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The Neural Network as an Indicator for Classifying Students in Athletics Throwing Activities According to Some Physical and Motor Abilities and Their Physical Measurements

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Abstract

Students for each activity of the researched (weight, disk, spear) for this game by means that each game or sporting activity needs appropriate physical measurements as its need for physical and motor capabilities, and the development in technology (artificial intelligence techniques), which we are witnessing in recent years, has given great opportunities To research the requirements of each activity or game of these games in general, and athletics in particular, which is like other games that consider testing and measurement as one of the important foundations that must be relied upon for classification and guidance to reach the individual to a high level as a result of continuous and organized research and a shortening of time and effort, From here, the problem of this study was embodied, as the researcher noticed that most of the competitions with the activities of pushing and throwing are represented by one player, and this is a phenomenon that must be considered. Because, as it is known, each activity has its own motor and physical capabilities and physical measurements, and for this the importance of the study lies in the classification and guidance of the use of artificial cell networks, where students are classified according to their physical measurements and physical and motor abilities.

In the light of the above, the research objectives were formulated to identify the reality of the sample in some of the physical abilities, movement and physical measurements that the students enjoy, in order to classify them into homogeneous groups and classify the students according to some of the physical abilities, movement and physical measurements they have. The researcher used the descriptive approach in survey and correlation studies, and its suitability and the nature of the problem to be solved. The research community was determined by the students of the second stage in the College of Physical Education and Sports Sciences / University of Babylon for the academic year 2022-2023, whose number is (95) students. As for the statistical methods used, the researcher dealt with a group of them To facilitate its work and achieve its objectives.

Keywords: Artificial intelligence, classification, neural networks, throwing events.

Introduction

The scientific and technological progress that included all areas of life, including the mathematical field, was the result of the use of objective tools, which are testing and measurement. Tests and measurement are among the important tools that aim to consolidate programmed work, and are also important in evaluating

various aspects of life in general and aspects related to sports activity in particular. Athletics is one of the games that are based in its development on other sciences, primarily tests, measurement and sports training. By employing these sciences, the level of digital achievement of these events can be developed and an advanced digital level is achieved in accordance with the physical and motor requirements and physical measurements required to practice the activity to be studied.[1]

Throwing events are one of the athletics activities spread in many countries of the world, which include (javelin throwing, discus throwing, and iron ball throwing), and these events witnessed a remarkable development, and this development is due to the use of correct and integrated scientific application, especially In the classification process on the basis of some physical and motor abilities and physical measurements of the students practicing it, as physical measurements (anthropometrics) and physical and motor abilities represented an important place in the various scientific fields to identify the difference between human races and the influence of environments on them, and that these variables provide us with certain foundations that will be used in comparison Between the sports performance of individuals, each type of sports activity needs its own physical, motor and physical specifications. In order to reach high levels, the body must be suitable for the type of sports activity practiced. As for the importance of physical and motor capabilities for the activities of throwing in athletics, it is necessary for every sports activity that requires practitioners to have physical and motor capabilities and certain physical measurements that are appropriate to the nature of the sport and make its practice more practical. Efficiency and productivity in order to return to the student the best results during the competition.[2]

And since classification is distinguishing things from each other and putting everything that shares one or more characteristics together in groups to facilitate access to them, and that working with athletes players of different positions or class and technical levels requires us to separate them from each other and organize them into groups that differ from one another, provided that Each group is homogeneous vocabulary with each other; On it: The classification process must be present, the investigation is an important goal, which is the gathering of individuals with similar abilities in one group. Regarding the purpose of this classification, we find that some scholars and experts in the field of physical education and sports sciences resort to classification for the purpose of grouping individuals with similar abilities or close to each other in groups so that they organize their own curricula.[3]

Evaluation and development of student performance in shooting activities is not limited to training units only, despite their importance, but development in the level of achievement, improvement and evaluation is linked to classifying students with their motor and physical capabilities and appropriate body measurements effectively, although there is tangible progress in Throwing activities and their continuous development However, the typical specifications of the players must be determined through continuous testing and measurement to determine the extent to which the results are in harmony with their motor and physical abilities and their physical measurements, and as a result of the multiplicity of methods, statistical methods and scientific techniques, and the multiple fields of their use, and the sciences vary in the degree of their dependence And its use of certain statistical methods. There are statistical methods that have proven their validity in a field, and have become widely used, but they have not been studied in other fields. One of the most prominent of these

modern technologies is artificial intelligence (neural networks). That artificial intelligence occupies an important place in various scientific fields, including medical and humanitarian fields such as economics and medicine, its use in educational and mathematical fields is still very limited - within the limits of what the researcher has seen of studies and research - so it is important to study the possibility of benefiting From this technology in sports science and education and knowing the extent of its effectiveness through one of its components, which is (artificial neural networks). Therefore, the researcher sought to shed light on artificial intelligence networks, where he classifies students in athletics shooting activities according to the variables: (physical measurements, physical abilities, and movement) in homogeneous groups based on common characteristics.[4]

