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Scholarships Determination to Talented Students Based on Academic Characteristics with Deep Learning Approach and Particle Swarm Optimization Algorithm

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Highlights

- *Having a decision-making and knowledge-management system is crucial for MsC students*
- *Providing decision management systems for colleges or companies is an interesting topic*
- *An ideal decision-management approach is investigated to recommend a suitable university*
- *The suggested approach is based on natural language processing, text mining, data mining*

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Abstract

Knowledge is the most basic and important principle for students. Students can be classified based on knowledge. This classification is based on students' abilities and activities. Since MsC students need to receive scholarships to other countries to gain more knowledge, it is essential to provide a decision management and knowledge management system. Therefore, there is a need for a data set of students' information in order to perform a data mining process in order to find those elite students based on their activities and abilities of students and recommend them scholarships. Therefore, the present research tries to present such a system which is based on Natural Language Processing (NLP), feature extraction operations with Particle Swarm Optimization (PSO) algorithm and finally offers suggestions with deep Convolutional Neural Network (CNN). The results show that the accuracy of the proposed approach is higher than previous methods.

1. Introduction

One of the important issues that should be considered in today's universities is the issue of education and then identifying talented students. The most important component of education, whether in person or electronically, is the topic of learning and teaching others. This training aims to provide skills as well as knowledge through face-to-face meetings or offline and on the web. In university education systems, identifying students as top talent is important. This can affect their education and knowledge, and by identifying these students, their future careers can be secured, as well as other students who can benefit from these persons. Talented students can also establish the future of an industry and even a country on a larger scale, and these persons are common [1]. Today, organizations have realized that having the best talent can make them successful in various parts of this complex and discrete world. Because these talented people are competent and capable people with their knowledge and abilities, in addition to reaching a suitable position, they can lead to the growth and development of an organization. Therefore, with the aim of identifying students, these organizations provide facilities that can be used in universities. Therefore, these organizations provide smart methods to identify these talented students from other students and plan for their future. The goals of

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organizations can be for students as a career or education.

Scholarships for students are one of the most important issues for organizations and even universities in today's world. The purpose of this scholarship is for the student to be educated free of charge and sometimes even for a fee, and later to provide it to other students or an organization. Unfortunately, in Iran, as many talent discovery processes are not carried out, talented students need to be identified in universities and through other organizations, which poses a serious threat to the life of the country in the future years. By identifying such students, competent and knowledgeable administrators of a country can be delivered to the community for the future years. Therefore, this research presents an intelligent method with the aim of identifying talented students from four prestigious universities so that they can be identified and introduced for future processes. The available data are based on students' grades and individual abilities, which were collected through questionnaires and textual data. However, there is no smart way to process this information, discover the best talents, and introduce them to a context. Scholarship articles and studies have not been conducted exclusively for talented students in the world. However, such systems have been conducted in various countries worldwide, including the United Kingdom, Australia, Austria, Belgium, Germany, Netherlands, Sweden, and other parts of the world. Therefore, based on the studies, a data mining method can be presented with the aim of data analysis [2].

Using data mining methods, textual data can be processed, and information that is necessary and initially requested from the system can be discovered and extracted. This knowledge-based system can make decisions based on analysis rather than relying on the users of an organization or university, which creates a state of mediation and corruption. Discovering important information from students' data can determine their skills in their fields [3]. Information from students' work and educational backgrounds can help with data processing. One of the methods that can be used in the field of data mining is the use of deep learning principles that, with their high capabilities, can classify information. Of course, before this classification, there is a need for a fast, robust, efficient and optimal method to be able to extract the main features of the data set based on prior knowledge and the needs of a community. Therefore, this research tries to use the Particle Swarm Optimization (PSO) algorithm with the aim of identifying and extracting properties. In the family of evolutionary algorithms and swarm intelligence, this algorithm can perform state-specific optimization operations by identifying the state space. The purpose of this algorithm in this research is to extract features based on pre-given knowledge and state space in a data set. The data is divided into various classes of abilities required by a country and placed in them after the feature extraction operation. Based on the student's abilities, it makes them volunteer for scholarships. This classification operation is based on deep learning that will use the Convolution Neural Network (CNN) technique.

The most important aspect of this research is the presentation of a data mining system to identify talented students and provide scholarships to them through universities or related organizations. Also, the data mining approach, which is based on feature identification and extraction and then classification, combines the PSO algorithm and convolutional neural network as a deep learning technique that can create an intelligent system that can be used and commercialized.

2. Literature Review

There are limited studies in Iran to find talented students with data mining principles. For example, [12] described the use of data mining to identify the potential of talented student management. Due to the importance of the subject in this research, issues related to talent management were examined, and the application of data mining techniques in this field was expressed. In particular, the application of data mining identified potential talents of the organization, which is one of the vital tasks in management described. Also, a proposed model is presented to identify the potential talents of the organization by predicting the performance of its employees and, finally, by mentioning an example, the feasibility of several data mining techniques examined for employee performance data.

In [13], a detailed study was performed on students' data which used data mining techniques to try to find their successes or failures in their field of study as well as courses. The use of a priori algorithm with the aim of data analysis of data mining from 74 courses in three university classes considered that the analysis results have an appropriate evaluation and measurement criteria. In another study conducted in [14], a knowledge-based management system for student data mining proposed to provide facilities and employ students at higher levels, such as scholarships for doctoral or master's degrees. Analysis of data academic of students in one year based on the obtained scores and their abilities in different courses has been done using two different models, namely the J48 decision tree and the M5P model. The results of both methods are impressive.

In [15] used, data mining principles to estimate performance, analyze progress and predict student

potential. First, modelling based on unnecessary characteristics and information of students is presented by a method called the Student Attributes Matrix (SAM). The values obtained can be used for further analysis of these results. The Back-Propagation (BP) neural network is then used to categorize student performance based on the student's prior knowledge and information in the data set. Students' progress in a specific field is also predicted based on their grades and abilities, which is also done with the Back-Propagation neural network model. The results represented that its optimal and relatively accurate predictions after one year.

In another study presented in [16], educational data mining was used to predict students' performance and abilities in three years based on their grades and scores in the university. Several different algorithms have been used to predict this task, which can be the Probabilistic Neural Network (PNN), Random Forest algorithm, decision tree algorithm, Naïve Bayesian method, tree ensemble algorithm and logistic regression. The results are generally 89% accurate in advance with the least error in forecasting with the logistic regression algorithm, which has a 10.85% error.

3. Methodology

Scholarships are offered to talented students in four universities in the proposed method of this research. Careful examination of users' abilities requires the analysis of text and its introduction to an intelligent system that will work based on the natural language processing structure. In the first part, which is natural language processing, students' information, along with the most important feature, namely abilities, is given to the system, and its analysis is performed. In this phase, feature extraction operations are performed based on accurate analysis of a natural language processing-based lexical analyzer system by improving feature space with a Particle Swarm Optimization algorithm and then classification based on capabilities and finding a series of scholarships from the data with a deep learning approach based on Convolution Neural Network technique. Therefore, the proposed approach is divided into three general sections: natural language processing with lexical analyzer with the aim of identifying features, improving feature space with PSO algorithm, and finally classifying and offering scholarship proposals based on CNN.

3.1 Natural language processing with lexical analyzer with the aim of identifying features

In the natural language processing section, lexical analysis of each student's characteristics is used to find the roots in linguistic words and vocabulary. In general, the architecture of this system can be explained in such a way that first, an input text in the Persian language enters the system, which is the information of the students. In the natural language processing section, the corresponding bodies with the Persian language are extracted and identified with the help of a lexical analyst. In this way, determining the structure of the text along with the normalization of the text is done with the help of a lexical analyst. In the same lexical analyzer structure, phonetic analysis is defined as the conversion of letters as well as the analysis of the temporal tension of each word. Then the labelling section of semantic roles comes into play. Examining the coverage statistics of Persian text modes has a direct relationship with the quality of output when presenting a lexical analyst. So, in similar conditions, by increasing the coverage of text mode units, one can expect better quality analysis and sound from the natural language processing system. A text body is used in order to static the input text data layer. This statistic extracted from the text body is applied only to words and sentences with a length between 1 and 80 words. The number of Persian phonemes is 29, including 23 consonants and 6 vowels and syllables are considered of three types cv, cvc and cvcc. In this case, without the prohibition of conjugation, the possible syllables of the Persian language are equal to 76314. However, less than 6,000 are in Persian today used. It is necessary to be able to use the transliteration alphabet with a specific standard in this research.

