

ABSTRACT

Explanatory note size – 126 pages, contains 20 illustrations, 102 tables, 4 applications, 30 references.

Topicality. The relevance of the problem of constructing multivariate regressions based on an active or passive experiment is actual, firstly, because it allows finding deterministic patterns used in modern information diagnostic systems, and secondly, because the initial data of the experiment additively include realizations of a random variable with a sufficiently large variance. This leads to the fact that today there are no effective universal methods for constructing multivariate regressions. Each of the known methods is effective only under certain restrictions that are set theoretically or experimentally. The particular complexity of constructing multivariate regressions is associated with the volume of experimental data, namely, the smaller their number, the more difficult it is to obtain effective estimates of the coefficients of multivariate regression. Therefore, the creation of a method for constructing multivariate linear regression given by an over-description on a small volume of experimental data, which increases the efficiency of the general algorithmic procedure of the least squares method, is relevant.

The aim of the study. The main target is to increase the efficiency of constructing multivariate linear regression given by over-description on a small amount of experimental data.

The object of research: mathematical and software solutions for calculating coefficients of multivariate linear regression given by over-description.

The subject of research: methods and software tools for constructing multivariate linear regression and methodology for studying their effectiveness on a small amount of experimental data.

To achieve this goal, the **following tasks** were formulated:

- critical scientific analysis of methods for constructing multivariate regressions;
- critical analysis of software implementing methods for constructing multivariate regressions;

- development of a methodology for conducting a statistical simulation experiment to model the effectiveness of the method for constructing multivariate linear regressions given by over-description on a small amount of experimental data;
- development and justification of the architecture of software that implements the original method for constructing multivariate linear regressions given by over-description, and a statistical simulation modeling system that allows finding the area of its effective application;
- development of software that implements the original method for constructing multivariate linear regressions on a small amount of experimental data and a system for statistical simulation modeling of its effectiveness;
- development of recommendations for using the method under study based on the conducted statistical studies.

The scientific novelty of the results of the master's dissertation is:

- an original methodology for conducting statistical simulation experiments was developed to substantiate the area of effective use of the universal method for constructing multivariate linear regressions, given by over-description, on a small amount of experimental data;
- a software structure has been developed and substantiated, which for the first time implements an original method for constructing multivariate linear regression given by an over-description on a small volume of experimental data and a statistical simulation modeling system for finding the area of its effective use.

The practical value of the obtained results is that a cross-platform library (monolith) has been developed that implements an original algorithm for constructing multivariate linear regression, given by an over-description, on a small amount of experimental data, which can be used in modern diagnostic and expert systems.

Relationship with working with scientific programs, plans, topics. Work was performed at the Department of Informatics and Software Engineering of the National Technical University of Ukraine «Kyiv Polytechnic Institute. Igor Sikorsky».

Approbation. The scientific provisions of the dissertation were tested at the VII International Scientific and Practical Conference of Young Scientists and Students “Software Engineering and Advanced Information Technologies SoftTech-2024”.

Publications. The scientific provisions of the dissertation were published in:

1) Pavlov O. A., Golovchenko M. M., Hrytsiuk V. V. Methodology for studying the effectiveness of the method for constructing multivariate linear regression on a small volume of experimental data // Software Engineering and Advanced Information Technologies (SoftTech-2024): materials of the abstracts of the VII International Scientific and Practical Conference of Young Scientists and Students – Kyiv: NTUU “KPI them Igor Sikorsky” November 19-22, 2024.

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