Hot Topic Workshop on

Fuzzy Theory and Applications

▶ *Dates* _ December 12 ~ December 14, 2012

▶ *Location* _ NIMS, Daejeon, Korea

http://open.nims.re.kr/events/fta

Organizers :

- Hae Kyung Kim (Yonsei University)
- Kyung Chan Min (Yonsei University)
- Seung Hoe Choi (Korea Aerospace University)
- Jin Hee Yoon (Yonsei University)

Invited Speakers :

- Young Geun Bang, Gangwon University, Korea
- Seung Hoe Choi, Korea Aerospace University, Korea
- Sun Young Choi, Yonsei University, Korea
- Jozsef Dombi, University of Szeged, Hungary
- Chanha Hwang, Dankook University, Korea
- Hye Young Jeong, Yonsei University, Korea
- Hae Kyung Kim, Yonsei University, Korea
- Hee Sik Kim, Hanyang University, Korea
- Woo Hwan Kim, Yonsei University, Korea
- Woo Joo Lee, Yonsei University, Korea
- Baoding Liu, Tsinghua University, China
- Kyung Chan Min, Yonsei University, Korea
- Vilem Novak, University of Ostrava, Chezch Republic
- Peiman Pazhoheshfar, Islamic Azad University, Iran
- Irina Pefilieva, University of Ostrava, Chezch Republic
- Morteza Saberi, University of Tafresh, Iran
- Ju Young Shim, Inje University, Korea
- S. Mahmoud Taheri, Isfahan University of Technology, Iran
- Junzo Watada, Waseda University, Japan
- Ji Hoon Yoon, Yonsei University, Korea
- Jin Hee Yoon, Yonsei University, Korea

NIMS
National Institute for Mathematical Sciences

Hot topic workshop on Fuzzy Theory and Applications

Time	Dec. 12 (Wed)	Time	Dec. 13 (Thur)	Time	Dec. 14 (Fri)
09:00~09:30	Registration				Session 7 Chair : Baoding Liu
	Session 1 Chair : Kyung Chan Min		Session 4 Chair : S. Mahmoud Taheri	09:00~09:50	Baoding Liu (China)
09:30~10:20	Vilem Novak (Czech)	09:30~10:20	S. Mahmoud Taheri (Iran)	09:50~10:40	Morteza Saberi (Iran)
10:20~11:10	Junzo Watada (Japan)	10:20~11:10	József Dombi (Hungary)	10:40~11:00	Coffee Break
11:10~11:30	Coffee Break	11:10~11:30	Coffee Break	11:00~11:30	Peiman Pazhoheshfar (Iran)
11:30~12:20	Martin Klimo (Slovakia)	11:30~12:20	Irina Pefilieva (Czech)	11:30~12:20	Jin Hee Yoon (Yonsei Univ.)
12:20~02:00	Lunch	12:20~02:00	Lunch	12:20~02:00	Lunch
	* Session 2 Chair: Jin Hee Yoon		* Session 5 Chair : Chanha Hwang		
02:00~02:50	Woohwan Kim (Yonsei Univ.)	02:00~02:50	Changha Hwang (Dankook University)		
02:50~03:20	Ji Hun Yoon (Yonsei Univ.)	02:50~03:40	Jooyong Shim (InJe Univ.)		
03:20~03:50	Sun Young Choi (Yonsei Univ.)	03:40~04:00	Coffee Break		
03:50~04:10	Coffee Break		* Session 6 Chair : Seung Hoe Choi		
	* Session 3 Chair: Jin Hee Yoon	04:00~04:50	Hee Sik Kim (Hanyang University)		
04:10~05:00	Hae Kyung Kim & Hye Young Jeong (Yonsei Univ.)	04:50~05:30	Young Keun Bang (Kangwon Univ.)		
05:00~05:30	Woo-Joo Lee (Yonsei Univ.)	05:30~06:20	Seung Hoe Choi (Korea Aerospace Univ.)		
			* Afternoon Daejeon Excursion: (Visiting Scholars only)		
06:00~08:00	Special Dinner	06:30~08:30	Banquet		
	Session 1 : Engilish		Session 4 : Engilish		Session 7 : English
	Session 2,3 : Korean		* Session 5,6 : Korean		