In order to investigate the difference between the unit events in the text database compared to its counterpart event in the body, the Callback Labeler divergence or relative entropy is used. Callback Labeler is an asymmetric value of the difference between two possible distributions between Q and P. Specifically, the divergence of Q from P is the amount of information lost so that the distribution of Q can approximate the distribution of P. This type of divergence is calculated by Equation (1).

$$D_{KL}(P||Q) = \sum_{w \in W} P(w) ln \frac{P(w)}{Q(w)} \quad (1)$$

In equation (1), W contains a set containing all possible words. w is an optional unit of the set W. $P(w)$ is the probability w observed in the text database and $Q(w)$ is the probability w observed in the text body. $D_{KL}(P||Q)$ is the divergence of the callback label Q from P. Based on this equation, the resulting Callback Labeler, the closer to zero, indicates the appropriate coverage of the unit compared to

the text body of the source, and vice versa, the further away from the number zero, indicates the insufficient amount, and it is a unit in a text database.

The amount of Callback Labels obtained from the coverage of different units shows that between the units, the least and most differences for the divergence of Q, ie the unit covered in the text database, which are from P, ie the counterpart of that unit in the text body. The face has no support, and the syllable before the two points is based on the face. Respectively, after the phoneme without the application of support, the best unit covered is the phoneme without the support, the phoneme with support, the hedge without support and the syllable without support. In general, the syllables before the colon are not properly covered and may indicate that in the final lexical analytics reconstruction system using the natural language processing system, compared to other units of syllables, the syllables before two points have a lower quality.

In the natural language processing section, the output provided in this section includes a multi-level data structure, at the lowest level of which are the words related to the input text and the linguistic information related to those words. This linguistic information includes word transliteration, lexical category, syntactic role and its place in syntactic groups. In addition, the boundary and distance between each word and the sentence are specified in this section, and the specific features of each sentence, especially the phonetic features related to the meaning, are extracted for the sentences. One of the most important tasks of natural language processing is to determine the linguistic features of the input text, such as the morphological and syntactic features of the input text words. This includes defining the boundaries between words in a sentence, assigning morphological features, defining syntactic groups, defining the boundaries between sentences and specifying the type of sentence, including a question, surprise, command, and news, along with some semantic features related to its mode such as to be happy, sad or nervous, which of course is not part of this research.

The input text is first entered into the tokenizer module. In this module, the text is divided into tokens with different types with the help of a finite state machine such as number, text string, punctuation mark, etc. This tokenized text is provided to the preprocessor module. This module uses text-based services to search for text strings in the vocabulary and if there is a word in the vocabulary, attributes the morphological features along with the textual string to the text string. In addition, in this module, dual punctuation marks such as parentheses and the relationships between them are detected, and text normalization is performed and completed in the same module.

The lexical analyst is responsible for determining the morphological features and determining the transliteration of the root of the words used. In addition, the lexical analyzer identifies syllabic words and determines and explains other path selections. Data needs to be trained in an environment. As an idea, first of all, the PSO algorithm to improve the feature space identified by the lexical analyzer resulting from the natural language processing system and feature extraction (which is the best ability of users and its adaptation in classification to the needs of universities) and CNN is considered as a deep learning technique for classifying and offering scholarship offers to students.

3.2 Features State Optimization with PSO

Many optimization algorithms are gradient-based. However, the Particle Swarm Optimization (PSO) algorithm belongs to evolutionary algorithms that do not require information obtained from the error function gradient. Initially, this algorithm was applied to discover the patterns that govern the simultaneous flight of birds and to change their path and optimize batch deformation abruptly. In Particle Swarm Optimization (PSO), particles flow through the search space. The displacement of particles in the search space is influenced by the experience and knowledge of themselves and their neighbours. So the position of another particle's mass affects how a particle searches. The result of modelling this social behaviour is the search process that particles tend to be successful areas. The particles learn from each other and move on to the best of their neighbours based on the knowledge gained. The basis of Particle Swarm Optimization (PSO) is based on the principle that at any given moment, each particle adjusts its place in the search space according to the best location so far and the best location in its whole neighbourhood.

In Particle Swarm Optimization (PSO), a group of birds is randomly assigned to feed in space. There is only one piece of food in the space in question. The birds are still determining where the food is. One of the best strategies can be to follow the bird that is the shortest distance to the food. This strategy is actually the lifeblood of the algorithm. Each solution, called a particle, is equivalent to a bird's algorithm in the bird's mass movement algorithm. Each particle has a merit value that is calculated by a merit function. The closer the particle is to the target search space, the food in the bird movement model, the more appropriate it is. Each particle also has a speed that guides its movement of the particle. Each particle continues to move through the problem space by following the optimum particles in the current state. The beginning

of this algorithm is that a set of particles from the Particle Swarm Optimization (PSO) are randomly generated and try to find the optimal solution by updating generations. At each step, each particle is updated using the two best values. The first is the best situation the particle has ever achieved. This position is recognized and maintained. The best value is P_{best} or local best solution. The best situation ever achieved by a particle population is called G_{best} or global best solution. After finding the best values, the velocity and the location of each particle are updated using Equations (2) and (3)

$$v[\,] = v\,[\,] + C_1 \times random(\,) \times (P_{best}[\,] - position\,[\,]) + C_2 \times random(\,) \times (G_{best}[\,] - position\,[\,]) \quad (2)$$

$$position[\,] = position[\,] + v[\,] \quad (3)$$

The right-hand side of Equation (2) consists of three parts, the first part being the actual particle velocity, and the second and third parts being the change of the particle velocity and its rotation to the best personal experience and the best group experience. If the first part is not considered in this Equation, then the particle velocity is determined only by the present situation and the best particle experience and the best cumulative experience. As such, the best particle remains in place, and the others move toward it. The motion of a mass of particles without the first part of Equation (2) would be a process whereby the search space gradually becomes smaller, and a local search is formed around the best particle. In contrast, if only the first part of Equation (2) is considered, the particles go their usual way to reach the boundary wall and perform some kind of global search. It is then necessary to calculate the velocity update equation, which is a social behaviour whose relation is (4).

$$w(t)V_i(t-1) + C_1 \times r_1 \times \big(P_i - X_i(t-1)\big) + C_2 \times r_2 \times \big(g - X_i(t-1)\big) \quad (4)$$

Therefore, the third period in the update will be according to the formula $C_2 \times r_2 \times (g - X_i(t-1))$, which represents an interaction between particles and the social interaction of particles. The convergence rate is another important issue in the Particle Swarm Optimization (PSO) algorithm. Several methods have been proposed to increase the convergence speed of the Particle Swarm Optimization (PSO) algorithm. This scheme usually involves changes in the updating equations of the Particle Swarm Optimization (PSO) algorithm without altering the structure of the algorithm. Therefore, a better result is usually seen in local optimization performance, sometimes with a slight change in function performance. One of the advancements of the Particle Swarm Optimization (PSO) algorithm is the introduction of weight inertia. Weight or inertia is a factor for scaling in relation to velocity during the previous time step. As a result, a new equation for updating the velocity equation (5) can be found.

$$w(t)V_i(t-1) + C_1 \times r_1 \times \big(P_i - X_i(t-1)\big) + C_2 \times r_2 \times (g - X_i(t-1)) \quad (5)$$

In general cases, the Particle Swarm Optimization (PSO) algorithm for updating the value equation and setting W is $w = 1$. According to the investigations of the Particle Swarm Optimization (PSO) algorithm, the value of W in the range [0, 1.4] is taken into account. But it varies over time, so the results of the experiments show that it has a value in the range [0.8, 1.2] that results in more convergence. Another important point to keep in mind is that if W is greater than one and two, the optimal convergence will fail. The acceleration coefficients C_1 and C_2, in principle, control how far a particle will move in a single repetition. Both coefficients are considered 2 for these two parameters. Although shown to be $C_1 \neq C_2$, it can lead to improved performance. The performance of the Particle Swarm Optimization (PSO) algorithm depends on the parameter settings, including the weight inertia W and acceleration constant C_1 and C_2, the maximum number of iterations T, and the initialization of the population. Weight inertia usually decreases uniformly from the maximum number of T repeats.

