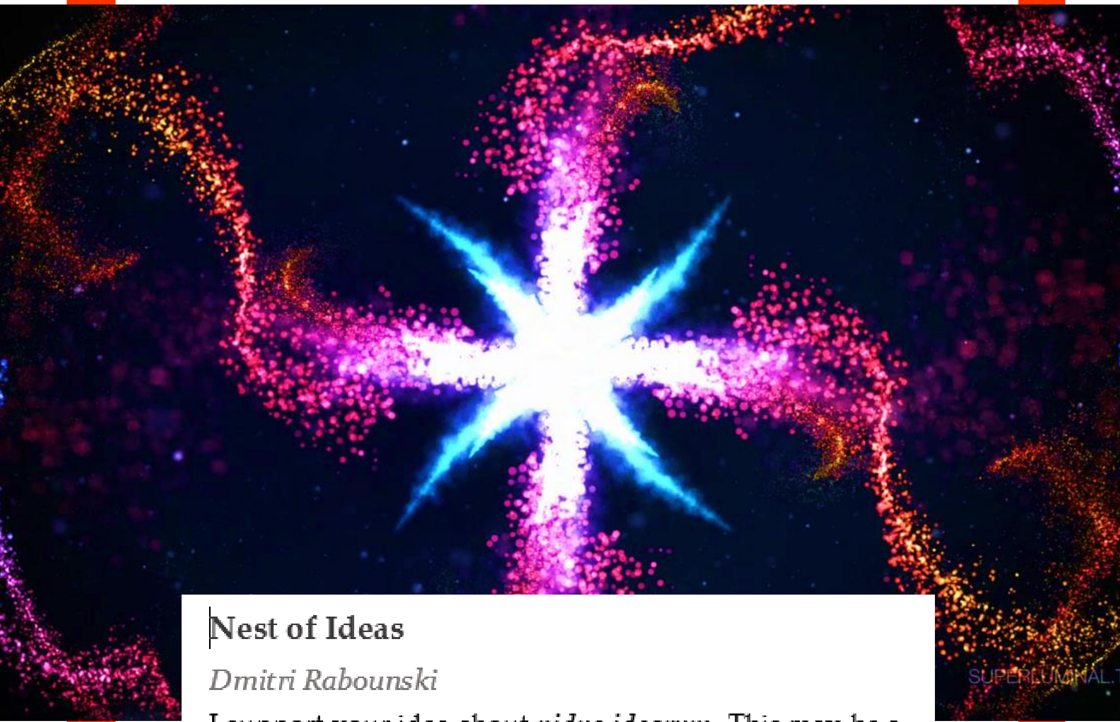
scilogs, VII

florentin smarandache

Nidus idearum

superluminal physics

third edition



Nest of Ideas

Dmitri Rabounski

I support your idea about ***nidus idearum***. This may be a beginning of the best future for science. Your *nest of ideas* will target a new generation of students who will supposedly think about ideas, not commercial profit.

pons

Florentin Smarandache

NIDUS IDEARUM.
scilogs, VII: *superluminal physics*
third edition

Brussels, 2019

Exchanging ideas with Akeem Adesina A. Agboola, Muhammad Akram, Octavian Blaga, Said Broumi, Kajal Chatterjee, Vic Christianto, Octavian Cira, Mihaela Colhon, B. Davvaz, Luu Quoc Dat, R. Dhavaseelan, Jean Dezert, Hoda Esmail, Reza Farhadian, Ervin Goldfain, Muhammad Gulistan, Yanhui Guo, Keli Hur, Saeid Jafari, W. B. Vasantha Kandasamy, J. Kim, J.G. Lee, Xinde Li, P. K. Lim, R. K. Mohanty, Mumtaz Ali, To Santanu Kumar Patro, Xu Peng, Dmitri Rabounski, Nouran Radwan, A.A. Salama, Musavarah Sarwar, Ganeshsree Selvachandran, Le Hoang Son, Selçuk Topal, Andrușa Vătuiu, Ștefan Vlăduțescu, Xiaohong Zhang

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FOREWORD

Welcome into my scientific lab!

My **lab**[oratory] is a virtual facility with non-controlled conditions in which I mostly perform scientific meditation and chats: *a nest of ideas* (**nidus idearum**, in Latin). I called the jottings herein *scilogs* (truncations of the words *scientific*, and gr. Λόγος – appealing rather to its original meanings "ground", "opinion", "expectation"), combining the welly of both science and informal (via internet) talks (in English, French, and Romanian).

*

In this *seventh book of scilogs* collected from my nest of ideas, one may find new and old questions and solutions, referring to different scientific topics – email messages to research colleagues, or replies, notes about authors, articles, or books, so on. Feel free to budge in or just use the *scilogs* as open source for your own ideas!

Special thanks to all my peer colleagues for exciting and pertinent instances of discussing.

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TOPICS

Nest of Ideas

Dmitri Rabounski

I support your idea about ***nidus idearum***. This may be a beginning of the best future for science. Your *nest of ideas* will target a new generation of students who will supposedly think about ideas, not commercial profit.

Equilibrium & Non-equilibrium

To Vic Christianto

It is a *fluctuation* between *equilibrium* and *non-equilibrium*, in any field (economics, life, science, feelings, weather, etc.).

Neutrosophic Systems

An incomplete system of axiom gives birth to a partial theory. If we introduce two contradictory axioms into an axiomatic system, we get a contradictory system.

A neutrosophic system is a system that contains at least a $(t, i, f) \neq (1, 0, 0)$ axiom, meaning axiom that is not 100% true, or at least two axioms that have a non-null degree of contradiction.

A proposition in a neutrosophic system has some degree of decidability, some degree of indeterminate decidability, and some degree of undecidability, i.e. it is a (d, i, u)-decidable proposition.

We can introduce a threshold $Thres = (d_{thres}, i_{thres}, u_{thres})$, where d_{thres}, i_{thres}, u_{thres} are crisp numbers in [0, 1], for decidability, indeterminate-decidability, and undecidability respectively, whence $d \geq d_{thres}$, $i \leq i_{thres}$, $u \leq u_{thres}$ respectively, when *d, i, u* are crisp numbers in [0, 1]; but if *d, i, u* are subsets of [0, 1], we may consider either *max(d), max(i), max(u),* or *min(d), min(i), min(u),* or *mid(d), mid(i), mid(u)* with *mid(.)* being the midpoint of the set, or other function:

$$f: \mathbb{P}([0, 1]) \to [0, 1],$$

where $\mathbb{P}([0, 1])$ is the power set of the interval [0, 1],

depending on the application and experts, as *f(d), f(i), f(u)* respectively.

Open Question.

Is it possible from a subgroup *G* of an axiomatic system, using the deducibility methods, to get a set of deducible propositions D_1, and from this to get D_2, and so on, until one obtains (after a finite or infinite) number of steps $D_{n+1} = D_n$? We mean fixed points, or the sequence of resulted theories $D_1, D_2, \dots D_n$ converging to a maximum theory?

S-denying a theory

It means to take an axiom of a theory and *S*-deny it, i.e. validate and invalidate it in the same space, or only invalidate it but in many ways.

For example, let's consider the axioms of a group.

Let's take the *existence of a neutral element* axiom.

To *S*-deny the existence of a neutral element we can find group elements $e_1, e_2, \ldots, e_n$ that have as neutral element n_1, and other group elements that have as neutral element with respect to the same algebraic law the element n_2, and other group elements that have no neutral element.

S-denying is alike the *Smarandache geometries*.

Aristotelian Logic vs. Modern Logics

Florentin Smarandache

I think we cannot use the *Aristotelian logic* to judge the *modern logics*, since in Aristotelian logic one has the *law of excluded middle*, while in modern logics you have the *law of included middle*, and in neutrosophic logic even more: the *law of included <u>multiple</u>-middle*.

Selçuk Topal

My main aim is to open a door in natural logic for your theory and to provide to find applications of the theory in the natural language studies (for the areas of Logic, Language, and Information).

Efficient Market Hypothesis

Vic Christianto

Please check a review of Mandelbrot's view on market, he is a fervent opponent of *efficient market hypothesis*: *https://static1.squarespace.com/static/5325c4b3e4b05fc1fc6f32ed/t/5374b8ece4b02c5d204eb7fc/1400158444541/2012-01-04_BR_MP.pdf*

Mandelbrot's book can be obtained freely from: *http://en.bookfi.net*.

Florentin Smarandache

(…) What *efficient market hypothesis* actually means? Does it mean *stability / equilibrium*? (…)

Vic Christianto

1. Yes, our paper can be read as short review paper. But to me it is more than that, it is an outline for policy makers in Indonesia. This is why I cited Indonesia case.
2. Sure you can extend and combine whatever you like. But do you care enough whether your extension meets the reality. First of all, do you care what is the distinction between *efficient market hypothesis* and *financial instability hypothesis*? Are they reconcilable or not? And if you improve, will your improved theory be used by working economists or not?
3. Improvement of economics theories are beyond my reach, because I am not economist and I was not taught like them. I only try to bring *nonlinear dynamics* to

macroeconomics, and this is first step for common-sense economics modelling based on physical theories.

4. If I become such a talented mathematician like you, I would try to read some papers on *post-keynesian theories*, and then focus on what are weaknesses of Hyman Minsky and Steve Keen's models. For example, some parameters in econometric are crisp and uncertain numbers, and you can start to extend the existing equations with fuzzy differential equations. Then extend the equations from fuzzy ODE (Ordinary Differential Equations) to become Neutrosophic ODE version. That makes more sense...

See for instance:

https://www.ijser.org/researchpaper/A-fourth-order-Runge-Kutta-Method-for-the-Numerical-Solution-of-first-order-Fuzzy-Differential-Equations.pdf

5. If you wish, I can send to you a review paper on Goodwin and Keen's models, then we can work out *an extension to neutrosophic ODE version*. Goodwin model can be reduced to become a coupled ODE so they are solvable.
6. Or maybe you can introduce uncertainties in the parameters used for modelling, for instance:

$$x \text{ becomes } x' = x_{average} + ks,$$

where k is coefficient and s is standard deviation.

That is how uncertainty in the models become apparent. So the outcome of prediction always give a range of numbers. For instance, the real GDP growth will be within range 1.0% to 1.5%... or something like that.

7. If you really want to take a deep look at Steve Keen, I can send his PhD dissertation, and you can work starting from there, or at least download and try to use MINSKY software (*gnu license*). This is a software for robust macroeconomic modelling based on Keen model.

*

Efficient Market Hypothesis (EMH) is a market theory developed in the dissertation of Eugene Fama (1960). It asserts that the stock market reflects all information by market players, hence market is always efficient. So the basic tenet is that none can beat the stock market, Dow Jones etc.

But many mathematicians have argued that EMH is only myth, the truth is that market is inefficient, it is more like playing bridge or poker when none knows what cards the other side holds. No market player holds full information regarding the stock prices, hence it is always possible to beat the market.

There are three ways you can beat the market:

a. *Technical Prediction*: many people use microtrading through computerized neural network software, or we can try to use Mandelbrot's fractal theory. See his book, the failure of efficient market hypothesis.

b. *Fundamental Prediction*: people like Warren Buffett play by carefully analyzing fundamentals of stocks. Try to find his books.

c. *Speculative Manipulation*: some people play like this. They carefully put positions against weak countries, then take advantage after their economies crash.

Din interior se sparge mai ușor un sistem ca din exterior

Andrușa Vătuiu

De foarte mult timp mi-am pus întrebarea cum reușește un biet pui să spargă coaja oului din care iese, când se știe că pentru a sparge un ou, este nevoie de o forță mult mai mare decât cea a bietului puișor. Consider că răspunsul ar putea fi acesta: coaja oului poate fi spartă cu o forță mult mai mică atunci când forța se aplică din interior spre exterior, decât invers.

Analizând societatea umană, am constatat câteva similitudini. Cunoaștem din istorie exemplul multor cetăți care nu au putut fi cucerite atunci când au fost atacate din exterior. Dar au căzut când atacul s-a produs din interior. La fel se întâmplă și cu alte structuri (fizice, biologice, organizatorice etc.).

Fără să încerc vreo explicație prin metoda analizei impactului forțelor ce acționează în acest caz și creionarea printr-un calcul matematic adecvat, bănuiesc a se obține același rezultat.

Florentin Smarandache

Ciocnind din exterior coaja oului, trebuie o forță mai mare datorită faptului că și presiunea interioară (a conținutului și aerului ca un tot unitar) se opune. Atacând din exterior, trebuie să birui toate forțele interioare unite.

Atacând din interior, doar de-asamblezi ceva, și atunci întregul nu mai funcționează la întreaga forță, se destramă.

Imaginary Indeterminacy

To Santanu Kumar Patro

About your *imaginary indeterminacy* which is *indeterminacy in sub-conscience* or *indeterminacy in sleeping time*, I agree with it.

Try to get more such concrete examples and use them within the frame of the neutrosophic set.

Smarandache Lucky Science

If, by a wrong calculation (method, algorithm, operation, etc.) in mathematics, physics, chemistry, and in general in any field of knowledge, one arrives to the right answer, this is called a *Lucky Calculation* (Method, Algorithm, Operation, etc.)! The wrong calculation (method, algorithm, operation, etc.) should be funny (somehow similarly to a correct one, but producing confusion and liking it)!

Can someone find such *Lucky Integration or Differentiation*?

References:

[1] Smarandache, Florentin, "Collected Papers", Vol. II, University of Kishinev Press, Kishinev, p. 200, 1997.

[2] Ashbacher, Charles, "Smarandache Lucky Math", in <Smarandache Notions Journal>, Vol. 9, p. 155, 1998. *http://fs.unm.edu/LUCKY.HTM*

Demonstrație

Octavian Cira

Cunoști o demonstrație a faptului ca $2p^2+1$ este multiplu de 3, dacă p este prim și este diferit de 3?

Florentin Smarandache

Dacă $p = 3k+1$, atunci $2(3k+1)^2 + 1 \equiv 2(3k+1) + 1 \equiv 2 \times 1 + 1 \equiv 3 \equiv 0 \pmod 3$.

Dacă $p = 3k+2$, atunci $2(3k+2)^2 + 1 \equiv 2(3k+4) + 1 \equiv 2 \times 4 + 1 \equiv 9 \equiv 0 \pmod 3$.

Se poate generaliza la:

Dacă p nu este divizibil cu 3, atunci $2p^2+1$ este multiplu de 3 (nu trebuie neapărat ca p să fie prim).

Smarandache's Conjecture on Consecutive Primes

Reza Farhadian

By the article *Smarandache's Conjecture on Consecutive Primes*, we know that there is a relationship between the *Firoozbakht's conjecture* and your conjecture.

On the other hand, we know that my conjecture is stronger than the Firoozbakht's conjecture.

Therefore, I think that there must be a relationship between my conjecture and your conjecture.

Neutrosophic Set

To Ganeshsree Selvachandran

Thank you for your message and questions.

I'll try below to answer your questions. If they do not satisfy you, please do not hesitate to write back to me and Mumtaz Ali.

Ganeshsree Selvachandran

The *amplitude* term will denote the result of the first process while the *phase* term will denote the result of the second process. So what if there are third and fourth processes taking place?

Florentin Smarandache

In *neutrosophic set* (NS) we have refined the components T, I, F, in $T_1, T_2, \ldots; I_1, I_2, \ldots; F_1, F_2, \ldots$.

Such thing was not done in *intuitionitic fuzzy set* (IFS).

Now we (Mumtaz, me, and two Vietnamese researchers) are working on *refined neutrosophic complex set*, where the *amplitude* is refined too, and the *phase* is refined too (for each of the three neutrosophic components).

Ganeshsree Selvachandran

The neutrosophic set seems to be very similar to the IFS model.

Florentin Smarandache

Please see the paper with distinctions between IFS and NS: http://fs.unm.edu/IFS-generalized.pdf.

