity as multiscale structure, providing a conceptual basis for decimal fractal readings. Mandelbrot, B. B. (1982). *The fractal geometry of nature*. W. H. Freeman.
(28) Nicolis & Prigogine (1977) develop the theory of self-organization in nonequilibrium systems (dissipative structures), supporting the term's use in multiscale modeling. Nicolis, G., & Prigogine, I. (1977). *Self-organization in nonequilibrium systems: From dissipative structures to order through fluctuations*. Wiley.

5.2.2. Applied example: fractal observation of π across UC levels

π (≈ 3.141592653589793) is analyzed from two structural perspectives:

1) From the base UC level: using π directly as the observed value.

2) From a fractal sublevel: scaling π downward (π ÷ 10) to place it within the level's operational range.

First case: π as a direct observed value

Observed value: 3.141592653589793 Minimum observed value: 0.000000000000010 Maximum observed value: 0.999999999999990 Conversion factor: −0.999999999999990

Result (UC Value): −3.141592653589810

Interpretation:

The value of π lies outside the standard UC operational range (limited to ±0.999...990). When the formula is applied, a structural inversion occurs: the system "returns" virtually the same number, but with a negative sign, operating as a signal of structural overflow.

Conceptual metaphor (pedagogical reading):

Like a "structural bubble" that is too large and, instead of bursting, inverts onto itself to stabilize the system without collapsing it: the form is preserved (π), but it manifests in the opposite direction.

Second case: π scaled to a fractal sublevel (π ÷ 10)

Observed value: 0.314159265358980 Identical UC range Conversion factor: +0.999999999999990

Result (UC Value): +0.314159265358970

Interpretation:

By scaling π downward, the value falls within the operational range. The formula returns essentially the same value without distortion or inversion: the system accommodates it naturally.

5.2.3. Emergent structural law: Coherent Scaling Law

"*Any value that exceeds the operational limit of a UC level can find coherent expression within another fractal level, preserving its relative proportional structure.*"

In operational terms: what cannot be expressed directly at one level can manifest as part of a structure contained in another; coherence is not lost when changing structural level—only the manifestation of form changes.

Conceptual representation (π case):

UC Level	Observed Value	UC Value	Structural Status
Base level (S_1–S_{16})	3.141592653589793	−3.141592653589810	Expelled / Inverted
Fractal level +1	0.314159265358980	+0.314159265358970	Hosted / Coherent

5.3. Tool for interdisciplinary research and collaboration

In real research environments (and especially in interdisciplinary use), the critical point is not only the formula, but the consistency of the procedure[29]: range selection, validation, factor, and input/output precision. For this reason, it is useful to formalize the logic behind the sign of the factor and to rely on a calculation tool.

5.3.1. On the logic of the sign of the UC factor (automatic selection)

In the practical development of UC calculation, it was observed that the sign of the conversion factor does not need to be imposed manually: it can be selected automatically through a simple validation of the observed value with respect to the defined range.

Reference code (GameMaker Studio 2) as used for the visual factor:

```
// Visual conversion factor with full validation
draw_set_color(c_white);
var visual_conversion_factor = "+ 0.999999999999990";

if (current_field != "" && min_field != "" && max_field != "") {
    var current_value = real(current_field);
    var min_value = real(min_field);
    var max_value = real(max_field);

    if (current_value < min_value || current_value > max_value) {
        visual_conversion_factor = "- 0.999999999999990";
    }
}

draw_text(pos_x + 260, pos_y + spacing * 3, visual_conversion_factor);
```

This logic implies:

· If current_value is within the range (min_value to max_value), the system uses: + 0.999999999999990

· If current_value is outside the range, the system uses: – 0.999999999999990

(29) Wilson et al. (2014) propose best practices for reproducible scientific computing (validation, traceability, error control), aligned with the use of tools such as the UC Converter. Wilson, G., Aruliah, D. A., Brown, C. T., et al. (2014). *Best practices for scientific computing*. PLoS Biology, 12(1), e1001745.

What matters is not only the "sign change" as an external decision, but that the UC calculation's own structure tends to produce coherent readings:

- **Values above the maximum** (overflow) tend to produce negative results (a reading of contraction/perturbation).

- **Values below the minimum**, although insufficient, do not generate negative values; they tend to preserve a minimal positive expression (a neutral or reduced structural effect), since the sign of the factor and the sign of the numerator compensate for each other.

5.3.2. "UC Converter" as support for precision and communication

Given the required precision and the need for operational consistency, a specific tool (UC Converter) is introduced, which facilitates:

· Entering values in a 16-digit format.

· Automatic range validation.

· Selection of the conversion factor.

· Structural visualization associated with the results.

In terms of interdisciplinary collaboration, this reduces manual errors, improves reproducibility, and makes it possible to share "clean" examples (same numerical convention, same procedure, same structural reading).

