Artificial intelligence method to detect psychological/ learning disorders in physical education and sports activities

UDC 37.01

Dr. Hab., Professor **M.G. Kolyada**[1]
Dr. Hab., Professor **S.I. Belykh**[1]
PhD, Associate Professor **T.I. Bugaeva**[1]
Postgraduate student **O.S. Oleinik**[1]
[1]Donetsk National University, Donetsk

Corresponding author: kolyada_mihail@mail.ru

Abstract
Objective of the study was to analyze benefits of an artificial intelligence application method for detecting psychological/ learning disorders in the physical education and sports sector.

Methods and structure of the study. Many Russian scientists including A.I. Akhmetzyanov, S.A. Vasyur and N.I. Iogolevich, A.N. Gud et al. have made efforts to adapt the existing intellectual analytical methods and develop new ones using temporal series to describe poorly structured processes and detect disorders thereof; although, regretfully, modern artificial intelligence methods are still underdeveloped in application to the physical education and sports service abnormalities detection purposes. Basically, a disorder detection approach will be designed to determine whether some process (or local data array) falls into the normality field – and if not, rate it abnormal.

Abnormalities in data arrays are usually suspected in cases of omissions or excesses in the data groups going beyond the permissible range, whilst the disorder detection approaches should address, in addition to the above, the behavioral anomalies in the entire data range including specific disorders in the local trends. Therefore, specific detection and analyzing methods need to be selected as dictated by some of the two above provisions.

Results and conclusion. Special selected methods and algorithms applied by artificial intelligence systems help not only successfully find disorders/ abnormalities in the data arrays – where genuine correlations of specific indicators can hardly be found by other means, particularly when the indicators refer to complex psychological, learning and/ or psychophysiological phenomenon/ process – but also effectively forecast consequences of the detected disorders.

Keywords: artificial intelligence, psychological/ learning disorders, anomalies, retardations, giftedness, taxonomic method, physical education and sports.

Background. Self-learning systems of artificial neural networks are being widely applied in modern physical education and sports sector as they are considered beneficial in many aspects including prediction, with certain probability, of contributions (weight) of different psychophysical test rates into competitive progresses on a separate/ synergized basis, in view of aesthetic merits, sensatory experiences, multisided semantics, meanings and many other things that can hardly be formalized – albeit are still relevant and influential for modern physical education and sports.

Objective of the study was to analyze benefits of an artificial intelligence application method for detecting psychological/ learning disorders in the physical education and sports sector.

Methods and structure of the study. Many Russian scientists including A.I. Akhmetzyanov, S.A. Vasyur and N.I. Iogolevich, A.N. Gud et al. [2, 3] have made efforts to adapt the existing intellectual analytical methods and develop new ones using temporal series to describe poorly structured processes and detect disorders thereof; although, regretfully, modern artificial intelligence methods are still underdeveloped in application to the physical education and sports service abnormalities detection purposes. Basically, a disorder detection approach will be designed to determine whether some

process (or local data array) falls into the normality field – and if not, rate it abnormal.

Abnormalities in data arrays are usually suspected in cases of omissions or excesses in the data groups going beyond the permissible range, whilst the disorder detection approaches should address, in addition to the above, the behavioral anomalies in the entire data range including specific disorders in the local trends. Therefore, specific detection and analyzing methods need to be selected as dictated by some of the two above provisions.

Results and discussion. We have taken for the case study a group of trainees as the multidimensional data array subject to the disorder detection method with an objective to find the most gifted individuals in the group. We opted in the case for the taxonomic method in the wide artificial intelligence application toolkit. Taxonomy may be defined as the theoretical study of the fundamentals, principles, rules and procedures of scientific classification of objects based on their similarities, relationship or other correlation criteria [1]. Numerical taxonomy in this context may be interpreted as the reliable quantitative classification/ clustering tool designed to rate correlations/ similarities of objects under consideration.

As far as the individual physical education and sports giftedness is concerned, its detection mission may be reduced to finding a specific abnormality (a peak in the test criteria in this case) versus the normal variation range of criteria in the group under study, and, hence, may be defined as the systematization of multidimensional objects by the relevant taxonomic procedures. This method will primarily find the so-called taxonomic distance i.e. the distance between points of a multidimensional data array/ space described by a range of parameters/ criteria (five in the case) characteristic of the studied object (giftedness). Having found these distances, we will locate every specific point relative to the others and thereby systematize the whole array [4]. In other words, the key principle is that the closer the parameters of two objects are, the closer they are in their features. Therefore, when we rate a degree of similarity/ difference of the parameters/ criteria,

we should first find the distance between them within the relevant conditional coordinates. Using this principle, we would describe the taxonomic ordering/ systematizing of multidimensional parameters as including the following stages:

1. Define a universal criterion as the reference ratio needed to analyze the entire multidimensional object;

2. Find the distance between a specific point (study object) and the universal ratio;

3. Systematize the multidimensional points (conditional "weights" of trainees in the case) by their proximities to the reference point; and

4. Find the taxonomic progress ratio, i.e. the proximity (minimal distance) to this reference point.

Conclusion. Special selected methods and algorithms applied by artificial intelligence systems help not only successfully find disorders/ abnormalities in the data arrays – where genuine correlations of specific indicators can hardly be found by other means, particularly when the indicators refer to complex psychological, learning and/ or psychophysiological phenomenon/ process – but also effectively forecast consequences of the detected disorders.

References

1. Gorodnov V.P., Romanchik T.V. Taxonomic analysis as method for rating competitiveness of industrial products. Biznesinform. 2010, no. 2. pp. 24-28.

2. Minullina A.F. Research of anticipation consistency in the families of drug addicts. Middle-East Journal of Scientific Research. 2014. Vol. 19. pp. 1099–1103. DOI: 10.5829/idosi.mejsr.2014.19.8.21042.

3. Natvig G.K., Albrektsen G., Qvarnstrom U. Psychosomatic symptoms among victims of school bullying. Journal of Health Psychology. 2001. Vol. 6, issue 4. pp. 365–377. DOI: 10.1177/135910530100600401.

4. Plyuta W. Wielowymiarowa analiza por wnawcza w Badaniach Ekonomicznych. Metoda ekonomiczna. Warszawa. 1977. 245 p. (In Poland).