In IFS the sum of components should be 1, while in NS it can be up to 3 (*http://fs.unm.edu/neutrosophy.htm*), since T (truth/membership), I (indeterminacy/neutral), F (falsehood/nonmembership) are independent, because they can be provided by different sources or by a single source bur from different perspectives (parameters of estimation of the neutrosophic components).

This allows contradictory/paraconsistent information (when $T+I+F > 1$), incomplete information (when $T+I+F < 1$) and complete information (when $T+I+F = 1$).

Also, in IFS when applying the operators [union, intersection, negation, implication], you apply them on T and F only {not on indeterminacy I, indeterminacy (hesitancy) is ignored}. In our opinion, the indeterminacy should NOT be ignored.

In NS the operators are applied on all three components *T*, *I*, and *F*.

Ganeshsree Selvachandran

I would like to know how we can represent events that occurs repeatedly (more than two times) using the *Complex Neutrosophic Set* (CNS) model.

Florentin Smarandache

I have extended the CNS to *Complex Neutrosophic MultiSet* (CNMS) that allows repetitions of the elements of a complex neutrosophic set. For example, a CNMS can be:

$$\{x(.), x(.), x(.), y(.), y(.), z(.)\},$$

where the element *x* is repeated 3 time, *y* 2 times, and *z* 1 time, while the components of the elements *x, x, x, y, y, z* are in the complex neutrosophic form (i.e. each of the *T, I, F* have amplitude and phase).

Ganeshsree Selvachandran

If the amplitude term denotes the result of the first round of voting, the phase term denotes the result of the second round of voting, then how do we denote the results of the third and fourth rounds of voting via the CNS model?

Florentin Smarandache

The best would be to consider the amplitude as the result of voting, while the phase as an attribute / characterization of the amplitude (depending on what the expert needs to know, for example the phase could be the margin of this amplitude, etc.).

Then use the CNMS, where $x((T_{a1}, T_{p1}), (I_{a1}, I_{p1}), (F_{a1}, F_{p1}))$ will be the first round, i.e. the T_{a1} is the amplitude and T_{p1} the phase of this amplitude, of the people voting for candidate x in the first round, and I_{a1}, I_{p2} the amplitude and phase of this amplitude of people who did not vote in the first round, while F_{a1} is the amplitude and F_{p1} the phase of this amplitude, of the people voting against candidate x in the first round.

Then, similarly, for round two we have: $x((T_{a2}, T_{p2}), (I_{a2}, I_{p2}), (F_{a2}, F_{p2}))$, then for round three: $x((T_{a3}, T_{p3}), (I_{a3}, I_{p3}), (F_{a3}, F_{p3})$, etc.

So, we get a CNMS of the form:

$$\{ x((T_{ai}, T_{pi}), (I_{ai}, I_{pi}), (F_{ai}, F_{pi})),$$

with $i = 1, 2, 3, \ldots .\}$.

In CNMS we may have a repeated element, the candidate x in this case, but whose complex neutrosophic multiset components change from a round to another.

Literal Indeterminacy & Infinity

To Hoda Esmail

We may consider I / ∞, where I = *literal indeterminacy*. Actually:

$$\lim_{x\to\infty} (I/x) = \lim_{x\to\infty} [(1/x) \cdot I] = I \cdot \lim_{x\to\infty} (1/x) = I \cdot 0 = 0.$$

Types of Neutrosophic Indeterminacies

To Hoda Esmail & W. B. Vasantha Kandasamy

Should $I \times 0$ (indeterminacy times zero) be indeterminacy or zero?

1) For literal indeterminacy I, we have that: zero times any letter is equal to zero:

$$0x = 0,\ 0y = 0,\ 0a = 0,\ 0b = 0\ldots$$

So it is legitimate to consider $0I = 0$ (zero times letter I is equal to zero).

2) But for the numerical indeterminacy, the result depends on each specific numerical indeterminate. Let's see below examples with different results.

i) Let $f(x) = 5$ or 6. Then the limit:

$$\lim_{x\to\infty} f(x)/x = (5 \text{ or } 6)/\infty = 5/\infty \text{ or } 6/\infty = 0 \text{ or } 0 = 0.$$

ii) Let $g(x) = -1$ or 0. Then the limit:

$$\lim_{x\to 0^+} g(x)/x = (-1 \text{ or } 0)/0^+ = -1/0^+ \text{ or } 0/0^+ =$$

$= -\infty$ or undefined $= -\infty$ or indeterminacy,

where $x \geq 0$ or $x > 0$.

3) There are also mixed literal-numerical indeterminacy, for example:

$$(2 \text{ or } 5) + 6I.$$

Herein we apply the previous two types of indeterminacies.

Neutrosophic Duplet Set

To Mumtaz Ali

Neutrosophic Duplet Set, $(D,\#)$, is a set defined as follows: for any x in D, there is a $neut(x) \in D$, such that

$$x \# neut(x) = neut(x) \# x = x,$$

and there is no $anti(x) \in D$ such that

$$x \# anti(x) = anti(x) \# x = neut(x).$$

*

Even more: we can develop a new type of structures: *Neutrosophic Duplet Structures*.

Neutrosophic Duplets and Neutrosophic Triplets

To Mumtaz Ali

We can operate directly on
neutrosophic duplets $<a, neut(a)>$,
and on neutrosophic triplets $<a, neut(a), anti(a)>$.

Degrees of Dependence and Independence

R.K. Mohanty

In neutrosophic sets all three measures (*Truth, Falsehood, Indeterminacy*) are independent; how one affects another in decision making? (*Ex*: In case of intuitionistic fuzzy, if membership increases, then, certainly the sum of other two measure will decrease.)

Florentin Smarandache

In intuitionistic fuzzy set, the components membership and nonmembership are dependent, so their sum should be ≤ 1, therefore if one increases the other one decreases.

I give you a simple example where the components are independent:

Let's say there is a soccer game between India and Pakistan. If I ask you who will win, you may say, since you're subjective and patriot, that India will win, let's say with a chance of 70%; but if I ask somebody from Pakistan, he would say that Pakistan will win, let's say with 60% chance. But asking a neutral expert, he may say that there is 40% chance of tie game.

All sources are independent, meaning they do not communicate with each other and they do not know the response of each other.

Summing we get $0.7 + 0.6 + 0.4 > 1$.

We have in this case contradictory information (when the sum > 1, but if the sum < 1 we have incomplete information (we do not know all information), while if sum = 1 we have complete information as in intuitionistic fuzzy set.

Please see below a paper on degrees of dependence and independence between the neutrosophic components (T, I, and F):

http://fs.unm.edu/nss/DegreeOfDependenceAndIndependence.pdf .

See also the UNM website about neutrosophics: *http://fs.unm.edu/neutrosophy.htm.*

R.K. Mohanty

When the following conditions occur in a real life situation:

(T, I, F) : (1,0,1), (1,1,0), (1,1,1), (0,0,0), (0,1,1)

Florentin Smarandache

Let's change the order to (T, I, F) since this is the common order in neutrosophics, without altering the result.

A paradox is a proposition which is true and false in the same time, i.e. $T = 1$, $I = 0$ (well defined), $F = 1$.

See for example the last U.S. Presidential election: the pools predicted that Hilary Clinton will win 100% (or $T = 1$ for Hilary), while the outcome was the opposite (Donald Trump won, so $F = 1$ for Hilary).

Depending on the type of paradox, we may also have: $T = 1$, $I = 1$ (not well defined, i.e. totally indeterminate proposition/paradox), $F = 1$.

For (0, 0, 0) again: in a soccer game India - Pakistan a source may say that the chance of winning for India is 0%, other independent source may say that the chance for India to loose if 0%, and a third independent source may say that the chance of tie game is 0%.

R.K. Mohanty

In decision making applications how to sort in best to worse (higher truth value is better) order for following:

(T, I, F): (1,0,0) (1,0,1), (1,1,0), (1,1,1),
(0,0,0), (0,1,1), (0,1,0) ?

Florentin Smarandache

Sorting depends on each specific application criterion.

On the triplets (T, I, F) we have partial orders, but total orders can be defined as well.

T has a positive quality, while I and F have negative quality. We may say that:

$$(T_1, I_1, F_1) > (T_2, I_2, F_2) \text{ if } T_1 > T_2 \text{ and } I_1 \leq I_2, F_1 \leq F_2.$$

Other orders can be defined too on the triplets, depending on the optimistic or pessimistic point of view.

Addition and Multiplication of Neutrosophic Numbers

To Nouran Radwan

If you have, for example, two singles valued neutrosophic numbers

$$A_1 = (T_1, I_1, I_1) \text{ of weight } w_1,$$

$$A_2 = (T_2, I_2, F_2) \text{ of weight } w_2,$$

then Jun Ye used the below formula for multiplying a neutrosophic number with a scalar:

$$w_1A_1 = (\ 1-(1-T_1)^{w1},\ 1-(1-I_1)^{w1},\ 1-(1-F_1)^{w1}\ ),$$

$$w_2A_2 = (\ 1-(1-T_2)^{w2},\ 1-(1-I_2)^{w2},\ 1-(1-F_2)^{w2}\ ),$$

then he adds two neutrosophic numbers according to another equation:

$$(t_1, i_1, f_1) + (t_2, i_2, f_2) = (t_1+t_2-t_1t_2,\ i_1+i_2-i_1i_2,\ f_1+f_2-f_1f_2),$$

i.e. in our case:

$$w_1A_1 + w_2A_2 = (\ 1-(1-T_1)^{w1},\ 1-(1-I_1)^{w1},\ 1-(1-F_1)^{w1}\ ) +$$
$$+ (\ 1-(1-T_2)^{w2},\ 1-(1-I_2)^{w2},\ 1-(1-F_2)^{w2}\ ) = \ldots$$

For the truth:

$$\{\ 1-(1-T_1)^{w1}\ \} + \{\ 1-(1-T_2)^{w2}\ \} - \{\ 1-(1-T_1)^{w1}\ \}\{\ 1-(1-T_2)^{w2}\ \} =$$
$$= 2-(1-T_1)^{w1} - (1-T_2)^{w2} - 1 + (1-T_2)^{w2} +$$
$$+ (1-T_1)^{w1} - \{(1-T_1)^{w1}\}\{(1-T_2)^{w2}\} =$$
$$= 1 - (1-T_1)^{w1}(1-T_2)^{w2},$$

this is just an algebraic multiplication and addition and subtraction as in beginning algebra.

He afterwards generalizes from 2 neutrosophic numbers to n neutrosophic numbers:

$$w_1A_1 + w_2A_2 + \ldots + w_nA_n = 1 - (1-T_1)^{w1}(1-T_2)^{w2}\ldots(1-T_n)^{wn}.$$

Similarly for I and for F, just replacing T for I and respectively for F.

Examples of Single-Valued / Interval-Valued Complex Neutrosophic Set

To Luu Quoc Dat, Le Huang Son, Mumtaz Ali

Let's suppose a factory polishes car pieces.

Each worker from this factory receives 10 car pieces per day to polish.

1) *Neutrosophic Single-Valued Set*.

The best worker, John, successfully polishes 9 car pieces, 1 car piece not finished, and he wrecks 0 car pieces.

So, John's neutrosophic work is (0.9, 0.1, 0.0).

The worst worker, George, successfully polishes 6, not finished 2, and 2 wrecked.

So, George's neutrosophic work is (0.6, 0.2, 0.2).

2) *Interval-Valued Neutrosophic Set*.

The factory needs to have one worker come in the weekend to work a day, in order to finish a required order of a customer. Since the factory management cannot impose the workers to work in the weekend, the manager asks for a volunteer.

How many car pieces will be polished during the weekend?

Since the manager does not know which worker (W) will volunteer, he estimates that the work that will be done in a day of the weekend will be:

$$W([0.6, 0.9], [0.1, 0.2], [0.0, 0.2])$$

i.e. an interval for each T, I, F respectively between the minimum and maximum values of all workers.

3) *Single-Valued Complex Neutrosophic Set*.

The factory's quality control unit argues that although many workers correctly/successfully polish their car pieces, some of the workers do the work of a better quality than others.

Going back to John and George, the factory's quality control unit measures the work quality of each of them and finds out that:

John's work is ($0.9e^{0.6}$, $0.1e^{0.4}$, $0.0e^{0.0}$), and

George's work is ($0.6e^{0.7}$, $0.2e^{0.5}$, $0.2e^{0.1}$).

Thus, although John polishes successfully 9 car pieces, more than George's 6 successfully polished car pieces, the quality of John's work (0.6, 0.4, 0.0) is less than the quality of George's work (0.7, 0.5, 0.1).

4) *Interval -Valued Complex Neutrosophic Set*.

Let's come back to the factory's need to have one worker come in the weekend to work a day, in order to finish a required order of a customer.

Again, the manager asks for a volunteer worker W.

We found out that the number of car pieces that will be done over one weekend day is *W*([0.6, 0.9], [0.1, 0.2], [0.0, 0.2]), which are actually the amplitudes for *T, I, F*.

But what will be their quality?

Their quality will be

$W([0.6, 0.9]e^{[0.6,\ 0.7]}, [0.1, 0.2]e^{[0.4,\ 0.5]}, [0.0, 0.2]e^{[0.0,\ 0.1]})$,

by taking the [*min, max*] for each corresponding phases for *T, I, F* respectively for all workers.

Bipolar Complex Neutrosophic Graph

To Said Broumi, Muhammad Akram,
Musavarah Sarwar

Dr. Akram and Dr. Sarwar have introduced the *Bipolar Neutrosophic Graph*, which can be combined with the *Complex Neutrosophic Set*.

In Bipolar Neutrosophic Set we have bipolar (positive / negative) neutrosophic components:

$$(T^+, I^+, F^+;\ T^-, I^-, F^-),$$

where T^+, I^+, F^+ are subsets of the interval [0, 1],

while T^-, I^-, F^- are subsets of the interval [-1, 0].

In the Complex Neutrosophic Set we have complex neutrosophic components, of the form:

$$(T_1e^{T2}, I_1e^{I2}, F_1e^{F2}),$$

where (T_1, I_1, F_1) are the amplitudes, while (T_2, I_2, F_2) are their corresponding phases.

By combination, we get bipolar (positive / negative) complex neutrosophic components:

$$(T_1^+e^{T2+}, I_1^+e^{I2+}, F_1^+e^{F2+};\ T_1^-e^{T2-}, I_1^-e^{I2-}, F_1^-e^{F2-})$$

for the Bipolar Complex Neutrosophic Graph.

A graph which has at least one vertex or at least one edge which has the form of bipolar complex neutrosophic number is called a *bipolar complex neutrosophic graph*.

Positively or Negatively Qualitative Neutrosophic Components

To Muhammad Gulistan

Here it is the general picture on the neutrosophic components *T, I, F*:

- the *T* is consider a positively (good) qualitative component;
- while *I* and *F* are considered the opposite, i.e. negatively (bad) qualitative components.

When we apply neutrosophic operators, for *T*'s we apply one type, while for *I* and *F* we apply an opposite type of operator.

Let's see examples:

- *neutrosophic conjunction* ($\wedge_N$):

$$<t_1, i_1, f_1> \wedge_N < t_2, i_2, f_2> = <t_1 \wedge_F t_2, i_1 \vee_F i_2, f_1 \vee_F f_2>,$$

as you see we have *t-norm* ($\wedge_F$) for t_1 and t_2, but *t-conorm* ($\vee_F$) for i_1 and i_2, as well as for f_1 and f_2;

- *neutrosophic disjunction* ($\vee_N$):

$$<t_1, i_1, f_1> \vee_N <t_2, i_2, f_2> = <t_1 \vee_F t_2, i_1 \wedge_F i_2, f_1 \wedge_F f_2>, \text{ etc.}$$

Nonassociative & Associative Neutrosophic Triplet Ring

To Mumtaz Ali

I think we should name / define a *Nonassociative Neutrosophic Triplet Ring*, which is a set R(*,#), where (R,*) is a neutrosophic triplet commutative group, while (R,#) is, with respect to the law #, well-defined, nonassociative, such that for each $x \in$ R, there is a $neut(x) \in$ R, such that x # $neut(x) = neut(x)$ # $x = x$, where $neut(x)$ is different from the classical unitary algebraic unit; also there is no $anti(x)$.

