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«Teaching stochastics to bachelors of mathematics:
computer simulation for conceptual understanding»

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Problem statement

The professional training of mathematics students is notable for the large volume and complexity of the content of educational material. In this regard, the problem of **conceptual understanding** is relevant.

Since many objects in mathematics have a high level of abstraction, studying them, it is essential to come to conceptual understanding through **various forms of knowledge representation**, and **computer simulation** will help in solving this problem.



Solution methods

Our objectives of a computer workshop on stochastics are:

- assistance in understanding the probabilistic nature of the objects;
- active, meaningful assimilation of probabilistic concepts;
- the formation of the skills necessary for the analysis and processing of data using a computer and stochastic modeling skills.

Discussed **method for the formation of probability theory concepts** involves the experience of the stochastic activity, many alternative approaches, various representations of the same object: symbolic, graphic, computer model.

To achieve understanding in the new material, we:

- focus on those aspects that include new knowledge in the knowledge mastered earlier;
- formulate task so that there is a problem that needs to be addressed.



Solution methods

We have developed task systems in stochastics, which enable students to create an image of the concept under study.

Example: task for study of the properties of various distributions

The task's essence is:

- to generate random numbers in a mathematical package, distributed according to the normal law and the Cauchy law;
- to present results in graphical form;
- to verify some properties and the Chebyshev theorem experimentally.

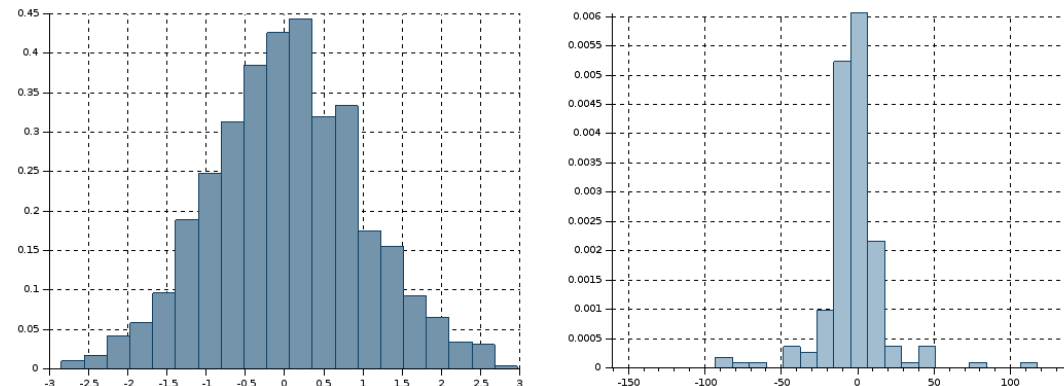


Figure 1. Graphical presentation of the task results



Conclusions

Results, implementation

It is assumed that as a **result of the assignment**, students:

- will form images of some fundamental stochastic concepts;
- will learn a new interpretation of previously studied topics (understanding);
- will learn to use the material studied (application).

Conceptual understanding allows students:

- to use alternative approaches to solve the tasks better;
- to apply the knowledge in a new context;
- to estimate the possibilities and limits of statistical methods in the study of real data.



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