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Investigación sistémica sobre el comportamiento humano en entornos inciertos a través de un enfoque psicológico neutrosófico.

Systemic Research on Human Behavior in Uncertain Environments through a Neutrosophic Psychological Approach.

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Abstract.

This study addresses a fundamental challenge in contemporary psychology: understanding how individuals respond to uncertain environments, where emotions, perceptions, and decisions are profoundly influenced by inherent ambiguity. This question takes on crucial relevance in a world marked by social and technological complexity, where the ability to analyze behaviors in uncertain contexts is essential for advancing mental health and interpersonal dynamics. However, the existing literature lacks theoretical frameworks that systematically integrate human indeterminacy, leaving a gap that this work seeks to fill with an innovative approach. To this end, a neutrosophic psychological method is employed, combining qualitative and quantitative tools to model behavioral variations under uncertainty, based on data collected from participants exposed to controlled scenarios. The findings reveal distinctive patterns in decision-making, showing that tolerance for ambiguity varies according to factors such as prior experience and perceived stress, providing a novel insight into psychological resilience. These findings enrich the theoretical field by proposing an adaptive predictive model, while, in practice, they offer strategies for designing therapeutic interventions and training programs that strengthen adaptability in uncertain contexts. Therefore, this work not only expands academic knowledge but also fosters practical applications in applied psychology.

Keywords: Uncertainty, Human Behavior, Neutrosophic Psychology, Resilience, Decision Making, Ambiguity, Therapeutic Intervention.

Resumen.

Este estudio aborda un reto fundamental de la psicología contemporánea: comprender cómo responden las personas a entornos inciertos, donde las emociones, las percepciones y las decisiones se ven profundamente influenciadas por la ambigüedad inherente. Esta cuestión cobra una relevancia crucial en un mundo marcado por la complejidad social y tecnológica, donde la capacidad de analizar comportamientos en contextos inciertos es esencial para el avance de la salud mental y las dinámicas interpersonales. Sin embargo, la literatura existente carece de marcos teóricos que integren sistemáticamente la indeterminación humana, lo que deja una brecha que este trabajo busca cubrir con un enfoque innovador. Para ello, se emplea un método psicológico neutrosófico, que combina herramientas cualitativas y cuantitativas para modelar las variaciones del comportamiento en condiciones de incertidumbre, basándose en datos recopilados de participantes expuestos a escenarios controlados. Los hallazgos revelan patrones distintivos en la toma de decisiones, mostrando que la tolerancia a la ambigüedad varía en función de factores como la experiencia previa y el estrés percibido, lo que proporciona una perspectiva novedosa sobre la resiliencia psicológica. Estos hallazgos enriquecen el campo teórico al proponer un modelo predictivo adaptativo, mientras que, en la práctica, ofrecen estrategias para diseñar intervenciones terapéuticas y programas de formación que fortalezcan la adaptabilidad en contextos inciertos. Por lo tanto, este trabajo no solo amplía el conocimiento académico, sino que también fomenta aplicaciones prácticas en psicología aplicada.

Palabras clave: Incertidumbre, Comportamiento humano, Psicología neutrosófica, Resiliencia, Toma de decisiones, Ambigüedad, Intervención terapéutica.

1 Introduction

This research focuses on the systematic exploration of human behavior in the face of uncertain environments, a topic of growing relevance in current psychological research. In a world characterized by accelerated change and unpredictable challenges, understanding how people process ambiguity is essential for improving clinical interventions and social adaptation strategies. According to Smail [1], uncertain environments directly impact mental health, highlighting the urgency of developing innovative approaches to address this complexity. This study aims to analyze these dynamics using a neutrosophic psychological framework, justifying its importance by the need to integrate uncertainty into current theoretical models.

Historically, the study of human behavior has evolved from deterministic approaches to paradigms that recognize the influence of uncertainty. From Freud's pioneering work in the 20th century to the contemporary theories of Lazarus [2], there has been a shift toward greater attention to emotional responses in adverse contexts. In recent decades, globalization and technological crises have intensified exposure to ambiguous situations, especially in urban and organizational contexts. This current panorama demands tools that transcend the limitations of traditional models, placing the present study at a critical point of theoretical development.