And an *Associative Neutrosophic Triplet Ring*, where (R,#) is, with respect to the law #, well-defined, associative, with $neut(x)$, but no $anti(x)$.

Refined Neutrosophic Complex Set

To: Le Hoang Son, Mumtaz Ali, Luu Quoc Dat

In extension of our previous paper on *Neutrosophic Complex Set*, we may do the *Refined Neutrosophic Complex Set* never done before.

In 2013, I published a paper on *neutrosophic refinement*:

http://fs.unm.edu/n-ValuedNeutrosophicLogic-PiP.pdf.

We have for Neutrosophic Complex Set

$$<a \cdot e^{jT}, b \cdot e^{jI}, c \cdot e^{jF}>,$$

where $j = \sqrt{(-1)}$, and T, I, F are the neutrosophic components.

Then:

"a" and "T" are refined as $a_1, a_2, \ldots, a_p$ and $T_1, T_2, \ldots, T_p$ respectively;

similarly:

"b" and "I" are refined as $b_1, b_2, \ldots, b_r$ and $I_1, I_2, \ldots, I_r$ respectively, and:

"c" and "F" are refined as c_1, c_2, ..., c_s and F_1, F_2, ..., F_r respectively.

Then we define the *refined neutrosophic complex set operators*.

Soft set

Let U be an initial universal set and K be a set of attributes. Suppose that $P(U)$ denotes the power set of U and A be a non-empty subset of K. A pair (F, A) is called a soft set over U, where,

$$F: A \to P(U)$$

is a mapping.

Γ-Soft set

Let U be the universal set and $P(U)$ be the power set of U. Let K and Γ be two sets of attributes. The triad (F, A, Γ) is called a Γ-soft set over the universal set U, if

$$(F, A, \Gamma) = \{ F(a, \gamma): a \in A, \gamma \in \Gamma\},$$

where F is a mapping given by $F: A \times \Gamma \to P(U)$ and A is the subset of K.

Hypersoft Set (Smarandache, 2018)

But more general, let $\mathcal{U}$ be a universe of discourse, $(\mathcal{U})$ the power set of $\mathcal{U}$. Let a_1, a_2, … , a_n, for $n \geq 1$, be n distinct attributes, whose corresponding attribute values are respectively the sets A_1, A_2, …, A_n, with $Ai \cap Aj = \emptyset$, for $i \neq j$, and $i,j \in \{1, 2, \dots , n\}$.

Then the pair $(F, A1 \times A2 \times \dots \times An)$, where:

F: $A1 \times A2 \times \dots \times An \longrightarrow (\mathcal{U})$ is called a Hypersoft Set over $\mathcal{U}$. See this paper:

http://fs.unm.edu/NSS/ExtensionOfSoftSetToHypersoftSet.pdf

Neutrosophic Cubic Graphs

To Muhammad Gulistan & R. Dhavaseelan

Types of *neutrosophic cubic graphs*:

- when both the vertexes and the edges have the form of neutrosophic cubic sets;
- when only one of them (either vertexes, or edges) have the form of neutrosophic cubic forms, while the others have the form of neutrosophic sets;
- when only one of them (either vertexes, or edges) have the form of neutrosophic cubic forms, while the others are literal indeterminacy (i.e. they are "*I*", meaning indeterminacy).

The best to study will be the first type.

Neutrosophic Triplet Order

To J. Kim, K. Hur, P.K. Lim, J.G. Lee

In general an element *a* may have many *neut(a)*'s. So, when you define the neutrosophic triplet order of *a*, denoted as *nto(a)*.

This is defined with respect to a specific *neut(a)*. So, let's say that *neut(a)* = $\{b_1, b_2\}$. Then, the neutrosophic triplet order of *a* with respect to *neut(a)* = b_1 may be n_1, which means that n_1 is the smallest positive integer ≥ *1* such that $a^{n1} = b_1$; while the neutrosophic triplet order of *a* with respect to *neut(a)* = b_2 may be n_2, which means that n_2 is the smallest positive integer ≥ *1* such that $a^{n2} = b_2$; with n_1 different from n_2.

Set-to-Set Function

To Saeid Jafari

I think we can extend *Berge's point-to-set multifunction* to a set-to-set function:

$$f: X \to Y,$$

where *f* maps the set A ⊆ X into the set B ⊆ Y, and we write as f(A) = B.

Let C ⊆ Y. Now, the Upper (Smarandache-Jafari) Inverse of C is:

$$f^{+}(C) = \bigcup_{Z \subseteq X,\, f(Z) \subseteq C} Z$$

the Lower (Smarandache-Jafari) Inverse of C is:

$$f^{-}(C) = \bigcap_{Z \subseteq X,\, f(Z) \cap C \neq \phi} Z$$

A set-to-set function is said subjective if *f(X)* = *Y*.

Reference:

C. Berge, *Espaces topologiques functions multivoques*, Paris, Dunod (1959).

Neutrosophic Quadruple Algebraic Structures

To A. A. A. Agboola, B. Davvaz

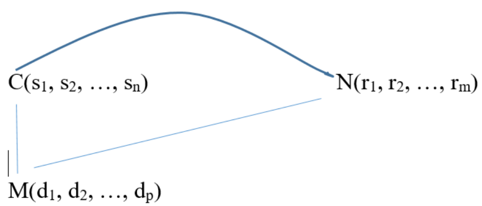
It was a good idea to extend the *Neutrosophic Quadruple Algebraic Structures* (NQAS) to *Neutrosophic Quadruple Algebraic Hyperstructures* (NQAH) and their applications.

Neutrosophic Set Graph

To Said Broumi

The *Neutrosophic Set Graph* is a graph whose vertexes are groups of individuals (vertices), not only one.

For example, a vertex *C* may be all students of computer science in a university, a vertex *N* the group of all neutrosophic researchers from that university, another vertex *M* can be the group of all researchers in MCDM etc. Each vertex can be in neutrosophic style. Between two vertices (groups) one has a neutrosophic edge.



Reference:

W. B. Vasantha Kandasamy, Ilanthenral K., Florentin Smarandache, *Subset Vertex Graphs for Social Networks*, EuropaNova, Brussels, 288 p., 2018.

Refinement of refinement

Yanhui Guo

We can define the data point's T, I and F on each feature vector. For example, for data point $F_1=(f_{11}; f_{12})$, $F_2=(f_{21};f_{22})$... We can use neutrosophic c-mean on $(f_{11},f_{21},\ldots,f_{n1})$ to have T_{11},T_{12}, T_{13}, T_{21}, T_{22}, T_{23}, …., and I_1, $I_2,\ldots$, F_1, F_2, ... In this way, we can have a matrix with T, I and F using an iteration way which is a general way and work for any data.

Florentin Smarandache

Yes, it is possible to do a neutrosophic refinement of first level of T, I, F into T_1, T_2, ..., I_1, I_2, ..., F_1, F_2, ...;

and then a refinement of the refinement [refinement of second level], T_1 to T_{11}, T_{12}, ...; T_2 to T_{21}, T_{22}, ... ;

and similarly for I_1, I_2, ... to be refined, and for F_1, F_2, ... to be refined.

We can go further, if needed into the application, to do refinement of third level (T_{11} refined into T_{111}, T_{112}, ...;

T_{12} refined into T_{121}, T_{122}, ...; and similarly for I_{11}, I_{12},...; F_{11}, F_{12}, ...).

So, in general refinement of level $n \geq 1$ as needed in each application.

Such refinement, and refinement of refinement, then refinement of refinement of refinement, and so on, were not done in fuzzy and intutionistic fuzzy theories.

*

Now, other things which were not done in fuzzy and intuitionistic fuzzy theories: *neutrosophic overset* (when *T, I, F* can be > 1) and *neutrosophic underset* (when *T, I, F* can be < 0).

They occur in our everyday life. For example, if a full-time worker works 40 hours per week, then his membership is $T(40) = 40/40 = 1$ (we suppose that the norm is 40 h/week).

But some people work overtime, for example John works 42 hours, hence $T(42) = 42/40 > 1$.

Another person, George works no hour, so $T(0) = 0/40 = 0$, while Richard works no hour and in addition he intentionally starts a fire to destroy the company, therefore his membership has to be less than *zero* (because he is worst than George).

*

Thus, you might use the *neutrosophic over-/under-/off-set* for describing the outlayer data points (too small data points, or too big data points).

These were never used before, but they are accepted by the mainstream, since my below book was accepted in the *arXiv.org*: https://arxiv.org/ftp/arxiv/papers/1607/1607.00234.pdf

You are an expert in image processing, so I bring you some idea of how the neutrosophics might help.

For example, you may assign membership degrees less than zero to too small outlayers, and membership degrees greater than 1 to very big outlayers...

*

Yanhui Guo

One quick question, what is the advantage of refinement of refinement? It increases the complexity.

Florentin Smarandache

Indeed, it increases the complexity.

But, if in some application you might need such complexity (I mean, you might need a more detailed result), it would be okay.

The computers become faster and faster.

Yanhui Guo

For the second thinking, if we set the range from [0, 40] to [-100, 100], can we solve the underperformance and overperformance problems?

Florentin Smarandache

You may in general enlarge [0, 40] to [0-*a*, 40+*b*], where "*a*" and "*b*" are positive numbers.

How much should "*a*" and "*b*" be? It depends on each application and its expert. In your case, if somebody gets the degree of membership between [-100, 0) then it is underperformance, but if the degree of membership is between (40, 100] then it is overperfromance (as you said).

We can apply the over/under/off-sets in the spaces where we have some defined norm, for example in a factory the norm of working is in general 40 hours per week.

Depending on the factory, a worker can be allowed to work only 5 hours overtime (in other factory maybe only 2 hours overtime).

Only using the over/under/off set you can characterize the *under*- and *over*-performance.

Multi-Space

To Mihaela Colhon, Ștefan Vlăduțescu

Poate vă interesează: cu extragerea/descoperirea de reguli (privind predicate, funcții etc.) pentru *machine learning*.

Mihaela Colhon

Am lucrat mult cu reprezentări bazate pe reguli și am fost surprinsă să aflu anul acesta că aceste (vechi) reprezentări își (re)găsesc utilitatea în studiile actuale.

Florentin Smarandache

Eu folosesc un *multi-space* (un spațiu de (sub)spații diferite, cu diferite norme). Acestea produc noi reguli prin inducție automată.

Mihaela Colhon

Pentru că nu am epuizat studiul *WordNet*-ului și a scorurilor de sentiment atașate cuvintelor, aș putea folosi teoria Smarandache de multi-space, pentru a reprezenta diversele sensuri ale cuvintelor? Și cum anume, care ar fi codificarea?

De exemplu, cuvântul "line" are mai multe sensuri (notate #1, #2, ...) și poate avea chiar mai multe părți de vorbire (Parts-Of-Speech).

POS – ID – PS – NS – Sense - Gloss

v 00454135 0 0 line#5 fill plentifully; "line one's pockets"

v 01582645 0 0 line#3 make a mark or lines on a surface; "draw a line"; "trace the outline of a figure in the sand"

v 02703539 0 0 line#1 be in line with; form a line along; "trees line the riverbank"

n 00582388 0 0 line#19 the principal activity in your life that you do to earn money; "he's not in my line of business"

n 02934168 0 0 line#9 a conductor for transmitting electrical or optical signals or electric power

Am notat cu "POS" - *part of speech*, "ID" (id-ul în *sentiwordnet*), "PS" (*positive score*), "NS" (*negative score*).

Florentin Smarandache

Am un sait despre multispace:

http://fs.unm.edu/multispace.htm, unde mai multe spații (cu metrici și proprietăți în general diferite) formează un *multispace*.

În cazul lui *WordNet* eu aș vedea interpretarea astfel:

- un 'multispațiu' format dintr-un 'spațiu principal' și mai multe 'spații secundare':
- un 'spațiu principal' de cuvinte; de exemplu cuvântul "line" aparține acestui spațiu principal;

- iar în fiecare dintre 'spațiile secundare' proiecțiile (sensurile) acestor cuvinte din spațiul principal; [de exemplu, proiecția (sensul) cuvântului "line" în fiecare spațiu secundar]; sunt atâtea proiecții diferite (atâtea spații secundare) câte sensuri diferite are "line".

Cumva ca în 'universuri paralele' (ipoteza propusă în fizică la începutul sec. XX).

Apoi, în fiecare spațiu (principal sau secundar) se poate considera o metrică (poate fi aceeași metrică, sau diferită) cu proprietățile lui.

Distanța Asimetrică

To Mihaela Colhon, Ștefan Vlăduțescu

M-am gândit că și în geometria reală putem avea $d(A, B) \neq d(B, A)$, unde $d(A, B)$ înseamnă distanța dintre *A* și *B*:

de pildă între două orașe *A* și *B* există un drum îngust cu sens unic de la *A* înspre *B*,

dar de la *B* înspre *A* trebuie mers pe alt drum, din cauza că pe primul drum nu se poate (fiind teren necorespunzător pentru a permite două sensuri).

Neutrosophic MCDM

In *neutrosophic multicriteria decision making*, instead of having crisp (positive number) values for the weights of the criteria, we have triplets (t, i, f) – values for the weights, where *t* is the degree of positive (in the qualitative sense, not in numerical sense) value of a criteria weight, *i* is the degree of indeteminate value, and *f* is the degree of negative (in the qualitative sense) value of a criterion weight.

Of course, *t, i, f* are numbers (and in general subsets) of the interval [0, 1].

Similarly for the neutrosophic alternatives, whose values are not crisp, but similarly (*t, i,f*) – values.

DSm Reliability (DSmRel)

To Jean Dezert

A better *discounting reliability*, than that done by Shafer, in Dempster-Shafer Theory, is that after applying the discounting reliability factor $\alpha \in [0, 1]$, for each hypothesis *A* in the focal frame of discernment:

$$\alpha \cdot m(A),$$

the loosing mass:

$$(1- \alpha) \cdot m(A)$$

should be transferred, not to the total ignorance θ as in Shafer's reliability method, but to the smallest partial ignorances that include *A*.

It is a more refined redistribution, a better redistribution.

Example:

Let the frame of discernment θ = {A, B, C}, the source *m()*, and DSm reliability factor $\alpha = 0.8$.

	A	B	B∪C
M	0.5	0.3	0.2
α·m	0.4	0.24	0.16
(1- α)·m(A)	0.1	0.06	0.04

Lost mass of m(A) of 0.1 is going half-half to A∪B and to A∪C;

Lost mass of B of 0.06 is going half-half to A∪B and to B∪C;

Lost mass of B∪C of 0.04 is going to A∪B∪C.

The result:

	A	B	B∪C	A∪B	A∪C	A∪B∪C
	0.4	0.24	0.16	0.05	0.05	0.04
			0.03	0.03		
DSm Reliability	0.4	0.24	0.19	0.08	0.05	0.04
DST Reliability	0.4	0.24	0	0	0	0.36

DSmRel is more specific than DSTRel.

Neutrosophic MCDM Problems

Kajal Chatterjee

Presently I am working on MCDM problems in uncertain domains. Few papers are published by mine and few are under processing (in fuzzy, rough, grey); neutrosophic set is good area. I have read many papers of yours and others jointly working with you.

I have few queries for you:

I want to apply neutrosophic set and its extensions in MCDM problems. I have studied Interval valued neutrosophic set (NS), intuitionistic NS, Bipolar NS, fuzzy rough NS etc... But can you suggest me the latest one you have find out, to be applied here.

I have published papers and few are in pipeline on areas of Multi-Criteria Decision Making (MCDM) methods like TOPSIS, VIKOR, COPRAS which are used in uncertain domain (fuzzy, rough, Grey sets and number). But studying deeply and seeing the flexibility in Neutrosophic set, I think it can be applied for decision making.

MCDM mainly applies in two part: 1st part is criteria weight selection, and 2nd part is ranking the alternatives based on the criteria weights.

There are many papers based on the above scenarios.

