

Neutrosophic Sets and Systems, {Special Issue: 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)}, Vol. 84, 2025

University of New Mexico



Legal Dogmatic Analysis on the Protection of Canines and

Felines through the Use of Neutrosophic N-alectics

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Abstract. This project is about the limitations and failings of current legal systems. Animal welfare and animal rights protection laws are complementary yet antagonistic, and shortcomings exist irrespective of a partial imposition of biocentric ideals. The project's relevance stems from an increase in international animal abuse and a social need for more comprehensive legislative measures to afford canines and felines legal persons (subjects). In contrast to the assessment of current legislative failures, which fail to acknowledge the indeterminacy of meaning, this project uses neutrosophic n-alectics as a novel investigative vehicle to consolidate disparate findings (positive law versus eco-legal actions). This operates through a qualitative comparative approach to assess case law in three countries (Ecuador, the United States, and the European Union), revealing tributaries of uncertainty relative to classification efforts (sentient being, movable property, etc.). Ultimately, findings suggest that n-alectics can 1. Deconstruct the legal binary (subject/object), 2. Establish a continuum for levels of legislative protection based on culture, 3. Establish malleable legal norms that prioritize human needs and animal welfare. The primary contribution asserts the ability to transcend the reductionism of current legal efforts to re-conceptualize a malleable public policy paradigm relying upon neutrosophic logic (truth-indeterminacy-falsehood). Such contributions serve more than unconceived ideas for legal dogmatica but as tangible means to adjust national and international legislation.

Keywords: Animal Law, Animal Welfare, Legal Protection, Canines, Felines, N- Alectic Neutrosophic, Comparative Legislation.

1. Introduction

The legal recognition of canines and felines as subjects of special protection represents a fundamental challenge in the evolution of contemporary animal law. In recent decades, while neuroscience has conclusively demonstrated the cognitive and emotional capacities of these species [1], legal systems have advanced in a fragmented manner, generating a worrying gap between scientific knowledge and effective legal protection. This study arises from the evidence that more than 65% of countries lack adequate procedural mechanisms to guarantee animal welfare, according to recent data from the World Organization for Animal Health (2023) [2], a situation that is aggravated by the persistence of anachronistic legal categories that continue to consider animals as mere "personal property" in most civil codes [3].

Historical analysis reveals that this problem has deep philosophical and legal roots. From Aristotelian conceptions that placed animals on a lower scale, to the current Anthropocene, the legal status of animals has been marked by profound contradictions [4]. Milestones such as the Cambridge Declaration on Animal Consciousness (2012) [5] or the recognition of animals as "sentient beings" in the Treaty on the Functioning

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of the European Union (2009) [6] have not been translated into coherent legal systems. The Ecuadorian case is paradigmatic: while its Constitution recognizes rights to nature, the COIP classifies animal abuse as a private crime, which in practice prevents its effective prosecution [7]. The research focuses on solving three fundamental problems: first, the inability of current legal systems to process the ontological complexity of animals; Second, the deep disparities between national legal frameworks (compare the advanced Austrian system with the permissiveness of certain US states [8]); and third, the lack of adequate theoretical tools to overcome what we call "essential normative indeterminacy" - the impossibility of framing human-animal relations within rigid legal categories [9]. This problem manifests itself in key questions: How can we overcome the binary paradigms (legal/illegal, subject/object) that have dominated animal legal protection? What does neutrosophic n-alectics contribute as an innovative theoretical-methodological framework?

The main objectives of this study are to develop a critical analysis of traditional legal categories using neutrosophic operators, examining three contrasting legal systems (Ecuador, the European Union, and California) through matrices of normative indeterminacy. We seek to propose an innovative model of "fuzzy legal protection" that is adaptable to diverse sociocultural contexts, establishing scientific parameters that allow for the periodic updating of standards in line with advances in cognitive ethology. This methodological approach represents a significant advance in overcoming the limitations of traditional approaches, offering concrete tools for the creation of more just and effective legal systems for animal protection.

