Okulicz-Kozaryn W.,
Dr hab in social sciences,
Professor of Institute of Management and quality Sciences,
Humanitas University
Kupczyk T.,
Dr hab in engineering sciences
Professor of Institute of Management and quality Sciences,
Humanitas University

MANAGEMENT OF SOCIAL SYSTEMS: USING CHATGPT 3.5 FOR CALCULATING STATISTICAL INDICATORS

This paper describes 2 prompts for the chatGPT 3.5 model to calculate statistical indicators: (M) and (δx). These indicators are necessary for the use of analytical methods in the management of economic, social and military systems. Previously, gaps and limitations of existing ways of calculating statistical indicators were identified, such as limited applicability to large amounts of data and the need for numerous manipulations. However, the use of modern technologies, such as the chatGPT 3.5 model, makes it possible to improve analytical methods and increase their effectiveness in managing economic, social and military systems.

Keywords: economic system, social system, military system, management, analytical methods, statistics, statistical indicators, chatGPT 3.5.

Analytical methods in the tasks of managing economic, social and military systems are based on a detailed analysis of the initial empirical data.

Statistics is the science of using information discovered from collecting, organizing, and studying numbers [1]. Statistics deals with the study of social systems from the point of view of analyzing the development of various processes in society [2]. Information about this area of society is collected, processed and analyzed here. One of the tasks of statistics at the present stage is to improve the analysis of statistical information.

Statistics relate to all aspects of data, including data collection planning in terms of survey and experiment planning [3]. The standard statistical procedure involves the collection of data leading to the verification of the relationship between two or more sets of statistical data. Statistics usually deals with the use of data in the context of uncertainty and decision-making under conditions of uncertainty [4]. Statistics has a significant number of methods for analyzing empirical data. Then, based on these empirical data, statistics helps to build a model of the development of the social system [2].

Inferential statistics infer the properties of a population, for example, by testing

hypotheses and obtaining estimates [5]. Descriptive statistics help inductive statistics analyze data and formulate key conclusions [6].

Descriptive statistics summarizes data from a sample using indexes such as the mean or standard deviation.

The most common form of presentation of statistical indicators used in socio–economic and military research is the average value (M). It provides a generalizing characteristic of a trait in a statistical aggregate under specific conditions of place and time [2]. In statistics, the standard deviation (δx) is a measure of the expected deviation of a random variable from its average value [7].

So, this paper is limited to the calculation of statistical indicators: the average value (M) and the standard deviation (δx). Below we will look at the calculation of statistical indicators for social systems.

In the scientific analysis of social systems data, there are several ways to calculate statistical indicators, such as mean (M) and standard deviation (δx), using various tools:

- The first way is to calculate manually using statistical formulas [8].
- The second way is to use electronic statistical calculators [9].
- The third way is to use software such as Microsoft Excel [10].
- Finally, the fourth way there are specialized programs for data analysis, such as MATLAB, Python, R and others [12-14].

The authors suggested a fifth way. It is possible to use neural networks for this purpose. Moreover, earlier, the authors of the article [15] showed satisfactory results of using neural networks in statistics for processing medical data.

The chatGPT 3.5 model was chosen due to the lack of payment for use.

In this paper, the authors have created two new prompts for calculating statistical indicators: (M) и (δx).

To write the prompts, the authors used modern and reliable research methods:
- review of scientific literature,
- analysis and synthesis,
- mathematical modeling,
- verification of statistical hypotheses.

In this study, the main prompt is compiled for situations of choosing one of several features for a unit of population (sample). For social systems, this can be described by the Likert scale [16]. This is the case when there are 5 answers to the questionnaire question. Respondents choose the level of agreement or disagreement with the statement (question) on a symmetrical five-step scale "agree - disagree" [16].

The format of a typical five-level Likert scale looks like this:
- I absolutely disagree,
- I do not agree,
- I neither agree nor disagree,

- I agree,
- I absolutely agree.

The scale may have a different number of steps.

An additional, simplified prompt was written for the case when the selection scale has only 2 options.

The problem was that the chatGPT 3.5 model easily calculated statistical indicators with a sample size of less than 20 units. In other cases, the chatGPT 3.5 model was wrong when calculating the standard deviation (δx). To eliminate these errors, the authors taught the chatGPT 3.5 model the correct calculations by writing two prompts.

These prompts check was performed for samples with a size of more than 15000 units. The authors calculated statistical indicators in two standard ways and using the chatGPT 3.5 model. Verification of statistical hypotheses was performed for the following conditions: general population size is above 100000 units, two-way verification, high verification level is 0.01, sampling error is 1.0%.

Testing of two prompts in the study of social systems showed a very good coincidence of statistical indicators. However, both prompts do not require manipulation of big data. This is a plus of these new prompts.

These two prompts can be used for managing social systems. At the same time, these 2 prompts can be used for managing economic and military systems [17, 18].

Using the chatGPT 3.5 model opens a new page in the calculation of statistical indicators. The results can be implemented in trending, planning, analysing and making of managerial decisions.

Conclusion

This study has provided an analysis of the use of analytical methods in managing economic, social and military systems. Analytical methods play an important role in the process of collecting, organizing, and analyzing data in various fields of science. They enable valuable data to be obtained from collected data, which in turn contributes to informed decision-making.