1. In crisp mode: AHP for criteria weights, and VIKOR for ranking alternatives.
2. In Fuzzy mode: fuzzy AHP for criteria weight, and fuzzy VIKOR for ranking alternatives. Similarly, uncertain numbers like Type-2 fuzzy, intuitionistic fuzzy, interval-valued fuzzy, multi-fuzzy are applied for the above in place of fuzzy numbers.
3. Similarly, Grey numbers, rough numbers are also applied. But each has its own advantage and disadvantage.

4. There are also hybrid uncertain numbers: rough fuzzy number, or fuzzy rough number, or interval valued fuzzy rough number in decision making.
5. Here, we want to apply from among one of your methods: *interval-valued neutrosophic set, intuitionistic neutrosophic set, bipolar neutrosophic set* etc.
6. But few works in MCDM are already done based on above methods. So, as a creator and originator of neutrosophic set, I want from you some recent works you have done, in current year, which can be applied in our paper.

Florentin Smarandache

1. I will go through my *α-discounting* method, an alternative to AHP and will try to apply it in uncertain domain. Only one paper "Fuzzy α-discounting method for multi-criteria decision-making" by Atilla Karaman and Metin Dagdeviren, has been developed where uncertain fuzzy number is applied.
2. Then we develop Neutrosophic EDAS methodology (a new MCDM method) for alternative ranking.
3. Finding a suitable case study, we will apply the above Neutrosophic α-discounting-EDAS MCDM methodology (which will be new in this field).
4. A comparative analysis will be done for α-discounting, fuzzy α-discounting and Neutrosophic α-discounting for the ranking of criteria weights.

5. Sensitivity analysis will be done based on change weights of criteria based Neutrosophic α-discounting method and see the ranking change on Neutrosophic EDAS methodology.
6. Finally we will check the stability and robustness of the method by any new developed method.

α-Discounting

Three examples where instead of crisp comparisons (i.e. for example C_1 is twice as important as C_2, or $x=2y$, where x represents the value of C_1, and y represents the value of C_2) I used non-crisp comparisons.

I used interval comparisons (i.e. C_1 is twice or three times as important as C_2, or $x = [2,3]y$, where [2,3] is an interval).

I solved the three examples attached: http://fs.unm.edu/alpha-DiscountingMCDM-book.pdf.

Of course, in several cases there are discussions (Tomoe has told me the same about her extensions).

Entropie d'une masse

To Jean Dezert

La seule possibilité est de considérer le cas général *f(m),* pour le moment, et si dans le future les gens vont trouver de telles fonctions qui charactérisent m d'une façon positive ou négative (pas néccesairement l'entropie, qui on dit que ne peux pas se calculer par rapport à la masse), on pourra appliquer cette méthode, sinon pas de problème.

Une autre question: l'on ne peut pas définit une "almost entropy" ou "pseudo-entropy" pour une masse?

*

J'ai noté en général *Ent(m)* comme *entropie d'une masse*.

Si la notation n'ai pas bonne, alors on peut utiliser autre notation et autre entropie.

Donc, dis-moi laquelle entropie tu veux et quelle est sa formule par rapport à une masse?

Oui, l'entropie doit avoir des values entre [0, 1].

Je vais essayer l'utiliser aussi.

*

Aussi, pas necessairement la entropie l'on peut utiliser, mais autre fonction en rapport avec la masse f(m) qui donne quelque information (sur la qualité positive ou négative) de la masse *m*.

L'entropie nous a donné une qualité négative de *m* (le désordre de *m*).

Jean Dezert

Pourquoi as-tu utilisé les formules

$$Pl(.) - [Pl(.)-Bel(.)]G(m)$$

plutôt que

$$Bel(.)+[Pl(.)-Bel(.)]G(m)?$$

L'entropie a une qualité négative, et elle était plus grande que 0.5 (le milieu de l'interval [0, 1]) dans ton example, donc le point devrait être plus près de *Bel* que de *Pl* (plus pessimistique).

Si on a une autre fonction *f(m)* qui donne une qualité positive sur la masse *m*, et si *f(m)* = 0.684 qui est plus grand que 0.5, alors le point doit être plus près de *Pl* que de *Bel* (donc plus optimistique).

On peut faire un article general, considerant *G(m)* comme tu l'as nommé, avec *G(m)* ∊ [0, 1], qui est une mesure de la qualité positive ou négative de *m*.

Si *G(m)* représente la qualité positive de *m(.)* ou qualité negative de *m(.)* l'on va tenir compte dans la choix du point entre *Bel* et *Pl*, plus près de *Pl* ou respectivement plus près de *Bel*.

La formule est similaire avec celle que j'ai utilisé.

Multi-Objective Probabilistic Transformation

To Jean Dezert and Xinde Li

I thought that, in order to simplify from intervals [*Bel, Pl*], why not simply using the interval midpoints:

$$(Bel + Pl) / 2 \ ?$$

Also, extending your MOEPT (*Multi-Objective Probabilistic Transformation*) to the superpower set $S^{\theta} = (\theta, \vee, \wedge, c)$ and using the DSm Cardinal.

Jean Dezert

L'utilisation du midpoint intervalle a été fait il y a longtemps dans des articles avec les belief functions vers les années 80's-90's. Je ne sais plus pourquoi elle n'est plus vraiment utilisée (il faudrait regarder les articles de l'époque). Je crois que c'est parce que ce n'est pas compatible avec la DS rule, tout comme la *BetP* en fait. Il y a surement d'autres bonnes raisons à retrouver. La *BetP* a été bien vendue par Smets et c'est pour cela qu'elle est encore utilisée. Le mid point et la *BetP* sont consistantes dans certains cas simples. Par exemple, si:

Θ ={A,B} et m(A)=0.1, m(B)=0.2 m(A∪B)=0.7

[Bel(A),Pl(A)]=[0.1; 0.8]

MidPoint(A)=(0.1+0.8)/2 = 0.45

BetP(A)=m(A)+m(A∪B)/2=m(A)+(Pl(A)-Bel(A))/2=0.1+0.7/2=0.45

[Bel(B),Pl(B)]=[0.2;0.9]

MidPoint(B)=(0.2+0.9)/2=0.55

BetP(B)=m(B)+m(A∪B)/2=m(B)+(Pl(B)-Bel(B))/2=0.2+0.7/2=0.55.

Florentin Smarandache

Une autre idee, alors, serait de consider un mipoint poidé (*weighted midpoint*) entre *Bel* et *Pl*. Mais comment calculer les poids w_1 et w_2 de *Bel* et respectivement de *Pl* affin de pouvoir determiner celui-ci ($w_1 Bel + w_2 Pl$) ?

Par ailleurs, la DSmP n'est plus la meilleure?

Importance de la Source dans la Fusion

Florentin Smarandache

Je pense que dans le cas quand l'importance de la source c'est $\beta = 0$, on élimine la source (discard the source), comme tu as dis aussi, car il n'y a pas du sense de considerer / combiner une source d'importance nulle!

Oui, si l'on a plusieurs sources d'importances $\beta_1, \beta_2, \ldots, \beta_n$ dans (0, 1] (attention, *zero* n'est pas compris), il ne faut pas que leurs somme soit 1.

J'ai fait un experiment sur un exemple, mais le resultat n'ai pas satisfaisant. Soient les sources m_1 et m_2, et les elements A, B, tels que $A \wedge B$ = vide; l'on utilise $PCR5_{empty}$, et ensuite l'on normalise. J'ai pris plusieurs beta's pour tester les resultats:

Pour $\beta_1 = \beta_2 = 1$

	A	B
m_1	0.6	0.4
m_2	0.5	0.5
$mPCR5_{empty}$	0.5700	0.4300

For $\beta_1 = \beta_2 = 0.8$

	A	B
m_1	0.6	0.4
m_2	0.5	0.5
$mPCR5_{empty}$	0.5750	0.4250

For $\beta_1 = \beta_2 = 0.2$

	A	B
m_1	0.6	0.4
m_2	0.5	0.5
$mPCR5_{empty}$	0.5725	0.4275

Donc, les sources restent les memes, leurs importances sont egales, mais la valeur de leur importance change entre 1, 0.8, et 0.2.

Je ne vois pas une grande difference, et je ne sais pas comment les interpreter?

Quelle est ton opinion?

Jean Dezert

Mon interpretation est la suivante:

Si l'on a $n \geq 2$ sources d'informations, et toutes ont la meme importance β in (0, 1], alors la fusion de ces n sources donnent des resultats proches aux celles du cas $\beta = 1$ pour toutes les sources.

Ou, avec d'autres mots, si l'importance et la meme pour toutes les sources de fusion, la valeur de l'importance des sources ne conte guère.

Toujours il y aura des plusieurs variantes.

Si l'on a:

	A	B	A∨B∨C
m	0.5	0.3	0.2

et $\beta = 0.7$

c'est mieux de transferer les masses perdues de A et de B a $A \vee B$, non-pas a $A \vee B \vee C$.

Donc, transferer toutes les masses perdues à la plus petite hypothèse (plusieurs fois il arrive que celle-ci soit une ignorance partielle) que de transferer directment a l'ignorance totale.

*

Florentin Smarandache

I saw that the following:

if we have:

	A	B
m	a	b

with a > b, and $A \wedge B$ = empty, then combining m with itself n times, we get that $m(A) \rightarrow 1$ and $m(B) \rightarrow 0$ when n approaches infinity, no matter if we use PCR5, PCR6, or DST.

If we have, for $A \wedge B$=empty:

	A	B
m	0.5	0.5

therefore a = b, then we get: $m(A) = 0.5$ and $m(B) = 0.5$ for any n number of combinations, no matter if we use PCR5, PCR6, or DST.

If we have

	A	B	$A \vee B$
m	*a*	*b*	*c*

with a > b, and $a, b, c \in [0, 1)$, $a+b+c=1$; no a, b, c be equal to 1; and A∧B = empty, then similarly one gets: $m(A) \to 1$ and $m(B) \to 0$, and $m(A \vee B) \to 0$, when n approaches infinity, no matter if we use PCR5, PCR6, or DST.

If $a = b > 0$, I expect that $m(A) \to 0.5$ and $m(B) \to 0.5$, and $m(A \vee B) \to 0$, when n approaches infinity, no matter if we use PCR5, PCR6, or DST.

*

Let's have the masses $m_1, m_2, ..., m_n$ on A, B, and A∨B, with A∧B = ϕ (empty set).

If the average of $m_i(A)$ > average $m_i(B)$ and for each new mass $m_{(n+1)}$, $m_{(n+2)}$, ... the mass of A is greater than the mass of B, then: $(m_1+...+m_n)(A) \to 1$, for $n \to \infty$, and of course: $(m_1+...+m_n)(B) \to 0$, for $n \to \infty$, $(m_1+...+m_n)(A \vee B) \to 0$, for $n \to \infty$, no matter if we use PCR5, PCR6, or DST.

*

Jean Dezert

The precise meaning of "*I*" is lacking and unclear for me. If I is something else than *T*∨*F* or T∧F, then it should be explained more precisely in particular what are *I*∧*F* *I*∨*F*, *I*∧(*T*∧*F*), *I*∨ (*T*∧*F*) etc. and justify why.

For me, if "*I*" means indeterminacy, then all propositions including *I* must equal to *I* because by definition we don't know what *I* precisely is (but its literal definition of course), for example it looks reasonable for me to consider $I \wedge F = I$, $I \vee F = I$, $I \wedge (T \wedge F) = I$, etc. The behavior of I in logical propositions is like a black hole (absorbing element). In fact, we should not use it as same semantic level as other truth / falsehood atoms T and F.

Florentin Smarandache

"*I*" in general means: indeterminate, neutral, vague, contradictory (true and false simultaneously), unknown, incomplete, uncertain (true or false), etc.

But in each problem to solve, "*I*" depends on the entity (idea, proposition, notion, etc.) we work on.

If we work on a "game", then I = tied (equal) game, where T = winning, F = loosing.

If we work on "particle's charge", then I = neutral charge, where T = positive charge, and F = negative charge.

If we work on a "propositional logic", then I = indeterminate logical value (i.e. neither true nor false.

Let's see a simple example, for the proposition:

"1+1 = ".

This proposition is neither true nor false, but incomplete; I = incomplete too.

About what are $T \wedge I$, $I \vee F$, etc. see my book *Symbolic Neutrosophic Theory* (2015), section: 6.9 *Truth-Value Tables of Neutrosophic Literal Operators*: http://fs.unm.edu/SymbolicNeutrosophicTheory.pdf.

Since we talk about subjective operators, the results vary depending on the problem to solve and on the expert (or on what is the prevalence: optimistic, pessimistic, etc.).

For example, in many cases I is considered that $T \wedge I = I$.

But there may be examples to solve where the expert, being too optimistic, might take $T \wedge I = T$.

Or we may take a lower bound (pessimistic) and upper bound (optimistic) for a truth-value.

Yes, about the absorbent. I defined in the same book: *7.5 Absorbance Law*, which actually is subjective too. We say that one symbol absorbs another. For example, if $T \wedge I = I$ we say that I absorbs T, and am also defined a order of the symbols T, I, F in terms of this absorbance law.

$T\% + F\% + I\% <=> 100\%$

Jean Dezert

For example, instead of considering "m(A)=0.5" as if we were sure that this numerical assignment is correct, then you consider that the assignment "m(A)=0.5" is $T\%$ correct, $F\%$ false and $I\%$ indeterminate {either correct or incorrect, or maybe both if we admit third include middle possible, or something else (what?)}, with $T\%+F\%+I\%=100$ to work with consistent information.

Florentin Smarandache to Arnaud Martin, Jean Dezert

For a complete information, indeed *T%+F%+I% = 100*. But for incomplete information we may have *T%+F%+I% < 100*, and for contradictory information *T%+F%+I% > 100*.

Although the last two inequalities come against the classical probability (and I was worry about this), they have eventually been accepted by the mainstream. The explanation below:

The sum of components may be different from 100, because the information for *T* might come from a source, while the information about *F* from another source, and the information about *I* coming from a third source (we consider these sources independent, so they do not communicate among them). Since one source may be capable to determine *T*, but not the other two components, and so on.

Of course, in such cases, when summing *T+I+F* rarely we get 100.

Dyads

Neutrosophic set and logic work in *dyads* (<*A*> and <*antiA*>), since in this case one considers that <*neutA*> is empty (as a set), or 0 (zero) as a number.

But in this case it is easier to use fuzzy set and logic.

*

In fuzzy set and in neutrosophic set there there are a fuzzy set of second type and neutrosophic set of second type, meaning the confidence in the first set.

But this trustability should be done in another paper. For a mass, let's say $m(\mathrm{A}) = 0.4$, we may say that is T% trustable, F% untrustable, and maybe I% unknown trustability (if you do not like "I" we can consider $I = 0$).

Probable, is it the same as discounting and reinforcing of a source as you said before?

*

Jean Dezert

$$\{T_1, T_2, \ldots, T_m, i_1, I_2, \ldots, I_n, F_1, F_2, \ldots, F_k\}).$$

This is just a direct mathematical and trivial extension

$\theta_T = \{T, F\}$. What is very important for applications, is to precisiate the meaning of all these elements/atoms of θ_T with the integrity constraints (if any) between elements of the frame θ_T with solid justification.

Florentin Smarandache

This refinement in T_j, I_k, F_l are from our real life, not simple mathematical explanation.

There are examples in the book I sent you before.

Let's see here a simple one. See the meaning of them:

T = percentage of French people who voted for François Hollande to become a president;

I = percentage of French people who did not vote, or voted but cut all candidates (black votes), or voted for all candidates (did not pick up any of them - white votes);

F = percentage of French people who voted against François Hollande.

But T, I, F can be refined in the following way:

T_1 = percentage of people from a specific French district D_1 who voted for F. H.

T_2 = percentage of people from the French district D_2 who voted for F. H.,

and so on (we can consider as many districts as we want).

Then corresponding:

I_1 = percentage of people from French district D_1 who did not vote, etc.