The process of measuring and evaluating students in athletics throwing events requires an accurate scientific method according to the most important variables that are related to the performance of the activities, such as physical measurements, physical and motor abilities. During the researcher's follow-up of the course of the educational process, he noticed that the process of selecting students to practice one of the throwing activities was not centered on individual differences for students through the process of objective evaluation based on their classification according to physical measurements, physical and motor abilities, but rather came collectively and randomly, and that the classification must be done for each A similar group separately and not to confuse different students with their measurements and physical and motor abilities, as these variables have a major role in the classification process. To do this, the researcher sought to build an evaluation model for the throwing activities by means of neural networks, through which the students are classified according to their physical and motor abilities and their physical measurements to help the specialist in choosing the most appropriate students to practice the throwing activities of athletics. There is no solution to the problem of our research except by investigating.

Research objectives

1. Identify the statistical description of the research variables investigated.
2. Recognizing the nature of the relationship between motor and physical capabilities and the studied physical measurements on the one hand, and between the physical and motor variables, physical measurements and achievement in throwing activities on the other hand.
3. Selecting the important and influencing variables in students' achievement in throwing activities (weightlifting, discus throwing, javelin throwing).
4. Building a classification model based on artificial neural networks to classify students in shooting activities according to their physical and motor abilities and their physical measurements.

Method and procedures

The researcher used the classroom method in the survey and correlational studies methods to suit the nature of the problem .[2] The research community was determined by the students of the second stage in the College of Physical Education and Sports Sciences / University of Babylon, for the academic year 2022/2023 AD, and they numbered (95) students. As for the research tools and devices used, they were (testing and measurement, observation, Arabic and foreign reference sources, a linen measuring tape with a length of (50 m),

one number, the athletics stadium at the University of Babylon, electronic stopwatches, and (20) legal barriers. As for the field procedures, they were.[5]

First, Determining the physical measurements of the shooters (disc, spear, weight).

In order to complete the research procedures and to achieve the goals, there must be tests for physical measurements appropriate to the research and the model on it. The researcher prepared a form for questioning the opinion of experts and specialists in testing, measurement, sports training and athletics, and their number reached (9) experts and specialists, and after collecting and emptying the forms The data and its validity were extracted using (Ca2), measurements that obtained a rate of (92.81%) were accepted.

Second, Determining the motor and physical capabilities of throwing activities in athletics

In order to determine the movement and physical capabilities of the students, the researcher prepared a questionnaire for the opinion of experts and specialists in testing, measurement, sports training and athletics, and their number reached (9) experts and specialists, and after collecting the forms, emptying the data and extracting their validity through (Chi square)), the capabilities that obtained a percentage of (92.59%) were accepted.

Third, Determine the physical and motor abilities tests for shooters in athletics

In order to complete the research procedures and to achieve the goals, there must be standardized scientific tests related to the phenomenon to be measured against. It has become necessary to choose the appropriate tests for the research and the model. After examining the sources and references, the researcher prepared a questionnaire for the opinion of experts and specialists in testing, measurement, sports training and athletics, and their number reached (9) An expert and specialist, and after collecting the forms, emptying the data, and extracting their validity through (Chi square), the tests that obtained a rate of (93.33%) were accepted.

Fourth: The main experiment: The researcher conducted the main experiment on Monday 12/21/2022 AD, at exactly nine o'clock in the morning, on the research sample of (68) students, with the help of the assistant team , on the playground of the College of Physical Education and Sports Sciences / University of Babylon, and the candidate exams have been conducted.

As for the statistical methods

The researcher used the following statistical methods (the mean, the standard deviation, the (t) test, the (F) test, the simple regression equation, the standard error, and the simple Pearson correlation coefficient.[1]

Results

First, The statistical description of the research variables (the reality of the sample in some physical and motor abilities and physical measurements that the students enjoy, in order to classify them into homogeneous groups).

After the researcher came out with the results of the tests, he worked on emptying them and then classifying them in special tables. He used the Statistical Bag for Educational and Social Sciences (SPSS) in

order to classify the research sample according to the tests it underwent in the light of physical measurements and physical and motor abilities in order to model and classify students according to the effectiveness of the practice of throwing in athletics. The researcher took his procedures regarding unpacking the data concerned with physical measurements and motor and physical abilities of the research sample members, as the classification process here aims to come out with generalities that can be adopted in scientific reasoning, and accordingly the data classification mechanism came to reduce and reduce the overlap between groups and according to the variables of physical measurements and motor abilities and The physical body of the candidate for work in a manner that is easy to deal with, as well as its suitability with the purpose for which the purpose of its classification was set.[6]

This research is based on a scientific idea that it is not possible to deal with any values of any inferential statistical coefficients unless a full description of the nature of the data is obtained, that is, a full description of the form of the variables is fulfilled. The description of the quantitative estimates of the results of the process of analyzing the variables, some of the physical and motor abilities, physical measurements, and the achievement of the throwing activities, enables us to identify more accurately the values of these variables, as through the description, it is possible to judge the moderation of the distribution of its data and its credibility in representing the sample, as well as identifying what the meanings mean. these estimates.[7]

