International Journal of Computer & Mathematical Sciences
IJCMS
ISSN 2347 – 8527
Volume 4, Issue 10
October 2015

Application of Probability and Fuzzy logic in a Practical Situation

V.Mythili
Assistant professor
Department of mathematics
Prince shri venkateswara padmavathy
Engineering college
Chennai,Tamil nadu

R.Rajalakshmi
Assistant Professor
Department of mathematics
Prince shri venkateswara padmavathy
Engineering college
Chennai , Tamilnadu

ABSTRACT

The process of interpersonal communication consists of a vast array of different types of simultaneously communicated signals many of which conflict with each other. It is therefore difficult to determine the precise intension and meaning of the communication, because of both distortion from environmental noise and ambivalence on the part of the sender. We outline here an approach which models this process in a practical situation and the vagueness with it through the use of fuzzy set theory

Key words : Probability, Fuzzy event, Fuzzy Message, Consistency, Expectation, Interpersonal Communication.

INTRODUCTION :

The theory of probability owes its origin to the study of games of chance or gambling. The distinctive feature of games of chance is that we are faced with situations where under the given conditions more than one result is possible. Although we know the possible results, we are not sure which of these results will actually appear. Probability theory is designed to deal with uncertainities regarding the happening of the given phenomena. The word "Probable" itself indicates such a situation. The aim of Probability theory is to provide a mathematical model to study uncertain situations in the same manner as geometry provides a mathematical theory for dealing with practical problems concerning areas, volumes and space.

DEFINITION 1:

Let $P(x_1),P(x_2),\ldots\ldots,P(x_n)$ represent the probabilities associated with each of the signals $X_1,X_2,\ldots\ldots,X_n$, then the probability of the fuzzy event of the receipt of message M is given by

$$P(M)=\sum M(x)p(x)$$

DEFINITION 2:

The possibility distribution $r(x) \in [0,1]$ indicates the receiver's belief in the possibility of signal x being sent. The total possibility of the fuzzy message M is calculated as

$$r(M)=\max[\min(M(x),r(x))]$$

DEFINITION 3:

If the received message conflicts with the expected possibility of communication, then the receiver may attempt clarification by requesting a repetition of the transmission. Before this new transmission is sent, the receiver will probably have already modified his or her expectations based on the previous message. If r_o indicates the initial possibilistic expectations of the receiver and r_1 is the modified expectations subsequent to the receipt of message M, then

$$r_1(x)=\min[r_0^{\alpha}(x),M(x)]$$

for each $x \in X$, where α indicates the degree to which past messages are considered relevant is the modifications of expectations.

An additional complication is introduced when we consider that the receiver may also introduce distortions in the message because of inconsistency with the expectations. Let

$$S(M,r)=\max[\min(M(x),r(x))] - 1$$

correspond to the consistency of the received message with the probabilistic expectations. Then let M' denote the message that the receiver actually hears, where $M'(x)=M^{s}(x)$.

for each $x \in X$ where $S=S(M,r)$

The less consistent M is with the expectations, the less M' resembles M. Since the receiver will be modifying his or her expectations based on the message thought to have been received, the new possibilisitic expectation structure is given by

$$r_1(x)=\min[r_0^{1-s}(x),M'(x)] \quad - 2$$

for each $x \in X$.

Finally, once a determination has been made of the signal $x \in X$ that was sent, an appropriate response must be chosen. Let Y be the universal set of all responses and let $R \subseteq Y \times X$ be a fuzzy binary relation in which R(y,x) indicates the degree of appropriateness of response of given signal x.

A fuzzy response set A $\in$ Y can be generated by composing the appropriateness relation R with the fuzzy message M,

$$A=R \circ M \quad \text{(or)} \quad A(y)=\max[\min(R(y,x),M(x))] \quad - ③$$

for each y $\in$ Y.

The following example illustrates the use of this model of interpersonal communication.

Suppose that a young man has just proposed marriage to a young woman and is now eagerly awaiting her response. Let us assume that her answer will be chosen from the set X of the following responses.

x_1=simple yes

x_2=simple no

x_3=request for time to think it over

x_4=request for the young man to ask permission of the young woman's parents

x_5=derisive laughter

x_6=Joyful tears.

Assume also that the young man has expectations of her response represented by the possibility distribution

$$r_o=(.9,.1,.7,.3,.1,.6)$$

The above distribution shows that the young man expects a positive answer.

Now assume that he receives the following message

$$M_1=.1/x_1+.8/x_2+.4/x_3+.1/x_5$$

The message is inconsistent with the young man's expectations.

From eqn ①,

consistency $S(M_1,r_o)=\max[\min(M(x),r(x))]$

$=\max[\min(.1,.9),\min(.8,.1),\min(.4,.7),\min(.1,.1)]$

$=\max[.1,.1,.4,.1]$

$=.4$

As the message is contrary to the young man's expectations, he introduces some distortion in such a way that the message he heard is

$$M_1'=.4/x_1+.9/x_2+.7/x_3+.4/x_5$$

Based on this message, he modifies his expectations according to equation ②

$$r_1(x)=\min[r_o^{1-0.4}(x),M_1'(x)]=\min[r_o^{0.6}(x),M_1'(x)]$$

for each $x \in X$.

$$\text{ie)}r_1=.4/x_1+.25/x_2+.7/x_3+.25/x_5$$

The young man has reduced his level of expectation of x_1 ie)"A simple Yes". Somewhat he increased his expectation of x_2 ie)"A simple no" and of x_5 ie)"Derisive laughter" and has given up all hope of possibilities of joyful tears.