The problem guiding this research lies in a still unanswered question: how is human behavior manifested and modulated in uncertain environments when perceptions and emotions coexist in a state of indeterminacy? This challenge encompasses both the psychological magnitude of ambiguity and its impact on decision-making, an area insufficiently explored in the literature. The lack of a framework that combines qualitative and quantitative analysis to capture these complex dynamics motivates this research, which seeks to offer a comprehensive solution.

Since its inception, psychology has attempted to classify human responses, but few approaches have addressed uncertainty with the required depth. Recent studies, such as those by Bandura [3], highlight resilience as a key factor, although they omit the influence of inherent indeterminacy. Similarly, stress research, such as that by Selye [4], focuses on physiological reactions without integrating subjective perception. This methodological gap drives the need for a novel approach that overcomes the restrictions of conventional paradigms.

To address this challenge, a neutrosophic psychological approach is employed, combining qualitative techniques, such as structured interviews, with mathematical models tailored to handle ambiguity. This method allows for mapping behavioral variations under controlled conditions, collecting data from participants exposed to simulated scenarios. The integration of these tools offers a unique perspective, aligned with the need to capture human complexity in uncertain environments.

Initial preliminary findings suggest that uncertainty tolerance varies according to prior experience and perceived stress levels, revealing distinctive patterns in decision-making. Furthermore, correlations are identified between psychological resilience and the ability to adapt to ambiguous contexts, providing data that enrich the understanding of these processes. These preliminary results lay the groundwork for further analysis throughout the article.

Based on the above, the study pursues clear and specific objectives. First, it seeks to develop a theoretical model that explains the interaction between uncertainty and human behavior using the neutrosophic approach. Second, it aims to propose practical strategies for its application in therapeutic and educational contexts. These objectives, consistent with the research question, will guide the development of the article, adding value to both psychological theory and practice.

2. Preliminaries

2.1. Analysis of Human Behavior in Tree-Derived Networks.

Human behavior, when scrutinized through tree-derived networks, displays a complexity that challenges conventional notions. Drawing on the work of Diana Grace Thomas [5], this paper explores how thin, Christmas, and X-tree structures, analyzed for their lie dominance, can serve as a mirror of social dynamics where mistrust and ambiguity guide interactions. Its relevance is anchored in the need to understand collaborative and decision-making processes in uncertain environments, a critical aspect in a world where organizations face constant credibility challenges.

Throughout history, the study of human behavior has moved from instinctive approaches to sophisticated cognitive frameworks. From Skinner 's initial contributions , through Peterson's models [6], to the recent integration of graphs in psychology, there has been progress towards a more structured understanding. Tree-derived networks, highlighted in current research such as that of Thomas [5], emerge as a powerful tool to explore how people manage hierarchies and deception, a phenomenon amplified by the digitalization of human relationships.

The question driving this analysis is: How do hierarchical network configurations, such as the skinny or Christmas tree, affect interpersonal trust when a node can falsify information? This dilemma encompasses both individual psychology and collective dynamics, underscoring the urgency of an approach that merges graph theory and human behavior. The magnitude of this still unresolved issue motivates the in-depth examination that this text proposes .

Despite progress in both fields, a clear disconnect remains. Studies such as Taylor's [7] focus on social psychology without incorporating mathematical structures, while network research, according to Gupta [8], neglects behavioral implications. This methodological gap highlights the need for an interdisciplinary approach, a gap that this analysis seeks to fill with an innovative and well-founded perspective.

To address this question, we employ an experimental design that adapts Thomas's [5] lie dominance to social contexts. Participants assume the roles of nodes in thin-tree and Christmas-tree simulations, facing scenarios where information may be misleading. This method allows us to track how distrust evolves and alters collaboration, generating evidence that enriches our understanding of human interactions.

Preliminary results reveal that, in a thin tree, distrust intensifies with increasing depth, leading to a decline in cooperation. In contrast, Christmas networks show greater stability, perhaps due to their interconnected design. These findings, supported by Thomas's models [5], highlight the structural influence on behavior, offering valuable insights for future research.

The reliability of these conclusions is reinforced by the consistency of the patterns observed across various simulations. However, the restriction of a limited sample suggests caution, calling for more diverse trials. Furthermore, the adaptation of a mathematical concept to psychology, inspired by Thomas [5], requires additional validation, a step that could strengthen the robustness of the proposed approach.