Table 1. Shows the results of the statistical description of the research sample in physical measurements, physical and motor abilities, and the achievement of students in throwing activities

Anthropometric measurements								
S	**Variables**	**Units**	**Highest value**	**Lower value**	**Mean**	**STD**	**STD. Error**	**Skewness**
1	Body weight	Kg	102.00	64.00	75.81	5.48	0.66	0.93
2	Total length	Cm	190.00	170.00	177.01	5.35	0.65	0.56
3	Trunk length	Cm	70.00	45.00	55.09	4.63	0.56	0.57
4	Humerus length	Cm	36.00	27.00	30.94	2.07	0.25	0.26
5	Forearm length	Cm	34.00	26.00	30.31	1.67	0.20	-0.41
6	Palm length	Cm	28.00	16.00	19.78	1.52	0.18	0.08
7	Forearm and palm length	Cm	57.00	42.00	48.15	3.03	0.37	0.39
8	Arm length	Cm	98.00	70.00	78.10	4.54	0.55	0.90
9	Lower limb length	Cm	106.00	80.00	94.46	4.94	0.60	-0.30
10	Thigh length	Cm	53.00	40.00	45.35	3.18	0.39	0.59
11	Leg length	Cm	52.00	38.00	44.35	3.15	0.38	0.32
12	Shoulder width	Cm	48.00	30.00	43.60	2.94	0.36	-0.54
13	Chest expansion	Cm	38.00	23.00	28.65	3.01	0.37	0.87
14	Pelvic widening	Cm	54.00	25.00	32.12	3.63	0.44	0.21
15	Thigh circumference	Cm	67.00	46.00	53.90	5.06	0.61	0.54
16	Humerus circumference	Cm	37.00	23.00	30.22	3.20	0.39	-0.08

17	Forearm circumference	Cm	33.00	23.00	27.85	2.16	0.26	0.15
Achievement in the researched activities								
1	Weight achievement	Meter	10.45	5.11	8.13	0.11	0.90	-0.49
2	Disk completion	Meter	20.11	10.11	15.58	0.20	0.65	-0.31
3	Spear achievement	Meter	30.21	13.11	18.81	0.42	0.05	0.38
physical capabilities								
1	Arms explosive ability	Meter	10.00	8.00	8.91	0.61	0.07	0.00
2	Two men's explosive ability	Meter	2.62	1.88	2.25	0.26	0.03	-0.09
3	Two men's explosive ability	Cm	50.00	30.00	37.31	7.20	0.87	0.60
4	Distinctive strength with speed for the arms	Numb.	14.00	8.00	11.31	1.42	0.17	-0.21
5	Distinctive strength with speed for the arms	Numb.	22.00	14.00	18.16	2.53	0.31	-0.18
6	Distinguished strength with speed for the two men	Meter	99.00	45.00	79.65	16.25	0.97	-0.70
7	Bearing strength for the arms	Numb.	37.00	20.00	28.19	5.12	0.62	0.11
8	Bearing strength for the two men	Numb.	37.00	15.00	25.10	6.65	0.81	0.16
9	Arm speed bearing	Numb.	52.00	38.00	46.47	4.32	0.52	-0.41
10	Two-legged speed endurance	Sec.	52.13	36.77	45.09	4.21	0.51	-0.12
Motor abilities								
1	Agility	Numb.	12.14	9.11	10.82	0.80	0.10	-0.70
2	Balance	Sec.	45.13	22.75	33.01	5.94	0.72	0.57
3	Compatibility	Sec.	1.47	1.06	1.26	0.11	0.01	-0.04
4	Compatibility2	Numb.	14.00	10.00	12.07	1.15	0.14	-0.21
5	Kinetic flexibility1	Cm	48.00	23.00	33.63	6.37	0.77	0.07
6	Kinetic flexibility 2	Cm	41.00	28.00	35.88	3.69	0.45	-0.24

What is shown in Table (1), is the lack of standard error values (p), which confirms the appropriateness of the sample size and the correctness of its representation of the original population. As the value of the standard error is a measure of the degree of dependence on the sample mean, the smaller its value, the greater the dependence on it .[8] It is also noted that all the values of the torsion coefficient do not exceed (±1) in any way, and this indicates that the candidate tests are characterized by moderation, it is possible to rely on drawing results and

trust them, as well as the possibility of classifying them into homogeneous groups according to one class and different according to classes (heavy, disc , spear), and after the researcher made sure of the validity of the sample and its readiness for classification, he conducted the appropriate analysis for this purpose, and from it he went to extract the inter-correlations matrix, for the purpose of conducting the (LASSO) process.[9]

Second, steps to build an artificial neural network for the purpose of classification.

A / Presentation and analysis of the results of the correlation relations of the matrix.