The particle can be a simple representation of the space of data objects, especially passwords, which is the main focus of this research. The location of a particle in multidimensional space represents a solution to this problem. When a particle is moved to a new location, a new solution is found for each object. This solution is evaluated by a fitting function that is of little value to the solution. The Particle Swarm Optimization (PSO) algorithm method consists of three main parts:

- ✓ Select training examples from any region in encrypted or non-encrypted data.
- ✓ Teach the selected samples using the Particle Swarm Optimization (PSO) algorithm and identify the central cluster of each region.
- ✓ Finally, the outputs of the result of the input data monitoring are obtained with respect to the center of the cluster.
- ✓ This method can be implemented as follows:

- ✓ Step One: Select the training sample for each area in the monitoring system according to the number of classes.
- ✓ Step Two: Generate Initial Congestion $X(0)=\{X1\ (0), X2\ (0)\ldots\ldots xm\ (0)\}$, and generating $T = 0\ F_{best} = P_{best},\ \ i = 1,2,\ldots,m$, and also $F_{best} = G_{best}$.
- ✓ Step Three: Calculate the fitting function of all the particles. For the problem of improving the monitoring system and creating optimal classes, the value of the central cluster or $C = \{c1\ , c\ 2\ ,\ldots\ldots c\ m\ \}$ means the average value of all the particles. The particle fitting function, which is $X(t)=\{X1\ (t), X2\ (t)\ldots\ldots xn\ (t)\}$, is defined as Equation (6).

$$Fitness\big(X(t)\big) = \sum_{i=1}^{n} |X_i(t) - C_i| \tag{6}$$

- ✓ Step 4: Update the position and velocity of all the particles in Equations (7), which the value of $X(t+1)$ is taken as the result of the particle swarm.

$$\begin{aligned} &w(t)V_i(t-1) + C_1 \times r_1 \times \big(P_i - X_i(t-1)\big) \\ &\qquad + C_2 \times r_2 \\ &\times (g - X_i(t-1))\ X_i(t+1) = X_i(t) + V_i(t) \end{aligned} \tag{7}$$

- ✓ Step Five: For every particle that is in $X(t+1)$, if the value of $Fitness\big(X_i(t)\big) < Fbest_i$, then it needs to be changed and the value of $Fbest_i = Fitness\big(X_i(t)\big)$ and $P_i = X_i(t+1)$. If $Fitness\big(X_i(t)\big) < Fbest_i$, then $Fbest = Fitness\big(X_i(t)\big)$ and $G = X_i(t+1)$ are placed.
- ✓ Step 6: If we reach the stop condition, the value of $X(t+1)$ is the output of the algorithm and stop at that point. Otherwise, we set $t = t+1$ and move on to the third step. Meanwhile, the stopping condition is the maximum number of T repeats.
- ✓ Step Seven: Get the most optimal central cluster obtained from the congestion center.
- ✓ Step Eight: Repeat Step 2 to Step 7 for each class and get the optimal cluster center from each class.
- ✓ Step 9: After training each area, we calculate the distance between each data and cluster centers, thus assigning each cluster to the closest class or class.

3.3 Scholarship Recommendation with CNN based on Talents

After identifying the exact characteristics (which are the students' talents and abilities), a relation such as Equation (8) is used to find words and phrases similar to an input text data.

$$sim(a.b) = \frac{\sum_{p\in P}(r_{a.p} - \bar{r_a})(r_{b.p} - \bar{r_b})}{\sqrt{\sum_{p\in P}(r_{a.p} - \bar{r_a})(r_{b.p} - \bar{r_b})}} \tag{8}$$

Due to this equation, the degree of similarity is obtained based on their average vote P. However, the reason for subtracting the vote from the average is that it is not possible for every word to declare itself. In general, the word p is a subset of the average vote, and $(r_{a,p} - \bar{r_a})(r_{b,p} - \bar{r_b})$ is a set of words in a sentence up to Reach the point or comma. Equation (8) is a relation called Pearson that is considered for similarity in a system that is also considered in CNN. But the main suggestion for extracting the corresponding figures in student data and providing a classification structure to provide scholarship offers to students in the system based on reliability in statistical data is the use of Cronbach, which is in equation (9).

$$\begin{aligned} &Prediction_{Cronbach}(a.b) \\ &\qquad = \bar{r_a} + \frac{\sum_{b\in N} sim(a.b) \times (r_{b.p} - \bar{r_b})}{\sum_{b\in N} sim(a.b)} \end{aligned} \tag{9}$$

Before CNN training applies, the similarity of textual data, including words and sentences using Pearson equation and then checking the reliability of this similarity based on words and sentences, using Cronbach. Then it is necessary to determine the importance of the data in the data set in the classification phase. It is necessary to use a statistical-probabilistic method to find the importance of data (word, word and sentences) which is the same as students' abilities. The method in question is TF-IDF. Its equation is in the form of (10).

$$tf(t.d) = 0{,}5 + \frac{0{,}5 \times f(t.d)}{max\{f(w.d).\ w \in d\}} \tag{10}$$

According to Equation (10), the value of tf represents the raw frequency of a word or character in the data, and t is equivalent to the words or characters, and in a document set, these words or characters are stored, which is d is the number of times. It also contains the word or character. Also w is the weight of these words or characters. Equation (10) for the TF section is from the TF-IDF method. The second part of the TF-IDF method is the IDF, which shows how much information about a document, ie D is provided by a word or character based on its repetition frequency in

the document or N, which is also related to Equation (11).

$$idf(t.D) = log\frac{N}{|d \in D \quad . \quad t \in d|} \tag{11}$$

Multiplication between TF sections in IDF provides a new equation that determines the importance or weight of a word or character in the data, which is in the form of an equation (12).

$$td, idf(t.d.D) = tf(t.d) \times idf(t.D) \tag{12}$$

Now is the time to train the system. Accordingly, the CNN apply in mathematical explanations, and the performance function evaluates the appropriate items in the proposal as $i \in Items$ for each $u \in words$ student, which is determined as equation (13).

$$R: words \times Items \rightarrow R_0 \tag{13}$$

According to Equation (13), a word represents a set of all $word$, and $Items$ is a set of all possible items that can be assigned to $word$. R_0 normally displays a pause between text input data. Interruption means the same information is recorded in the system at different time intervals. The function is more of a subset of the $words \times Items$ space, because, as mentioned earlier, a word may have an arbitrary subset of its words that belong only to it, and so on. Vocabulary does not have such words and a subset of it and has a higher value or vote (such as Ali, from which Ali Reza and Ali Mohammad can be made). Natural language processing systems must cluster and then predict the function performance $R(u, i)$ for the word u of item i, and then recommend the item with a view to maximizing the function. This explanation will be in the form of equation (14) in mathematical form, which is the same as providing the scholarship recommendation to the student.

$$\forall u \in words. i = arg\ max_{i \in Items} R(u. i) \tag{14}$$

In equation (14), $arg\ max$ is equivalent to the maximum elements in the natural language processing system. Applying this procedure repeatedly causes the natural language processing system to provide and read more words. In the multi-criteria approach, which is also a lexical analysis, the voting or value function is modelled as an equation (15) to consider the number of votes or values.

$$words \times Items \rightarrow R_0 \times R_1 \times \ldots \times R_k \tag{15}$$

In equation (15), R_0 represents the sum of votes or values expressed by the word to items i and $R_j (j \in \{1, \ldots, k\})$ for each criterion in the field of the lexical analyzer method. Then, an initial training using CNN with a training method in the form of layer by layer in twisting and polishing is presented to recommend the figures (i.e., to determine the capabilities that have already been done with the PSO algorithm and provide scholarship offers to students) are used. The resulting data is entered into the CNN and trained. The neural network classifier has two output layers C_1 and C_2 that display the data. The output layer neuron has a sigmoid tangent transfer function. Hence C_1 and C_2 are spaced. Isolation of the output neuron representative for both classes provides a better data separator. Ideally, for the best data features it is $C_1 - C_2 = 2$ and for other data features, it is $C_1 - C_2 = -2$. To achieve a simple classification step, a threshold θ is introduced as $0 < \theta \leq 2$, which keeps the data and its properties in the overlap area. A higher value than $C_1 - C_2$ means that there was more confidence in the data classes to recognize the attribute. Classify as relation if $C_1 - C_2 \geq \theta$. then class is if feature, else class is non features. In this regard, θ is the threshold constant for the data, which plays a critical role in controlling the positive rate of failure in the accuracy criterion as well as its optimal value in various data.