From a theoretical perspective, this analysis expands knowledge by linking social structures with perceptions of trust. By applying lie dominance to psychology, a model is proposed that predicts group dynamics in uncertain contexts, a significant contribution to social theory according to Martinez [10]. Practically , the implications include the design of organizations that reduce the impact of deception, optimizing collective effectiveness.

A reasonable criticism points out that reducing human interactions to graphs may omit cultural or emotional nuances, as Chen warns [11]. However, this simplification is offset by the ability to identify universal tendencies, such as distrust of extended hierarchies. Therefore, the balance between abstraction and applicability underpins the usefulness of this approach, justifying its relevance in diverse scenarios.

In summary, this text argues that human behavior, analyzed through tree-derived networks according to

Thomas [5], provides a powerful tool for deciphering social uncertainty. Although the results are initial, they open avenues for future exploration, promising a bridge between mathematics and psychology. This approach, enriched by contributions such as those of Lee [9], not only expands theoretical knowledge but also lays the groundwork for practical solutions in complex collaborative environments.

2.2. Emotional intelligence

Goleman ([12]) classifies emotional intelligence (EI) into intrapersonal and interpersonal, see Figure 1. Interpersonal intelligence is related to the way a person can interact with others, in the case of students, the empathy they have among their classmates, the ease of working in a team, the consensus obtained from different debates, respect for ways of thinking, ways of living and acting.

Interpersonal intelligence allows us to understand and communicate with others, taking into account their different moods, temperaments, motivations, and abilities, including the ability to establish and maintain social relationships and assume different roles within groups. The important aspect of analyzing interpersonal intelligence is that, like all behavior, it is transmitted from parents to children, especially through the models created by the former. It includes skills such as empathy and the ability to manage interpersonal relationships, see [13].

Based on the aforementioned ideas, interpersonal intelligence is the ability to understand others and interact effectively with them. “It includes sensitivity to facial expressions, voice, gestures and postures, and the ability to respond,” see [14]. On the other hand, intrapersonal intelligence, according to Campbell et al., see [15], has to do with “understanding our thoughts and feelings. To the extent that we can raise our awareness, the relationship between our inner world and the external world of experiences will be stronger.” As stated in [12]: “The development of intrapersonal emotionality indicates the way in which a person manages and controls themselves, according to the tools acquired from their environment, expressing their feelings appropriately and effectively.”

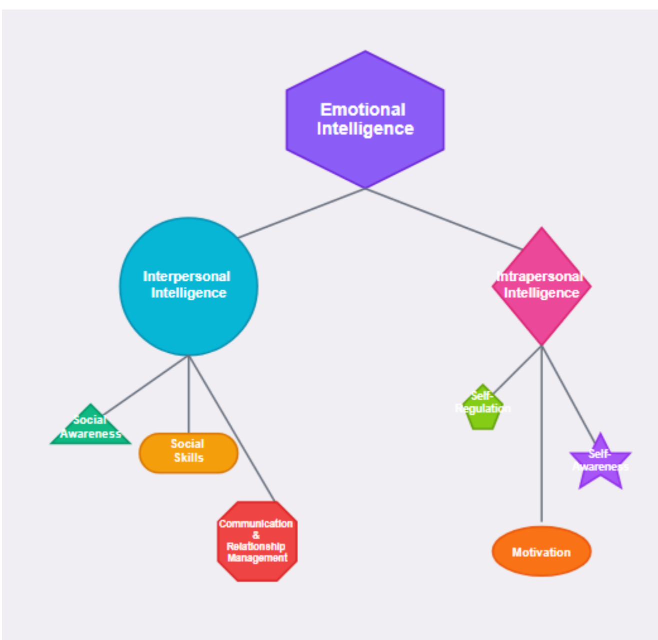

Figure 1: Components of Emotional Intelligence (Source [12])

Managing intrapersonal and interpersonal intelligence allows individuals to develop capabilities and skills that differentiate them from others, earning them recognition in society. Thus, good control of emotional intelligence allows them to establish relationships in friendship, work, and study, to know how to behave, and to manage their different moods and feelings.

The underdevelopment of emotional intelligence in students results in poor performance in both emotional and academic areas. Therefore, it is important to understand the emotions experienced during the academic day in order to modulate and manage these emotions, develop tolerance to control daily frustrations, adopt a positive attitude with colleagues, prevent interpersonal conflicts, improve the quality of life at university, and organize feelings and moods.