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Fuzzy Theory and Applications

Fuzzy Natural Logic: Beginning of a Long Path

Vilem Novak

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Abstract

G. Lakoff in his paper [1] discussed in depth the concept of natural logic whose goals are the following: to express all concepts capable of being expressed in natural language, to characterize all the valid inferences that can be made in natural language, and to mesh with adequate linguistic descriptions of all natural languages. He also formulated a hypothesis that *"natural language employs a relatively small finite number of atomic predicates that take sentential complements (sentential operators) and are related to each other by meaning-postulates that do not vary from language to language."*

At the same time, in [2] the concept of fuzzy logic in broader sense as an extension of mathematical fuzzy logic in narrow sense was introduced. Its idea is to develop a formal theory of natural human reasoning, which is characterized by the use of natural language. Thus, the theory should encompass mathematical models of special expressions of natural language, take into account their vagueness and develop specific reasoning schemes.

Our goal in this paper is to put the things together and introduce a new concept of Fuzzy Natural Logic that is a special branch of mathematical logic extending fuzzy logic in narrow sense but being developed in accordance with the paradigm of natural logic. This is a long term run that has already begun. The present state of the fuzzy natural logic can be characterized as consisting of the following theories:

1. Formal theory of evaluative linguistic expressions.
2. Formal theory of fuzzy IF-THEN rules and approximate reasoning.
3. Formal theory of intermediate and generalized quantifiers and their syllogisms.

References

[1] G. Lakoff, Linguistics and Natural Logic. Synthese 22(1970), 151-271.

[2] V. Novak, Towards formalized integrated theory of fuzzy logic, in: Z. Bien, K. Min (Eds.), Fuzzy Logic and Its Applications to Engineering, Information Sciences, and Intelligent Systems, Kluwer, Dordrecht, 1995, pp. 353~63.

[3] V. Novak, Reasoning about mathematical fuzzy logic and its future. Fuzzy Sets and Systems 192 (2012) 25~4.

Fuzzy Random Variable Approach to Regression Analysis

Junzo Watada

Waseda University

Abstract

In real-world regression analysis, statistical data may be linguistically imprecise or vague. Given the co-existence of stochastic and fuzzy uncertainty, real data cannot be characterized by using only the formalism of random variables. In order to address regression problems in the presence of such hybrid uncertain data, fuzzy random variables are introduced in this study to serve as an integral component of regression models. A new class of fuzzy regression models that is based on fuzzy random data is built, and is called the confidence-interval-based fuzzy random regression model. First, a general fuzzy regression model for fuzzy random data is introduced. Then, using expectations and variances of fuzzy random variables, sigma-confidence intervals are constructed for fuzzy random input-output data. the confidence-interval-based fuzzy random regression model is established based on the sigma-confidence ! intervals. The proposed regression model gives rise to a nonlinear programming problem that consists of fuzzy numbers or interval numbers. Since sign changes in the fuzzy coefficients modify the entire programming structure of the solution process, the inherent dynamic nonlinearity of this optimization makes it difficult to exploit the techniques of linear programming or classical nonlinear programming. Therefore, we resort to some heuristics. Finally, we explain its applications.