6. Conclusions and Perspectives

The Limited-Precision Universal Coherence Scale (UC Scale) proposes a heuristic advance(30) for the relational measurement of heterogeneous phenomena(31), extending the principles of the Universal Coherence Project toward practical applications. This closing section synthesizes its main contributions, outlines future lines of development, and invites the research community to test and refine it collaboratively(32).

6.1. Main contribution

The UC Scale's central contribution lies in offering a universal structural metric capable of unifying quantitative observation without imposing disciplinary reductionisms. By evaluating phenomena in relation to an ideal asymptotic point and operating within a limited-precision framework, the tool is presented as a complement—not a substitute—for existing approaches. Taken together, it promotes interpretive clarity and stability, articulated through the criterion of "fruit," and facilitates interdisciplinary bridges by integrating diverse dimensions within a deliberately humble and non-totalizing framework.

6.2. Perspectives and future work

Planned extensions include the development of complementary operational modules, including a model of simultaneous structural functions and detailed mathematical algorithms for more precise calculations. These developments will enable a transition from a primarily qualitative heuristic toward more advanced quantitative simulations(33), with potential application in domains such as artificial intelligence or the study of collective dynamics, while maintaining heuristic caution and the explicit recognition of contextual limits.

6.3. Invitation

Researchers from different disciplines are invited to explore and refine the UC Scale as an open tool(34), contributing contextual applications, critical evaluations, and proposals for improvement. Its complementary use alongside existing frameworks can enrich human knowledge by fostering collaborations aimed at identifying cross-cutting patterns of coherence.

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(30) Box (1976) defends the value of models/heuristics as useful instruments under explicit limits, reinforcing a methodologically humble approach. Box, G. E. P. (1976). *Science and statistics. Journal of the American Statistical Association, 71*(356), 791–799.

(31) Repko et al. (2017) systematize interdisciplinary research as methodological integration across domains, useful for justifying bridges without reductionism. Repko, A. F., Szostak, R., & Buchberger, M. P. (2017). *Interdisciplinary research: Process and theory* (3rd ed.). SAGE Publications.

(32) Nosek et al. (2015) argue for an open research culture oriented toward testing, review, and collaborative improvement (transparency and cooperation). Nosek, B. A., Alter, G., Banks, G. C., et al. (2015). *Promoting an open research culture. Science, 348*(6242), 1422–1425. https://doi.org/10.1126/science.aab2374

(33) Munafò et al. (2017) articulate a framework for advancing toward reproducible science, which becomes crucial when projecting a move from heuristic work to quantitative simulation. Munafò, M. R., Nosek, B. A., Bishop, D. V. M., et al. (2017). *A manifesto for reproducible science. Nature Human Behaviour, 1*, 0021. https://doi.org/10.1038/s41562-016-0021

(34) Wilkinson et al. (2016) propose the FAIR principles so that data/methods are findable, accessible, interoperable, and reusable, aligning with the invitation to refine the tool openly. Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J. J., et al. (2016). *The FAIR guiding principles for scientific data management and stewardship. Scientific Data, 3*, 160018. https://doi.org/10.1038/sdata.2016.18

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(2) Wildman (2006) argues that in relational ontologies, relations are more fundamental than entities, aligning with principles that emerge from interactions. Wildman, W. J. (2006). *An introduction to relational ontology*. Boston University. https://people.bu.edu/wwildman/media/docs/Wildman_2009_Relational_Ontology.pdf — p. 1

(3) Capra (1996) critiques reductionism in systems theory, proposing holistic approaches that preserve complexity without collapsing it to a single level. Capra, F. (1996). *The web of life: A new scientific understanding of living systems*. Anchor Books. — p. 1

(4) Bar-Yam (2004) describes asymptotic points in multiscale complexity, where patterns emerge from critical thresholds. Bar-Yam, Y. (2004). *A mathematical theory of strong emergence using multiscale variety. Complexity, 9*(6), 15–24. https://doi.org/10.1002/cplx.20029 — p. 1

(5) Sivakumar & Boon (2024) emphasize limited precision within epistemic humility for interdisciplinary integration. Sivakumar, K., & Boon, M. (2024). *The role of intellectual humility in promoting epistemic fluency for interdisciplinary engineering education. Frontiers in Education, 9*, Article 1395265. https://doi.org/10.3389/feduc.2024.1395265 — p. 1

(6) Korzybski (1933) proposes relational reading architectures, distinguishing map (description) from territory (reality). Korzybski, A. (1933). *Science and sanity: An introduction to non-Aristotelian systems and general semantics*. Institute of General Semantics. — p. 2

(7) Gigerenzer (2008) describes heuristics as theoretical tools for simplifying complex decisions under uncertainty. Gigerenzer, G. (2008). *Rationality for mortals: How people cope with uncertainty*. Oxford University Press. — p. 3

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