I_2 = percentage of people from French district D_2 who did not vote, etc.

Similarly:

F_1 = percentage of people from district D_1 who voted against F. H.

F_2 = percentage of people from district D_2 who voted against F. H.

Etc.

*

I can prove that if average of $\mu(A)$ > average of $\mu(B)$ for n sources, and the n+1th source gives the mass of A greater than the mass of B, and keep that way for the next masses, then mass A → 1.

If there are fluctuations of the sources *n*+1, *n*+2, ... regarding the mass of A greater and then less than mass of B, then there might be no limit.

*

L'ensemble neutrosophique est defini/parti par rapport a l'ensemble flou (*fuzzy set*) de Zadeh; Zadeh a consideré le degrée d'appartenance d'un élément a un ensemble (*membership degree*); tandis que je l'ai etendu à trois components: (*membership degree, indeterminate appurtenance degree, nonmembership degree*), et j'ai laissé la somme des components jusqu'à 3 (pas jusqu'à 1, comme dans le classique), car les components peuvent être donnés par des sources différentes ou par la même source mais selon différent points-de-vue. Personne n'a fait ça (somme 3), car tous avaient le *brain-washed* par la probabilité classique.

Neutrosophic Set, il y a 20 ans, n'ai pas du tout parti de la théorie d'évidence, de Dempster des fonctions de croyances, etc.

Neutrosophic set est serieux et *mainstream*.

Ensuite il a été etendu à la logique neutrosophique, mesure neutrosophique, etc. J'essai maintenant de le connecter avec la théorie d'évidence.

*

Par exemple on peux étende la DSmT par faire un article sur "indeterminate intersection" et dans le même temps on élargi les models: Shafer model, hybrid model, free model, and indeterminate model (when at least one intersection is unknown).

Nulle théorie a consideré pour le moment l'intersection indéterminée.

C'est normal d'avoir des contradictions dans la science, mais il faut pas se laisser dévoré par elles.

*

To Xu Peng

If the *n*-sources provide information simultaneously, it is good to apply PCR6 for all *n*-sources at once.

If the sources provide information one after the other (I mean after an interval of time), then it is better to apply the PCR5 for 2 sources, then apply PCR5 for the resulted information and the new source, and so on. Because the newer information is considered more accurate than the old one.

Probabilité subjective vs. probabilité objective

Le calcul de la probabilité subjective ne doit pas être consistent avec le calcul de la probabilité objective.

Aussi, je sais qu'un théorème doit être le plus compréhensible qu'il est possible, sinon il y aura de cas où il ne marchera pas [par exemple: sur le *hyperpower set* et *superpower set*].

Indeterminate Model

After I read a paper about using the *Intuitionistic Fuzzy Set (IFS) in information fusion*, I realized that there are cases when the models are indeterminate, i.e. we don't know if the intersections are empty or not. Therefore, we don't have neither a free model, nor a hybrid, or Shafer model, but a fourth category called "*Indeterminate Model*" (when at least one intersection, let's say $A \wedge B$, is indeterminate).

Incomplete Models are a new trump (advantage) of DSmT over other theories which can not deal with them since Incomplete Models cannot be refined!

In this case we have to use the Neutrosophic Set, which allows for incomplete information, i.e. when the sum of components is less than 1 (IFS does not allow that).

The missing information is just caused by the indeterminate intersection(s): we don't know for example if $A \wedge B$ = empty [i.e. to transfer the mass $m_{12}(A \wedge B)$ in this case] or if $A \wedge B$ = nonempty [hence the mass $m_{12}(A \wedge B)$ should stay on $A \wedge B$, i.e. no transfer].

The missing information causes the sum of components to be less than 1 (see $Bel(A)+Dis(A)+Ind(A) < 1$, etc. in the example attached).

What is very nice and consistent with the previous results is that in the dynamic fusion if we later find out about the indeterminate intersection, if this is empty or not, the final result approaches to the limit that case.

I know Arnaud Martin and Deqiang Han used the fuzzy set in information fusion.

Also Jean Dezert used a Neutrosophic Cube 3D geometrical figure in defining the neutrosophic components (in *Multiple Valued-Logic / An International Journal*, Vol. 8, No. 3, 2002, which dedicated the whole issue to *neutrosophics*).

A triangle of this neutrosophic cube (a small diagonal) was used in a paper on IFS by two Polish authors.

We can combine Jean Dezert's cube with these Polish authors in order to better do a geometric interpretation of neutrosophic set used in information fusion.

This new category of models - indeterminate models -, upon my knowledge, is entirely new in information fusion, and we can do more research in this direction.

We have an indeterminate model if there is at least one indeterminate non-empty element from G^{θ}, or during the process of fusion at least one element is indeterminate (i.e. not well known, or even unknown).

$A \wedge B$ = indeterminate est une autre atu de la DSmT par rapport aux autres theories, car aucune autre n'a fait ca!

*

Mais, dans le temps reel (*real time running software - dynamic fusion*) on ne peut pas attendre pour avoir plus d'information pour savoir si cette intersection deviendra empty ou non-empty

*

La masse de A∧B=empty est transferrée à A et B.

Donc la masse de A∧B=indeterminate doit être transferrée d'une facon ou autre à quleque chose de A et de B.

For each element A we have three possibilities: a believe in A, a disbelieve in A, and a neutral / indeterminate / unknown (i.e. neither believe not disbelieve) of A.

The believe in A is just *Bel(A)*=sum of masses of elements included in A;

the disbelieve in A is *Dis(A)=1-Pl(A)*=sum of masses of elements which are outside of A (their intersection with A is empty),

while indeterminate of A is *Ind(A)*=sum of masses of elements which intersect A but are not included in A (actually elements which are on the frontier of A).

These three sums are disjoint (they have no term in common).

It is very logical, and I don't see why you don't understand these.

*

Therefore, it is very normal to transfer the mass of $A \wedge B$ to the indeterminate part of A and indeterminate part of B (not to A and B effectively since this would mean that we add something to the believe in A and B, or we increase the believe in A and B - which should not be the case).

*

The indeterminate (neither believe nor disbelieve) in A makes a nice connection with intuitionistic logic (which is a logic done with incomplete information).

*

If we transfer the mass of $A \wedge B$=indeterminate to $A \vee B$ and later in the fusion process we find out that for example $A \wedge B$=empty we easily adjust the re-transfer of masses I_A to A and I_B to B respectively, and we get the same result as if we knew from the beginning that $A \wedge B$=empty (see page 4 the paragraph; "In the above example...").

But, if we transfer the mass of $A \wedge B$=indeterminate to $A \vee B$ and later in the fusion process we find out that $A \wedge B$=empty, we cannot do a re-transfer of masses in order to get the same result. We have to re-do the previous fusion (i.e. a posteriori fusion - which is not a scientific way)...

Similarly as applying Dempster's rule in Zadeh example, then finding out that Dempster rule doesn't work, therefore apply a posteriori another fusion rule or procedure.

A posteriori procedures do not work in a real time fusion process.

*

An indeterminate model means either an indeterminate intersection, or an indeterminate element, or maybe indeterminate union, or indeterminate complement, etc.

Maybe I did not choose very well this example? Can we use as focal elements: colors or countries with unclear frontiers between them, etc.?

In my example I wanted to show that even if the third suspect "X" is unknown (indeterminate), we don't need to know him/her since we found out from our fusion process that George is the criminal (his mass is the biggest: 0.429), while *m*PCR5(X)=0.093 is very tiny.

The three definitions of *Bel(A)*, *Dis(A)*, and *Ind(A)* are very clear and intuitive and logical.

Discounting Methods

Jean Dezert

Ce qui n'est pas clair, c'est le manque de justifications de toutes ces méthodes. On peut imaginer plusieurs méthodes ad-hoc d'affaiblissements partiels. Ce n'est pas un très gros problème technique, mais le manque de justification reste un point très délicat selon moi. Mais si tu veux, tu peux rédiger un article sur ce sujet que l'on pourra inclure dans le livre.

Florentin Smarandache

If we discount A, then the missing mass should go to the smallest ignorance that contains A. If we discount an ignorance, say A∨B, then the missing mass should go to the smallest ignorance that includes A∨B.

Should we consider the case when we discount the total ignorance as well? If so, the missing mass should go to the emptyset.

If we discount A, B, C, then the missing masses of A, B, C can all go to A∨B∨C as first method, the most rough! Second the missing masses of A will go to A∨B and A∨C either half-half, or proportionally w.r.t. the reliability coefficients of B and C (in order to catch the cases when the coefficients are zero or 1).

The principle is:

If $\alpha X < 1$, then the missing mass of X will go to the smallest ignorance that includes X. In this way, the new mass is more specific than the mass proposed by Shafer which transferred the whole missing mass to the total ignorance.

Question pour Jean: If $\alpha A \wedge B < 1$, the missing mass will go to A∨B, ou bien tu préféres que la masse manquante va à A et à B ? Et alors, quelle soit l'explication pour chaqu'un de ces deux cas?

Heureusement pour nous, c'est la proposition des Chinois d'utiliser la Dempster's rule pour l'importance des sources, qui ne marche pas pour quelques cas (comme déjà expliqué).

Jean Dezert

Je ne me souviens pas d'avoir vu des applications concrètes du contextual discounting de Denoeux et je n'ai pas d'article sur cela. Il faut rechercher sur le web si il en existe. "If we discount A, then the missing mass should go to the smallest ignorance that contains A." Oui, on peut faire cela bien sûr, mais cela est une vision "optimiste" il me semble qui n'est pas forcément mieux justifiée que la méthode "pessimiste" qui consiste à dire "If we discount A, then the missing mass should go to the biggest (total) ignorance that contains A."

Je ne sais pas si on doit autoriser une solution avec m(emptyset) > 0. Dans ce cas, cela défend et justifie le modèle TBM de Smets. Je n'aime pas beaucoup cette idée car cela introduit une forte ambiguité sur l'interprétation de l'empty set (interpreted normally as the impossible event corresponding to the true matehmatical empty set, or interpreted abusively (i.m.o.) as a complementary hypothesis outside the elements of the original frame).

*

Jean Dezert

As said before, this principle can be viewed as "optimistic" principle, whereas Shafer's reliability discounting can be seen as pessimistic one.

Ce qu'il faut analyser en fait, c'est l'impact de ces deux principes de discounting sur les fonctions *Bel(.)* et *Pl(.)* quand tous les coefficients α sont identiques ou bien différents. Je pense que cette analyse devrait montrer le caractère optimiste ou pessimiste de ces principes (voir si ils permettent d'augmenter ou non la belief ou la plausibilité des elements de θ).

"If αX < 1, then the missing mass of X will go to the smallest ignorance that includes X." Cette formulation n'est pas totalement correcte car il peut exister plusieurs smallest ignorances that includes X as soon as |θ| > 2.

"If αX < 1, then the missing mass of X will go to all ignorances of smallest cardinality that includes X."

Plus précisement:

"If αX < 1, then the missing mass of X will go to all elements of G^θ of smallest cardinality that includes X."

If αA∧B < 1, the missing mass will go to A∨B, if Shafer's/pessimistic discounting is used (I suppose here that θ={A,B}, and free model), sinon si θ={A,B,C,...} je n'ai pas d'explication/justification pour faire cela.

If αA∧B < 1, the missing mass will go to A and to B if the optimistic discounting principle above is used.

Le discounting optimistic selon moi pourrait être utilisé car mathématiquement il est bien définissable, mais je ne sais pas si il doit (et comment) il peut être justifié pour faire de reliability discounting, ou de l'importance discounting. Ce type de discounting n'est pas lié à la fusion proprement dite (je crois), c'est juste une transformation des masses selon moi. Mais il se peut qu'il existe une méthode de fusion (à découvrir) adaptée qui justifie le discounting optimistic ...

Fizica Supraluminală și Fizica Instantanee

To Octavian Blaga

Este bine că experimentul de la Universitatea de Tehnologie Delft, din Olanda, din octombrie 2015, privind comunicarea dintre particulele legate (entangled particles), a reușit. Pe entangles particles [particule legate] s-a bazat și ipoteza mea] că nu există limita de viteză în univers, simplu am spus că variind distanța dintre particulele legate putem obține/construi orice viteze dorim, deci și viteze supraluminale, contrazicând astfel teoria relativității. Chiar am propus inițierea a două noi domenii de cercetare în știință: *fizica supraluminală*, și *fizica instantanee* {adică studierea proprietăților / legilor / teoriilor etc. fizice la viteze supraluminale, respective la viteze apropiate de cea instantanee}.

Faster Than Light

The worldwide news at CERN Laboratory in Europe has made public the fact that there have been detected particles (*neutrinos*) that travel at a speed greater than the speed of light.

I had this intuition long ago (since 1972), when I proposed this hypothesis of particle speed greater than the speed of light, which is called in the Encyclopedia of Physics on my name, but it is criticized:

http://scienceworld.wolfram.com/physics/SmarandacheHypothesis.html

Newton's Laws work for small speeds, Einstein's Relativity works for speeds close to the speed of light (c). Many physics laws valid for small speeds are not valid for relativistic speeds, and reciprocally.

Since it is almost sure that there are particles with speeds greater than the speed of light, new physics are needed. Not only energy and information can be transmitted at speeds greater than c, but also mass.

We should think at the phenomena with velocity $v > c$, even what would happens at infinite (or close to infinite) velocities? What laws might occur? They would, of course, be different from those laws at small speeds and at relativistic velocities.

Unmatter

Ervin Goldfain

După cum ți-am mai spus, scriu un capitol la o carte despre fizica "Beyond Standard Model".

În secțiunea despre "exotic phases of matter" am să vorbesc de lucrarea comună și de Unmatter. Peste weekend mi-a venit următoarea idee: sunt indicații cum că "sterile neutrinos" au fost observate în detectorii MiniBoone și LNSD. Aceștia reprezintă o nouă varietate de "right-handed" neutrinos care nu participă în interacțiile slabe, de aceea se numesc "sterile". Dimpotrivă, se știe cu siguranță că neutrinii din SM sunt Dirac "left handed particles" și participă în interactiunile slabe.

Unmatter interacționează foarte slab cu particulele din SM, adică sunt aproape decuplate de materia obișnuită. Pare plauzibil ca "sterile neutrinos" să fie de fapt urme de unmatter, pentru că:

1) sunt foarte slab cuplate cu SM, adică cu materia obișnuită.
2) pot fi combinații între Dirac și Majorana particles: Dirac particles sant "left-handed" și se manifestă ca particule și anti-particule. Spre deosebire, Majorana particles

sant "right handed" fermioni care se manifestă ca particule și anti-particule în același timp (Majorana particles are identical with their antiparticles).

Deci ceea ce se numesc "sterile neutrinos" pot apărea ca amestecuri neobișnuite de Dirac și Majorana particles, interacționează foarte slab cu materia obișnuită, apar ca amestecuri între "left-handed" și "right handed" states. Sânt neutre din punct de vedere electric, așa că ar putea constitui o buna parte din Dark Matter. Faptul că sunt cuplate foarte slab cu materia obișnuită se poate atribui faptului că sunt neutre și că apar în numere fracționale de quantum states, așa cum am descris în lucrare.

*

Ervin Goldfain

Dacă te referi la "spin", particulele elementare nu pot fi concepute ca obiecte tridimensionale, adică nu au extensiune spațială în sensul obișnuit al cuvântului. Asta decurge din principiul lui Heisenberg care spune că obiectele cuantice nu pot fi localizate în spațiu sau timp ci apar ca "probability clouds". Particulele sânt manifestări ale câmpului cuantic sub forma de fluctuații de energie care apar și dispar continuu din "vacuum" ("vacuum excitations"). Așadar conceptul de spin al particulei elementare nu se poate interpreta ca o rotație în jurul axei proprii a unui obiect tridimensional. Spinul unei particule elementare este o proprietate intrinsecă (ca și masa de repaus și sarcina electrică) și, deși este definit ca moment unghiular măsurat în sistemul de referință în repaus (the "rest-frame"), nu este analogul unei rotații interne ca în mecanica obiectelor masive.