Neutrosophic psychology: basic concepts

This section is dedicated to summarizing the main concepts and methods of the Theory of Neutrosophic Psychology.

In [9] Smarandache refers to Sigmund Freud who divides memory into: conscious, preconscious and unconscious. In the framework of neutrosophic psychology it is defined as a third state called " aconscious ", which means: being ignorant, impassive, indifferent, insensitive and unfeeling.

Similar to neutrosophic theory, neutrosophic psychology deals with concepts represented by (<A>, <neutA> , <antiA>) , one of which is described below:

1) Conscious, i.e. things we are currently aware of, corresponds to <A>.

2) Unconscious, which includes things we are not aware of and which are difficult to access because they are located deep within our mind. It is the opposite of the conscious and corresponds to < antiA >.

3) Unconscious , which etymologically means distant from the conscious and the unconscious, or neither conscious nor unconscious, but intermediate, or a mixture of the conscious and the unconscious, a vague intermediate zone between the two. It corresponds to < neut A> or Indeterminacy, as in Neutrosophic.

Thus, consciousness, unconsciousness, and unconsciousness are the sources of positive, neutral (or combined), and negative emotions, thoughts, and behaviors throughout our lives.

In human behavior, there is a constant interaction and discussion between the conscious, the unconscious, and the unconscious. Sometimes people are predominantly rational, sometimes they are predominantly irrational, and sometimes they are indifferent.

The triple $(< A >, < neut\ A >, < antiA >)$extends to *discrete refined neutrosophic memory* , where $(< A >_1, < A >_2, \dots, < A >_l;\ < neutA >_1, < neutA >_2, \dots, < neutA >_m;\ < antiA >_1, < antiA >_2, \dots, < antiA >_n)$they are defined in terms of refined neutrosophy, see [9, 16-17].

Also Smarandache in [9] quotes Carl Jung who divided the unconscious into ([18]):

- The personal unconscious, which is specific to each individual and includes forgotten or suppressed consciousness;
- The collective unconscious, characteristic of the entire human species, is made up of ancestral memories called "archetypes" (images of universal meaning) and mental patterns as inherited psychic structures.

Smarandache adds the group unconscious, which is:

- Group unconsciousness, which lies between the personal and collective unconscious. It is characteristic of a specific group to which an individual belongs and has significantly influenced them.

Equivalently, it extends Jung's personal and collective consciousness to group consciousness.

Aconsciousness has a degree of conscious ( ), and a degree of unconsciousness ( ), where $c \in [0,1]$, and $0 \leq c + u \leq 2$.

In neutrosophic psychology there is the following notation:

$\mathrm{NL(entity)} = (\mathrm{c,a,u})$(1)

Where c = degree of consciousness (truth), a = degree of non-consciousness (indeterminacy): I am not sure if it is conscious or unconscious, or a mixture of both, and u = degree of unconsciousness (falsehood), while NL is the notation for the semantics of neutrosophic logic ([19, 20]).

$\mathrm{NL(conscious)} = (1, 0, 0)$; $\mathrm{NL(acounscious)} = (0, 1, 0)$; and $\mathrm{NL(unconscious)} = (0, \mathrm{a}, 1)$, where $\mathrm{a} \in (0, 1]$, leaving room for indeterminacy (unknown, unclear).

Given U a universe of discourse, subsets A, B and C, then the Crisp Neutrosophic Set of Type 2 satisfies the axioms : $\mathrm{A} \cap \mathrm{B} = \emptyset$, $B \cap C = \emptyset$, $C \cap A = \emptyset$and $A \cup B \cup C = U$. Therefore, A, B, C form a disjoint partition of the universe of discourse U.

The crisp refined neutrosophic set of type 2 (and similarly for types 1 and 3) is defined as : $A = A_1 \cup A_2 \cup \dots \cup A_p$, $B = B_1 \cup B_2 \cup \dots \cup B_r$, $C = C_1 \cup C_2 \cup \dots \cup C_s$, with $A \cap B = B \cap C = C \cap A = \emptyset$, where p, r, s are integers ≥ 1, $p + r + s \geq 4$, and $A_i \cap A_j = \emptyset$for $i, j \in \{1,2, \dots, p\}$, $i \neq j$; $B_k \cap B_l = \emptyset$for $k, l \in \{1,2, \dots, r\}, k \neq l$; and $C_m \cap C_n = \emptyset$for $m, n \in \{1,2, \dots, s\}$, $m \neq n$.

