



MATHEMATICAL MODELING

FUZZY ROBUST REGRESSION ANALYSIS FOR FUZZY INPUT-OUTPUT DATA

page 4–8

In multiple regression analysis data analysis is very important. If data set has outliers, robust methods are used in parameter estimates. When input data are fuzzy and data set has outlier, the weight matrix is defined by the membership function of the residuals. In this study, multiple regression is suggested when the dependent and independent variables are triangular fuzzy numbers and parameters estimation are crisp numbers. The weighted fuzzy least squares are used with the weight matrix. Outliers influence the model by very small degree of membership, the degrees of membership of the other observation values are 1 or close to 1, and the effects of those on the estimation of the regression model are very important. The fuzzy robust regression method may be able to detect outliers automatically. Thus, possible negative effects of the outlier on the model may be minimized.

Keywords: robust regression, fuzzy regression, membership function.

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ANALYSIS OF INFORMATION-ANALYTICAL SYSTEMS DEVELOPMENT OF ENVIRONMENTALLY DANGEROUS SITUATION MODELING

page 8–12

The paper focuses on the possibility of using a systematic approach to information-analytical system. Using mathematical modeling for optimization problems of environmentally hazardous situations was studied. The methodological aspects of monitoring of background concentrations of toxic contaminants were investigated for emissions of environmental facilities and technology systems. The principles of construction of information-analytical models on the analytical description of points sets were proposed to create simulation systems for environmental systems management tasks. The most widely used computer-aided tools were analyzed. Examples of prob-

lems that can be solved with the help of various software (spreadsheet MS Excel, package SPSS for Windows, Gran 2D et al.) were presented. Thus it allows to carry out environmental monitoring and calculation of damage from natural and man-made factors in the environment with using low level of software operation complexity.

Keywords: simulation system, information-analytical model, mathematical modeling, priority settings, environmentally dangerous situations.

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DETERMINATION OF ADVERSE PREGNANCY OUTCOMES USING DISCRIMINANT FUNCTION ANALYSIS

page 13–16

The article is devoted to determination of adverse pregnancy outcomes, using discriminant function analysis, which improves the efficiency of diagnosis and prognosis of this condition by improving the accuracy of determining the likely outcome, which is achieved by obtaining informative, prognostic significant signs. The calculation of diagnostic coefficient values by the selected method allows revealing 6 significant characteristics of protein, carbohydrate, nucleic acid and mineral metabolism and canonical coefficients to determine the pregnancy outcome. The use of discriminant functions and the most significant characteristics allows synthesizing a new mathematical model for determining the pregnancy outcome, which allows describing the condition of the patient. The validity of the synthesized mathematical model has been confirmed by independent testing factors on sample examination with classification accuracy for which amounted to 95,8 %. This method has several advantages: takes into account the variability of parameters included in the model, considering the totality of all the prognostic value and indicates the proportion of the impact of each characteristic on the formation of the severity of the condition. The results provide a timely opportunity to choose the optimal treatment and care of women with threatened miscarriage.

Keywords: discriminant function analysis, mathematical model, pregnancy, premature birth.

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INFORMATION TECHNOLOGIES

RESEARCH OF METHODS FOR CONSTRUCTING ECOSYSTEM MODELS OF EDUCATIONAL SOFTWARE

page 17–24

In this paper a clear definition is given for ecosystems of the software and an ecosystem model is also constructed with ecosystem concept of educational software is also reviewed and studied here. The algebra systems using with presenting the educational software ecosystem are taken with the got results of algebraic operations conjunction over the autonomous component systems. The ecosystem models of educational software are presented: using Petri network, the case of the ecosystem diagrams using and SR ecosystem models. The UML model of the educational software ecosystem is investigated, that can be represented using use-case diagrams. An analytical view of educational software through using Petri nets is also presented in the article. It is considered that the ecosystem of educational software is presenting an association of the software developers, software users, and relevant educational institution. It needs to understand that the key role in this interaction plays a human, because in case that he/she develops, uses and learns it. It can be possible talk about the ecosystem of educational software as one of the science branches that has to be explored a long time.

Keywords: ecosystem, educational software, research, SR model, modeling, tuple, Petri nets, UML.

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THE MECHANISM OF TERMINOLOGICAL ANALYSIS OF PERFORMANCE INDEXES OF THE INTEGRATED INFORMATION SYSTEM

page 25–28

It was analyzed the problem of automatically determining time series element in the text flow for machine documents and selecting statistical and linguistic criteria, allowing precise aims of research, which is to create problems for parsing unit and formation of context rules.

Software was developed as a result of the practical implementation of the formed parsing block of context rules.