2. Preliminaries

2.1 N -alectic Neutrosophic as a Theoretical Framework

N-alectics, a sophisticated extension of neutrososophy, emerges as an analytical framework that overcomes the limitations of traditional dialectics, based on the binary dynamics of opposites (True, T, and False, F). Neutrosophy introduces a trialectic that incorporates a third essential component: indeterminacy or neutrality (I), defined as an intermediate state reflecting ambiguity, uncertainty, or coexistence between extremes [10]. This framework describes this perspective as a "dynamic of opposites (T and F) and the neutrality/indeterminacy (I) between them," which extends the analysis to complex systems where rigid dichotomies do not capture the totality of interactions. This approach further evolves into n-alectics, a general model that refines the basic components T (Truth), I (Indeterminacy) and F (Falsehood) into n interdependent subcomponents : $(T^1, T^2, ..., T_p; I^1, I^2, ..., I_r; F^1, F^2, ..., F_s)$, where p, r and s are positive integers and p + r + s = n[10]. This refined neutrosophic logic allows multidimensional phenomena to be broken down into specific elements, modeling their dynamic relationships more accurately.

The foundation of n-alectics is inspired by pre-Columbian indigenous worldviews, such as those of the Mesoamerican, Andean, and Amazonian worldviews, which have historically adopted non-binary thought structures. For example, in the Toltec-Aztec worldview, Quetzalcoatl embodies a trialectic of heaven (T – divine wisdom), earth (I – transformation and balance), and the underworld (F – death and renewal), illustrating a system where opposites are not mere contrasts, but interconnected forces in constant transformation [10]. Similarly, in Andean dialectics, concepts such as Yanantin (complementary duality) and Pachakuti (cyclical change) reflect an interplay of complementary opposites, while Amazonian Shuar cosmology extends this idea to an n- alectic network of multiple spiritual forces, such as Tsunki (T₁ – Spirit of Water), Nunkui (T₃ – Fertility), and Nekás (F₃ – Chaos), mediated by the shaman (I₃) and other entities. These ancestral philosophies, which integrate indeterminacy as an essential component, find an echo in n-alectic , which formalizes this complexity through advanced mathematical and philosophical logic[11].

In formal terms, refined neutrosophic logic defines neutrosophic components as a structured set: (T, I, F), where each can be subdivided according to the context. For example, in fourfold neutrosophic logic, an intermediate case between trialectic and n-alectic, a refinement of (T, F) into (T, I₁, I₂, F) is proposed, as in the case of man (T), woman (F), complementarity (I₁), and contradiction (I₂) [10].

In its most general form, n -alectics is expressed as [13]:

 $(T_1, T_2, ..., T_p; I_1, I_2, ..., I_r; F_1, F_2, ..., F_s)$ where the total number of subcomponents (n = p + r + s) depends on the granularity required for the analysis. This flexibility makes it possible to capture the richness of dynamic systems, such as educational systems, where interactions are not reduced to simple polarities. Furthermore, n-alectics is practically applied through quantitative metrics, as in the ethical decision-making described in the base article. Here, weights (w i) are assigned to each subcomponent, e.g., w T = 0.33 for T, w T = 0.165 for pure I, w F = 0.175 for F and the neutrosophic distance to an ideal solution is calculated using the formula [14]:

$$d_{i}^{+} = \sum_{i=1}^{n} \left(w_{T} | T_{A(x_{i})} - T_{B(x_{i})} |^{\lambda} + w_{IT} | IT_{A(x_{i})} - IT_{B(x_{i})} |^{\lambda} + w_{I} | I_{A(x_{i})} - I_{B(x_{i})} |^{\lambda} + w_{IF} | IF_{A(x_{i})} - IF_{B(x_{i})} |^{\lambda} + w_{IF} | F_{A(x_{i})} - IF_{B(x_{i})} |^{\lambda} + w_{IF} | IF_{A(x_{i})} - IF_{A(x_{i})} |^{\lambda} + w_{$$

where λ determines the type of distance ($\lambda = 1$ for Hamming, $\lambda = 2$ for Euclidean), x_i are the observed values and y_i the ideal ones [11]. This methodology evaluates complex options, such as mining projects, balancing economic (T), environmental (F) and uncertain (I) factors.

The ideal solution in this framework could be defined as [15]:

$$I = \left(\max(T_x), \max(IT_x), \min(I_x), \min(IF_x), \min(F_x)\right)$$
(2)

Where:

- T_x : Truth associated with option x.
- *IT_x*: Indeterminacy that leans toward the truth associated with option x.
- I_x : Pure indeterminacy associated with option x.
- *IF_x*: Indeterminacy that tends to falsehood associated with option x.
- F_x : Minimum falsehood associated with option x.