Now CNN is used to find the relationship between the votes for each criterion and the total votes in the data based on the input textual data in order to produce appropriate data, i.e. to provide scholarship offers to students based on abilities and predictions. The sum of these votes and the presentation of the classification structure are used. In deep learning models, the outputs depend on the inputs by mathematical mapping using layers. The shape of the layers and their arrangement is determined by the vote or the number of words or phrases in a sentence. The natural language processing section consists of modules such as phonetic string generator, stress determination, hedging, temporal tension determination, delay determination, screw curve determination, blocker and synthesis engine. These modules are processed in a chain based on the order of their input. In addition to these modules, there are other auxiliary modules, such as nova data, that are used to teach nova determination models. Some of these modules, such as the screw curve modulator, may themselves consist of several sub-modules. In addition, some modules, such as modules for determining the speed of speech and volume, are intended for future development. The Natural Language Processing part is responsible for producing important parameters in text synthesis and then producing output, i.e. offering scholarships to students based on their abilities. For this purpose, the input text, along with the

information from the natural language processing section, is first sent to the phonetic generator module to produce the final phonetic string of the words. This module has two main sub-modules for sound production, which include the phonetic equivalent generator of words and the model of converting characters into sentences or phrases or words. One of the reasons that CNN is used in the structure of the natural language processing system is due to the wide range of linguistic words and the lack of coverage of a word in the process of determining its features and structure. Considering the production time of recommending scholarships to students based on their abilities after entering textual data is one of the most important factors in the text processing part. According to the method and principles stated in this method may be offered scholarships to talented students. Also, considering that two separate systems, namely the natural language processing section, along with the offering of scholarship proposals to students based on their abilities, have been considered in this research, so the simulation method should be multi-threaded.

4.Simulation and Results

The simulation is performed in a MATLAB environment. Initially, a series of data is required to provide scholarships to talented students. Therefore, information has been obtained from 100 students in 4 universities. This information includes a series of features such as student ID, student name, field of study (all students are in computer science), student grade point average, field and specialization and number of articles published, respectively. It is noteworthy that the most important features are the field of students, their grade point average, the field of specialization and activity, along with published articles that will affect the scholarship offer. This information was collected as a complete questionnaire from individuals in the form of a data set, the full view of which can be seen in Table (1). It should be noted that all students are for master's degrees and scholarships are for a doctoral degree.

Table 1. data collection collected from students

Article Numbers	Careers	Student Condition	Major	Students	ID
2	Machine Learning	18.68	Artificial Intelligent	Aynaz Sohrabi	1
0	Image Processing	14.87	Artificial Intelligent	Farkhondeh Hoseini	2
0	Pattern Recognition	17.32	Software Engineering	Bahram Sheibani	3
2	Computer Networks	18.65	Computer Networks	Bahador Azizi	4
2	Hardware Architecture	18.31	Hardware Engineering	Nina Moharrami	5
0	Data Mining	18.47	Software Engineering	Sheyda Gholami	6
2	Databases	19.24	Information Technology	Nazanin Kasayi	7
0	Machine Learning	15.02	Artificial Intelligent	Farzaneh Zarin	8
3	Signal Processing	19.08	Artificial Intelligent	Melika Hoseini	9
0	Machine Learning	17.41	Software Engineering	Nazgol Fadayian	10
0	Databases	16.32	Artificial Intelligent	Shayan Taheri	11
0	Machine Learning	17.54	Artificial Intelligent	Gholam Reza Mohammadi	12
3	Databases	19.38	Information Technology	Taher Khoshro	13
0	Hardware Architecture	15.57	Hardware Engineering	Andisheh Soheili Azad	14
2	Pattern Recognition	19.35	Software Engineering	Fariborz Naseri	15
2	Banking and Stocks Prediction	19.08	Information Technology	Toba Shahpori	16
1	Pattern Recognition	14.8	Artificial Intelligent	Nadia Soleimani	17
0	Computer Networks	16.36	Computer Networks	Mohammad Nazemi	18
0	Computer Networks	18.56	Computer Networks	Sonia Por Moallem	19
0	Computer Networks	17.68	Artificial Intelligent	Saber Monajati	20
0	Neural Networks	18.32	Software Engineering	Shadi Abedzadeh	21
1	Data Mining	18.96	Software Engineering	Homeira Gholami	22
2	Computer Networks	19.5	Software Engineering	Zahra Bakhshandeh	23
0	Business Intelligent (BI)	16.31	Information Technology	Nazanin Sobhi	24
0	Computer Networks	17	Computer Networks	Tanin Mojahed	25
0	Databases	14.74	Information Technology	Saba Mazlomi	26
0	Hardware Architecture	18.25	Hardware Engineering	Fahime Bahador	27
0	Data Mining	15.36	Software Engineering	Ali Azad Moradi	28
4	Computer Networks	19.65	Computer Networks	Tayebe Hoseini Nejad	29

0	Data Mining	17.54	Software Engineering	Mohammad Ali Akbarian	30
0	Machine Learning	16.35	Artificial Intelligent	Shanaz Mohammadi	31
1	Data Mining	18.34	Software Engineering	Sina Taheri Azad	32
0	Hardware Architecture	17.32	Hardware Engineering	Pouria Shirazi	33
0	Fuzzy Logic	14	Information Technology	Shila Nomadi	34
0	Machine Learning	14.54	Artificial Intelligent	Parham Elahiyari	35
0	Databases	18.32	Software Engineering	Saeed Ali Abadi	36
1	Pattern Recognition	15.69	Software Engineering	Hori Safayi	37
0	Data Mining	15.78	Software Engineering	Mohammad Ganjeyi	38
0	Business Intelligent (BI)	16.3	Information Technology	Sanam Shakouri	39
1	Data Mining	17.2	Software Engineering	Mohammad Reza Momen	40
2	Machine Learning	19.47	Artificial Intelligent	Hamed Tahmasbi	41
1	Data Mining	19.12	Software Engineering	Elaheh Tavakoli	42
1	Computer Networks	14.38	Computer Networks	Ali Asghari	43
0	Pattern Recognition	17.56	Artificial Intelligent	Mosa Mousavi	44
1	Pattern Recognition	19.65	Artificial Intelligent	Seyed Fardin Shahmoradi	45
0	Fuzzy Logic	15.32	Software Engineering	Soheil Goudarzi	46
0	Data Mining	17.45	Artificial Intelligent	Mina Tari Moradi	47
0	Data Mining	16.85	Software Engineering	Behnaz Darvishi	48
0	Hardware Architecture	14.18	Hardware Engineering	Aydin Korani	49
0	Data Mining	17.56	Information Technology	Nima Erfani	50
0	Neural Networks	14.29	Computer Networks	Mona Ahmadi	51
0	Machine Learning	16.32	Software Engineering	Zari Parizad	52
0	Data Mining	18.65	Software Engineering	Shila Rezayian	53
1	Data Mining	19.25	Software Engineering	Bahador Ghorbani	54
0	Databases	17	Software Engineering	Paria Soeili	55
0	Data Mining	18.56	Software Engineering	Aziz Allah Hamidi	56
0	Business Intelligent (BI)	15.75	Information Technology	Seyed Mohammad Alijani	57
0	Machine Learning	14.82	Artificial Intelligent	Helia Saberi	58
0	Data Mining	18.21	Artificial Intelligent	Hassan Zarei	59
2	Machine Learning	19.15	Artificial Intelligent	Mahdi Gholm Nejad	60
0	Databases	14.37	Software Engineering	Iman Pakzad	61
0	Data Mining	18	Software Engineering	Reza Sheikhi	62
0	Computer Networks	15.32	Computer Networks	Reza Moallem	63
0	Data Mining	17.84	Software Engineering	Fardin Sabori	64
0	Data Mining	16.32	Software Engineering	Taher Allah Yari	65
0	Pattern Recognition	17.57	Software Engineering	Hossein Sheibani	66
0	Fuzzy Logic	17	Information Technology	Amir Reza Heidari	67
3	Neural Networks	19.54	Software Engineering	Ehsan Sabori Manesh	68
0	Data Mining	17	Software Engineering	Gonbad Farhadi	69
0	Data Mining	13.89	Software Engineering	Mahgol Zahedi	70
0	Business Intelligent (BI)	14.5	Information Technology	Maryam Omidi	71
0	Neural Networks	16.4	Artificial Intelligent	Masome Sanayi	72
0	Data Mining	15.5	Software Engineering	Morad Rezayian	73
0	Computer Networks	18	Information Technology	Ahmad Reza Rahimi	74
0	Neural Networks	14.7	Artificial Intelligent	Soheil Kashi	75
0	Pattern Recognition	18.2	Artificial Intelligent	Samane Mansouri	76
0	Computer Networks	15	Computer Networks	Bahram Azad	77
0	Image Processing	15.65	Software Engineering	Farnaz Shakouri	78
0	Business Intelligent (BI)	18.25	Information Technology	Shahram Babayi	79
0	Data Mining	19.2	Software Engineering	Shohreh Mohammadi	80
0	Image Processing	17	Information Technology	Lida Tahmasbi	81
0	Machine Learning	18.25	Software Engineering	Soheil Hossein Jani	82
0	Databases	14.86	Software Engineering	Jozeph Malatisian	83
0	Hardware Architecture	14.27	Hardware Engineering	Behnam Absardi	84
0	Data Mining	15.62	Information	Shakour Moradi	85