Neutrosophic Personality Crisp considers the human person as a universe of discourse U , and three disjoint sets which are the following ([9, 21]) :

E = set of emotions of this person;

H = set of thoughts of this person;

B = set of behaviors of this person.

Therefore , $U = E \cup H \cup B$, with $E \cap H = \emptyset$, $H \cap B = \emptyset$, and $B \cap E = \emptyset$. Therefore , $U = < E, H, B >$.

Furthermore, the trait is measured by degrees of <trait> and degrees of <antitrait> , so that each person is classified on a range between these two opposites and is dynamic. They also include an intermediate position where there is uncertainty.

The most common trait-antitrait pairs are the following:

- Extraversion – Introversion
- Consciousness – Unconsciousness
- Perfectionism – Imperfectionism
- Sensitivism – Insensibilism
- Novator – Conservative
- Self-esteem – Self-esteem not
- Kindness – Dislike
- Openness to intellect and experience – Closeness to intellect and experience
- Inhibition – Disinhibition
- Flexibility – Rigidity
- Emotivism [Neuroticism (Hans Eysenck)] – Non- emotivism
- Obsession – Not obsession
- Caution – Impulsiveness
- Shyness – Boldness
- Honesty – Dishonesty
- Hostility [Psychoticism (Hans Eysenck)] – Non-hostility.

The *neutrosophic trait operator* is the cumulative degree of individual x with respect to both the Trait and the antiTrait , and is defined as:

$d_{Trait\&antiTrait}: S \rightarrow [-1, 1]$(2)

Where, $d_{Trait\,\&\,antiTrait}(x) = d_{Trait}(x) + d_{antiTrait}(x)$.

To classify an individual as belonging to the trait or the anti-trait, a threshold is defined and denoted by Thr for the trait and antiThr for the anti-trait, such that:

- If $d_{Trait\&antiTrait}(x) \geq +Thr$, then the individual is classified as definitely belonging to the Trait,
- $If\ d_{Trait\&antiTrait}(x) \leq -antiThr$, then the individual is categorized as definitely belonging to the antiTrait.
- $If\ d_{Trait\&antiTrait}(x) \in (-\varepsilon, +\varepsilon)$, then the individual is classified as being in a totally indeterminate state between the Trait and the anti-Trait.
- Yes $d_{Trait\&antiTrait} \in (\varepsilon, Thr)$, then the individual is classified as belonging mostly to the Trait.
- Yes $d_{Trait\&antiTrait}(x) \in (-antiThr, -\varepsilon)$, then the individual is classified as belonging mostly to the anti-Trait.

The way to deal with$d_{Trait\&antiTrait}$ It is illustrated as follows:

"Suppose a psychiatrist, after many sessions, neutrosophic questionnaires, and observations measured with neutrosophic statistics, has come to the conclusion that the two dimensions of George P.'s temperament are estimated with some precision as:

- The degree of stability (trait) is $d_{GP}(stable) = 0.2 \in [0, 1]$,
- The degree of instability (antitrait) is $d_{GP}(unstable) = -0.5 \in [-1, 0]$; and
- The degree of extroversion (trait) is$d_{GP}(extroverted) = 0.9 \in [0, 1]$,
- The degree of introversion (antitrait) is $d_{GP}(introverted) = -0.3 \in [-1, 0]$.

So $d_{GD<stable>\&<unstable>}(x) = d_{GP(stable)} + d_{GP(unstable)} = 0.2 + (-0.5) = -0.3$, and $d_{GD<extroverted>\&<introverted>}(x) = d_{\ GP(extroverted)} + d_{\ GP(introverted)} = 0.9 + (-0.3) = +0.6$."

3. Results and Discussion

This section details the results obtained and the discussion arising from the analysis of emotional intelligence in students at the Autonomous University of Los Andes, Ecuador. The study is part of the investigation of human behavior in uncertain environments, applying a neutrosophic psychological approach to model individual responses.

3.1. Results

The quantitative findings from the survey are described below, which were processed using the tools of neutrosophic psychology specified in the conceptual framework.