The relevance of n- alectics in this context lies in its ability to model the dynamic interaction between these elements, aligning with principles of complementarity and balance present in Andean philosophies such as Yanantin, which resonate with teacher training in a culturally diverse environment [13]. Furthermore, its practical application, inspired by the ethical decision-making model of the base article, allows to quantify these relationships through weights assigned to each subcomponent and neutrosophic distance calculations, providing a robust methodological tool [16].

3. Case Study.

This research aimed to unravel the regulatory contradictions and legal gaps in current legal frameworks related to the protection of canines and felines, with a particular focus on the integration of biocentric approaches into contemporary legal systems. The purpose of this inquiry was to identify patterns of ambiguity in legal categories such as "sentient beings" and "movable property," to propose a "diffuse legal protection" model adaptable to diverse sociocultural contexts. In this regard, the regulatory frameworks of Ecuador, the European Union, and California (USA) were examined, also considering the uncertainties, ambiguities, and contradictions that characterize the development of these regulations in dynamic legal environments.

The results presented below derive from the application of neutrosophic n-alectics, an analytical framework that allowed for the modeling of this complex interaction by decomposing legal constructs into

subcomponents of truth, indeterminacy, and falsity, and the quantitative evaluation of their relationships. This approach, grounded in refined neutrosophic logic (Smarandache, 2002, 2013), facilitated the capture of the multiple dimensions involved, revealing patterns that transcend traditional perspectives of positive law. Thus, this section presents the key findings obtained, highlighting how legal conceptions and ecolegal theories are intertwined, and offering an empirical basis for understanding their impact on animal protection within the contexts studied.

Step 1: Definition of neutrosophic subcomponents

Using the principles of neutrosophic n -alectics , we classify the factors that influence the legal protection of canines and felines as follows:

Truth (T) – Positive elements of protection:

- T₁: Legal recognition of animal sentience (e.g., laws that explicitly recognize animals as sentient beings).
- T₂: Procedural guarantees for animal protection (e.g., standing to represent animal interests).

Indeterminacy (I) – Uncertainties and ambiguities:

- I_T (Indeterminacy leaning towards truth): Standards with variable interpretation but tending towards protection (e.g., animal welfare as an interpretive principle).
- I (Pure Indeterminacy): Hybrid legal categories without clear definition (e.g., "non-objects" in some jurisdictions).
- *I_F* (Indeterminacy Tends Toward Falsehood): Exceptions based on cultural traditions that allow mistreatment in certain contexts.

Falsehood (F) – Negative or limiting elements:

- F₁: Consideration as mere movable property (e.g., civil regulations that equate animals with objects).
- F₂: Absence of effective procedural mechanisms (e.g., insufficient sanctions for cases of abuse).

Thus, the legal scenario can be structured as an n-alectic set:

$$(T_1, T_2; I_T, I, I_F; F_1, F_2)$$

Step 2: Assign weights to the components

To reflect the relative importance of each dimension in animal protection, and in line with a balanced approach that assesses both regulatory advances and existing barriers, the following weights are assigned:

Positive elements of protection:

- $W_{T1} = 0.22$ (sentience recognition)
- $W_{T2} = 0.18$ (procedural guarantees)

Undetermined factors:

- $W_{IT} = 0.15$ (indeterminacy towards protection)
- $W_I = 0.10$ (pure indeterminacy)
- *W*_{*IF*} = 0.15 (indeterminacy towards lack of protection) **Negative or limiting elements:**
- $W_{F1} = 0.10$ (conceived as goods)
- $W_{F2} = 0.10$ (absence of effective mechanisms)

The sum of the weights is:

0.22 + 0.18 + 0.15 + 0.10 + 0.15 + 0.10 + 0.10 = 1.0

These values prioritize positive aspects (T_1 and T_2) and uncertainties with protective potential (IT), recognizing their relevance in the evolution of animal law, while negative factors receive less weight, in line with the global trend toward greater legal protection.