Implementation of Fuzzy Logic Systems by Nanotechnology

Martin Klimo

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Abstract

Success story of fuzzy logic systems is more then twenty years old, and we can find many implementations in control, prediction, pattern recognition, classification etc. The main way for implantation is writing the program on the computer, that will transform information from sensors or databases into information for actuators, or making decision. The main bottleneck of such as classical approach is that von Neumann computer concept has some bottlenecks itself. If we would like to have more complex fuzzy logic systems we will need a massive parallel computation, but in von Neumann multiprocessor computer any small part of the program that cannot be parallelized will cause a performance limit that cannot be overcame by adding new processors. The only way out is using of massively parallel fuzzy logic systems, where each elementary fuzzy logic function is calculated independently of others. This can be reached by a hardware implementation of elementary functions by transistors. It is possible to reach high density today (22 nm transistor was presented in 2011), anyhow there is another disadvantage – a need for an energy source to keep the transistor in on/off states even when there is no need for processing. On the other side we know, that there are non-volatile memories and they need no energy to store information. This rises the question whether this non-volatile elements cannot provide also some processing. The answer is positive and we can see Boolean functions implemented by such as elements, that we will call “memristors”. The term memristor will be used in this presentation for any non-volatile element that can be set into on/off states by external voltage. And the presentation will show how to use memristors also for min, max implementation, what will allow to implement more complex fuzzy logic functions. The memristor is a passive element; therefore the fuzzy logic function will be implemented by passive circuit. The only problem remains – how to implement negation. The presentation will show how to keep the network kernel passive. We have to keep on mind, that a passivity of the circuit is an added value that allows building reversible computing. The reversible computing is not only a way how to overcome the Landauer limit for energy dissipations, but it is important in solving some problems. Shortest path problem or maze problem are good examples and the presentation will show how memristor grids can help.

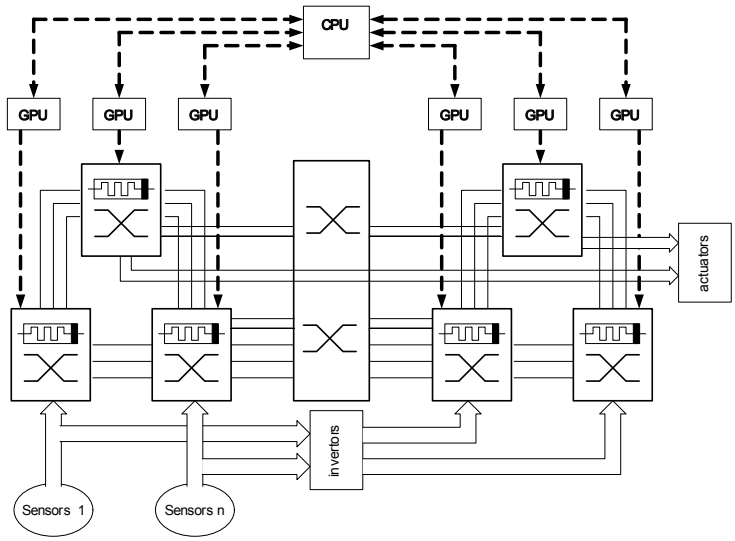

Fig. 1. General purpose fuzzy logic system architecture

All properties mentioned above lead us to the general purpose fuzzy logic system architecture given on Fig. 1. This is two-layer architecture. At the bottom are memristor universal circuits for the real time processing with input-output interfaces from sensors – into actuators, as well as invertors for the dual system. We can see dual logic architectures consisting from two "hemispheres". If more memristor chips create one hemisphere that may be given by capacity constraints, sense domain separation or hierarchy needs, then additional chips may be needed. Also switch that will connect the corresponding functions in both hemispheres ("Corpus Callosum") belongs to this layer. At the top layer there are classical computers (CPU/GPU) that generate topology of memristor network within memristor chips and switches regarding required fuzzy logic functions given by logic program. This topology may be fixed; anyhow we assume that local rules within one chip can be adapted by program in corresponding GPU (short-term plasticity) while the long-term strategies (like supervised learning) will be distributed from the supervising CPU on the top.

References

[1] M. Klimo, O. Šuch.: Memristors can implement fuzzy logic., http://arxiv.org/abs/1110.2074

[2] O.Šuch, M.Klimo, S. Foltán, K. Grondžák, Computational Concept Based On Complementary Resistive Switches, Frontiers in Electronic Materials. 190-191, 2012.