Cu toate acestea, un SISTEM de particule elementare separate spațial poate fi rotit în jurul unei axe arbitrare. De exemplu, poți vorbi de faptul că nucleonul este un ansamblu de quarks și posedă un "overall spin" (spin resultant). Momentul unghiular total al nucleonului este suma vectorială a momentului cinetic (L) și al spinului resultant (S) al quarkurilor constituente: J = L + S (suma vectorială).

Florentin Smarandache

Unmatter poate fi și neutră, și pozitivă, și negativă - depinde de combinațiile de quarks și antiquarks (spre deosebire de antimaterie care e numai negativă).

Apropo, am citit ca la LHC s-a produs antimaterie (parcă atomul de antihidrogen) care a durat 0.2 secunde.

Care-i definiția lui Dark Matter? S-ar putea conecta cu unmatter? Există Dark antimatter?

[Parcă te-am mai întrebat asta?] Putem avea, pe lângă energie și antienergie [=energie negativă?], dar un-energie [combinație de energie pozitivă și energie negativă]?

Ervin Goldfain

Sarcina anti-materiei este definită ca opusul scarcinii materiei (nu neapărat sarcina electrică, dar de exemplu culoarea în cromodinamica cuantică, cu alte cuvinte "*gauge charge*"). Operatorul de conjugare (C) transformă o particulă în anti-particulă corespunzătoare și deci inversează semnul lui "*gauge charge*". Prin convenție positronul are sarcina electrică pozitivă iar un "*anti-red quark*" este antiparticula lui "*red quark*".

Unmatter poate într-adevăr să aibă sarcini electrice fracționale (ca și *quark*-urile).

"In astronomy and cosmology, dark matter is matter that is inferred to exist from gravitational effects on visible matter and background radiation, but is undetectable by emitted or scattered electromagnetic radiation. Its existence was hypothesized to account for discrepancies between measurements of the mass of galaxies, clusters of galaxies and the entire universe made through dynamical and general relativistic means, and measurements based on the mass of the visible "luminous" matter these objects contain: stars and the gas and dust of theinterstellar and intergalactic media."

Dark Matter nu interacționează cu materia obișnuită pentru că este neutră. Poate fi detectată numai prin effecte gravitaționale asupra materiei obișnuite, ca de exemplu curbarea razelor de lumină (*gravitational lensing*).

Conexiunea dintre Dark Matter și Unmatter se poate face, de exemplu, prin fizica neutrinilor sterili, așa cum am descris în emailul de dinainte. Dar sânt și alte modalități de a stabili conexiunea care trebuie confirmate prin rezultate experimentale de la LHC și de la sateliți și platforme de înregistrare și analiză a lui Dark Matter lansate în spatiul cosmic. Pentru că nu se știe ce este de fapt Dark Matter, la ora actuală nu se știe dacă Dark Anti-Matter există și sub ce formă se manifestă.

Energia este un concept pozitiv definit pentru particulele materiale reale. Anti-particulele reale au aceiași masă ca și particulele (în virtutea așa numitei teoreme CPT din teoria câmpului cuantic) și deci au de asemenea energie pozitivă. Particulele virtuale sânt excitații temporare de câmp și pot avea energie negativă, dar nu reprezintă cuante de câmp reale.

Florentin Smarandache

Sunt de acord cu aceste Sisteme Complexe ale lui Ervin Goldfain care-s dezechilibrate, sofisticate, nestabile, cu stări care se bifurcă (chiar multi-furcă am putea zice?) la temperaturi critice.

Self-organizing, between order and chaos, between cooperation and competition, nonlinear interaction…

Mixtures of order and disorder, cooperation and competition, linearity and nonlinearity can be considered as in a paradoxist or even Neutrosophic behavior.

Eu am publicat ceva privind multispațiile și multistructurile lor - vezi alăturat - în cartea: *http://fs.unm.edu//MultispaceMultistructure.pdf* .

Cred că s-ar putea face o unificare în acest fel, deși eu numai calitativ am definit multispace-ul, fiindcă unele ar putea avea metrice altele nu...

Nu știu dacă am putea lega sistemele complexe ale sale cu multispațiile (multistările simultane ale unui sistem) sau cu aceste paradoxuri care împing spre limitele științei?

Ervin Goldfain

Unificarea de care vorbești se poate realiza teoretic. Dar trebuie cumva să faci legătura între multispații și multistructuri cu spațiile de tip fractal, adică spațiile caracterizate de o măsură fracțională (așa numita măsură Hausdorff). Motivul este ca tranziția la "*chaos*" și apariția așa numiților "*strange attractors*" este strâns legată de spații fractale.

Ilya Prigogine a fost primul cercetător care a sugerat că spațiile de tip fractal sânt relevante pentru dinamica în afara echilibriului. Poți să citești despre așa numitele "*Rigged Hilbert spaces*" pe care el și școala lui le-a introdus în fizică.

Florentin Smarandache

Aveam o idee de a generaliza la un astfel de operator mixt: derivato-integral... Ar avea aplicații în fizică pentru sistemele neechilibrate la temperaturi foarte înalte cred.

1) Și atunci care este diferența între *f(x)* derivat de 2.3 ori și *f(x)* integrat de 2.3 ori?

2) Există și diferențieri/integrări negative? Adică *f(x)* derivat de -2.3 ori ori integrat de -2.3 ori?

Erwin Goldfain

Cărți de specialitate în "*fractional calculus*": Podlubny sau Samko și Kilbas de exemplu. Derivatele și integralele fracționale au aplicații în multe domenii din fizică, mecanică, electrodinamică, fizica plasmei, fizica fluidelor, și așa mai departe.

Florentin Smarandache

Eu am abordat în mod neconformist multe studii, poate de aceea și neînțelegerea unei părți a operei mele, destul de întinse - îndrăznesc să afirm. Nu mi-a plăcut să merg pe drumuri bătute, deși parțial am făcut și acest lucru – depinzând de subiect, desigur.

O întrebare vroiam mai de mult: se poate vorbi (sau este nevoie) de o diferențiere fracțională și integrare fracțională în același timp ale aceleiași funcții?

În fizică am câteva realizări {am făcut – pe lângă ipoteza supraluminală - și ceva privind "nemateria", care-i între materie și antimaterie, legată acum de "neparticulă" (cele mai recente cercetări); apoi am niște paradoxuri}. {Restul articolelor, singur sau cu coautori, sunt interpretări sau prelungiri ale unor ecuații fizice, ale unor metrici fizice, etc. bazate pe alte teorii mai vechi.}

*

Florentin Smarandache

For connecting the different metrics in different spaces, I have some small/simple ideas.

Consider a metric which is a piece-wise function of two metrics m_1 and m_2 respectively (each metric is a function piece), for two spaces S_1 and respectively S_2, or $m = f(m_1, m_2)$. Then how to define this combination of the two metrics? Kronecker's symbol δ might be able to switch from a metric to another.

Robert Davic

See how your concept of "unmatter", and the Brightsen prediction of "unmatter" within the proton [P] can be related mathematically to the Paul Dirac Equation, for which he received the Nobel Prize in 1933. I now strongly believe that the mathematical understanding of how "unmatter" can exist in general will come about when someone studies in specific how the Dirac Equation can be applied to Brightsen Model and "unmatter" !

The Dirac Equation was the first in history of physics (1928) to predict mathematically the possible existence of ANTIMATTER. It shows via a beautify and simple equation how both MATTER & ANTIMATTER must coexist for the electron. It is thus application of the Dirac Equation that would predict the existence of positronium (e^- plus e^+ coexistence) to form a type of "unmatter" !

*

Florentin Smarandache

Many people reject ideas they don't understand, or they don't want to understand, or they do not like the ideas' authors, or they don't read. People reject things that they don't want to exist, even if these things do exist.

People indulge in intellectual inertia.

*

Florentin Smarandache

Eu am scris un articol despre posibilitatea vitezei supraluminale, folosind chiar paradoxul Einstein-Podolski-Rosen, care se bazează pe "entangled particles" [particule legate/conectate între ele, în sensul că au caracteristici opuse/complementare; adică: dacă măsori carateristicele uneia, automat știi și caracteristicele celeilalte particule - pentru că sunt opusele primei]. Deci, informația de la o particulă la alta circulă cumva.

Lăsând particulele legate A și B să zboare în direcții opuse la o distanță mare, apoi măsurând particula A, avem automat caracteristicele particulei B. Calculând în mod simplu viteza, adică distanța împărțită la timp, putem construi cu cele două particule legate viteze mai mari decât "c" (viteza luminii).

În *Enciclopedia de Fizică* "Ipoteza Smarandache" este - desigur - criticată, cum ați observat: *http://scienceworld.wolfram.com/physics/SmarandacheHypothesis.html* .

O altă teorie a mea este introducerea termenului de "nematerie" [*unmatter*] (în 2004, în site-ul CERN: *http://cdsweb.cern.ch/record/798551?ln=pt*), adică nici "materie" nici "antimaterie", ci între cele două.

Definită tot simplu, din faptul că există [*quarks*] și [*antiquarks*] care se combină [*bind*] împreună. Ceea ce este de remarcat, că noile cercetări internaționale la nivel cuantic [în vogă astăzi] se referă la așa-zisa "neparticulă" [*unparticule*, 2007, care nu e nici particulă nici antiparticulă, propusă de Howard Georgi], care însă este o formă de nematerie, fiindcă neparticulele sunt stări care conțin mixturi de particule și antiparticule (deci nemateria definită de mine cu 3 ani înaintea lui Georgi). Folosirea operatorilor fractali de derivare și integrare conduce la o conecție între neparticule și nematerie.

Aceste combinări de contrarii și neutrarii mi-au provenit din neutrosofie (o generalizare a dialecticii) și din paradoxism.

Cartea mea despre neutrosofice “A Unifying Field in Logics…” are în prima parte un stil filozofic (MetaFilozofie - aș zice eu). Adică interpretări neutrosofice ale unor școli și idei filozofice (unire a contrariilor și neutrarilor ca-n neutrosofie).

Paginile 15-89 (capitolul "Neutrosofia, o nouă ramură a filozofiei") este o incursiune neutrosofică prin filozofie. FILOZOFIE PURĂ.

Paginile 90-108 sunt tot o incursiune, dar prin logică. Logica face parte atât din matematică cât și din filozofie.

În situl *http://fs.unm.edu/eBooks-otherformats.htm* sunt 11 cărți de filozofie (e drept, unele traduceri în rusă, chineză - cu caractere tradiționale dar și cu caractere simplificate, și arabă).

Cartea *http://fs.unm.edu/NeutrosophicDialogues.pdf* este pur și simplu un dialog filozofic (neutrosofic) prin email între mine și profesorul Feng Liu de la o universitate din Xi'an, China. Tot el mi-a tradus și cartea de neutrosofice în chineză.

Cartea *http://fs.unm.edu/ArabicNeutrosophy-en.pdf* se refetă la interpretări neutrosofice ale unor filozofi arabi; vedeți ultima copertă pentru o prezentare succintă.

Cartea *http://fs.unm.edu/NeutrosophicProceedings.pdf* are articole filozofice de-ale mele, sau ale mele împreună cu alți co-autori, sau ale altora.

Cartea *http://fs.unm.edu/Neutrality.pdf* este de logică neliniară (adică având operatori logici neliniari), împreună cu un profesor din Bielorusia.

Și cartea groasă (cea mai voluminoasă a mea) *http://fs.unm.edu/MultispaceMultistructure.pdf* are câteva lucrări filozofice.

Neutrosofia este o metafilozofie, i.e. găsirea de părți comune la filozofii opuse...

Geopathogeneous Radiation

To Dmitri Rabounski

The human being is continuously transforming, and the most adapted will perpetuate. Adapted to radiation, adapted to cosmos traveling...

Indeed, it will be interesting to see how the born-in-space children will be? How lack or high gravitation will influence the human biology.

You introduced the *geopathogeneous radiation* [“fundamental radiations of the Earth causing changes (*mutationa*) in the levels of genes”] concept.

The Solar System considered as a body, and even more the while Universe is considered as unitary body.

Small changes can produces big output?

Time

There exist many types of time: *subjective time, biological time, psychological time, mechanical time, optical time*, and so on.

*

If black holes are real, does time is travelling in them?

*

Relative time can dilate or contract, but the absolute time – no.

Neutrosophic Probability Density

Neutrosophic Probability Density can better represent in Quantum Physics the momentum and position of a particle, than the classical and imprecise probabilities.

Symmetry

A perfect symmetry there exists in idealistic spaces, not real ones. Any symmetru has some degree of assymetry, and reciprocalyy. Between matter and antimatter there exists unmatter. With respect to unmatter, some types of matter are symmetric with respect to correponding types of antimatter.

If the universe expands…

…it is anistropic or isotropic?

Energy of a Particle

Particle's energy depends on its own speed, mass, space's energy that it passes through, its moving time, not on the light speed.

Binary Logic vs. Neutrosophic Logic

Binary logic from physics has to be replaced by the neutrosophic logic, which leaves room for uncertainty, indeterminate, contradictory information.

Neutrosophic logic allows conclusions which are partially true, we call them (*t*, *i*, *f*) – conclusions, i.e. *t*% true, *i*% indeterminate, and *f*% false, with *t*, *i*, *f* subsets of [0, 1].

DNA as non-particle

Vic Christianto

Research related to wave nature of DNA. I am interested in Gariaev research called wave genetics, it is against the standard view of DNA as particle.

No, I will not go to Russia. Instead I am trying to persuade him to come to Indonesia, because I heard that there is lack support to his research in Russia.

Florentin Smarandache

What about if we say like De Broglie that the DNA is both particle and wave?

Gariaev and Montagnier support the wave nature of DNA.

If all life come from life via frequency, what about when no life was: how the life arose from non-life?

Vic Christianto

Dr. Vladimir Netchitailo's model is interesting indeed. But with one caution: the fifth extra dimension that he postulated has not been discovered or proved yet.

Florentin Smarandache

I agree, the fifth dimension is unrealistic (at least to our understanding today), maybe similarly like the String Theory with... 11 dimensions!

*

Your paper on DNA as non-particle is very read in *Academia.edu*. By non-particle, do you mean only wave? Or there might be another state between particle and non-particle - as in neutrosophy? I am thinking at a possibility of intermediate state between particle and way (i.e. neither particle nor wave, or both particle and wave simultaneously as <neutA> in neutrosophy)... how would that be?

Acoustic View of DNA and Consciousness

To Vic Christianto

I'd be interested in cooperating with your friend Dr. Harmander Singh too, but in interpretation or combination from a philosophical or psychological point of view, not physical point of view.

I did some philosophy (the neutrosophy, as generalization of dialectics and Chinese Yin Yang), and now I try the study of neutrosophic psychology.

A paper on acoustic view of DNA and consciousness and their role in developmental psychology may interest me too.

Evolutionism vs. Creationism

To Vic Christianto

I just returned from Galapagos, where Darwin went about 180 years ago.

You are both, a scientist and a religious man.

Can you tell me what do you think about Evolutionism vs. Creationism ?

Is there the possibility of a p% evolutionism and a q% creationism, with p, q in [0, 1], and $p+q = 1$, i.e. mixture of both (again <neutA>)?

*

Evoluția - parțial științifică și parțial creaționistă?

Știința este, într-adevăr, abia la început. Este greu să imiți producerea artificială a tot ceea ce a produs natura.

Nu se știe cum a provenit viața pe Pământ. Unii zic că ar fi venit de pe altă planetă pe vreun meteorit...

*

Evolution depends not only on the natural selection, but on many other parameters: the good luck and the bad luck, the happening, the environmental juncture, the friends and the enemies, etc.

There exists *instantaneous evolution* (i.e. *punctuated equilibrium*) or *quantum speciation* (Ernst Mayr) when new species suddenly occur.

Evoluție vs. Divin

To Andrușa Vătuiu

Probabil știați de Teoria Neutrosofică a Evoluției (vedeți articolul meu atașat, în engleză și română)

http://fs.unm.edu/neutrosophic-evolution-PP-49-13.pdf după călătoria din Galapagos?