Testing of the software using text content control revealed that a mechanism of terminological analysis of performance indexes of the integrated information system performs all tasks assigned to it.

The proposed mechanism of terminological analysis is reliable in terms of getting time series of the integrated system. The resulting application performances are clear of noise. Test results of the developed mechanism are more accurate than the previously obtained by other methods.

Keywords: semantic network, terminological analysis, machine-readable documents, statistical criteria, integrated information system.

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THE WIRELESS COMPUTER NETWORKS STATE RECOGNITION OVER THE THREE-DIMENSIONAL FIELD OF DIRECTIONS

page 28–35

It is shown that the features of the visual display of the wireless computer networks with partially unavailable monitoring operation elements do not allow detecting their condition by the known intelligent processing methods of static images. It was developed and implemented the method of detection using a three-dimensional field of directions. It was improved method for three-dimensional visual imaging of the structure of partially inaccessible for monitoring damaged wireless computer networks, which is based on the determination of the probability of efficiency inaccessible network elements available from the signals and image processing, the brightness of each pixel is proportional to the corresponding probabilities.

It was improved methods of recognizing the visual image of state of the wireless computer network structure by constructing a three-dimensional field of directions for it, and searching the image for the last encoding in a database corresponding to these codes that is recognized as an imprint of the real state of the network.

It was performed the test of developed methods in the daily activities of the Intelligence Directorate of Staff of the Land Forces Command of the Armed Forces of Ukraine during the study of features a set of forces and reconnaissance of operational commands and confirmed the possibility of the timely repair and replacement of damaged elements of the wireless network that guarantees the increase in the overall level of efficiency of the latter.

Keywords: wireless computer network, state recognition, visual image, three-dimensional field of directions.

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DEVELOPMENT OF INFORMATION SYSTEM FOR HUMAN'S CLINICAL AND LABORATORY PARAMETERS ANALYSIS

page 35–40

The article is devoted to the development of information system for human's clinical and laboratory parameters analysis and processing that allowed to automate processing of the results of all kinds of laboratory tests (hematology, biochemical, immunological, cytological, microbiological), internal and external laboratory quality control.

One of the main components of the information system is designed relational database that allows storing information in a convenient form and simplifies the work with documentation for technical personnel. The presence of the embedded modules of internal and external quality assessment of laboratory research allows enhancing the research quality by the systematic implementation of appropriate control with the construction of Yuden-Murakami, Levey-Jennings, Westgard charts, calculation of cumulative amounts, parallel samples, controlling the reproducibility of duplicates, the average normal values with the usage of Bull's algorithm and SQC method. This makes it possible to take into account the effect of systematic and random errors, as well as biological and analytical variation on the results of clinical researches.

Keywords: information system, database, quality assessment, laboratory researches.

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DEVELOPING THE LOCAL MODEL OF MONITORING ORGANIZATION FOR REGIONAL GAS SUPPLY

page 40–46

The problem of monitoring the regional gas supply is urgent now, because of the obsolescence of equipment of gas supply systems and increasing the volume of leaks in gas pipelines. In these circumstances, it is necessary to improve the reliability of gas transport in regional systems of gas supply due to timely information on the results of monitoring, which takes place by the monitoring systems. One of the important tasks in the creation of a monitoring system is organization.

The research allowed developing a conceptual model of the organization of monitoring, highlighting the main sub-steps of the monitoring organization of the regional gas supply. Partial mathematical models of the organization of a regional gas supply were developed based on the received information from the functional model. The calculations confirm the adequacy of the proposed partial models and allow making decisions under multicriteria and fuzzy of initial data.

Keywords: monitoring, organization, regional gas suppliers, models, criteria.

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APPLICATION OF COMBINATORIAL-LOGICAL APPROACH FOR MANAGING TEAM OF MULTI-PROJECT ORGANIZATION

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The features of managing the project team of multi-project organization are considered. The literature analysis showed that the management of projects in the multi-project organization must take into account limitations related to the involvement of employees in several projects of the portfolio, the maximum allowable engagement metrics for each job position, the restrictions associated with the interests of stakeholders. It is proposed to use the criterion of the degree of involvement of human resources for the analysis of the project portfolio. It is proposed to use a positional diagram of overlapping projects by «human resources» parameter to analyze the involvement of human resources in the project portfolio. A method for the analysis of the involvement of human resources in the portfolio, based on the use of combinatorial-logical approach to managing teams of multi-project organization was developed. An example of applying the method of analysis of the staff involvement in the portfolio projects was considered.

Keywords: project, project management, team, multi-project organization, combinatorial-logical approach.

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