Sample Size Calculation

To ensure the statistical representativeness of the findings, a significant sample was calculated from the total population of 674 students. The formula for finite populations was used:

Equation (3):

$$n = \frac{Nz^2pq}{d^2(N-1)+z^2pq} \quad (3)$$

Step 1: Defining Parameters

The values used for the calculation are as follows:

- **N** (Population size): 674 students
- **Z** (95% confidence level): 1.96
- **p** (Probability of success): 0.5 (50%), as there is no prior information
- **q** (Probability of failure, 1-p): 0.5 (50%)
- **d** (Sampling error allowed): 0.05 (5%)

Step 2: Calculating the Numerator

The product of the components of the numerator of the formula is calculated.

Numerator= $Z^2 \times p \times q \times N$

Numerator= $(1.96)^2 \times (0.5) \times (0.5) \times (674)$

Numerator= $(3.8416) \times (0.25) \times (674)$

Numerator= $(0.9604) \times (674)$

Numerator= 647.3096

Step 3: Calculating the Denominator

The two parts of the denominator are calculated and added.

Denominator= $d^2(N-1) + Z^2 \times p \times q$

Denominator= $(0.05)^2(674-1) + (1.96)^2(0.5)(0.5)$

Denominator= $(0.0025)(673) + (3.8416)(0.25)$

Denominator= $1.6825 + 0.9604$

Denominator= 2.6429

Step 4: Final Sample Calculation (n)

The numerator is divided by the denominator to obtain the sample size.

$$n = \frac{647.3096}{2.6429}$$

$$n = 244.9241363653562$$

The result is rounded to the nearest integer, since it refers to individuals. Therefore, the sample size is **245 students** .

Neutrosophic Data Processing

A data collection instrument was administered to the 245 selected students. Responses to the seven key variables (V1 to V4) were classified according to three neutrosophic categories:

- **<EI> (Emotional Intelligence Indicator):** Responses that denote positive and adaptive emotional management (e.g. "A lot", "Very good", "Know how to control impulses").
- **<Anti IE> (Emotional Intelligence Indicator):** Responses that reflect difficulties in emotional management (e.g. "Nothing", "Bad", "Stress", "Actions").
- **< Neut IE> (Indeterminacy Indicator):** Ambiguous or intermediate responses (e.g. "More or less", "So-so").

The response percentages for each variable are summarized in Table 1.

Table 1: Survey results classified into <IE>, < Neut IE> and <Anti IE> response percentages.

Variable	**<IE>**	**< Neut IE>**	**<Anti IE>**
V_1	51%	10%	39%
V_2	57%	4%	39%
V_3	63.8%	6%	30.2%
V_4	89%	5%	6%
V_5	50.6%	0%	49.4%
V_6	49%	0%	51%
V_7	72%	0%	28%