However, despite the widespread use of analytical methods, this study has identified some gaps and limitations. One of the main gaps lies in the limited applicability of existing methods to large volumes of data, as well as the need for numerous manipulations to obtain the required results.

The authors created 2 prompts for the chatGPT 3.5 model to calculate statistical indicators: (M) and (δx). These indicators are necessary for the use of analytical methods in managing economic, social and military systems.

The verification of 2 prompts showed a very good coincidence of statistical indicators obtained by standard methods and using the chatGPT 3.5 model.

Thus, this study highlights directions for further research in the development of

analytical methods for managing economic, social and military systems, as well as underscores the importance of using modern technologies, such as the chatGPT 3.5 model, to solve complex analytical tasks.

References

1. Statistics. The Cambridge Academic Content Dictionary. Cambridge University Press, 2020. URL: https://dictionary.cambridge.org/dictionary/english /statistics.

2. BS_9641. Business Statistics 5, Textbook for the Program 'Masters of Business Administration'. Kingston University, 2010.

3. Dodge Y. The Oxford Dictionary of Statistical Terms. Oxford University Press, 2003. 506 p.

4. Moore D. Teaching Statistics as a Respectable Subject. In *Statistics for the Twenty-First Century*/ F. Gordon; S. Gordon (eds.). Washington, DC: The Mathematical Association of America. P. 14–25. ISBN 978-0-88385-078-7. 1992.

5. Upton G., Cook I. Oxford Dictionary of Statistics. DOI: 10.1093/acref/9780199679188.001.0001

6. Christopher A. Interpreting and using statistics in psychological research. SAGE Publications, Inc. 2017. DOI: 10.4135/9781506304144.

7. Bland J.M., Altman D.G. Statistics notes: measurement error. *BMJ*. 1996. № 312 (7047), 1654. DOI:10.1136/bmj.312.7047.1654.

8. MathIsFun. Standard Deviation Formulas. URL: https://www.mathsisfun.com/data/standard-deviation-formulas.html

9. How To Use A Scientific Calculator For Statistics? URL: https://djst.org/windows/how-to-use-a-scientific-calculator-for-statistics/

10. Statistical functions (reference). URL: https://support.microsoft.com/en-us/office/statistical-functions-reference-624dac86-a375-4435-bc25-76d659719ffd/

11. MathWorks. Data Import and Analysis. URL: https://www.mathworks.com/help/matlab/data-import-and-analysis.html

12. Python 3.12.1 documentation. URL: : https://docs.python.org/3/

13. Pandas 1.2.4 Documentation. URL: https://pandas.pydata.org/docs/

14. The R Project for Statistical Computing. URL: https://www.R-project.org/

15. Goyal H., Sherazi S. A. A., Gupta S., et al. Application of artificial intelligence in diagnosis of pancreatic malignancies by endoscopic ultrasound: a systemic review. *Therapeutic Advances in Gastroenterology*. 2022. vol. 15. DOI:10.1177/17562848221093873.

16. Likert R. A Technique for the Measurement of Attitudes. *Archives of Psychology*. 1932. Vol. 140. P. 1–55.

17. Gellai D. B. Enterprising Academics: Heterarchical Policy Networks for Artificial Intelligence in British Higher Education. *ECNU Review of Education*. 2023.

Vol. 6(4). P. 568-596. DOI: 10.1177/20965311221143798.

18. Geerling W., Mateer G. D., Wooten J., & Damodaran N. ChatGPT has Aced the Test of Understanding in College Economics: Now What? *The American Economist*. 2023. Vol. 68(2). P. 233-245. DOI: 10.1177/05694345231169654.

Абламська В.,
старший викладач
кафедри бізнес-аналітики та цифрової економіки,
Національний авіаційний університет

РОЛЬ СПЛАЙН-ІНТЕРПОЛЯЦІЇ В АНАЛІЗІ РЕЗУЛЬТАТІВ ЕКОНОМІЧНОЇ ДІЯЛЬНОСТІ

В роботі розглянуто підхід до використання методів апроксимації поліномом Лагранжа та сплайн-інтерполяції для аналізу деяких показників. За графіками інтерполяційного полінома Лагранжа та кубічного сплайна визначено перевагу застосування методу побудови сплайн-функції. В подальшому визначено, що сплайн-функція має переваги в точності і рекомендована для практичної побудови моделі та для прогнозування в економіці.

Ключові слова: контролюючі засоби; інтерполяція, кубічний сплайн, поліном Лагранжа, методи та моделі для прогнозування.

Економічна діяльність постійно потребує контролю над виконанням та реалізацією поставлених завдань. Це необхідно для ефективного управління підприємствами та в бізнесі. Для проведення контролюючих засобів неоюхідним є збір показників діяльності підприємстві, аналіз результатів та своєчасне реагування на зміни в показниках.

Основними інструментом для проведення аналізу на основі зібраних показників є економіко-математичні методи і моделі. Особливо важливим є їх застосування у економічному аналізі з використанням сучасних програмних засобів оброблення кількісної інформації.

Найбільш поширеними моделями сьогодні є моделі, побудовані на основі регресійного аналізу, які передбачають наявність вихідної статистичної інформації достатньо великого обсягу. Але у більшості досліджень дані значних масивів стискаються для побудови аналітичного виразу з невеликою кількістю параметрів.

А для побудови такого виразу застосовують засоби аналітичної обробки даних на основі методів і алгоритмів апроксимації (наближення) функцій, таких