0	Business Intelligent (BI)	18.54	Technology Information Technology	Sina Mohammadi	86
0	Computer Networks	14.6	Computer Networks	Sakine Masoumi	87
0	Computer Networks	15.79	Computer Networks	Leyla Boromand	88
0	Computer Networks	18	Computer Networks	Tahmineh Farjad	89
0	Banking and Stocks Prediction	15.32	Information Technology	Poran Sabour	90
0	Data Mining	17.48	Artificial Intelligent	Bita Aziz Allahi	91
0	Computer Networks	19.5	Computer Networks	Saeed Yari	92
0	Banking and Stocks Prediction	16.32	Information Technology	Mohsen Mazinani	93
1	Data Mining	17.52	Artificial Intelligent	Shahriyar Haghani	94
0	Pattern Recognition	18.68	Artificial Intelligent	Atefeh Sangani	95
0	Data Mining	17	Information Technology	Mitra Jahed	96
0	Image Processing	15.89	Software Engineering	Norik Petrosian	97
0	Data Mining	16.32	Information Technology	Hatef Kalileh Abadi	98
0	Neural Networks	18.74	Artificial Intelligent	Hora Nazanin	99
0	Computer Networks	13.4	Computer Networks	Asad Allah Piri	100

According to Table (1), it can be seen that 100 students have provided their information. Available disciplines include artificial intelligence, software engineering, computer networking, hardware engineering, and information technology. Also, areas in which people specialize include image processing, signal processing, data mining, machine learning, machine vision, neural networks, fuzzy logic, business intelligence, databases, banking and stock, pattern recognition and hardware architecture. In the simulation that is presented, students with a grade point average of 18.50 to 20 are considered elite students and between 16.50 and 18.50 as simple students. Certainly, elite students have a better chance of getting a scholarship and offering it at a cost. A total of 30 universities will be introduced, and Table (2) announces the list of universities and their needs for 2020. It should be noted that there are two domestic (Iranian) universities on this list for university scholarships. It should be noted that the information on these universities has been collected from the reputable website https://www.universityrankings.ch/en.

Table 2. List of universities and their needs for 2020

Major 2	**Major 1**	**Country**	**University Name**	**University ID**
Neural Networks	Machine Learning	Finland	Aalto University	U1
	Image Processing	England	University of London Computer Science	U2
	Data Ming	Sweden	Chalmers University of Technology	U3
	Machine Learning	Sweden	Lund University	U4
Image Processing	Machine Vision	Norway	University of Oslo	U5
Image Processing	Machine Vision	Germany	University of Tübingen	U6
Neural Networks	Fuzzy Logic	Norway	Norwegian University of Science and Technology	U7
	Hardware Architecture	Italy	Polytechnic University of Milan	U8
	Data Ming	Italy	Polytechnic University of Milan	U9
	Database	Italy	University of Bologna	U10
	Computer Networks	France	University of Pisa	U11
Machine Vision	Image Processing	Netherland	Leiden University	U12
	Computer Networks	Netherland	University of Amesterdam	U13
	Banking and Stocks Marketing	France	University Polytechnic Hauts-de-France	U14
	Business Intelligent (BI)	China	Shanghai Jiao Tong University	U15
Data Ming	Machine Learning	Switzerland	University of Zurich	U16
	Computer Networks	Germany	Technical University of München	U17

	Image Processing	Germany	Technical University of Dresden	U18
Neural Networks	Fuzzy Logic	Germany	Karlsruhe Institute of Technology	U19
	Computer Networks	Austria	University of Vienna	U20
	Computer Networks	Iran	Sharif University of Technology	U21
Neural Networks	Fuzzy Logic	Iran	Sharif University of Technology	U22
Data Ming	Business Intelligent (BI)	Hong Kong	University of Hong Kong	U23
Fuzzy Logic	Database	England	University of Lincoln (England)	U24
Machine Vision	Image Processing	Estonia	University of Tartu	U25
	Computer Networks	Canada	University of Toronto	U26
Image Processing	Machine Vision	Canada	McGill University	U27
	Signal Processing	Canada	University of Alberta	U28
Neural Networks	Machine Learning	Canada	University of Ottawa	U29
Fuzzy Logic	Neural Networks	Canada	University of British Columbia	U30

According to the two tables (1) and (2) and according to the main references of this research [12-16], these are outside the data set. In this regard, there is no student scholarship based on background, interests and abilities, and all these researchers have collected the data set. In fact, the main source of this research is the information from the website https://www.universityrankings.ch/en, but the exact same data does not exist on that site. In fact, this site provides scholarship information from universities in the technical fields of engineering, especially computer science and electricity in the doctoral program that we have taken from them, as well as the websites of the mentioned universities, these scholarships themselves. They have practically announced their education. According to the website https://www.universityrankings.ch/en as well as the university website, scholarship information for students and courses is included in this data set, and student information is taken from them. And has been collected.

This data is given to the proposed method. Initially, natural language processing should be done as a transliteration alphabet in English with a statistical set of coverage of the entire input text database and English body and the resulting Callback Label for the whole units. At this time, the features are specified. The main features include students' GPA and specialization, which is based on determining the numerical range of GPA and specializations and matching with the needs of universities in Table (2) with the PSO algorithm. This operation requires the use of PSO algorithm operators to specify the properties. Therefore, it starts the initial population or particles equal to 30 particles with a velocity of 2.5 and a numerical sum of two operators C1 and C2, 1.5 and 1, respectively, as well as an inertia of weight 0.2 and a threshold of 0.02, which is repeated in a 200 iteration. In these 200 iterations, it is necessary to enable the fitness function of the PSO algorithm to select the best features, which have a GPA between 18.50 and 20 as elite and lower as simple students (range 16.50 Up to 18.50). Table (3) shows the initial values of the PSO algorithm operators.

Table 3. Initial value of PSO's operators

Initial particle's population	**300 Particles**
Initial particles' velocity	2.5
C1 value	1
C2 Value	1.5
Particle's threshold	0.02
Particle's weight Inertia	0.2
Lower and upper bound	0 to 10

Then it is necessary to start training with CNN. It is necessary first to determine the CNN architecture. Therefore,Figure (1) is the CNN architecture.

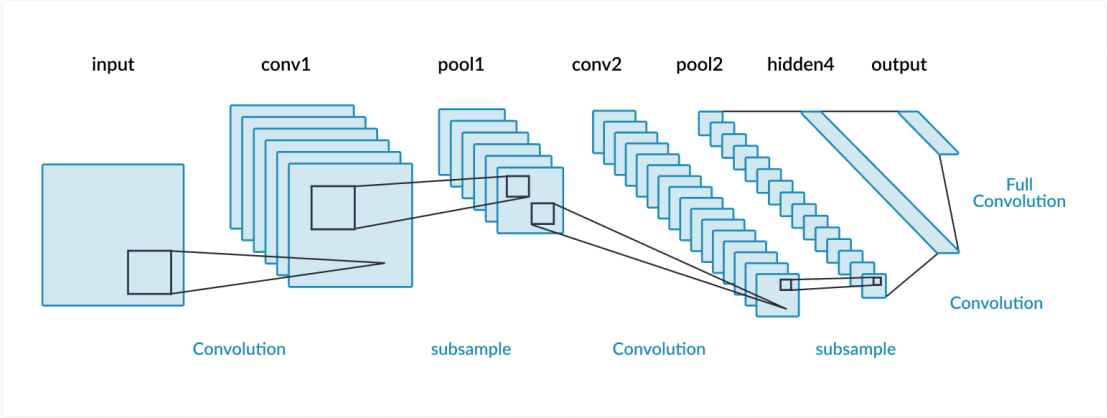

Fig.1. CNN architecture

In this architecture, the input layer consists of a series of neurons that receive features from the PSO algorithm and provide 70% training and 30% testing. A repetitive cycle is required to train and test these features in the CNN, which is set at 240 rounds, and its core training will be the Levenberg-Marquardt algorithm. CNN are one of the most important deep learning methods in which several layers are trained in a powerful way. This method is very efficient and is one of the most common methods in various applications. A CNN generally consists of three main layers: the convolution layer, the pooling layer, and the fully connected layer. Different layers perform different tasks. There are two training steps in each CNN, Feed-Forward and Back-Propagation stage. In the first stage, the input is fed to the network, and this operation is nothing but multiplying the point between the input and the parameters
of each neuron and finally applying convolution operations in each layer. The network output is then calculated. Here, in order to adjust the network parameters or, in other words, the network training, the output result is used to calculate the network error. To do this, compare the network output with an error function with the correct answer and thus calculate the error rate. In the next stage, based on the amount of calculated error, the Back-Propagation stage begins. In this step, the gradient of each parameter is calculated according to the rule chain rules, and all parameters change according to the effect they have on the error created in the network. After updating the parameters, the next step starts, i.e. feedback. After repeating a good number of these steps, the network training ends. Table (4) shows the parameters used for CNN.