Connectedness and Spillover among International Stock Market

Woohwan Kim

Abstract

During recent financial crises, we observed the unusual and simultaneous breakdown of international stock market, therefore the spillover between markets and whole financial system have been paid much more attention to policy makers and market participants. In general, most previous studies focused on the return and/or volatility to explain maeket spillover, however it is somewhat restricted to explain sudden comovement in tail region, which is one of the important characteristics on the empirical spillover in financial market. This paper examines the spillover dynamics based on the time varying jump intensity, not observable thus extracted from econometric model, using *GARCH-ARJI* model. By analyzing the weekly return of stock indices of G7 countries, we find that the conditional jump intensities implied on stock returns clearly show time varying and they dramatically increase during the period of crisis. Based on the empirical result, we argue that the conditional jump intensity is a possible indicator of financial turmoil, furthermore it is worth to examine spillover based on the time varying jump intensity. To measure connectedness of international stock markets, we employ various connectedness measures proposed by Diebold and Yilmaz (2011) based on the generalized error variance decomposition in vector autoregressive model. In addition, by conducting rolling window analysis, we find that the spillover indexes of all conditional moments reach their highest level in the late of 2008 and keep the higher level during almost two years, and then gradually decrease in 2011. We conclude that financial spillover is not simply matter on return and/or volatility, and it is also informative to examine spillover based on the jump intensity.

Keywords

time varying jump intensity, GARCH-ARJI model, connectedness, spillover, rolling window analysis.

JEL Classification: G32, G15.

Option pricing under stochastic elasticity of variance and statistics of the elasticity

Ji Hun Yoon

Abstract

This paper deals with the fuzzy least squares estimation of the fuzzy linear regression model with fuzzy inputoutput data with error structure. The fuzzy least squares estimators (FLSE's) for regression parameters based on the metric introduced by Diamond [2] are proposed and showed that the estimators are fuzzy-type linear estimators. For these, we first provided a notion of triangular fuzzy matrices whose elements are given as triangular fuzzy numbers and also provided suitable operations among all triangular fuzzy matrices. Simple computational examples of its application are given.

Keywords

Fuzzy random variable; Fuzzy least squares estimation; Triangular fuzzy matrix

Explaining the Determinants of Credit Default Swap Premium with the Elasticity of Variance.

Sun Yong Choi

Abstract

We demonstrate the determinants of credit default swap(CDS) premium, using linear regression. The regression model contains firm leverage, volatility and the riskless interest rate as theoretical explanatory variables. The model contains also liquidity, past stock returns practical explanatory variables and a novel explanatory variable the elasticity of variance. Our empirical results suggest a new structural model to explain CDS premium with the elasticity.

Likelihood Inference based on Fuzzy Data in Regression Model

Hye Young Jung

Abstract

In regression analysis, such as other statistical inference problems, imprecise data may be encountered.

In this paper, we focused on statistical inference on the basis of information the supplied by the available fuzzy data based on imprecise data. For these, we first consider the maximum likelihood estimates of linear regression parameters based on fuzzy data for the variety of membership

functions. Next, we extend the likelihood ratio procedure to a unified treatment of the method with fuzzy data, which is a generalization of the usual approach. It is also verified that the asymptotic distribution of the statistic $-2 \ln \lambda$ for the likelihood ratio $\lambda = L(\hat{\omega})/L(\hat{\Omega})$ in the crisp case is preserved in the fuzzy case with a larger sample, which allows us to determine the critical value of that statistic for each significance level. Some numerical examples are given for estimating and testing the regression parameters in order to provide an illustration of the procedure. Some simulation results are also presented to illustrate the behavior of maximum likelihood estimates based on fuzzy data.

Fuzzy regression analysis using bootstrap techniques

Woo-Joo Lee,
Hye Young Jeong, Hae Kyung Kim

Abstract

In this study, we estimate the parameters of fuzzy regression models and perform a statistical inferences with crisp inputs and fuzzy outputs for each alpha-cuts. The proposed approach of statistical inferences are fuzzy least squares methods(FLS) and bootstrap techniques. FLS is constructed on the basis of minimizing the square of the total difference between observed and estimated outputs. The advantage of bootstrap method do not need specific population shapes such as normal distribution. Numerical example is illustrated to perform the testing hypotheses and to provide the percentile confidence regions by propose approach.