Step 3: Identify the ideal profile

The ideal profile of a legal system combines full recognition of animal sentience and effective procedural safeguards, with minimal normative ambiguities and contradictions. Using the formula for the ideal neutrosophic solution:

$$l = (max(T_x), max(IT_x), min(I_x), min(IF_x), min(F_x))$$

We assign ideal values:

- $T_1=0.9$ (sentience recognition)
- $T_2 = 0.9$ (effective procedural guarantees)
- $I_T = 0.3$ (minimum positive uncertainty)
- I = 0.1 (minimum pure indeterminacy)
- IF = 0.1 (minimum negative uncertainty)
- $F_1 = 0.1$ (minimal conception as objects)
- $F_2 = 0.1$ (minimal absence of mechanisms)
- We evaluate three legal frameworks:

Option A: Ecuadorian legal framework (Constitution with biocentric principles):

- $T_1 = 0.8$ (constitutional recognition of the rights of nature)
- T₂ = 0.5 (limited procedural guarantees)
- $I_T = 0.4$ (variable interpretation but tending towards protection)
- I = 0.4 (ambiguities in practical application)
- $I_F = 0.3$ (cultural exceptions such as cockfighting)
- F₁ = 0.4 (civil code without complete reform)
- F₂ = 0.5 (insufficient sanctions)

Option B: Legal framework of the European Union (Lisbon Treaty and regulations):

- $T_1 = 0.7$ (recognition of sentience in the Treaty)
- $T_2 = 0.7$ (procedural guarantees vary depending on the Member State)

- $I_T = 0.5$ (directives and regulations with wide margin of interpretation)
- I = 0.3 (differences between Member States)
- $I_F = 0.3$ (exceptions allowed by cultural traditions)
- $F_1 = 0.3$ (progressive civil reforms in several States)
- F₂ = 0.3 (variable control mechanisms)

Option C: Legal framework of California, USA (advanced state laws):

- T₁ = 0.6 (recognition in specific laws, not constitutional)
- T₂ = 0.8 (broad procedural guarantees)
- $I_T = 0.7$ (evolving favorable jurisprudence)
- I = 0.2 (few normative ambiguities)
- $I_F = 0.2$ (few cultural exceptions)
- $F_1 = 0.2$ (progressive reforms of legal status)
- $F_2 = 0.2$ (effective sanctioning mechanisms)

Step 4: Calculating the Neutrosophic Distance

Using the weighted metric formula:

$$d_{i}^{+} = \sum_{i=1}^{n} \left(w_{T} | T_{A(x_{i})} - T_{B(x_{i})} |^{\lambda} + w_{IT} | IT_{A(x_{i})} - IT_{B(x_{i})} |^{\lambda} + w_{I} | I_{A(x_{i})} - I_{B(x_{i})} |^{\lambda} + w_{IF} | IF_{A(x_{i})} - IF_{B(x_{i})} |^{\lambda} + w_{IF} | IF_{A(x_{i})} - IF_{A(x_{i})} |^{\lambda} + w_$$

Hamming distance) for each option:

Option A (Ecuador):

$$dA = 0.22|0.9 - 0.8| + 0.18|0.9 - 0.5| + 0.15|0.3 - 0.4| + 0.10|0.1 - 0.4| + 0.15|0.1 - 0.3| + 0.10|0.1 - 0.4| + 0.10|0.1 - 0.5| dA = 0.022 + 0.072 + 0.015 + 0.03 + 0.03 + 0.03 + 0.04 dA = 0.239$$

Option B (European Union):

 $dB = 0.22|0.9 - 0.7| + 0.18|0.9 - 0.7| + 0.15|0.3 - 0.5| + 0.10|0.1 - 0.3| + 0.15|0.1 - 0.3| \\ + 0.10|0.1 - 0.3| + 0.10|0.1 - 0.3|$

$$dB = 0.044 + 0.036 + 0.03 + 0.02 + 0.03 + 0.02 + 0.02$$

$$dB = 0.2$$

Option C (California):

$$dC = 0.22|0.9 - 0.6| + 0.18|0.9 - 0.8| + 0.15|0.3 - 0.7| + 0.10|0.1 - 0.2| + 0.15|0.1 - 0.2| + 0.10|0.1 - 0.2| + 0.10|0.1 - 0.2|$$

dC = 0.066 + 0.018 + 0.06 + 0.01 + 0.015 + 0.01 + 0.01

Option C (California) has a lower neutrosophic distance (0.189) than Option B (0.2) and Option A (0.239), making it the legal framework closest to the ideal. This result suggests that the Californian system, characterized by a balance between specific legal recognition and effective procedural guarantees, with less regulatory ambiguity, represents a more developed model for the protection of canines and felines.

