

## ABSTRACT

Explanatory note size – 105 pages, contains 17 illustrations, 38 tables, 20 references, 1 addition.

**Topicality.** The work addresses issues related to the formation of Skyline samples for multidimensional data, analysis of existing multi-criteria decision-making methods, investigation of scalability problems and the “curse of dimensionality” (CoD), as well as the specifics of integrating the Skyline approach into information systems. The main characteristics of existing solutions, their advantages, and disadvantages are presented. The need to find methods for solving the problem of the sharp increase in the size of Skyline samples when working with multidimensional data (CoD) is identified.

**The aim of the study.** The main goal is to solve CoD-related problems and the high complexity of integrating existing solutions for forming Pareto fronts by developing and implementing a method and specialized software tool for generating Skyline samples.

The object of research: algorithms and software for generating Skyline samples.

The subject of research: approaches, methods, and tools for developing software to form Skyline samples.

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

- Analysis of existing multi-criteria decision-making methods.
- Investigation of scalability issues for large data volumes when generating Skyline samples.
- Study of methods for forming Skyline samples from multidimensional data.
- Investigation of clustering as a way to address the “curse of dimensionality” (CoD).
- Evaluation of the effectiveness of the proposed solution.

**The scientific novelty** of the master's thesis results lies in the proposed architectural solution for forming Skyline samples which, unlike existing approaches, provides the user with the ability to limit the size of the Pareto front and interactively explore it. The result was achieved by developing a modernized Skyline-sample formation method.

**The practical value** of the results lies in the development of a software tool for Skyline filtering and multi-criteria evaluation of alternatives, which can be integrated into application systems supporting decision-making in fields such as e-commerce, financial scoring, logistics, tourism services, and analytical platforms. The tool improves decision quality, transparency of selection logic, and efficient use of large data sets.

**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 findings of the thesis were presented at the IX International Scientific and Practical Conference of Young Scientists and Students “Software Engineering and Advanced Information Technologies (SoftTech-2025)”.

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

1) Kryvonosiuk V.V., Stetsenko I.V. Method and software tool for forming Skyline samples from multidimensional data. Proceedings of the IX International Scientific and Practical Conference of Young Scientists and Students “Software Engineering and Advanced Information Technologies (SoftTech-2025)”. Section of the Department of Computer Science and Software Engineering. November 26–28, 2025. Kyiv.

2) Kryvonosiuk V.V., Stetsenko I.V. Method for forming Skyline samples from multidimensional data. *Adaptive Automatic Control Systems*, Volume 1, No. 48 (2026).

**Keywords:** Skyline, Pareto front, curse of dimensionality, clustering, BNL, SkyCell, Randomized Multi-Pass.