keyword

Fuzzy regression, Fuzzy least squares method, Bootstrap method

12월 13일

Fuzzy Theory and Applications

Some Robust Fuzzy Regression Models

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Abstract

As it is well-known, two main approaches to construct a regression model in fuzzy environment are: 1) The possibilistic approach, 2) The fuzzy least-squares approach. Over the last years, some adjusted models have been proposed within these two categories. However, it seems that we need to develop some robust approaches to fuzzy regression modeling, especially to deal with real-world problems. Here, we introduce and investigate some robust fuzzy regression methods for three kinds of data sets: 1) Data sets with some outlier(s), 2) Data sets with large variations issues, 3) Data sets with a non-specific regular model. The discussed methods include some fuzzy least-absolutes methods and some hybrid methods in which the MARS (Multivariate Adaptive Regression Splines) technique is combined with fuzzy regression methods. The introduced methods are compared with several existing fuzzy regression methods by some goodness-of-fit criteria. Several data sets, including some real-world data sets, are employed for such comparisons.

On a consistent operator system and its application

József Dombi

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Abstract

We give a new representation theorem of the negation based on the generator function of the strict operator. We study a certain class of strict monotone operators which build DeMorgan class with infinite negations. We show that the necessary and sufficient condition for this operator class is $f_c(x)f_d(x) = 1$, where $f_c(x)$ and $f_d(x)$ are the generator function of the conjunctive and disjunctive operators.

In the second part of the we examine the relationship between Dombi's aggregative operators, uninorms and strict, continuous t-norms and t-conorms. We show that the class of representable uninorms is equivalent to the class of those uninorms which are also aggregative operators. We give new representation theorems for strong negations, and discuss the correspondence between strong negations, aggregative operators and strict, continuous (logical) operators.

We show that in this system the four (conjunction, disjunction, aggregation, negation) operators can be described using only one generator function.

Keywords

aggregative operators, uninorms, multiplicative pliant systems, Dombi operators

Fuzzy Transform - A Powerful Soft Computing Technique

Irina Perfilieva

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Abstract

The fuzzy transform (F-transform) is a special and very general mathematical technique introduced several years ago. Since then, it became a well developed theory that has many applications in various areas, e.g. in time series analysis and forecasting, image processing, mining associations from numerical data, numerical computation methods, and elsewhere.

In general, the F-transform establishes a correspondence between a set of continuous functions on an interval of real numbers and a set of n-dimensional (real) vectors. The core idea lays in forming a fuzzy partition of a universe into n fuzzy subsets (factors, clusters, granules, etc.). Each fuzzy subset is assigned a certain average of functional values that is called component. The given (continuous) function is thus represented by a finite number of components. This step is called direct F-transfrom. A formula called inverse F-transform (inversion formula) converts the n-dimensional vector of components into another continuous function which approximates the original one. The advantage of the inversion formula of the F-transform is a simple approximate representation of the original function.

Thus, in complex computations we can use the inversion formula instead of precise representation of the original function. Moreover, in a solution of many problems (e.g. computation of a definite integral, solution of differential equations, etc.) we may operate with images of the original functions obtained by applying the F-transform. By this trick, the problem can be transformed into a respective problem in the n-dimensional vector space and solved using methods of linear algebra.

We distinguish zero and higher-degree F-transform. The difference is that unlike the zero-degree F-transfor m where components are certain average values, components of higher-degree F-transform are polynomials. It can be proved that every polynomial component approximates a certain restriction of an original function and that as the degree of the polynomial increases, so does the quality of approximation. Similarly as in the case of zero-degree F-transform, the inverse higher-degree F-transfrom approximates the original function on the whole domain. It can be proved for all degrees that a sequence of inverse F-transforms uniformly converges to the original function. Besides many other properties, the F-transform has exceptional filtering properties.

References

[1] I. Perfilieva, Fuzzy transforms: theory and applications, Fuzzy Sets and Systems 157 (2006) 993-1023.
[2] I. Perfilieva, M. Dankova, B. Bede, Towards a higher degree f-transform, Fuzzy Sets and Systems 180 (2011) 3-19.
[3] V. Novak, M. Stepnicka, A. Dvorak, I. Perfilieva, V. Pavliska, L. Vavrickova, Analysis of seasonal time series using fuzzy approach, Int. Journal of General Systems 39 (2010) 305-328.