Vorbeam de faptul că, în noul mediu: unele părți și funcționalități ale corpului evoluează, altele involuează (deoarece nu mai sunt folosite), iar celelalte rămân la fel (neutre, deoarece au nevoie de aceleași functionalități)...

Doriți să comparăm teoriile științifice ale evoluției cu teoria divină? Adică ceva între opoziții?

Andrușa Vătuiu

Cred că începem să formulăm o dezbatere destul de interesantă. Lucrarea în opinia mea, ar trebui să fie structurată în trei părți.

1.*Creația*

2. *Evoluția*

3. *Teoria Neutrosofică a Evoluției*.

1. *Creația*. Teoria creației poate fi împărțită în două : creația divină susținută de religie și creația științifică (fiindcă există și o creație științifică, deoarece și știința se joacă de-a divinitatea când prin intervenții asupra geneticii celulare sau a ADN-ului unor specii biologice, creează specii noi sau clone ale unor specii existente).
2. *Evoluția*. Această parte ar trebui să plece de la teoria evoluționistă a lui Darwin și să susțină prin exemple ideea evoluției sistemelor biologice.
3. *Teoria neutrosofică a evoluției* care, așa cum ați demonstrat, poate duce la evoluție, involuție sau indeterminare (neutru). Cred că aici s-ar putea continua și cu o teorie neutrosofică a creației : creație, distrugere și neutralitate.

Fiecare parte va trebui să cuprindă atât argumentele care susțin teoria respectivă, dar și contraargumente care arată că excepția nu confirmă regula. Bănuiesc a avea ca finalitate o acceptare a ambelor teorii și în același timp o negare a lor, deci vom intra pe tărâmul indeterminării, demonstrat atât de bine de dvs.

Florentin Smarandache

Teoria neutrosofică a evoluției este o generalizare a teoriei lui Darwin; eu nu îl neg pe Darwin, dar completez idea sa, și anume arăt că unele părți ale organismului evoluează (așa cum Darwin a zis), dar el nu a mai spus că alte părți involuează, și nici că a treia parte rămân neschimbate (neutre).

Uitați-vă peste articolul meu în românește unde sunt exemple clare, recunoscute de știința contemporană.

La creația științifică (genetică), s-ar putea probabil mula logica neutrosofică: unele părți evoluind, altele neschimbate, iar a treia parte degenerând - dar am avea nevoie de exemple științifice.

Dar nu știu ce am putea spune la creația divină?

Andrușa Vătuiu

Referitor la creația divină, aceasta consider că poate avea unele nuanțe. Creația , așa cum o vede religia poate fi exemplificată ca punct de plecare în această mare discuție privind creația biologică. Dar, un alt aspect se desprinde aici , în ultimii ani, foarte mulți cercetători s-au întors spre ideea creației dar nu ca rezultat al acțiunii unui anumit personaj divin, ci mai degrabă a intervenției unui colectiv sau a unei supercivilizații. Astfel creația, capătă mai mult un aspect tehnicist, care s-ar putea explica și prin interesul științelor actuale de a obține forme biologice noi. Dacă citim și în Biblie capitolul genezei, nici aici nu găsim vreo referire exactă dacă Dumnezeu este un personaj singular, sau este vorba de un personaj multiplu. Chiar trinitatea, tatăl, fiul și duhul sfânt mă duce spre ipoteza unui personaj multiplu (nu este exclusă referirea la vreo supercivilizație care ar exista în jurul nostru). Dar, acest aspect, destul de amplu, care poate ușor să umple mii de pagini, ne aruncă în teoria extrasenzorialului. De acest aspect ne putem ocupa chiar noi într-o lucrare viitoare.

Darwin's Theory of Evolution

I have asked my elementary school zoology teacher, when learning about Darwin's Theory of Evolution: *why the monkey do not transform even today into humans?*

Three-Ways Decision is a particular case of Neutrosophication

i. Neutrosophication

Let <*A*> be an attribute value, <*antiA*> the opposite of this attribute value, and <neutA> the neutral (or indeterminate) attribute value between the opposites <*A*> *and* <*antiA*>.

For examples: <A> = *big*, then <antiA> = *small*, and <neutA> = *medium*; we may rewrite:

(<A>, <neutA>, <antiA>) = (big, medium, small);

or (<A>, <neutA>, <antiA>) = (*truth* (denoted as *T*), *indeterminacy* (denoted as *I*), *falsehood* (denoted as *F*)) as in Neutrosophic Logic, or (<A>, <neutA>, <antiA>) = (*membership, indeterminate-membership, monmembership)* as in Neutrosophic Set,

or (<A>, <neutA>, <antiA>) = (*chance that an event occurs, indeterminate-chance that the event occurs or not, chance that the event does not occur)* as in Neutrosophic Probability,

and so on.

And let by "Concept" mean: an item, object, idea, theory, region, universe, set, notion etc. that is characterized by this attribute.

The process of **neutrosophication** means:

- converting a *Classical Concept* { denoted as ***$(1_{<A>}, 0_{<neutA>}, 0_{<antiA>})$-ClassicalConcept***,

or ***ClassicalConcept$(1_{<A>}, 0_{<neutA>}, 0_{<antiA>})$*** }, which means that the concept is, with respect to the above attribute,

100% <A>, 0% <neutA>, and *0% <antiA>,*

into a *Neutrosophic Concept* { denoted as ***$(T_{<A>}, I_{<neutA>}, F_{<antiA>})$-NeutrosophicConcept***,

or ***NeutrosophicConcept$(T_{<A>}, I_{<neutA>}, F_{<antiA>})$*** }, which means that the concept is, with respect to the above attribute,

T% <A>, I% <neutA>, and *F% <antiA>,*

which more accurately reflects our imperfect, non-idealistic reality,

where *T, I, F* are subsets of *[0, 1]* with no other restriction.

ii. Example 1:

Let the attribute <A> = cold temperature, then <antiA> = hot temperature, and <neutA> = medium temperature.

Let the concept be a country *M*, such that its northern part (30% of country's territory) is cold, its southern part is hot (50%), and in the middle there is a buffer zone with medium temperature (20%). We write:

$$M(\ 0.3_{cold\ temperature},\ 0.2_{medium\ temperature},\ 0.5_{hot\ temperature}\ )$$

where we took single-valued numbers for the neutrosophic components $T_M = 0.3$, $I_M = 0.2$, $F_M = 0.5$, and the neutrosophic components are considered dependent so their sum is equal to 1.

iii. <u>Example 2:</u> **Three-Ways Decision is a particular case of Neutrosophication**

Neutrosophy (based on *<A>*, *<neutA>*, *<antiA>*) was proposed by Smarandache [1] in 1998, and Three-Ways Decision by Yao [2] in 2009.

In Three-Ways Decision, the universe set is split into three different distinct areas, in regard to the decision process, representing:

Acceptance, Noncommitment, and *Rejection* respectively.

In this case, the decision attribute value *<A>* = Acceptance, whence *<neutA>* = Noncommitment, and *<antiA>* = Rejection.

The classical concept = *UniverseSet*.

Therefore, we got the *NeutrosophicConcept*($T_{<A>}$, $I_{<neutA>}$, $F_{<antiA>}$), denoted as:

UniverseSet($T_{Acceptance}$, $I_{Noncommitment}$, $F_{Rejection}$),

where $T_{Acceptance}$ = *universe set's zone of acceptance*, $I_{Noncommitment}$ = *universe set's zone of noncomitment (indeterminacy)*, $F_{Rejection}$= = *universe set's zone of rejection.*

iv. Three-Ways Decision as a particular case of Neutrosophic Probability

Let's consider the event, taking a decision on a universe set.

According to Neutrosophic Probability (NP) [3] one has:

NP(decision) = (the universe set's elements for which the chance of the decision may be accept; the universe set's elements for which there may be an indeterminate-chance of the decision; the universe set's elements for which the chance of the decision may be reject).

v. Refined Neutrosophy

Refined Neutrosophy was introduced by Smarandache [4] in 2013 and it is described as follows:

<*A*> is refined (split) into subcomponents <A_1>, <A_2>, …, <A_p>;

<*neutA*> is refined (split) into subcomponents <*neut*A_1>, <*neut*A_2>, …, <*neut*A_r>;

and <*antiA*> is refined (split) into subcomponents <*anti*A_1>, <*anti*A_2>, …, <*anti*A_s>;

where *p, r, s ≥ 1* are integers, and *p + r + s ≥ 4.*

vi. <u>Example 3.</u>

If $<A>$ = voting in country M, them $<A_1>$ = voting in Region 1 of country M for a given candidate, $<A_2>$ = voting in Region 2 of country M for a given candidate, and so on.

Similarly, $<neutA_1>$ = not voting (or casting a white or a black vote) in Region 1 of country M, $<A_2>$ = not voting in Region 2 of country M, and so on.

And $<antiA_1>$ = voting in Region 1 of country M against the given candidate, $<A_2>$ = voting in Region 2 of country M against the given candidate, and so on.

vii. Extension of Three-Ways Decision to n-Ways Decision

n-Way Decision was introduced by Smarandache in 2019.

In n-Ways Decision, the universe set is split into $n \geq 4$ different distinct areas, in regard to the decision process, representing:

Levels of Acceptance, Levels of Noncommitment, and *Levels of Rejection* respectively.

Levels of Acceptance may be: Very High Level of Acceptance $(<A_1>)$, High Level of Acceptance $(<A_2>)$, Medium Level of Acceptance $(<A_3>)$, etc.

Similarly, Levels of Noncommitment may be: Very High Level of Noncommitment $(<neutA_1>)$, High Level of Noncommitment $(<neutA_2>)$, Medium Level of Noncommitment $(<neutA_3>)$, etc.

And Levels of Rejection may be: Very High Level of Rejection $(<antiA_1>)$, High Level of Rejection $(<antiA_2>)$, Medium Level of Rejection $(<antiA_3>)$, etc.

Then the *Refined Neutrosophic Concept*

{ denoted as $\boldsymbol{(T1_{<A1>}, T2_{<A2>}, \ldots, Tp_{<Ap>};\ I1_{<neutA1>}, I2_{<neutA2>}, \ldots, Ir_{<neutAr>};}$

$\boldsymbol{F1_{<antiA1>}, F2_{<antiA2>}, Fs_{<antiAs>})}$***-RefinedNeutrosophicConcept,***

or ***RefinedNeutrosophicConcept*** $\boldsymbol{(T1_{<A1>}, T2_{<A2>}, \ldots, Tp_{<Ap>};\ I1_{<neutA1>}, I2_{<neutA2>}, \ldots, Ir_{<neutAr>};\ F1_{<antiA1>}, F2_{<antiA2>}, Fs_{<antiAs>})}$},

which means that the concept is, with respect to the above attribute value levels,

T1% <A1>, T2% <A2>, …, Tp% <Ap>;

I1% <neutA1>, I2% <neutA2>, …, Ir% <neutAr>;

F1% <antiA1>, F2% <antiA2>, Fs% <antiAs>;

which more accurately reflects our imperfect, non-idealistic reality,

with where $p, r, s \geq 1$ are integers, and $p + r + s \geq 4$,

where all $T1, T2, \ldots, Tp, I1, I2, \ldots, Ir, F1, F2, \ldots, Fs$ are subsets of $[0, 1]$ with no other restriction.

References:

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[2] Y. Yao, *Three-way decision: an interpretation of rules in rough set theory*, in Proceeding of 4th International Conference on Rough Sets and Knowledge Technology, LNAI, Vol. 5589, Springer Berlin Heidelberg, 2009, pp. 642–649.

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The neutrosophic triplet (n-ary HyperAlgebra, n-ary NeutroHyperAlgebra, n-ary AntiHyperAlgebra)

We introduce for the first time the n-ary HyperOperation, n-ary HyperAxiom, n-ary HyperAlgebra, also the n-ary NeutroHyperOperation, n-ary NeutroHyperAxiom, n-ary NeutroHyperAlgebra, and the n-ary AntiHyperOperation, n-ary AntiHyperAxiom, n-ary AntiHyperAlgebra respectively.

We form the following neutrosophic triplets:

(n-ary HyperOperation, n-ary NeutroHyperOperation, n-ary AntiHyperOperation),

(n-ary HyperAxiom, n-ary NeutroHyperAxiom, n-ary AntiHyperAxiom), and

(n-ary HyperAlgebra, n-ary NeutroHyperAlgebra, n-ary AntiHyperAlgebra).

Let U be a universe of discourse, a nonempty set $S \subset U$. Let $\mathcal{P}(S)$ be the power set of S (i.e. all subsets of S, including the empty set ϕ and the whole set S), and an integer $n \geq 1$.

1. n-ary HyperOperation (n-ary HyperLaw)

A *n-ary HyperOperation (n-ary HyperLaw)* $*_n$ is defined as:

$*_n : S^n \to \mathcal{P}(S)$, and

$\forall a_1, a_2, ..., a_n \in S$ one has $*_n(a_1, a_2, ..., a_n) \in \mathcal{P}(S)$.

The n-ary HyperOperation (n-ary HyperLaw) is well-defined.

2. n-ary HyperAxiom

A *n-ary HyperAxiom* is an axiom defined of *S*, with respect the above *n-ary* operation $*_n$, that is true for all *n-plets* of S^n.

3. n-ary HyperAlgebra, $(S, *_n)$, is the *S* endowed with the above n-ary well-defined HyperOperation $*_n$.

4. Types of n-ary HyperAlgebras

Adding one or more n-ary HyperAxioms to *S* we get different types of *n-ary* HyperAlgebras.

5. n-ary NeutroHyperOperation (n-ary NeutroHyperLaw)

A *n-ary NeutroHyperOperation* is a *n-ary* HyperOperation $*_n$ that is well-defined for some *n-plets* of S^n

[i.e. $\exists (a_1, a_2, ..., a_n) \in S^n, *_n(a_1, a_2, ..., a_n) \in P(S)$],

and indeterminate

[i.e. $\exists (b_1, b_2, ..., b_n) \in S^n, *_n(b_1, b_2, ..., b_n) = indeterminate$]

or outer-defined

[i.e. $\exists (c_1, c_2, ..., c_n) \in S^n, *_n(c_1, c_2, ..., c_n) \notin P(S)$]

(or both), on other *n-plets* of S^n.

6. n-ary NeutroHyperAxiom

A *n-ary NeutroHyperAxiom* is an n-ary HyperAxiom defined of *S*, with respect the above *n-ary* operation $*_n$, that is true for some *n-plets* of S^n, and indeterminate or false (or both) for other *n-plets* of S^n.

7. n-ary NeutroHyperAlgebra is an n-ary HyperAlgebra that has some n-ary NeutroHyperOperations or some n-ary NeutroHyperAxioms

8. n-ary AntiHyperOperation (n-ary AntiHyperLaw)

A *n-ary AntiHyperOperation* is a *n-ary* HyperOperation $*_n$ that is outer-defined for all *n-plets* of S^n [i.e. $\forall(s_1, s_2, ..., s_n) \in S^n, *_n(s_1, s_2, ..., s_n) \notin P(S)$].

9. n-ary AntiHyperAxiom

A *n-ary AntiHyperAxiom* is an n-ary HyperAxiom defined of *S*, with respect the above *n-ary* operation $*_n$, that is false for all *n-plets* of S^n.

10. n-ary AntiHyperAlgebra is an n-ary HyperAlgebra that has some n-ary AntiHyperOperations or some n-ary AntiHyperAxioms.

n-SuperHyperGraph and Plithogenic n-SuperHyperGraph

We introduce now for the first time the n-SuperHyperGraph (n-SHG), n-SHG-vertex, and n-SHG-edge, also the Plithogenic n-SuperHyperGraph (n-PSHG).

A **n-SuperHyperGraph** *SHG* is an ordered pair $n\text{-}SHG = (G_n \subseteq P^n(V), E_n \subseteq P^n(V))$, where $P^n(V)$ is the n-power set of the set V, for integer $n \geq 1$, defined as follows: $P^{n+1}(V) = P(P^n(V))$.

