



Artificial Intelligence, Neutrosophy, and Latin American Worldviews: Toward a Sustainable Future Workshop – March 18–21, 2025, Universidad Tecnológica de El Salvador, San Salvador, El Salvador.

For centuries, Western logical thought has predominantly relied upon the principles of non-contradiction and the pursuit of absolute certainty. Yet, when confronted with contemporary challenges—spanning artificial intelligence to ecological sustainability—this traditional logic often falls short in capturing the complexity, ambiguity, and plurality of perspectives inherent in real-world contexts, particularly within the dynamic and multifaceted realities of Latin America.



In contrast, alternative logics offer more flexible frameworks. Paraconsistent logics, for instance, accept contradiction, while neutrosophy embraces contradiction, indeterminacy, and novelty as legitimate paths toward deeper, more contextualized understanding. As certain contemporary philosophers suggest, paradox may not signify a failure of reason but rather serve as a gateway to higher insight.



Building on this foundation, this special issue of Neutrosophic Sets and Systems fosters a dialogue between neutrosophic frameworks and Latin American worldviews, many of which have long cultivated knowledge systems that transcend classical dualisms. Notably, the Amerindian perspectivism offers an ontological and epistemological framework challenging rigid separations between subject and object, human and non-human, life and technology. Within this approach, difference is not erased but negotiated, acknowledged, and interwoven.



Crucially, this volume recognizes the foundational contributions of Latin American thinkers to the global development of non-classical logic. Extending beyond paraconsistency, the



epistemology and logical framework developed by Florentin Smarandache, the founder of neutrosophy, are particularly relevant. His work champions a pluralistic approach, explicitly designed to handle the inherent indeterminacy and contradiction found in reality. This pluralism, rooted in concepts like MultiAlism (the co-existence of multiple truth states), deeply reflects the hybrid, complex, and often paradoxical nature of Latin American experiences and epistemologies, offering tools developed with such complexities in mind. These collective contributions, emerging from or resonating strongly with the Global South, provide essential foundations for contemporary advancements and reaffirm Latin America's role in constructing a pluriversal logic.



In resonance with this pluralistic perspective, a rethinking of the relationship between technology and cosmology is invited. This approach recognizes that technology is never developed in a vacuum; each technical system inherently reflects the cultural and metaphysical worldview from which it emerges. Consequently, the notion of a universal or neutral technology gives way to the understanding that multiple technosocial trajectories exist, each shaped by distinct cosmologies. This view finds strong parallels in Latin American Indigenous philosophies, which often embody relational, reciprocal, and cyclical understandings of time, life, and knowledge.





This understanding challenges the monocultural educational paradigm that often overshadows local and Indigenous knowledge systems. Education for the future, it is argued, must be grounded in an ecology of knowledge—a transgressive and emancipatory alliance between the epistemologies of the global North and South. Integrating ancestral languages and knowledges—technical, symbolic, spiritual, and ecological—becomes not only a matter of justice but a necessity for planetary sustainability. Local epistemologies, particularly from Afro-Caribbean and Afro-Latin American contexts, are critical for co-constructing futures centered on mutual correction, allocentric thinking, and epistemological pluralism. His concept of relational universalism envisions an education that restores dignity, cognitive diversity, and symbolic security, notably through decolonizing curricula and revaluing ancestral knowledge holders as educators.