Estimating value at risk with semiparametric support vector quantile regression

Changha Hwang

Abstract

Value at Risk (VaR) has been used as an important tool to measure the market risk under normal market. Usually the VaR of log returns is calculated by assuming a normal distribution. However, log returns are frequently found not normally distributed. This paper proposes the estimation approach of VaR using semiparametric support vector quantile regression (SSVQR) models which are functions of the one-step-ahead volatility forecast and the length of the holding period, and can be used regardless of the distribution. We find that the proposed models perform better overall than the variance-covariance and linear quantile regression approaches for return data on S&P 500, NIKEI 225 and KOSPI 200 indices.

Nonlinear Extension of Poisson Regression using Kernel Method

Jooyoung Shim

Abstract

Kernel method uses the kernel which is the inner product of feature mapping functions instead of the explicit computation of feature mapping functions. This operation provides computationally the easy extension of linear model to nolinear model. Poisson regression of GLM is popular in count data analysis. We present the kernel Poisson regression based on the penalized negative log-likelihood using kernel method, which provides the efficient estimation of the mean function of the response variable, where the canonical parameter is related to the input variables in a nonlinear form. Numerical results are then presented which indicate the performance of the proposed kernel Poisson regression in various cases.

On Abelian and Related Fuzzy Subsets of Groupoids

HEE SIK KIM*
AND J. NEGGERS

Abstract

In this paper, we introduce the notion of abelian fuzzy subsets on a groupoid, and we observe a variety of consequences which follow. New notions include among others, diagonal symmetric relations, several types of quasi-orders, convex sets and fuzzy centers, some of whose properties are also investigated.

A study on the fuzzy prediction and identification systems based on the rough sets

Young Keun Bang

Abstract

퍼지 이론은 데이터에 내재된 불확실성이나 불명확성을 효과적으로 취급할 수 있어, 전력, 금융, 경제, 기후 등 비선형적 또는 혼돈 데이터들을 취급하는 분야에 널리 활용되고 있다. 이와 더불어 러프셋 이론은 광범위한 정보로부터 유효한 정보를 추출함에 있어 매우 뛰어난 특성으로 인해, 데이터 마이닝, 의료 진단, 식별 등과 같은 분야에서 상당한 진전을 나타내고 있다. 우리는 이러한 퍼지 이론의 불 명확성을 취급할 수 있는 능력과 러프셋 이론에 의한 규칙기반의 감축 능력을 접목한 퍼지시스템을 설계하여 일상적으로 나타날 수 있는 시계열 데이터의 예측분야와 가스의 종류를 식별할 수 있는 식별 분야에 적용하는 연구를 수행하였으며, 5종의 시계열 데이터(예측)와 5종의 가스 데이터 및 농도가 다른 2종의 가스 데이터(식별)의 예측과 식별 결과를 통해 시스템 설계에 사용된 기법들의 효과와 유효성을 검증하였다.

Fuzzy curvilinear regression model

Seung Hoe Choi

Korea Aerospace University

Abstract

A fuzzy regression model, which is a fuzzy type of the classical regression analysis, can be classified into two types based on the functional relationship between the dependent and independent variables, which is expressed by response functions. If the relationship is unknown, the model is called a nonparametric fuzzy regression model; if the relationship is known, it is called a parametric fuzzy regression model.

In this paper we are to discuss the general problem of fitting a regression model with a monotonic response function to a set of fuzzy data in the parametric regression model and to propose a fuzzy curvilinear model with curve fitting problems. Also, some examples are used to demonstrate the efficiency of the fuzzy curvilinear model.

Key words

Fuzzy Number, Fuzzy Curvilinear Model, Least Square Estimation, Least Absolute Deviation Estimation.

12월 14일

Fuzzy Theory and Applications

Why is Uncertainty Theory Useful?