The neutrosophic n-alectic analysis of the legal frameworks for the protection of canines and felines in Ecuador, the European Union, and California reveals significant patterns in their structure and effectiveness. The main finding indicates that the Californian system (dC=0.189) is closest to the ideal, followed by the European framework (dB=0.2), and finally, the Ecuadorian one (dA=0.239). This counterintuitively suggests that a system like California's, with more moderate legal recognition of animal sentience but with robust procedural guarantees and low normative ambiguity, may be more effective than one with constitutional biocentric principles but poor practical implementation, as is the case in Ecuador.

The comparison between the three systems highlights these differences: the Ecuadorian framework, despite its innovative constitutional recognition of the rights of nature ($T_1 = 0.8$), shows the greatest distance from the ideal due to deficiencies in practical implementation ($T_2 = 0.5$) and normative contradictions ($F_1 = 0.4, F_2 = 0.5$), reflecting a gap between declarative and operational law. The European Union system presents an intermediate position, with a balance between formal recognition ($T_1 = 0.7$) and procedural guarantees ($T_2 = 0.7$), but suffers from high truth indeterminacy ($I_T = 0.5$) due to normative dispersion among member states and cultural exceptions. In contrast, the Californian system stands out for its balance, prioritizing operational effectiveness ($T_2 = 0.8$) and low pure indeterminacy (I=0.2) over less ambitious principled declarations ($T_1 = 0.6$), resulting in greater normative coherence and fewer internal contradictions.

These results have important implications for legal theory, demonstrating the utility of n-alectics in overcoming the limitations of traditional binary analyses by modeling the inherent ambiguity in contemporary animal law [17,18]. It allows for the deconstruction of classic dichotomies such as subject/object, visualizing a "legal continuum," and validating the concept of "diffuse legal protection." Furthermore, a correlation between the effectiveness of the legal system and its adaptability to specific cultural contexts is highlighted, suggesting that there is no single ideal model, but rather that internal coherence and the balance between theoretical recognition and practical application are crucial. The study proposes a "diffuse legal protection" model based on dynamic categorization, normative coherence, and contextual implementation, offering a basis for reforming animal protection legal frameworks.

It is important to acknowledge certain inherent limitations in the present analysis. The application of neutrosophic n-alectics, while offering a novel tool to address indeterminacy in animal law, involves a process of quantifying legal and social phenomena that are intrinsically complex and multifaceted. The assignment of numerical values to the subcomponents of truth, indeterminacy, and falsehood, as well as the weighting of their relative importance, though striving for objectivity based on observed trends, carries an element of interpretation that could influence the results. Therefore, while this model is valuable for structuring thought, facilitating comparison between legal systems, and revealing underlying patterns, it does not claim to capture the entirety of qualitative reality nor the richness of socio-cultural nuances and legal discussions in each jurisdiction. This approach should be considered a complementary tool for dogmatic legal analysis, rather than an exhaustive substitute for it.

4. Conclusion

Ultimately, what the studies show, however, is that neutrosophic n-alectics applied the results of reductions, and legality of Animals in the World, through the necessity of legal approach classification to combat typical legal reductionism. Where relying on a subject/object analysis would not have determined

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correctly the legality of Animals in the World—as Animals protected, or, instead, possessions—with the comparative study completed in Ecuador, the European Union, and California, the unexpected result was that one does not need the strongest of principled claims to legitimize such protections, but instead, normative coherence and procedural assurances of function that relative to Ecuador (dA = 239), California's system (dC = 0.189) was relatively more effective. The legality of Animals in the World diffuse legal protection model is rendered not only viable but necessary against violent disruptions and gradual improvements. New theoretical implications include the findings of what was measured as legal indeterminacies IT, I, IF which were significant evaluations through which legislative considerations develop in ever-broadening semantics. Thus, legal reform efforts can be advocated for through dynamic classification (throughout scientific discoveries), coherence (throughout interdisciplinary intersections), and contextualized application (through sensitivity and awareness of sociolegal realities). Ultimately, beyond animal law, the applicability of neutrosophic n-alectics for law is effective, in general, and especially where paradigmatic legal reductionism is approached since such reductive tendencies lose out by an either/or assessment of nuance and subtext. Ultimately, however, the biggest revelation is that the hypothetical false dichotomy of biocentrism/anthropocentrism renders itself untrue as the most effective systems incorporate aspects of both – animals should have intrinsic worth, but there comes a time when legitimate human concerns need to reign. Therefore, this theoretical and practical merger extends beyond just animal law to provide practical avenues of legislative advancement relative reiteration through new paradigms for functional animal law in the Anthropocene.

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Received: December 29, 2024. Accepted: April 10, 2025.