There is no doubt that the analysis of neural networks seeks to express the correlation coefficients with specific factors. In order to achieve these coefficients, it must be calculated from the data matrix using the simple correlation coefficient equation (Pearson). As the matrix of inter-correlations included (630) correlation coefficient, consider (matrix of inter-correlations).

The existence of a significant correlation between some variables between them on the one hand and between them and the dependent variable (achievement in pushing the weight, the disc, and the spear) on the other hand, and the matrix of simple correlations shows us in which the calculated correlation values vary as The total number of values was (630) between significant and non-significant in both positive and negative directions according to the rule of the number expansion = n x (n + 1)/2, and the tabular value at the degree of freedom (66) and the level of significance (0.05) is (0.24), so the height Any of the values calculated for the correlation from the tabular value indicates the existence of a significant correlation and its direction is determined by positive or negative according to the reference of the values, as the values were distributed between significant and non-significant, as for the moral values, which are either direct or inverse relationships, in the first aspect (Direct relationships) which numbered (282) positive significant values. The highest relationships are (forearm circumference x upper arm circumference), then (leg length x lower extremity length), then (arm length x forearm length) with calculated values (0.703), (0.644). , (0.579), respectively. In the second aspect, the inverse relationships amounting to (253) negative significant values. The relationships are (agility x strength distinguished by speed, two arms, thigh circumference x forearm length), then (speed endurance x two legs x chest breadth), and with calculated values (-0.449), (-0.346).), (-0.338), respectively. As for the variables that have a significant positive correlation with the dependent variable (achievement in pushing the weight, the disc, and the spear), the relationships (body weight, length of the hand, strength bearing by two legs) are calculated with values (0.282), (0.210), (0.238), respectively. While a variety of non-significant relationships appeared between the variables (physical measurements, physical and motor abilities, each other) and between the variables (physical measurements, physical and motor abilities), the throwing activities as a dependent variable, amounting to (95) non-significant values.[10]

B / Presentation and analysis of the results of the selection of variables using the method of (LASSO).

As an introduction to dealing with neural networks, independent variables must be configured in terms of not being extravagant in including a large number of variables, because this negatively affects the desired result of the network, so a mechanism must be employed to select variables as a necessary step to get rid of the problem of multiple correlation between variables and to represent each number of variables with a variable

represents him. Lasso Regression is a common type of regular linear regression, which is used to reduce data towards central points determined by equations suitable for each case of the variables. It also works to organize linear models ,[11]It is short for selection and shrinkage operator absolute Least , Which uses a function or parameter (Parameter Penalty) and is used to choose the variable. Its idea is summarized as working on the principle of minimizing the squares of the values in relation to the error according to a certain restriction that is imposed, which represents the absolute sum of the parameters. Through the nature of the constraint, the Lasso estimator works to make The number of coefficients is equal to zero and the others are reduced by a certain amount. Thus, it selects the important variables in the model, i.e. it performs the process of estimating and selecting the variables at the same time.

Table 2. Shows LASSO method

S	Variables	Coefficient	The sum of the standard coefficient
1	Body weight	**- 0.042**	**- 0.088**
2	Total length	**0.000**	**0.000**
3	Trunk length	**0.000**	**0.000**
4	Humerus length	**0.000**	**0.000**
5	Forearm length	**0.000**	**0.000**
6	Palm length	**0.024**	**0.097**
7	Forearm and palm length	**0.000**	**0.000**
8	Arm length	**0.088**	**0.423**
9	Lower limb length	**0.000**	**0.000**
10	Thigh length	**0.000**	**0.000**
11	Leg length	**0.000**	**0.000**
12	Shoulder width	**0.000**	**0.000**
13	Chest expansion	**- 0.071**	**- 0.313**
14	Pelvic widening	**0.000**	**0.000**
15	Thigh circumference	**0.000**	**0.000**
16	Humerus circumference	**0.057**	**0.181**
17	Forearm circumference	**0.000**	**0.000**
18	Arms explosive ability	**0.045**	**0.099**
19	Two men's explosive ability	**0.038**	**0.067**
20	Two men's explosive ability	**0.000**	**0.000**
21	Distinctive strength with speed for the arms	**0.000**	**0.000**
22	Distinctive strength with speed for the arms	**0.155**	**0.012**
23	Distinguished strength with speed for the two men	**0.000**	**0.000**
24	Bearing strength for the arms	**0.000**	**0.000**
25	Bearing strength for the two men	**0.000**	**0.000**
26	Arm speed bearing	**0.000**	**0.000**

27	Two-legged speed endurance	**0.000**	**0.000**
28	Agility	**0.000**	**0.000**
29	Balance	**0.028**	**0.235**
30	Compatibility	**0.000**	**0.000**
31	Compatibility2	**0.020**	**0.005**
32	Kinetic flexibility1	**0.000**	**0.000**
33	Kinetic flexibility 2	**0.000**	**0.000**