Baodong Liu

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Abstract

When the sample size is too small to estimate a probability distribution, we have to invite some domain experts to evaluate their belief degree that each event will occur. A lot of surveys showed that human beings usually overweight unlikely events (e.g., Kahneman and Tversky, 1979). Thus the personal belief degree may have much larger variance than the real frequency. Perhaps some people think that the personal belief degree is subjective probability or fuzzy concept. However, Liu (2012) declared that it is inappropriate because both probability theory and fuzzy set theory may lead to counterintuitive results in this case.

In order to distinguish from randomness and fuzziness, this phenomenon was named "uncertainty". How do we understand uncertainty? How do we model uncertainty? In order to answer those questions, an uncertainty theory was founded by Liu (2007) and subsequently studied by many researchers. Nowadays uncertainty theory has become a branch of mathematics for modeling human uncertainty. This talk will introduce some fundamental concepts of uncertainty theory and discuss why uncertainty theory is useful. This presentation is based on the speaker's book Uncertainty Theory published by Springer-Verlag, Berlin (http://orsc.edu.cn/liu/ut.pdf).

Biography

Baoding Liu (http://orsc.edu.cn/liu) received his B.S. degree in 1986 from Nankai University, and his M.S. degree in 1989 and Ph.D. degree in 1993 from Chinese Academy of Sciences. He joined Tsinghua University as Associate Professor in 1996, and was appointed Professor of Mathematics in 1998. Dr. Liu's research led to the development of uncertainty theory that is a branch of mathematics for modeling human uncertainty.

A Fuzzy Mathematical Framework for Integrated Knowledge Discovery and Synthesis through Multi-Hetero Information Sources

Morteza Saberi

Abstract

The increasing use by companies of information and communications technology (ICT) has led to the accumulation of enormous and diverse amounts of unstructured and semi-structured data. This is added to by users' access to various communication channels. Currently, about 80% of data is semi-structured or unstructured (Herschel and Jones 2005). Due to complex structural relationships, the mining of semi-structured and unstructured information poses additional challenges and is quite different from the well-researched field of structured data mining. Hence, there is an urgent need to integrate and customize the connection of such information with the structured information in order to improve the realizing and understanding of the various user data formats. For this task, we need novel mathematical tools. The mathematical base of fuzzy-logic-based formalism will be developed in order to discover hidden patterns and knowledge in unstructured customer data. Also, in today's competitive world, it is essential that organizations have the appropriate tools for customized data analysis. The development of tools with a sound mathematical basis will enable organizations to more accurately analyze data. Also approximate identity matching, data quality algorithm and statistical tests will be integrated with fuzzy-logic-based formalism to address the various dimensions of semi-structured and unstructured data. The main aim of this research project is improve retrieval, management and analysis processes by developing a solid mathematical base to deal with the complex structural relationship between semi-structured and unstructured information

Z-number, Introduction and Engineering Applications

Peiman Pazhoheshfar

Abstract

The reliability and probability theory have been integrated in a word computing sense within Z-number by L.A. Zadeh. The novelty of his idea could be used in various ranges of engineering applications. Project management is one of the important and vital part of each project. As in the real world problem project manager should interact with their employees using natural language is better than using crisp mathematics formula. In this study critical path method(CPM) is improved by incorporating Z-number to satisfy the above mentioned need. With incorporating Z-number the most real world language communication should be used in the real project management. To show the applicability and superiority of proposed method its outcome has been compared with the crisp and fuzzy numbers.

Fuzzy least squares estimation with new operations

Jin Hee Yoon

Abstract

This paper deals with the fuzzy least squares estimation of the fuzzy linear regression model with fuzzy inputoutput data with error structure. The fuzzy least squares estimators (FLSE's) for regression parameters based on the metric introduced by Diamond [2] are proposed and showed that the estimators are fuzzy-type linear estimators. For these, we first provided a notion of triangular fuzzy matrices whose elements are given as triangular fuzzy numbers and also provided suitable operations among all triangular fuzzy matrices. Simple computational examples of its application are given.

Keywords

Fuzzy random variable; Fuzzy least squares estimation; Triangular fuzzy matrix