STUDY OF RELATIONS IN FUZZY PROPOSITIONS

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ABSTRACT:

In fresh rationale, reality esteems gained by recommendations or predicates are 2-esteemed, specifically, True, False which might be equal to {0,1}. Be that as it may, in fluffy reality esteems are multi-esteemed, for example, totally evident, halfway obvious, exceptionally evident, completely false, etc. and are numerically proportionate to [0-1]. This work gives a thought of the rationale that set forward the surmising rules - Modus Ponens, Modus Tollens, Chain Rule and IF THEN standards and its compositional guideline of induction. Fluffy recommendations are doled out to fluffy sets. Assume a fluffy suggestion 'P' is allotted to a fluffy set 'An', at that point reality estimation of the recommendation is proposed by T (P) = $\mu A(x)$ where $0 \leq \mu A(x) \leq 1$

In this manner truthiness of a suggestion P is enrollment estimation of x in fluffy set A.

The consistent connectives like disjunction, combination, nullification and suggestion are additionally characterized on fluffy recommendations.
Key Words : Fuzzy rule, Tautology, Compound Proposition, Interpretations.

1. INTRODUCTION

Rationale is the art of thinking. Numerical rationale has ended up being an amazing computational worldview. Not exclusively does scientific rationale help in the portrayal of occasions in reality yet has additionally ended up being a viable apparatus for deriving or reasoning data from a given arrangement of certainties. Similarly as numerical sets have been ordered into fresh sets and fluffy sets, rationale can likewise be extensively seen as fresh rationale and fluffy rationale. Fresh sets get by on a two state enrollment (0/1) and fluffy sets on a multi-state participation [0-1], fresh rationale is based on (True/False) and fluffy rationale on a multi-state truth esteem (True/False/Very True/Partially false etc...). Induction is a system by which, given a lot of certainties or premises F1, F2,… . , Fn, an objective G is to be inferred. Different Authors connected fluffy rationale in various routes in taking care of complex issues (Zadah (1992, 1978) Dubois etal (1996, 2000), Singh T.P. (2012), G. Nirmala etal. (2013).

PRELIMINARIES

Definition : Proposition

A recommendation is a revelatory sentence that is either True or False.

Examples:

1. Is the colour of milk is white? Ans: True
2. Is 8+8=10? Ans: False

Definition Compound Proposition:

The development of new suggestion from existing recommendation utilizing coherent administrators or connectives is called compound suggestion.

NAME	SCRATCH NAMES	SYMBOLS
Negation	NOT	¬

Conjunction	AND	∧
Disjunction	OR	∨
Exclusive OR	XOR	⊕
Implication	Implies	→

Definition. Propositional Equivalence:
Propositional equality is to supplant an announcement with another equivalent truth esteem.
Examples:
I have a banana and I have a mango

p = I have a banana
q = I have a mango

Propositional equivalence of p and q : ¬(p∧q) =(¬p∨q¬)

Definition Tautology:
A compound suggestion p is redundancy if each reality task fulfills genuine. i.e All sections of its fact esteems are valid.
Examples:
1. (p → q) ↔ (¬ q →¬ p)
2. p ∨ p ↔ p
3. p ∨ ¬ (p∧q)

Definition Fuzzy Connectives:
Another announcement is shaped in fluffy sets utilizing connectives, for example ∧ ,∨,⇒,¬ are called fuzzy connectives.

Definition Rule of Inference:
In rationale, a standard of derivation is a coherent structure comprising of a capacity, which takes premises, breaks down their linguistic structure and returns an end.

Propositional Logic Connectives
The images ∧ ,∨,⇒ ,== are parallel administrators requiring two recommendations while is an unary administrator requiring a solitary suggestion .∨ and ∧ activities are alluded as disjunction and combination separately. On account of ⇒ administrator, the recommendation happening before the flag is called forerunner and the one happening after is called as ensuing. The semantics or significance of the Consistent connectives are clarified utilizing a reality table. A fact table includes lines known as elucidations, every one of which assesses the consistent equation for the given arrangement of truth esteems.

p	q	p∧q	p∨q	¬p	p⇒q	p=q
T	T	T	T	F	T	T
T	F	F	T	F	F	F
F	F	F	F	T	T	T
F	T	F	T	T	T	F

A coherent recipe involving n recommendations will have 2^n elucidations in its reality table. An equation which has every one of its understandings is genuine is known as redundancy and the one which is false is called logical inconsistency. Using this tautology we derive the equivalence of $(p \Rightarrow q) = (\neg p \vee q)$

p	q	A:p⇒q	¬p	B:¬p∨q	A=B
T	T	T	F	T	T
T	F	F	F	F	T
F	F	T	T	T	T
T	T	T	T	T	T

Here the last column yields "True" for all interpretations, it is a tautology. The logical formula presented above is of practical importance of $(p \Rightarrow q)$ is equivalent to $(\neg p \vee q)$ a formula devoid of " ⇒" connective. This equivalence can be applied to eliminate " ⇒" in logical formulae.