Suppose now that in disbelief he asks the young woman to repeat her answer and receives the following message

$$M_2=.9/x_2+.4/x_5$$

This message is stronger,clearer and less general than the first answer. Its consistency with the young man's new expectation is

$$S(M_2,r_1)=\max[\min(M_2(x),r(x)]$$

$$=\max[\min(0,.4),\min(.9,.25),\min(0,.7),\min(.4,.25)]$$

$$=\max[0,.25,0,.25]$$

$$=.25$$

Thus the message is highly contrary even to the revised expectation of the young man, so let us suppose that he distorts the message such that he hears

$$M_2'=.9/x_2+.8/x_5$$

His surprise has diminished the clarity of the message heard and has led him to exaggerate the degree to which he believes that the young woman has responded with derisive laughter.

Let us suppose that the response which the young man makes will have the characteristics chosen from the set

$$Y=\{y_1,y_2,\ldots,y_7\}$$

where y_1=happiness

y_2=pain

y_3=surprise

y_4=anger

y_5=patience

y_6=impatience

y_7=affection

Let the fuzzy relation R $\subseteq$ Y x X represent the degree to which the young man plans to respond to a given signal x with a response having the attribute to y.The following matrix represents the above relation

$$
\begin{array}{c}
 \\ y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \\ y_6 \\ y_7
\end{array}
\begin{array}{c}
\begin{array}{cccccc} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 \end{array} \\
\begin{pmatrix}
0.9 & 0 & 0.2 & 0 & 0 & 1 \\
0 & 0.9 & 0.1 & 0.2 & 1 & 0 \\
0.1 & 0.9 & 0.2 & 0.9 & 1 & 0.3 \\
0 & 0.5 & 0 & 0.6 & 0.7 & 0 \\
0.1 & 0 & 0.9 & 0 & 0 & 0.5 \\
0 & 0.3 & 0.2 & 0.3 & 0.4 & 0 \\
0.9 & 0 & 0.9 & 0.3 & 0 & 1
\end{pmatrix}
\end{array}
$$

Using equation 3 we can calculate the response the young man will make to the message M_2'

$A(y_1) = \max[\min(R(y_1,x),M_2'(x))]$

$= \max[\min(.9,0),\min(0,.97),\min(.2,0),\min(0,0),\min(0,.8),\min(1,0)]$

$= \max[0,0,0,0,0,0]$

$= 0$

$A(y_2) = \max[\text{mjn}(R(y_2,x),M_2'(x))]$

$= \max[\min(0,0),\min(.9,.97),\min(.1,0),\min(.2,0),\min(1,.8),\min(0,0)]$

$= \max[0,.9,0,0,.8,0]$

$= .9$

$A(y_3) = \max[\min(R(y_3,x),M_2'(x))]$

$= \max[\min(.1,0),\min(.9,.97),\min(.2,0),\min(.9,0),\min(1,.8),\min(.3,0)]$

$= \max[0,.9,0,0,.8,0]$

$= .9$

$A(y_4) = \max[\min(R(y_4,x),M_2'(x))]$

$= \max[\min(0,0),\min(.5,.97),\min(0,0),\min(.6,0),\min(.7,.8),\min(0,0)]$

$= \max[0,.5,0,0,.7,0]$

$=.7$

$A(y_5) = \max[\min(R(y_5,x),M_2'(x))]$

$= \max[\min(.1,0),\min(0,.97),\min(.9,0),\min(0,0),\min(0,.8),\min(.5,0)]$

$= \max[0,0,0,0,0,0]$

$= 0$

$A(y_6) = \max[\min(R(y_6,x),M_2'(x))]$

$= \max[\min(0,0),\min(.3,.97),\min(.2,0),\min(.3,0),\min(.4,.8),\min(0,0)]$

$= \max[0,.3,0,0,.4,0)$

$= .4$

$A(y_7) = \max[\min(R(y_7,x),M_2'(x))]$

$= \max[\min(.9,0),\min(0,.97),\min(.9,0),\min(.3,0),\min(0,.8),\min(1,0)]$

$= \max[0,0,0,0,0,0]$

$= 0$

Therefore, $A = R^oM_2'=.9/y_2+.9/y_3+.7/y_4+.4/y_6$

CONCLUSION:

The young man's response therefore will have the characteristics of a great deal of pain and surprise , a large degree of anger and some impatience.

REFERENCES:

1) George J.Klir/Bo Yuan, Fuzzy Sets and Fuzzy Logic, Theory and Applications,PHI Learning Private Limited, New Delhi.
2) Probability and Statistics with Reliability,Queuing and Computer Science Applications,Kishore S.Trivdei,PHI Learning Private Limited,New Delhi
3) Probability,Statistics and Queuing Theory with Computer Science Applications,Arnold o.Allen Academic Press,An imprint of Elsevier.
4) Probability,Statistics and Random Processes,T.Veerarajan,Tata McGraw Hill Education Private Limited,New Delhi.
5) Understanding Neural Networks and Fuzzy Logics-Stamatios V.Kartalopoulos,IEEE Neural Networks Council.
6) Neural Networks and Fuzzy Systems-Bart Kosko,University of Southern California,Prentice Hall of India Private Limited, New Delhi.