Table (2) shows the values of the coefficients after the process of reducing them, as this was done through a set of equations that reduce some coefficients to zero to be excluded from the selection process, while leaving other coefficients with real values that cannot be reduced to zero, which represent the coefficients of variables After filtering, the values of the non-normative and normative parameters are revealed, both of which indicate the accepted variables, which are the variables that contain coefficient values higher than zero. Therefore, the values of the (33) variables were reduced so that twenty-three variables were deleted. These variables vary in terms of the importance of their survival according to the absolute value. For the parameters, starting from the variable (a force distinguished by the speed of the arms) as the highest variable (according to the absolute coefficients, resist the contraction to the variable , which was on the edge of the non-reduced coefficients. The coefficients mentioned in the table express the y-axis, while the sum of the standard coefficient expresses is the owner of the final say in selecting one variable and leaving another.[12]

Third, Presentation and analysis of the results of the general classification model.

A / Presentation and discussion of dividing the sample into two groups (training and testing).

After the process of filtering the data, which is (10) variables, in addition to the (Bias) bias coefficient, which is the coefficient that works to move the intersection line of the slope line with the y-axis so that it represents flexibility in moving it in a way that does not interfere negatively in showing the best slope line, and this The parameter is associated with the input layer, the independent variables and the hidden layers. It enters the calculation equation and is treated as any other variable that can be trained. Its value is always (+1) as a variable. It affects the subsequent variables and those variables do not affect it, and making the dependent variables (throwing activities) is the result. The final analysis and its inclusion in the construction of the neural network, in which there is a hidden layer that works to improve the training process on the data under study, and as shown in Table (3) the percentage of samples used in the network.

Table 3. Show the proportion of samples used in the network

Samples	**Number**	**Percentage**
Training group	**44**	**64%**
test set	**24**	**35.3%**
the total number	**68**	**100%**
training error rate	**2.3%**	

test error rate	**4.2%**

It is clear from Table (3) above that the total sample of (68) individuals has been divided into two groups, the training group, which was used to train the input and output data, and the test group through which the weights were tested and with the presence of hidden layers, as the number of members of the first group (The training group) consisted of (44) individuals, constituting 64%, while the number of the second group (the test group) was 24 individuals, or 35.3%. It also turns out that all observations were valid for statistical treatment, and no scenes were excluded. After completing the training process, the results appeared, as the error rate was For testing and prediction, it is (4.2%), meaning that the performance of the network in relation to prediction is very high, while the error rate for the training group was (2.3%), and this indicates that the data has been fully trained and was very successful.

B / Presentation, analysis and discussion of the structure of the artificial neural network

After the process of selection and smoothing that was done through Laaso on the sample, the data (10) were extracted, then they were entered to build the neural network, where the researcher built an integrated neural network type (Feed Backward NN), and this network means that all inputs are Hit it with its own weights.

First , number of layers:

The network structure consists of two layers that are fully linked, including a hidden layer containing (10) units, while the second layer contains three units represented by the dependent variable, which are the throwing activities, in addition to the input layer, which contains (10) units represented by the independent variables, as shown in the figure (1).

Second , the functions used:

Activation function (Linear): The activation function (Linear) was used in the output layer, and it is the function in which the image of the output variables is similar to the image of the input variables and gives multiple and unlimited classifications.

Layer weight initializers function:

It means the layer weight initializer, which makes the selection of weights random to give an excellent training result, so if the weights are equal, it will give the same results.

Function (kernel initializer and bias initializer):

It means the kernel initializer and the bias initializer that makes the (bias) random, to reach weights.

Perfect for accurate results

mean absolute error)=(loss:

This function was used, and it is one of the important functions that are used with deep neural networks, and it is symbolized by (MAE). Acceptance or non-acceptance of the network, which in this case amounted to (2.3%).

Third , for the final shape of the artificial neural network

After identifying the shape of the variables and dividing the sample into groups, and then creating the layers and completing all the requirements for building the network from training, learning and testing, in addition to the activation functions, the final form became as in Figure (1).

It shows the number of independent variables amounting to (10) independent variables, which are each of (body weight, palm length, arm length, chest breadth, humerus circumference, explosive ability of the two legs, strength distinguished by speed for the arms, explosive ability of the arms, balance, compatibility) with the bias coefficient (BIAS), which is equivalent to the value of (b_o) in the regression equation, as it is included in the calculation equation and is treated as any other variable. It has a coefficient value that is included in all calculations, so it affects subsequent variables, and these variables do not affect it. It is associated with the layer of independent variables and hidden layers. We also note the presence of a hidden layer One and three variables dependent on the throwing activities (the weight of the disc and the javelin). As for the lines, each of them represents the point of weight (weight), or what is called the value of the coefficient that communicates the relationship between all cells. High and the weight of each variable is equal to its relative importance and the percentage of its contribution to the subsequent variable, as the weight in blue has a value less than zero, i.e. negative values, and its opposite is the gray line, whose value is greater than zero, i.e. a positive value. The size of the line in terms of its thickness or accuracy represents the strength of the value in the direction that It is represented by color. The first hidden layer has (10) cells in addition to the value of the baffle coefficient (bias), each value of which is calculated by multiplying the value of the input (X), which is the independent variable in the value of the random weight, then the result is entered into an equation called a function Activation, to reach ideal weights and the lowest error rate, and thus the values of each cell of the hidden layer appear, which in turn do the same to show the values of each cell, which are also the input values of the second output layer and symbolized by (H), and the same method continues, but the result that They appear to be entered into the activation function (Linear), and from here we see predicted output values and real values taken from the sample results, to extract the difference between them using the delta value (Δ), then the network makes a backward by using the delta values of the outputs to extract The delta values of the hidden layer, and thus the use of each Δ value used to extract a new weight (W^{new}) through an equation that uses the new delta (new) with the old weight (W^{old}) to extract the new weight:

$$W^{new} = W^{old} - \Delta^{new}$$

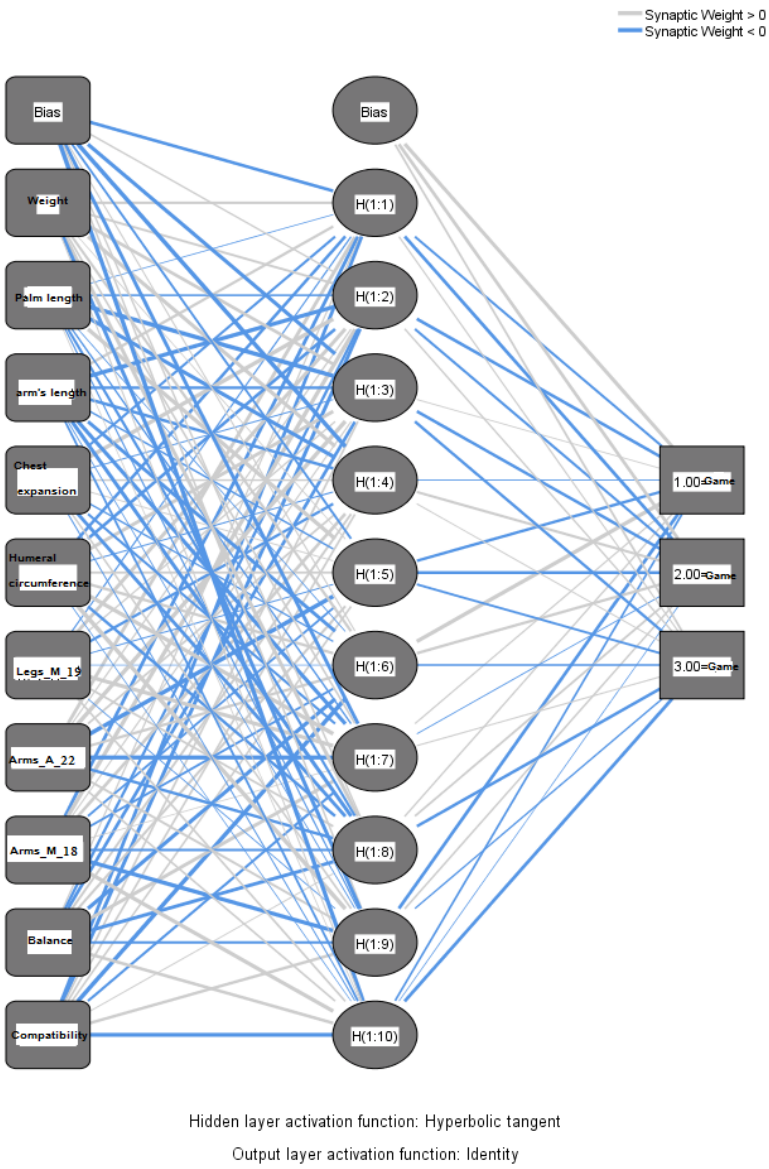

Figure 1. The final form of an artificial neural network

Thus, the process continues until a degree of stability is reached that does not change the value of the weights, as the network becomes ready for operation

Fourth , Presentation and discussion of the values of the weights between the layers and the percentage of contribution

After completing the construction of the network, two sets of weights were extracted, as shown in Table (4).

1- Coefficients of the effect of independent variables in the hidden layer:

That the presence of (10) cells. In the hidden layer, it was formed by multiplying the values of the independent variables in their random weights and according to the equation (Z = X * W) with the introduction of the value of the result (Z) in the (Sigmoid) equation through the equation (1 + e – z / g = 1), since New calculated values appear for the hidden layers, which are also multiplied by the random weights of the hidden

layer, and thus the expected values of the dependent appear, and thus there are (110) coefficients. 0.886), while the highest value in the negative direction was the explosive capacity of the two legs x the fourth cell, reaching (-1.117), while the other treatments ranged between these values.