This methodological opening directly addresses a significant gap in current AI and formal reasoning models. As highlighted in recent critiques, the underlying Aristotelian binary logic (true/false, either/or) common in many standard Causal AI and statistical models fail to adequately engage with complex social realities. Neutrosophic logic offers a powerful alternative precisely because it is grounded in MultiAlism. As a generalization of fuzzy and intuitionistic fuzzy logic, it enables the simultaneous modeling of degrees of Truth (T), Indeterminacy (I), and Falsity (F). This framework inherently supports n-alethic logic, allowing propositions to possess multiple distinct truth values simultaneously (e.g., true and false, true and indeterminate). This capacity is crucial for reflecting worldviews where ambiguity, paradox, and contradiction are intrinsic components of knowledge—precisely the kind of complexity found in Afro-diasporic spiritual traditions or Andean notions of *ch'ixi* (complexity/mixture) and *yanantin* (complementary duality). Indeed, the Chakana (Andean Cross)—a sacred symbol representing the tripartite structure of the universe (Hanan Pacha - upper world, Kay Pacha - this world, Uku Pacha - inner world) with its central opening symbolizing Chaupi, the portal of transition—serves as a potent visual representation of models capable of handling such multi-valued, n-alethic complexity, embodying knowledge beyond simple binaries.



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(a)



(b)



(c)



- a) *Maya zero/flower* – cyclical time and infinite beginnings, reflecting Indeterminacy (I);
- b) *Andean Chakana* – the universe's tripartite structure and its central portal, mirroring the coexistence of Truth (T) and Falsehood (F);
- c) *Incan textile panel (ch'ixi weaving)* – warps that do not merge yet coexist, embodying neutrosophic MultiAlism and the Andean notion of ch'ixi.

Building upon these insights, we believe it is both possible and necessary to envision and construct a Latin American cosmotechnics—a way of thinking and creating technology rooted in local histories, relational ontologies, and ancestral ecological knowledge. This implies not a rejection of artificial intelligence or digital innovation, but a reconfiguration of their development and application according to principles such as Buen Vivir (Good Living), Ayni (reciprocity), In Lak'ech (you are my other self), and ch'ixi. In this vision, technology transcends its role as a mere tool of efficiency or control, becoming instead a medium for collective care, territorial autonomy, and ontological plurality.



This volume, enriched by contributions stemming from the Workshop on AI and Data Analytics for a Sustainable Future (San Salvador, March 2025), showcases the breadth of these applications. Research herein explores how ancestral principles like Ayni can be formally modeled using multi-neutrosophic methods for ethical AI, and how Indigenous perspectives, such as those shared by the Náhuat Chair in El Salvador, inform intercultural dialogue. Diverse neutrosophic tools—including N-alectic reasoning, cognitive maps, Z-numbers, linguistic models, plithogenic statistics, N-Soft sets, superhypergraphs, and novel consistency measures—are applied across a wide spectrum of Latin American challenges. Examples featured in this issue include: evaluating educational quality, teacher performance, and pedagogical models in higher education; optimizing business strategies, lean manufacturing, circular economy projects, and branding for female entrepreneurship ; improving healthcare diagnostics, therapies (e.g., for Diabetes Mellitus or pulmonary conditions in Ecuador), medical decision-making, and assessing dental competency; designing sustainable infrastructure like water supply systems and



analyzing agricultural sustainability indicators; understanding consumer behavior through neuromarketing and sensory analysis; advancing NLP for scientific trend identification; enhancing social research methods and collaborative tourism platforms; addressing tax conflicts in SMEs; promoting women's inclusion in technology; and bridging neutrosophy with Causal AI and Web3 for complex decision-making.



These studies demonstrate concrete applications moving beyond abstract proposals towards tangible impacts in AI ethics, intercultural understanding, community well-being, economic development, sustainability, and participatory technology design. With this special issue, we aim not only to expand the methodological horizons of neutrosophic logic but also to honor and operationalize knowledge systems long marginalized by dominant scientific paradigms. By embracing the pluralistic epistemology championed by Smarandache and leveraging the capacity of n-alethic and neutrosophic models (grounded in MultiAlism) to navigate contradiction and indeterminacy, this endeavor reflects both an epistemic and ethical aspiration: to contribute to building more just, inclusive, and context-aware technologies that recognize diversity as a fundamental value, cosmology as an essential framework, and the complex, multi-valued nature of reality as a legitimate pathway to knowledge.





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