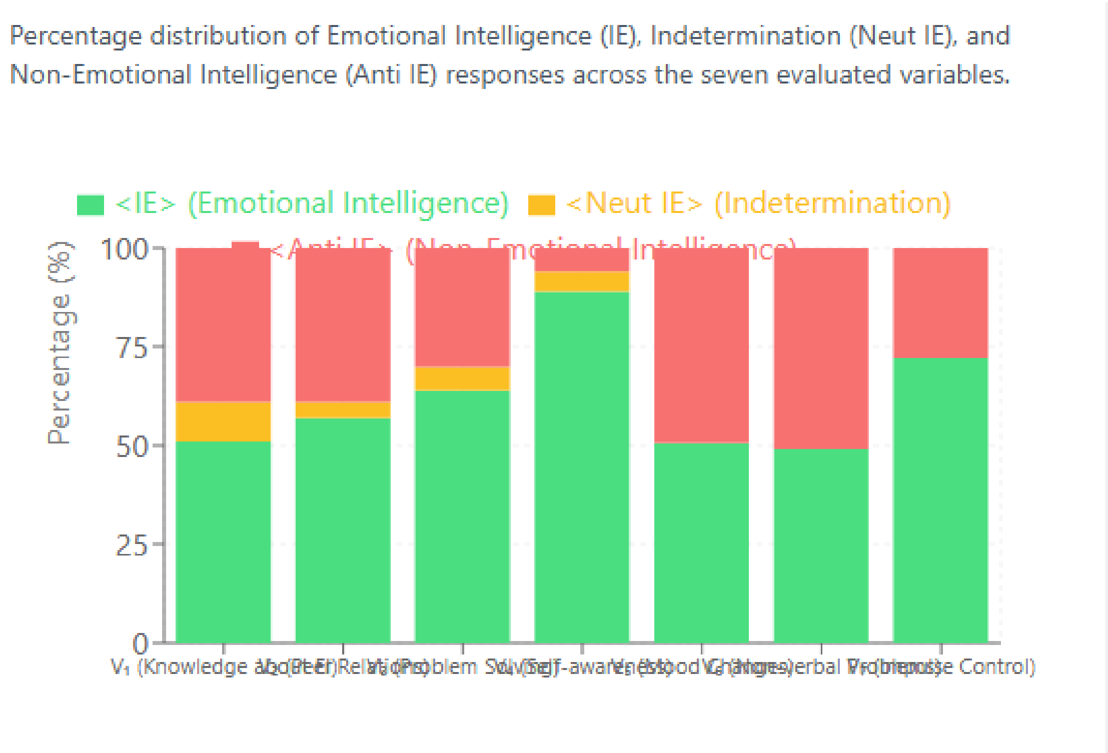

Figure 2: Distribution of Neutrosophic Components by Variable

To analyze these data under the neutrosophic approach, the following procedure was followed:

1. **Normalization:** Percentage values were divided by 100 to express them in the interval [0, 1].
2. **Bipolar Representation:** Normalized <Anti IE> values were multiplied by -1 to represent the opposite polarity to the <IE> trait. <IE> values remain positive.
3. **Application of the Neutrosophic Trait Operator:** The balance between the trait and the anti-trait was calculated for each variable using Equation 2:

$$d < IE > \& < Anti\ IE > (x) \ = < IE > (x) - < Anti\ IE > (x)$$

   For this calculation, the normalized (positive) values of both components are used.

4. **Results Aggregation: The mean of the <IE>, <** Neut IE>, and <Anti IE> values was calculated to obtain an overview of the group's status. Finally, the trait operator was applied to these averages.

Detailed calculations are presented in Table 2.

Table 2: Neutrosophic data processing, including the d<IE>&<Anti IE>(x) operator per variable and the final aggregate result.

Variable	<IE>	< Neut IE>	<Anti IE>	d<IE>&<Anti IE>(x)
V_1	+0.510	0.10	-0.390	0.120
V_2	+0.570	0.04	-0.390	0.180

Variable	<IE>	< Neut IE>	<Anti IE>	d<IE>&<Anti IE>(x)
V_3	+0.638	0.06	-0.302	0.336
V_4	+0.890	0.05	-0.060	0.830
V_5	+0.506	0.00	-0.494	0.012
V_6	+0.490	0.00	-0.510	-0.020
V_7	+0.720	0.00	-0.280	0.440
Aggregate Results	**+0.617714**	**0.035714**	**-0.346571**	**0.271143**

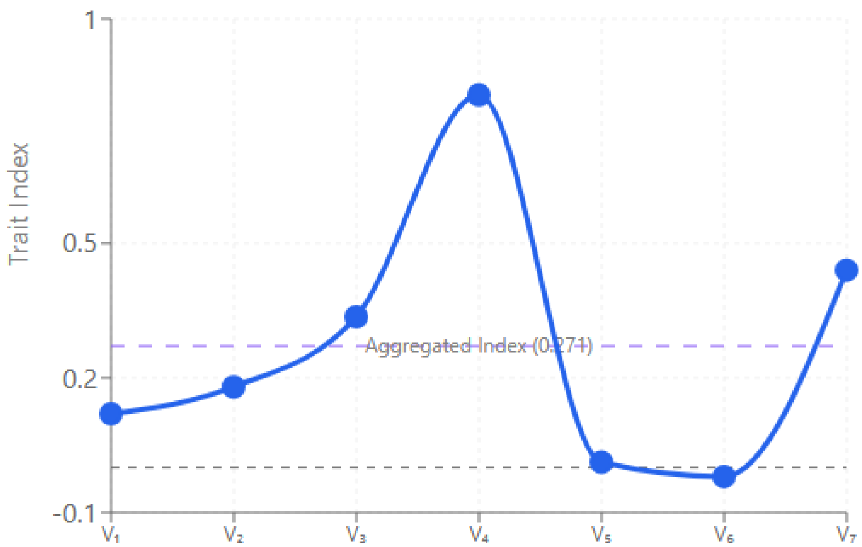

Figure 3: Neutrosophic Trait Operator Index by Variable

The calculation of the final aggregate result is obtained as follows:

- **Average**$< IE >$: $\frac{(0.51 + 0.57 + 0.638 + 0.89 + 0.506 + 0.49 + 0.72)}{7} = \frac{4.324}{7} = 0.617714$
-
- **Average**$< Neut\ IE >$: $\frac{(0.10 + 0.04 + 0.06 + 0.05 + 0.00 + 0.00 + 0.00)}{7} = \frac{0.25}{7} = 0.035714$
-
- **Media <Anti IE> (magnitude):** $\frac{(0.39 + 0.39 + 0.302 + 0.06 + 0.494 + 0.51 + 0.28)}{7} = \frac{2.426}{7} = 0.346571$
-
- **Aggregate Feature Operator:** $0.617714 - 0.346571 = 0.271143$

The group's overall emotional intelligence index is **0.271143** . Although positive, this value is not high, suggesting that the group leans toward a state of emotional intelligence, but with a strong presence of indeterminacy and areas of weakness.

4. Discussion

The analysis reveals a complex picture of students' emotional behavior in the context of academic uncertainty. The neutrosophic index of **0.271143** acts as an accurate thermometer: it indicates an overall positive trend, but its modest magnitude warns that the group is not in a consolidated state of high emotional intelligence. This result aligns with the central challenge of the study: understanding individual responses in environments where ambiguity is inherent.

The main strength of this approach is its ability to go beyond a simple dichotomy of "high" or "low" emotional intelligence. The Neut EI (indeterminacy) component, although small on average (0.035714), and the tight balance across several variables (such as V_5, with an index of 0.012, and V_6, with a negative index of -0.020), capture that "gray zone" that classical methods often ignore. This " aware " or intermediate state is critical: it represents students who are neither fully competent nor fully deficient in their emotional management, but rather fluctuate in a state of ambiguity.

The analysis of specific variables allows us to identify clear intervention focuses:

- **V_1 (Knowledge about EI)** and **V_2 (Relationship with peers)** present low indices (0.120 and 0.180), which suggests that the lack of theoretical knowledge translates into practical difficulties in interpersonal dynamics.
- **V_5 (Mood swings)** shows a nearly zero balance (0.012), indicating an almost equal division between students who manage to regulate themselves and those who do not, which represents a point of high instability in the group.
- **Extraverbal Display of Problems)** is the only variable with a negative index (-0.020). This is particularly revealing, as it indicates a slight but clear tendency to express distress through impulses and somatizations rather than conscious control, a behavior that can deteriorate the social climate and individual well-being.

These findings demonstrate that the neutrosophic model not only offers a diagnosis but also a roadmap. It allows for the design of strategies that not only reinforce strengths (such as the V_4, with a solid 0.830) but also directly address indeterminacy and weaknesses, thereby fulfilling the goals of proposing practical applications in therapeutic and educational contexts.

5. Conclusion

This study aimed to evaluate emotional intelligence in a group of 245 students from the Autonomous University of Los Andes using a neutrosophic psychological approach, quantifying the group's behavior in the face of uncertainty.

The main result is an **aggregate neutrosophic trait index of 0.271143** . This value classifies the student group as **predominantly belonging to the Emotional Intelligence trait** , but not conclusively. The index's proximity to a state of total indeterminacy underscores the existence of a significant tension between adaptive emotional capacities and difficulties managing ambiguity and stress.

Detailed analysis identified specific deficiencies that contribute to this state of vulnerability:

- There is **insufficient conceptual knowledge** about what emotional intelligence is and how it is applied in daily life (V_1).

- **Interpersonal relationships** , although mostly positive, do not reach an optimal level of cohesion and empathy (V_2).
- **marked instability in mood regulation** is observed in a significant part of the student population (V_5).
- There is a **negative tendency in the non-verbal manifestation of problems** , where impulsive reactions slightly exceed controlled responses (V_6).

In conclusion, this work not only validates the usefulness of the neutrosophic approach for modeling complex psychological phenomena but also offers a nuanced, empirical diagnosis. Generalizing these findings to the university population highlights the need to implement psychoeducational interventions aimed at strengthening self-awareness, emotional regulation, and social skills, thus reinforcing students' psychological resilience in the face of the challenges of an uncertain environment.

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