About a Pseudo-Genetic Algorithm and Some Features of its Practical Application

Valerii Fratavchan [1], Tonia Fratavchan [1], Victor Ababii [2]

[1] Yuriy Fedkovych Chernivtsi National University, Chernivtsi, Ukraine,
v.fratavchan@chnu.edu.ua, t.fratavchan@chnu.edu.ua, ORCID: 0000-0001-9347-
9855, 0000-0003-1076-0794, http://chnu.edu.ua
[2] Technical University of Moldova, victor.ababii@calc.utm.md, ORCID: 0000-0002-
0769-8144, http://utm.md

Abstract. The paper describes some of the difficulties of using the classical genetic algorithm in a multidimensional numerical space. An optimization algorithm is proposed, which functions according to the principle of the genetic algorithm, but works with numerical arguments and has a simpler implementation. Examples of the use of the pseudo-genetic algorithm for solving certain non-standard optimization problems and for conducting hybrid procedures for clustering sets of multidimensional points are demonstrated.

The Genetic Algorithm (GA) is used to solve optimization problems of the following form:

$$E(W) \rightarrow extr,$$
$$W \in D, \tag{1}$$

Provided: $E(W)$ is the objective function (fitness function) of the optimization problem; and W – is the composite vector of arguments of the optimization problem (chromosome) in the space of optimization parameters.

The proposed pseudo-genetic algorithm is a somewhat simplified model of the classical genetic algorithm, adapted for solving non-standard optimization problems in multidimensional numerical spaces. With this approach, the mathematical model of the problem can be easily adapted to the needs and specifics of the subject area, the need for data transformation

for the implementation of the genetic algorithm is significantly reduced, the procedure for checking the validity of the data when forming the initial population of the genetic algorithm and forming new generations is simplified. Overall, the software implementation of optimization tasks is significantly simplified, particularly when integrating the genetic algorithm into other software packages, where the use of library resources is limited, and there is a need for the direct implementation of such algorithms.

References:

[1] V. Fratavchan, T. Fratavchan, One Pattern Recognition Method for Complex Geometric Clusters Configuration, *In Proceedings of the 14th International Conference on Development and Application Systems, DAS-2018*, 24-26, May 2018, Suceava, Romania, pp. 200-203;

[2] С. В. Антонюк, М. Ю. Горбатенко, О. Л. Кириченко, І. В. Малик, *Машинне навчання. Методи кластерного аналізу.* Навчальний посібник. Чернівці : Чернів. нац. ун-т ім. Ю. Федьковича, 2023. 213 с.

[3] Т. М. Фратавчан, В. Г. Фратавчан, С. В. Антонюк, Р. В. Івасюк, Особливості кластеризації у випадку багатомодальності або складної топології кластерів. Інформаційне суспільство: технологічні, економічні та технічні аспекти становлення (випуск 81): матеріали *Міжнародної наукової інтернет-конференції*, (м. Тернопіль, Україна, м. Ополе, Польща, 11-12 жовтня 2023 р.) /редкол. : О. Патряк та ін. ГО "Наукова спільнота", WSZIA w Opolu. Тернопіль : ФО-П Шпак В.Б. 2023. ст. 54-55, ISSN: 2522-932х.