2- Coefficients of the effect of the hidden layer on the dependent variable:

The existence of three dependent variables, each of which requires the presence of a coefficient among the ten cells of the hidden layer with the bias coefficient (Bias), and thus there are (33) coefficients, the highest in the positive direction (0.397), and this coefficient was between (the sixth cell x weight),

While the highest was in the negative direction (-0.293). This coefficient was between (the tenth layer x the spear), As shown in table (4) below.

Table 4. Show coefficients of the effect of the hidden layer on the dependent variable

Variables		Hidden class										Output layer		
		Cell(1)	Cell(2)	Cell(3)	Cell(4)	Cell(5)	Cell(6)	Cell(7)	Cell(8)	Cell(9)	Cell(10)	[heavinesss]	Disc	Javelin
Input	(Bias)	0.410	-0.260	0.421	-0.557	0.821	0.425	0.799	0.112	-.449	-0.094			
	Weight	-0.048	-0.035	0.602	-0.946	0.199	0.164	0.191	-0.102	0.328	0.455			
	length_palm	-0.073	0.308	0.140	-0.100	-0.236	0.176	0.138	-0.096	-0.098	-0.523			
	Arm_length	-0.095	0.387	0.119	-0.181	-0.292	0.303	-0.081	-0.061	-0.134	-0.537			
	Breadth_chest	0.040	0.394	0.310	-0.919	-0.242	-0.020	-0.137	-0.211	-0.045	0.553			
	Circumference_humerus	-0.055	-0.042	0.052	0.123	0.121	-0.544	0.181	-0.381	-0.053	0.033			
	Twomen_m_19	0.093	-0.412	-0.045	-1.117	0.270	-0.126	0.362	0.397	0.698	0.328			
	Arms_	0.014	-0.468	0.184	0.170	0.226	0.075	-0.169	-0.181	0.130	0.108			

	p_22												
	Arms_m_18	0.375	0.236	0.030	0.198	0.053	-0.165	0.403	0.261	0.886	0.022		
	balance	0.272	0.398	0.421	-0.218	-0.260	0.195	-0.205	-0.292	0.147	0.176		
	Compatibility2_31	-0.295	-0.351	0.139	0.135	0.126	-0.520	-0.190	0.035	0.240	-0.459		
Hidden class	(Bias)											0.336	0.282	0.146
	Cell(1)											-0.173	-0.289	0.063
	Cell(2)											-0.268	-0.187	0.087
	Cell(3)											0.023	-0.250	-0.236
	Cell(4)											-0.049	0.188	0.044
	Cell(5)											-0.230	-0.245	-0.165
	Cell(6)											0.397	0.220	-0.131
	Cell(7)											0.067	-0.019	0.055
	Cell(8)											0.077	0.143	-0.263
	Cell(9)											-0.287	0.106	-0.076
	Cell(10)											-0.145	-0.007	-0.293

Table 5. Show the extent of trust in the network

Sample		The expectation			
		1.00	2.00	3.00	Correct percentage
Training	1.00	15	0	0	100.0%

	2.00	0	16	1	94.1%
	3.00	0	0	12	100.0%
	Total percentage	34.1%	36.4%	29.5%	97.7%
Testing	1.00	12	0	0	100.0%
	2.00	1	8	0	88.9%
	3.00	0	0	3	100.0%
	Total percentage	54.2%	33.3%	12.5%	95.8%

And to find out the extent of confidence obtained for the sample entering the network, through Table (5), where as we notice in the training sample, there are three columns representing the three activities, as well as the rows, as well as in the test sample, in the effectiveness of the weight, the number of the successful sample in the test is (15). And in the test sample (12), which is the total number of students accepted in the weight effectiveness with a confidence rate of 100%. As for the disk effectiveness, we note in the training sample the number of successful students (16) and the number of students in the test sample (8), where there is a student who was attracted to The spear and another student were attracted by the disk, and thus the number of the sample became (26), with a confidence rate of 94.1% in the training sample, with a confidence rate of 88.9% in the test sample, and it is considered a very high and successful confidence rate. As for the effectiveness of the spear, the percentage was 100% identical.

Fourth, Viewing and analyzing the results of classifying students according to the neural network model in some of their physical and motor abilities and physical measurements

Table 6. Shows the means and standard deviations after sorting the items

S	**Variables**	**Class first Push the weight**		**Class second Discus throwing**		**Class three Javelin**	
		Mean	**STD**	Mean	**STD**	Mean	**STD**
1	Body weight	75.6667	8.73102	76.1154	9.14911	75.5333	7.28861
2	Total length	177.740	5.66767	176.3846	4.94835	176.8	5.63408
3	Trunk length	55.9259	4.74687	53.8077	3.63339	55.8	5.68457
4	Humerus length	30.963	2.12098	30.6538	1.87494	31.4	2.32379
5	Forearm length	30.4815	1.50308	29.9231	1.76461	30.6667	1.75933
6	Palm length	19.7037	2.05342	19.6538	0.93562	20.1333	1.24595
7	Forearm and palm length	47.8889	3.14194	48.0385	2.77821	48.8	3.36367
8	Arm length	77.9259	4.30497	77.3462	2.65243	79.7333	6.90204
9	Lower limb length	93.4444	5.13909	94.6154	4.95643	96	4.39155
10	Thigh length	44.7037	2.77093	44.9615	3.01305	47.2	3.60951
11	Leg length	43.9259	3.72028	44.4615	2.65678	44.9333	2.89005
12	Shoulder width	43.6667	2.44949	43.6538	2.46483	43.4	4.40454