Table .4. CNN's parameter used in this research

Number of Input Layer Neurons	**25 cell maximum**
Automatic induction	0.5
Gaussian distributed density distribution	0.01
Initial thresholding of neurons	0.9
Number of iterations	240 cycles
Layers	Input layer, hidden layers include convolution, pooling and fully connected layer, output layer

When the program starts, the data is first called and processed first. This operation is based on natural language processing and shows the reading of texts and figures, the output of which can be seen in Figure (2).

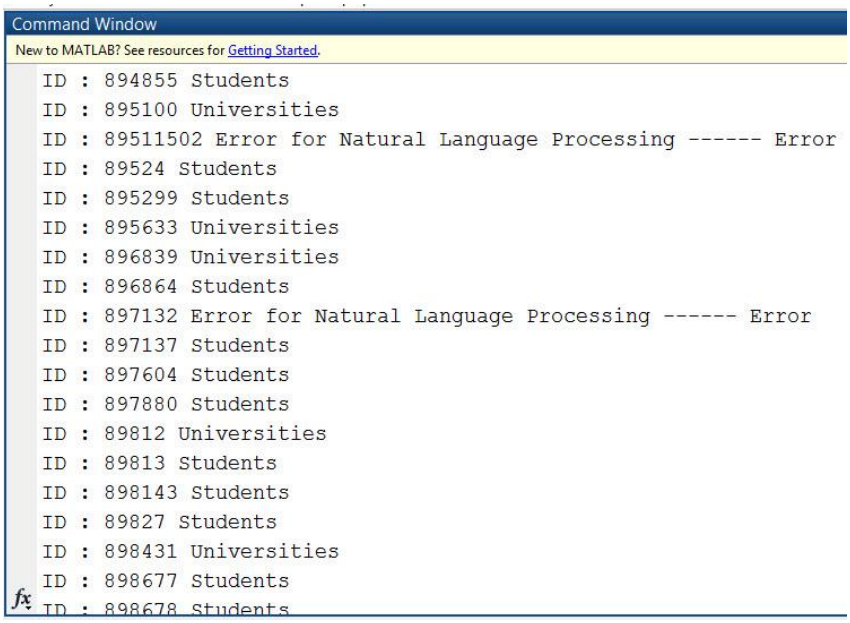

Fig .2. Reading data and processing natural language linguistic bodies in data

There are errors in some parts of the natural language processing of data. However, it reads almost all textual data correctly and receives and processes information processing of students and universities from two tables (1) and (2). Then the best features are selected with the PSO algorithm, and the convergence diagram of this algorithm is shown to reduce the dimensions of the data space, which is shown in Figure (3)

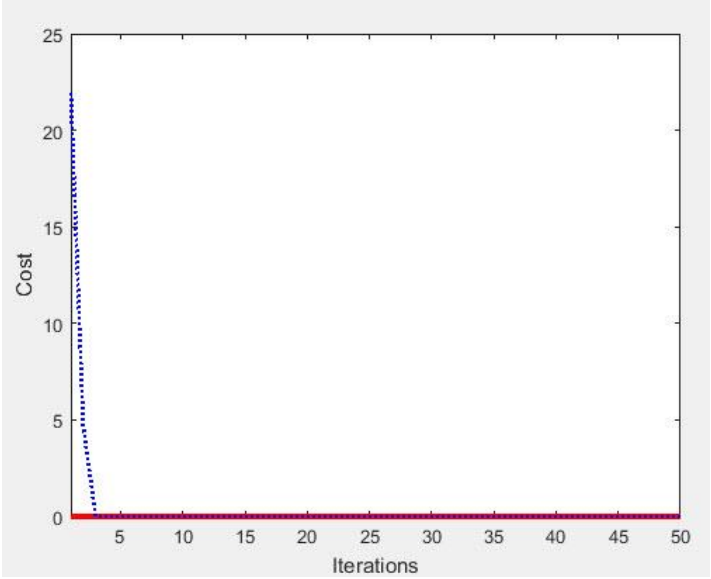

Fig .3. Convergence diagram of the PSO algorithm when dimension reduction, selection and feature extraction

Next, the reduced features as inputs will be entered into CNN. CNN can be installed on MATLAB by installing ALEXNET or CNN toolbox. The structural output of CNN during data processing and testing is shown in Figure (4).

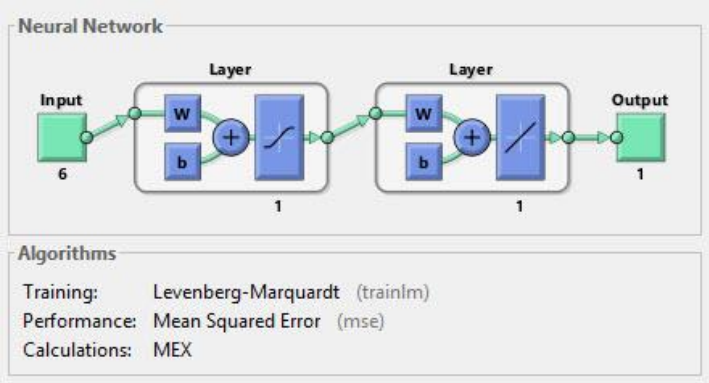

Fig. 4. Structural output of CNN during data processing and testing

According to Figure (4), it can be seen that only 6 students out of 100 students are able to receive scholarships, which are entered as reduced features, as the main data of the neural network and in the hidden layer, education, and they see the test. The result is the announcement of a university along with the title of the field. Also, the training mechanism, Levenber-Marquardt, along with the method of performance measurement, Mean Square Error (MSE) and its calculation in combination (MEX), has been specified and quantified. For a better and deeper understanding, after implementing the proposed approach, a graphical window with a graphical user interface is created in MATLAB. When the program runs, in the end, an output like Figure (5) appears that tells you to select the string

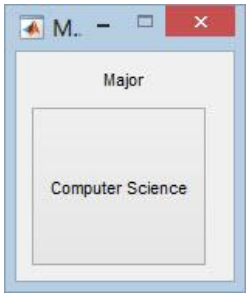

Fig .5. Major selection menu

After selecting the main field, computer science, the sub-field must be selected from among the 5 main items in the form of Figure (6). For example, the Artificial Intelligence option is pressed to display program performance and trained data.

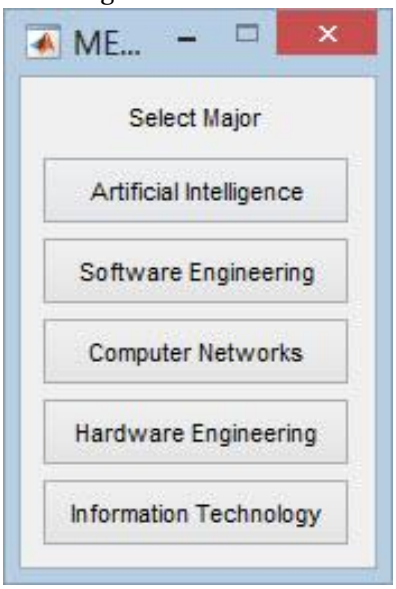

Fig. 6. Sub-major selection menu

After selecting the sub-field, the question of whether the scholarship is in Iran and other countries or only outside of Iran is asked in the form of a menu in Figure (7)

Fig .7. Menu for selecting Iran or abroad for scholarships

For example, to select the scholarship menu in countries, press the In Iran and Others option. Then the menu for determining the fund is displayed, which includes three options with a fund, no fund and no different, the menu in Figure (8).

Fig. 8. Menu of selection with fund, no fund and no different

In this menu, the option No Different is pressed. Then, based on the selected feature for the global optimal with the PSO algorithm as ordinary students in the average range of 16 to 18.50 and the local optimal as talented and elite students in the average range of 18.50 to 20, the menu is selected as Figure (9).