3.2.1 Inference in propositional Logic

In propositional rationale, three tenets are generally utilized for deducing certainties, in particular

(i) Modus Ponens:

Given $p \Rightarrow q$ and p to be true, q is true.

$$\frac{\begin{array}{c} p \Rightarrow q \\ p \end{array}}{q}$$

Here the equation over the line is the premises and the one underneath is the objective which can be derived from the premises.

(ii) Modus tollens

Given $p \Rightarrow q$ and $\neg q$ to be true, $\neg p$ is true.

$$\frac{\begin{array}{c} p \Rightarrow q \\ \neg q \end{array}}{\neg p}$$

(iii) Chain rule

Given $p \Rightarrow q$ and $q \Rightarrow r$ to be true, $p \Rightarrow r$ is

true $p \Rightarrow q$

$q \Rightarrow$

---

r p

$\Rightarrow r$

The chain rule is the representation of transitivity relation with respect to „⇒" connective.

3.3 Fuzzy Connectives

Symbol	Connective	Usage	Definition
-	Negation	$\bar{p}$	$1 - T(p)$
$\vee$	Disjunction	$p \vee q$	$\max(T(p), T(q))$
$\wedge$	Conjunction	$p \wedge q$	$\min(T(p), T(q))$
$\Rightarrow$	Implication	$p \Rightarrow q$	$\bar{p} \vee q = \max(1 - T(p), T(q))$

IF x is A THEN y is B, and is equivalent to

$$R = (A*B) \cup (A*Y)$$

The membership function of R is given by

$$\mu_R(x,y) = \max(\min(\mu_A(x), \mu_B(y)), 1 - \mu_A(x))$$

For the compound ramifications IF x is A THEN y is B ELSE y is C the connection R is given as

$$R = (A*B) \cup (\bar{A}*C)$$

The membership function of R is given by

$$\mu_R(x,y) = \max(\min(\mu_A(x), \mu_B(y)), \min(1 - \mu_A(x), \mu_C(y)))$$

4. DETERMINATION OF THE IMPLICATION RELATION

Let X = {a, b, c, d}; Y = {1, 2, 3, 4}

A = {(a,0.1), (b,0.6), (c,0.3), (d,1)}
B = {(1,0.2), (2,0.5), (3,0.8), (4,0)}
C = {(1,0), (2,0.3), (3,0.4), (4,0.8)}

Determine the implication relation

(i) IF x is A THEN y is B
(ii) IF x is A THEN y is B ELSE y is C

Solution:

To find (i) we know that,

$$R = (A*B) \cup (A*Y)$$

Where,

$$\mu_R(x,y) = \max(\min(\mu_A(x), \mu_B(y)), 1 - \mu_A(x))$$

Here (i) The operator " $*$ " represents the minimum of two sets .

(ii)The operator " ∪ " represents the maximum of two sets.

A * B =

	1	2	3	4
a	0.2	0.2	0.2	0
b	0.3	0.7	0.5	0
c	0.4	0.5	0.7	0
d	0.3	0.9	0.9	0

$\bar{A}$ * Y =

	1	2	3	4
a	0.8	0.8	0.8	0.8
b	0.7	0.7	0.7	0.7
c	0.6	0.6	0.6	0.6
d	0	0	0	0

R =

	1	2	3	4
a	0.4	0.4	0.4	0.4
b	0.3	0.4	0.5	0
c	0.5	0.5	0.5	0.5
d	0.1	0.3	0.7	0

Which speak to IF x is A THEN y is B

To find (ii) we know that,

$R = (A*B) \cup (\bar{A}*C)$

$\mu_R(x,y) = \max(\min(\mu_A(x),\mu_B(y),\min(1- \mu_A(x),\mu_C(y)))$

A * B =

	1	2	3	4
a	0.4	0.5	0.8	0
b	0.9	0.4	0.3	0
c	0.7	0.5	0.7	0
d	0.1	0.9	0.8	0

$\bar{A}$ * C =

	1	2	3	4
a	2	2	2	2
b	0.6	0.6	0.6	0.6
c	0.8	0.8	0.8	0.8
d	0.1	0.1	0.1	0.1

$R = \max((A*B), (\bar{A} * C))$ gives

R =

	1	2	3	4
a	1	1	1	1
b	0.7	0.7	0.7	0.7
c	0.6	0.6	0.6	0.6
d	0.2	0.5	0.8	0

The above R speaks to IF x is A THEN y is B ELSE y is C

CONCLUSION:

This work has underscored the principles of deduction, for example, Modus ponens, Modus tollens, Chain rule and the laws of propositional rationale are pertinent for inducing propositional and predicate rationale. Here we have gotten an induced end by applying the compositional guideline of surmising to the fluffy ramifications connection.

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