13	Chest expansion	28.037	2.98047	28.6154	2.89934	29.8	3.12136
14	Pelvic widening	31.963	2.82137	31.3462	2.20803	33.7333	5.95779
15	Thigh circumference	53.5556	4.5517	54.7692	4.99846	53	6.09449
16	Humerus circumference	29.5926	3.67171	30.9615	2.79257	30.0667	2.86523
17	Forearm circumference	27.4444	2.40725	28.5	2.00499	27.4667	1.76743
18	Arms explosive ability	8.9904	0.61152	8.9685	0.5713	8.6653	0.66729
19	Two men's explosive ability	2.2233	0.26837	2.2781	0.23025	2.2527	0.29195
20	Two men's explosive ability	37.1481	7.10744	36.0385	6.69018	39.8	8.04629
21	Distinctive strength with speed for the arms	11.0741	1.51723	11.1923	1.49718	11.9333	0.88372
22	Distinctive strength with speed for the arms	17.5556	2.53185	18.3846	2.35078	18.8667	2.72204
23	Distinguished strength with speed for the two men	80.6296	15.11023	83.9231	13.1846	70.4667	20.08861
24	Bearing strength for the arms	28.4444	5.69975	28.1538	5.00154	27.8	4.49126
25	Bearing strength for the two men	25.037	6.91421	24.2308	7.01603	26.7333	5.53517
26	Arm speed bearing	47.7778	3.38927	45.9615	4.99184	45	4.17475
27	Two-legged speed endurance	45.0307	3.54961	44.8065	4.86318	45.6673	4.34349
28	Agility	11.003	0.57373	10.9538	0.73481	10.248	1.03094
29	Balance	31.8648	5.68795	32.8058	5.79961	35.4027	6.33918
30	Compatibility	1.2652	0.11151	1.2377	0.10783	1.268	0.11226
31	Compatibility2	11.7037	1.17063	12.2308	1.21021	12.4667	0.83381
32	Kinetic flexibility1	33.3333	4.73936	34.6923	7.01866	32.3333	7.78888
33	Kinetic flexibility 2	36.2222	3.74508	35.2692	3.89418	36.3333	3.30944

When shedding light on what was stated in Table (6), we find that the values of the mean and standard deviations differ in each of the three classifications and in the variables of physical measurements and physical and motor abilities, as it becomes clear to us that the descriptive values of the researched variables have differed from one test to another, as well as from one category. to another, whether at the level of one test (agility), for example, or at the level of all tests. For example, we find that what has been achieved in the (agility) test from the mean has reached (11.003) for the first category (heavy push), which you see differs from what was achieved in the same test in the second category (disc throw), as it reached (10.95) years, as for the category The third (javelin throw), it reached (10.24). What we found in the mean, we find in the values of the standard deviations. The researcher believes that the reason for this difference between the tests of the same type is due to the fact that each of these tests measures a specific physical characteristic that differs in the unit of measurement and the nature of performance. These differences came according to the different numbers of the three categories. Table (7) shows the number of the sample in each category.

Table 9. Shows the number of students in each class

S	Class	The number of students
1	**Class first** **Push the weight**	27
2	**Class second** **Discus throwing**	26
3	**Class three** **Javelin**	15
5	Total	68

Conclusions

1. Through the statistical indicators concerned with the normal distribution, these estimates proved that the sample was moderately distributed in all the variables studied, which gave the researcher the opportunity to develop the model for classification purposes.
2. The researchers were able to construct the classification model by using neural networks using the Lasso method in the variables: (weight, arm length, palm length, chest width, humerus circumference, explosive power of the two legs, power distinguished by speed for the arms, explosive power of the arms, balance, compatibility).
3. The physical and motor abilities and the studied anthropometric measurements played an important role in the process of classifying the students to practice throwing activities in athletics.
4. The researchers concluded that one of the best techniques used in selecting the basic common variables in building the taxonomic model using neural network cell technology is (Lasso).
5. The repeated training and testing processes in the neural network system played a crucial role in reaching sound decision-making with an almost non-existent error rate in building the classification model.
6. The neural network technology was characterized by its flexibility and understanding to design a model through which students are classified according to their physical and motor abilities and their physical measurements to practice throwing activities in athletics.

Recommendations:

1. The researcher recommends leaving the traditional methods and methods used in the classification and guidance processes through the introduction of modern techniques to conduct them, including the technique of neuron networks and cluster analysis.
2. The researcher recommends the importance of expanding the use of these technologies and investing in the flexibility they enjoy to develop various activities in sports institutions.

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