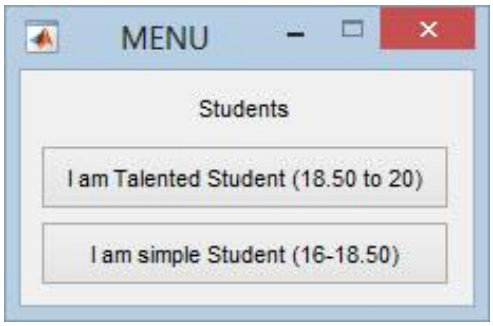

Fig. 9. Elite and simple student selection menu (based on features extracted from the PSO algorithm)

In the menu in Figure (9), the option I am Talented Students (18.50 to 20) is selected, which is, in fact, the optimal local option of the PSO algorithm for elite students. Then the menu for selecting specialties is displayed, which is shown in Figure (10).

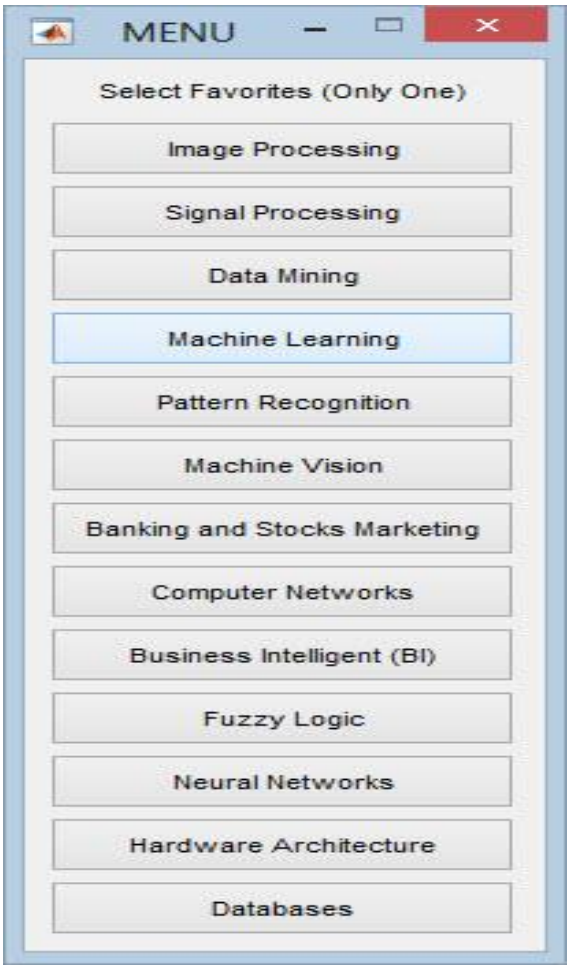

Fig.10. Specialties selection menu

For example, from the menu in Figure (10), Neural Networks selected and then displayed the proposed field at the university from which the scholarship can be received, which is shown in Figure (11) in The MATLAB command line is printed

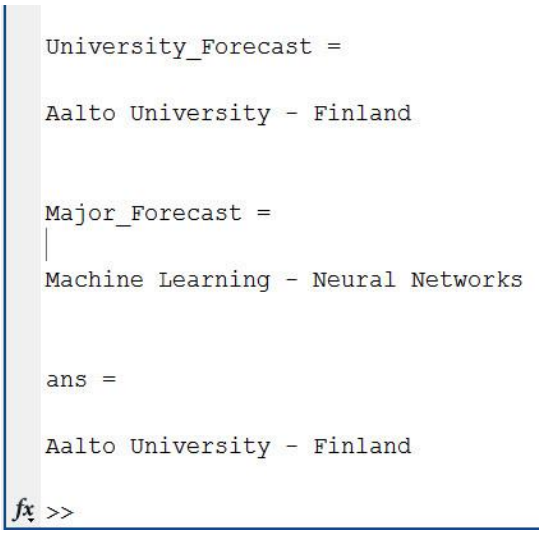

Fig.11. print the proposed field and university where scholarships can be obtained.

It is observed that the field of machine learning, as well as neural networks, is offered to doctoral students at Aalto University in Finland. It is necessary to pay attention to one point in the graphical user interface section. Note that these outputs in this dissertation in the graphical user interface window were done for 6 people selected with the PSO algorithm. Of course, its second implementation and the choice of other options can offer another scholarship or even lead to an error. The error could be due to the user's inability to make choices. Finally, the evaluation criteria of the proposed approach are shown in Table (5).

Table .5. evaluation criteria of proposed approach

Specificity (%)	Sensitivity (%)	Recall (%)	Accuracy (%)	SNR (dB)	PSNR (dB)	MSE
90.63%	91.18%	90.00%	97.50%	33.74	35.12	0.8

Now it is necessary to consider the advantages and disadvantages of the proposed method compared to the previous methods, the advantages of which are as follows:

- ✓ Ability to select each student based on their actual data and display the scholarship award after training and testing the proposed approach
- ✓ Has sufficient accuracy equal to 97.50% in estimating and predicting scholarships to students
- ✓ Ability to select for each student conversationally
- ✓ Accurate data analysis of existing data

Detailed mention of the proposed method and model

And the disadvantages of the proposed approach are as follows:

Some complexity computation in recent models with no good accuracy.

Also, Table (6) shows a comparison in terms of accuracy between the proposed approach and the basic research articles, i.e. [14-16].

Table 6. a comparison in terms of accuracy between the proposed approach and previous methods

References	Accuracy (in %)
Srecˇko Natek, and Moti Zwilling, 2014 [14]	94%
Fan Yanga, and Frederick W. B. Li., 2018 [15]	89%
Aderibigbe Israel, and Adekitana Odunayo Salau, 2019 [16]	89%
Proposed approach	97.50%

A comparison is also made technically with the reference article method [16]. The algorithm of that paper is analyzed with

the data of the proposed method. The results are in terms of mean squares error and accuracy in terms of percentage in the same conditions of using the data set as a table (7) and performance analysis as a figure (12).

Table 7. Comparison of the reference method [16] with the proposed approach of this research in the same conditions of data use

Method and Reference	MSE	RMSE	Accuracy (%)	Mean Error	ST.D Error
Proposed Method	0.0046	0.0679	97.50 %	1.8127e-08	0.0681
Regression Models [16	0.0284	0.1687	92.35 %	-0.008118	0.1701

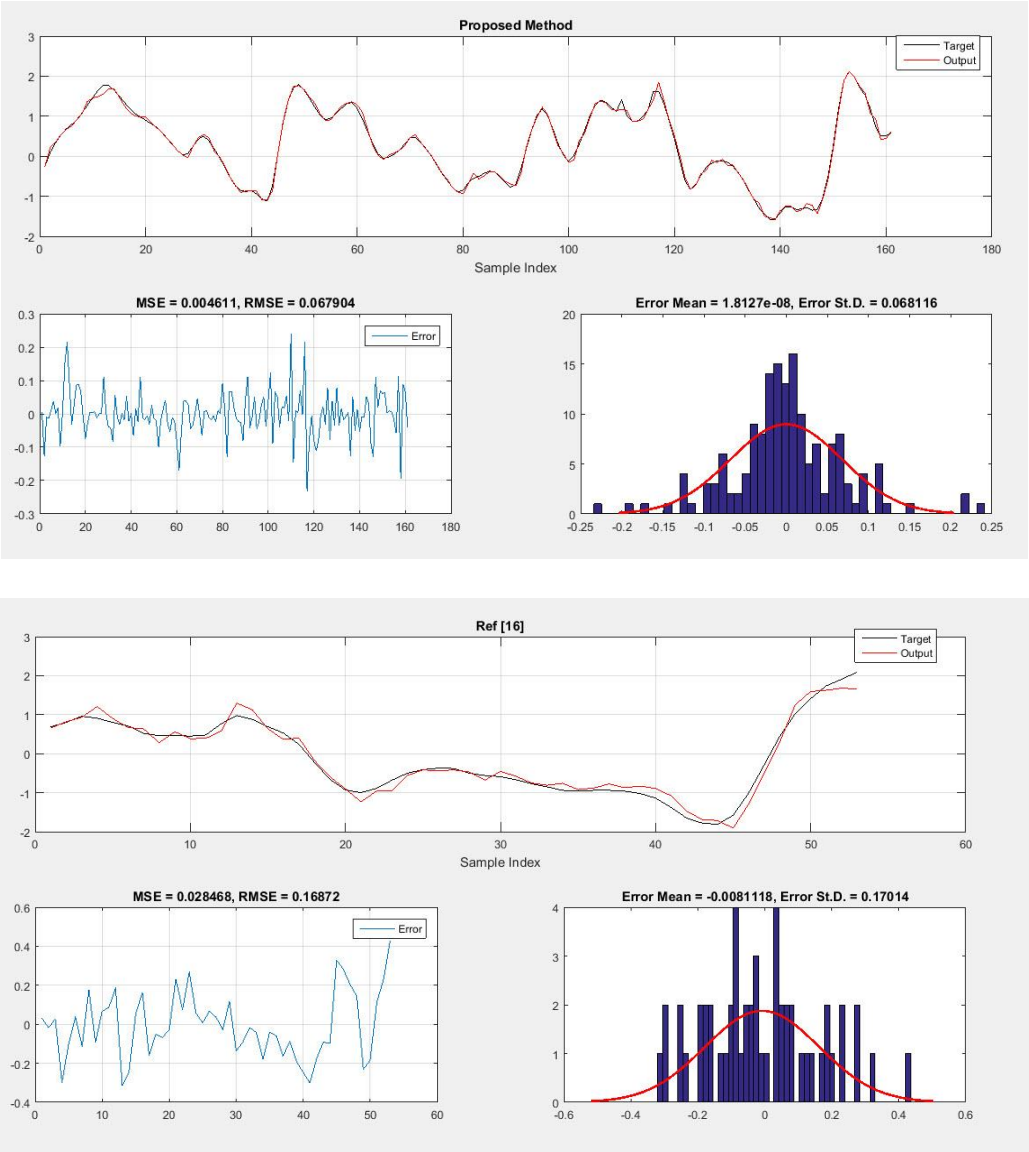

Fig.12. Analysis of the efficiency of the reference method [16] with the proposed approach of this research in the same conditions of data use