Also:

(i) $V = \{v_1, v_2, .., v_n\}$ is a finite set of $n \geq 1$ vertices.

(ii) P(V) is the power set of V (all subset of V). Therefore, an ***SHG-vertex*** may be a single (classical) *vertex*, or a *subset-vertex* (a subset of many vertices) that represents a group (organization), or even an *indeterminate-vertex* (unclear, unknown vertex).

(iii) $E = \{E_1, E_2, \ldots, E_m\}$, for $m \geq 1$, is a family of subsets of V, and each E_j is an SHG-edge. An ***SHG-edge*** may be a (classical) *edge*, or a *subset-edge* (edge between subset-vertices) that represents connections between two groups (organizations), or *hyper-subset-edge*) that represents connections between three or more groups (organizations), *multi-*

edges, or even an *indeterminate-edge* (unclear, unknown edge).

Therefore, the **n-SuperHyperGraph** n-*SHG* may have any of the below:

- *Single-vertices* (v_i), as in classical graphs, such as: v_1, v_2, etc.;
- *SuperVertices (or Subset-vertices)* (sv_i), belonging to *P(V)*, for example: $sv_{1,3} = v_1v_3$, $sv_{2,5,7} = v_2v_5v_7$, etc. that we introduce now for the first time. A subset-vertex may represent a group (organization, team, club, city, country, etc.) of many individuals
- *Indeterminate-vertices (*i.e. unclear, unknown vertices*);* we denote them as: Iv_1, Iv_2, etc. that we introduce now for the first time;
- *Simple-edges*, as in classical graphs, i.e. edges connecting only two single-vertices, for example: $E_{1,5} = \{v_1, v_5\}$, $E_{2,3} = \{v_2, v_3\}$, etc.;
- *HyperEdges*, i.e. edges connecting three or more single-vertices, for example $HE_{1,4,6} = \{v_1, v_4, v_6\}$, $HE_{2,4,5,7,8,9} = \{v_2, v_4, v_5, v_7, v_8, v_9\}$, etc. as in hypergraphs;
- *SubsetEdges*, i.e. edges connecting only two vertices (and at least one vertex is subset-vertex), for example $SE_{136,4579} = \{v_{136}, v_{4579}\}$ connecting two subset-vertices, $SE_{9,2345} = \{v_9, v_{2345}\}$ connecting one

single-vertex with one subset-vertex, etc. that we introduce now for the first time;

- *HyperSubsetEdges*, i.e. edges connecting three or more vertices (and at least one vertex is subset-vertex, for example $HSE_{3,45,236} = \{v_{3}, v_{45}, v_{236}\}$, $HSE_{1234,456789,567,5679} = \{v_{1234}, v_{456789}, v_{567}, v_{5679}\}$, etc. that we introduce now for the first time;
- *MultiEdges,* i.e. two or more edges connecting the same (single-/subset-/indeterminate-) vertices; each vertex is characterized by many attribute values, thus with respect to each attribute value there is an edge, the more attribute values the more edges (= multiedge) between the same vertices;
- *IndeterminateEdges* (i.e. unclear, unknown edges; either we do not know their value, or we do not know what vertices they might connect): IE_{1}, IE_{2}, etc. that we introduce now for the first time.

Examples of 2-SuperHyperGraph, SingleEdge, and MultiEdges

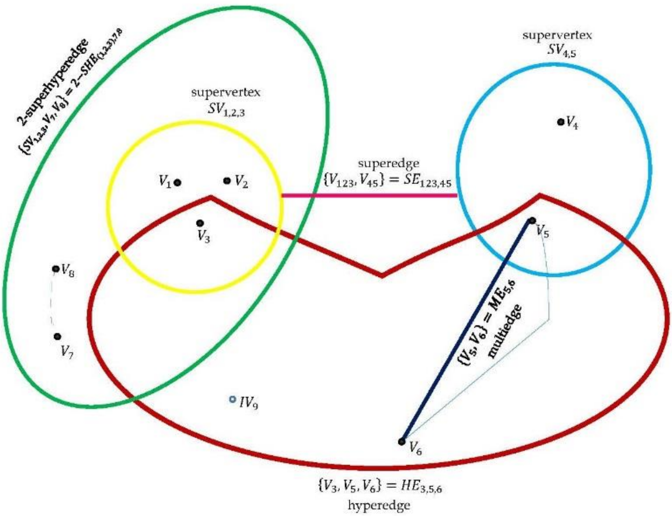

Figure 1. 2-SuperHyperGraph

Let v_1 and v_2 be two single-vertices, characterized by the attributes a_1 = size, whose attribute values are {short, medium, long}, and a_2 = color, whose attribute values are {red, yellow}.

Thus we have the attributes values (Size{short, medium, long}, Color{red, yellow}), whence: $v_1(a_1\{s_1, m_1, l_1\}, a_2\{r_1, y_1\})$, where s_1 is the degree of short, m_1 degree of medium, l_1 degree of long, while r_1 is the degree of red and y_1 is the degree of yellow of the vertex v_1.

And similarly $v_2(a_1\{s_2, m_2, l_2\}, a_2\{r_2, y_2\})$.

The degrees may be fuzzy, neutrosophic etc.

Example of fuzzy degree:

v_1(a_1{0.8, 0.2, 0.1}, a_2{0.3, 0.5}).

Example of neutrosophic degree:

v_1(a_1{ (0.7,0.3,0.0), (0.4,0.2,0.1),(0.3,0.1,0.1) }, a_2{ (0.5,0.1,0.3), (0.0,0.2,0.7) }).

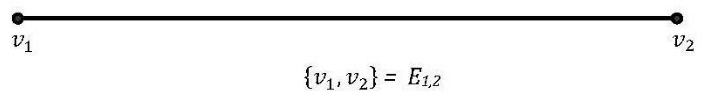

Figure 2. SingleEdge with respect with both attributes a_1 and a_2

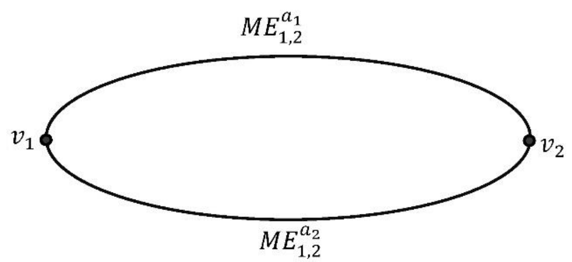

Figure 4. MultiEdge (= Refined-SingleEdge), top edge with respect to attribute a_1,

bottom edge with respect to attribute a_2

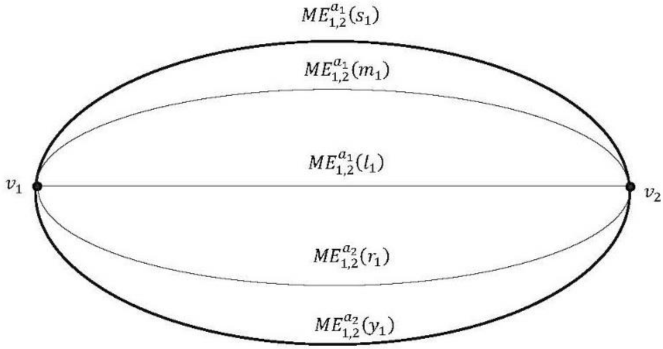

Figure 4. MultiEdge (= Refined RefinedSingleEdge), one edge for each of the attributes' values.

Depending on the application and on experts, one chooses amongst single-edge, refined-single-edge, or refined refined-single-edge, etc.

*

As a consequence, we introduce now for the first time the Plithogenic n-SuperHyperGraph.

A **Plithogenic n-SuperHyperGraph (PSHG)** is a n-SuperHyperGraph whose each n-*SHG-vertex* and each *n-SHG-edge* are characterized by many distinct attributes values $(a_1, a_2, \ldots, a_p, p \geq 1)$.

Therefore, one gets n-*SHG-vertex*($a_1, a_2, \ldots, a_p$) and n-*SHG-edge*($a_1, a_2, \ldots, a_p$).

The attributes values degrees of appurtenance to the graph may have crisp / fuzzy / intuitionistic fuzzy /

picture fuzzy / spherical fuzzy / neutrosophic / etc. / degrees with respect to each n-*SHG-vertex* and each *n-SHG-edge* respectively.

For example, one may have:

Fuzzy-n-*SHG-vertex*($a_1(t_1)$, $a_2(t_2)$, …, $a_p(t_p)$) and Fuzzy-n-*SHG-edge*($a_1(t_1)$, $a_2(t_2)$, …, $a_p(t_p)$);

Intuitionistic Fuzzy-n-*SHG-vertex*($a_1(t_1, f_1)$, $a_2(t_2, f_2)$, …, $a_p(t_p, f_p)$)

and Intuitionistic Fuzzy-n-*SHG-edge*($a_1(t_1, f_1)$, $a_2(t_2, f_2)$, …, $a_p(t_p, f_p)$);

Neutrosophic-n-*SHG-vertex*($a_1(t_1, i_1, f_1)$, $a_2(t_2, i_2, f_2)$, …, $a_p(t_p, i_p, f_p)$)

and Neutrosophic-n-*SHG-edge*($a_1(t_1, i_1, f_1)$, $a_2(t_2, i_2, f_2)$, …, $a_p(t_p, i_p, f_p)$);

etc.

Whence we get:

The Plithogenic (Crisp / Fuzzy / Intuitionistic Fuzzy / Picture Fuzzy / Spherical Fuzzy / etc. / Neutrosophic / Refined Neutrosophic) **n-SuperHyperGraph.**

Refined Neutrosophic Crisp Set (RNCS)

Salama and Smarandache defined in 2014 and 2015 [1] the Neutrosophic Crisp Set as follows.

Definition of Neutrosophic Crisp Set (NCS)
Let X be a non-empty fixed space. A neutrosophic crisp set is an object D having the form
$D = \langle A, B, C \rangle$, where A, B, C are subsets of X.

Types of Neutrosophic Crisp Sets
The object having the form $D = \langle A, B, C \rangle$ is called:

(a) A neutrosophic crisp set of Type 1 (NCS-Type1) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ (empty set).

(b) A neutrosophic crisp set of Type 2 (NCS-Type2) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ and $A \cup B \cup C = X$.

(c) A neutrosophic crisp set of Type 3 (NCS-Type3) if it satisfies:
$A \cap B \cap C = \phi$ and $A \cup B \cup C = X$.

Of course, more types of Neutrosophic Crisp Sets may be defined by modifying the intersections and unions of the subsets A, B, and C.

Refined Neutrosophic Crisp Set

In 2019, Smarandache extended for the first time the Neutrosophic Crisp Set to Refined Neutroosphic Crisp Set, based on his 2013 definition of Refined Neutrosophic Set / Logic / Probability [2], i.e. the truth *T* was refined/split into sub-truths such as $T_1, T_2, \ldots, T_p$, similarly indeterminacy *I* was refined/split into sub-indeterminacies $I_1, I_2, \ldots I_r$, and the falsehood *F* was refined/split into sub-falsehoods $F_1, F_2, \ldots, F_s$.

Definition of Refined Neutrosophic Crisp Set (RNCS)

Let *X* be a non-empty fixed space. And let *D* be a Neutrosophic Crisp Set, where
$D = \langle A, B, C \rangle$, with *A, B, C* as subsets of *X*.

We refined/split *D* (and denote it by *RD = Refined D*) by refining/splitting *A, B, C* into sub-subsets as follows:

$RD = (A_1, ..., A_p; B_1, ..., B_r; C_1, ..., C_s)$, where $p, r, s \geq 1$ are positive integers,

and

$$A = \bigcup_{i=1}^{p} A_i, \quad B = \bigcup_{j=1}^{r} B_j, \quad C = \bigcup_{k=1}^{s} C_k .$$

Types of Refined Neutrosophic Crisp Set

Similarly, we have:

(a) A refined neutrosophic crisp set of Type 1 (RNCS-Type1) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ (empty set).

(b) A refined neutrosophic crisp set of Type 2 (RNCS-Type2) if it satisfies:
$A \cap B = B \cap C = C \cap A = \phi$ and $A \cup B \cup C = X$.

(c) A refined neutrosophic crisp set of Type 3 (RNCS-Type3) if it satisfies:
$A \cap B \cap C = \phi$ and $A \cup B \cup C = X$.

And, of course, more types of Refined Neutrosophic Crisp Sets may be defined: by modifying the intersections and unions of the subsets *A*, *B*, *C*, or the intersections and unions of their sub-subsets A_i, B_j, C_k, for $i \in \{1, 2, \dots, p\}$, $j \in \{1, 2, \dots, r\}$, and $k \in \{1, 2, \dots, s\}$.

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[1] A.A. Salama, F. Smarandache, *Neutrosophic Crisp Set Theory*, Educational Publisher, Columbus, Ohio, USA, 2015; http://fs.unm.edu/NeutrosophicCrispSetTheory.pdf

[2] Florentin Smarandache, *n-Valued Refined Neutrosophic Logic and Its Applications in Physics*, Progress in Physics, 143-146, Vol. 4, 2013; https://arxiv.org/ftp/arxiv/papers/1407/1407.1041.pdf and http://fs.unm.edu/n-ValuedNeutrosophicLogic-PiP.pdf

Neutrosophic Statistics vs. Classical Statistics

While the Classical Statistics deals with *determinate data* and *determinate inference methods* only, Neutrosophic Statistics deals with *indeterminate data* and *indeterminate inference methods*, i.e. data that has any kind of indeterminacy (unclear, vague, partially unknown, contradictory, incomplete, etc.), and inference methods that degrees of indeterminacy as well (for example, instead of crisp arguments and values for the probability distributions, algorithms, functions etc. one may have inexact or ambiguous arguments and values).

Neutrosophic Statistics was founded by Smarandache in 1998 and developed in 2014.

The Neutrosophic Statistics is also a generalization of Interval Statistics, because of, among others, while Interval Statistics is based on Interval Analysis, Neutrosophic Statistics is based on Set Analysis (meaning all kind of sets, not only intervals).

Neutrosophic Statistics is more elastic than Classical Statistics.

If all data and inference methods are determinate, then Neutrosophic Statistics coincides with Classical Statistics.

But, since in our world we have more indeterminate data than determinate data, therefore more neutrosophic statistical procedures are needed than classical ones.

My **lab**[oratory] is a virtual facility with non-controlled conditions in which I mostly perform scientific meditation and chats: *a nest of ideas* (**nidus idearum**, in Latin). I called the jottings herein *scilogs* (truncations of the words *scientific*, and gr. Λόγος (*lógos*) – appealing rather to its original meanings "ground", "opinion", "expectation"), combining the welly of both science and informal (via internet) talks (in English, French, Spanish, and Romanian).

In this *seventh book of scilogs* collected from my nest of ideas, one may find new and old questions and solutions, referring to different scientific topics– email messages to research colleagues, or replies, notes about authors, articles, or books, future projects, and so on.

Special thanks to all my peer colleagues comprised in this booklet for exciting and pertinent instances of discussing (alphabetically ordered): Akeem Adesina A. Agboola, Muhammad Akram, Octavian Blaga, Said Broumi, Kajal Chatterjee, Vic Christianto, Octavian Cira, Mihaela Colhon, B. Davvaz, Luu Quoc Dat, R. Dhavaseelan, Jean Dezert, Hoda Esmail, Reza Farhadian, Ervin Goldfain, Muhammad Gulistan, Yanhui Guo, Keli Hur, Saeid Jafari, W. B. Vasantha Kandasamy, J. Kim, J.G. Lee, Xinde Li, P. K. Lim, R. K. Mohanty, Mumtaz Ali, To Santanu Kumar Patro, Xu Peng, Dmitri Rabounski, Nouran Radwan, A.A. Salama, Musavarah Sarwar, Ganeshsree Selvachandran, Le Hoang Son, Selçuk Topal, Andrușa Vătuiu, Ștefan Vlăduțescu, Xiaohong Zhang.

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