It can be seen that in the above figure, the proposed method in identifying objectives and output has not had better results than the lower figure, but in terms of analysis and evaluation in reducing errors in the system has been better than the lower figure and in terms of average squares error (MSE) and the root of the mean squares error (RMSE), as well as the analysis in terms of accuracy in terms of percentage, has a better performance than the reference article method [16] in the same conditions of data use. Also, the general regression is the proposed approach

for fitting the data, as shown in Figure (13)

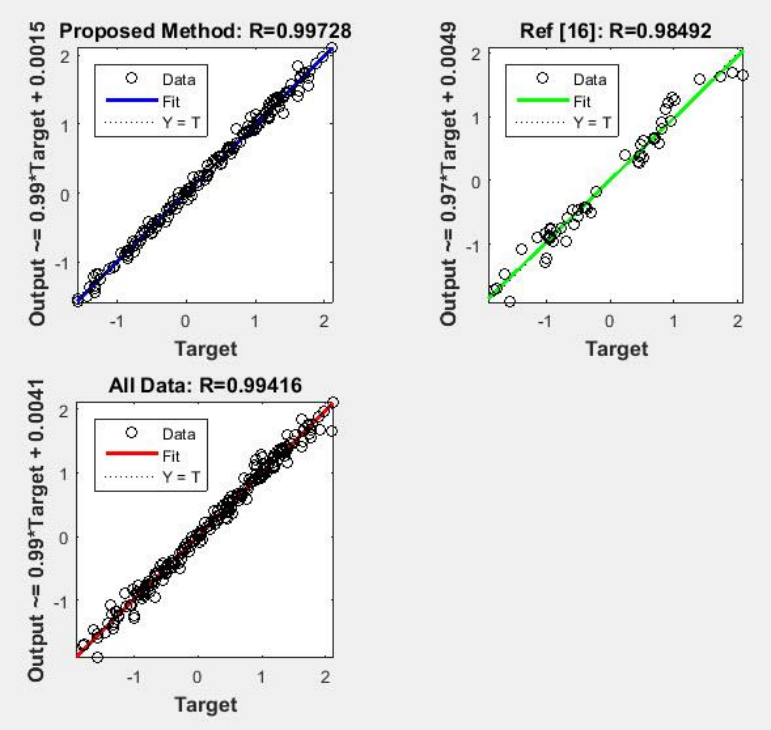

Fig. 13. proposed method regression for data fitting

It is necessary to compare the convergence diagram of the proposed method with three methods of reference regression [16], which was done according to the above explanations under the same conditions, i.e. the reference method [16] with the data of the proposed approach of this research, was used. The convergence diagram of the proposed approach with a red diagram of the three regression-based reference methods presented in [16] is shown in Figure (14).

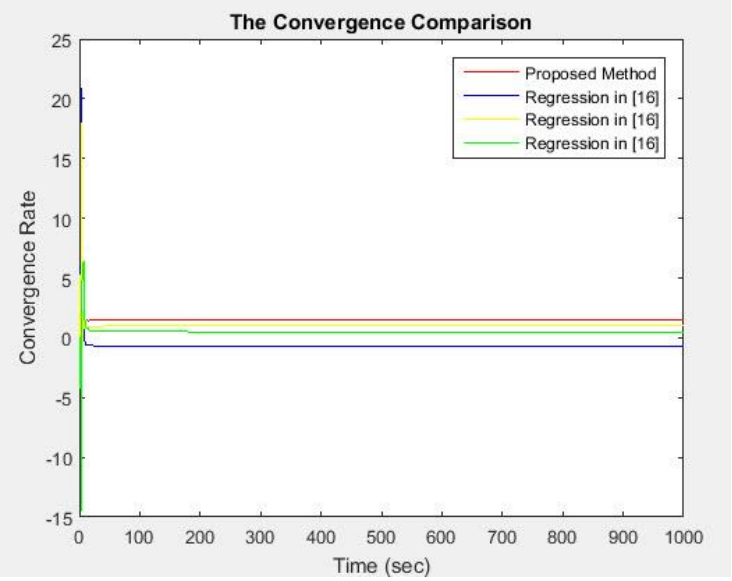

Fig. 14. comparison of convergence plot

According to Figure (14), it can be concluded that the convergence of the proposed method with the red graph is done at a higher and faster level. Also, after showing the convergence in this research, it is necessary to make a comparison between the methods that finds the fastest solution in each aspect which is done in Figure (15) of this comparison.

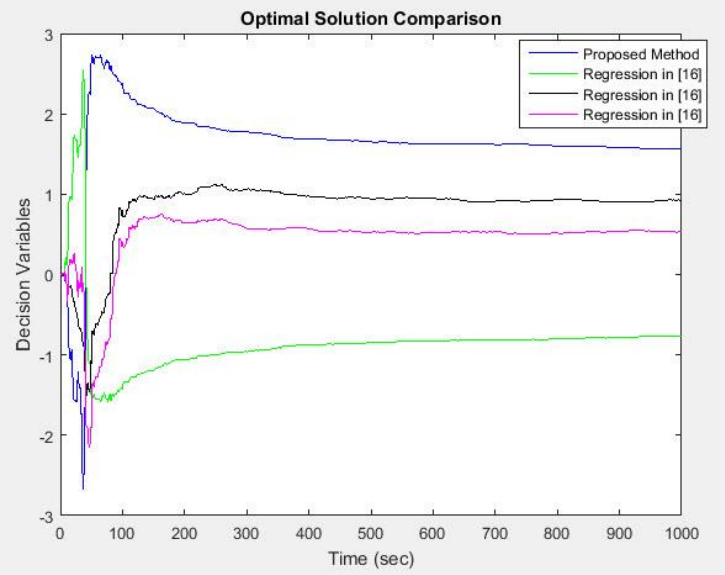

Fig.15. Comparative chart for finding the fastest and most optimal solution

Figure (15) also shows that the proposed approach with the blue diagram can find the fastest solution as a decision variable per unit of time (seconds) which shows the improvement of the proposed approach to regression methods. References [16] can be viewed from any aspect5. Conclusion

Today, students in Iran are faced with great problems. Certainly, one of these problems is that academic science is separate from industry. Therefore, after completing the master's degree, students consider studying and obtaining scholarships from prestigious foreign universities. It may be possible for brains to escape, but in today's world, people need to progress. In the absence of any facilities in a city or country, the need to change life situations is attractive and inevitable. Therefore, providing decision management systems for universities or organizations can be an interesting issue to help confused students in this field and prevent possible scams of companies. Therefore, in this research, an attempt has been made to provide an optimal decision management method based on the principles of natural language processing based on data mining and text mining which receives and processes student's information so that it can be a recommended suitable university based on students' talents and abilities. First, natural language processing is used to read the linguistic bodies of the data, and then the PSO algorithm is used to extract the features. Features should be reduced as much as possible, and a range should be considered for them, which we have calculated based on the student's grade point average as well as their published articles. Of course, more features can be added to it. A higher-grade point average in graduate school, along with academic papers which can provide an interesting opportunity to receive a scholarship if they have at least one ability. Then CNN is used as a deep learning technique for classification. In the training and test phase, the accuracy of the program offering scholarships to prestigious universities is determined. Its field is presented based on the abilities and talents of students. Creating a graphical user interface structure after the proposed approach, which has been trained and tested, allows students to increase their chances of winning a scholarship after entering their information into academic data.

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