

IMPLEMENTATION OF DEEP LEARNING MECHANISM IN BIG DATA USING HYBRID MVO WITH PSO

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Abstract

This research paper has simulated the integration of Particle Swarm Optimization (PSO) and Multi-Verse Optimizer (MVO) in order to represent the benefits of the proposed work over traditional Deep Learning. Deep thinking and quick learning are significant for viable artificial intelligence. Several research works have reviewed the current constraints in specific famous learning techniques. PSO has been considered as computational mechanism that is capable of optimizing issues by trying to improve the solution in an iterative manner to provide better-quality result. It is observed that PSO is one of the widely used and very popular met heuristics in the current trend. Its successful application in various optimization problems is proof for the same. Yet, there are several issues associated to PSO. This research paper has resolved those issues by integrating PSO and MVO. MVO technique is considered as sociological as well as biological inspired mechanism. This technique basically depends on three main concepts in cosmology, namely white hole, black hole, and worm hole. For the determination of fast convergence rate, the abilities of MVO are utilized. MVO makes use of roulette wheel selection and therefore it is possible to manage handle continuous and discrete optimization problems. This research is aimed at providing the proposal of innovative and more efficient MSO integrated PSO based system. The proposed research is supposed to be an efficient and vast system that should be capable of being used in several fields.

Keywords:

Deep Learning, Optimization, ALO, PSO, MVO

1. INTRODUCTION

This research focuses on the integration of PSO and MVO with an objective to represent the benefits of the proposed work over traditional deep learning research. Deep thinking is proved significant for viable artificial intelligence as many of the present research are related to deep learning techniques.

PSO is a contemporary met heuristics, which is a presently useful computational mechanism to get the best solutions in an iterative manner. The mechanism has been successfully applied in various optimization techniques. Hence, this research paper is opting to resolve the issues using the integration of PSO and MVO. MVO techniques focus on biological and sociological inspired mechanism that is explained in the ensuing parts of this paper with appropriate equation. The research aims at providing a proposal for an efficient MSO integrated PSO based system, which should be capable of being utilized in multiple areas.

1.1 DEEP LEARNING

Deep Learning, popularly known as deep structured learning, is also termed as hierarchical learning. It is an integral part of its broader family, Machine Learning mechanism, which is highly dependent on artificial neural networks. The methods which are used for the purpose of learning is divided into three types. Out of these three methods first is supervised, next is semi-supervised

and the last is unsupervised. The structure of Deep Neural Networks are based on deep belief networks. Recurrent neural networks are considered by them. Convolution neural networks are frequently implemented in such areas and they include computer vision along with speech recognition. Deep thinking and quick learning are significant for viable artificial intelligence.

Several research works have reviewed the current constraints in specific famous learning techniques. Reviewing such techniques may reinforce the learning. On other hand several research works have explained the research related to fuzzy expert system. It has also developed the fuzzy expert systems used in hotel selection. Neural networks have been influenced by information processing. It is also considering distributed nodes used in biological systems. The efficient working of Deep learning algorithms is directly related to large datasets. There is requirement of infrastructure for their training in reasonable time. With this, there is requirement of more experience under deep learning algorithms. Locating a neural network by using deep learning algorithms is more tedious. Comparatively, it is hard to apply random forests and SVMs. While in contrast, deep learning always proves better when there are complex problems like natural language processing, image classification and recognition of speech.

1.2 PARTICLE SWARM OPTIMIZATION (PSO)

PSO is a famous technique as a form of popular calculation mechanism, and it optimizes issues in an iterative manner. It is used to increase a candidate solution as per the quality measure. It has the capability to sort out the issues by using the sample of candidate population for solving the problem. Mathematical formulae are applied on dubbed particles along with moving particle in search space. The position with velocity is considered. Best known location can influence the movement of particle. It has been guided towards the location that is meta-heuristics like PSO are not assuring optimal solution. PSO is also not using gradient of issues that are optimized.

At this point of time, PSO becomes very famous in the form of a very helpful met heuristics. Due to this reason when it is used to solve the problems of maximization it has proven very useful. To organize itself independently is the fundamental ideology of this method. It exactly defines the activeness of difficult network. In order to deal with the problems connected with maximization in a helpful and smart arrangement it implements a very simplified form of protocol.

1.3 MULTI-VERSE OPTIMIZER (MVO)

It is a new type of invention. It is an effective maximization method which gets encouragement from environment. For putting this into operation, its creators were mindful of two customized factors. This method is invented by using three ideology of cosmology. In addition to this form, it also becomes famous in the

new form of meta-heuristic optimization method. It efficiently figures out the problems related to Optimal Power Flow (OPF).

1.4 RESEARCH OBJECTIVES

The objective is to study the existing researches related to PSO along with limitation. The objective value has been calculated considering existing data set using Traditional PSO Technique. The objective value and time consumption of tradition scheme would be noted. Then the MSO is integrated to traditional PSO model and the dataset is created according to it. Then the proposed cluster would be processed using proposed objective function. This objective function is mentioned in the modified PSO scheme. This PSO scheme comes into existence by combining particle swarm optimization with multi verse optimizer. The proposed work focuses on K-means integrated advanced PSO mechanism.

It is a method which gets continuous motivation from living body and social science stand point. In the working of this method

different ideology of cosmology are brought into use. In addition to the idea of white and black hole, the concept of wormhole is also used in this method. One of the most important strong points of this method is that it will find out fast rate of intersection. For this purpose, it uses roulette wheel selection. In addition to this, this algorithm is able to deal with regular and discrete optimization issues.

2. LITERATURE REVIEW

There have been several background researches in the relevant field, the highlights for some of the main papers are discussed below along with author details, year of invention, title, technique or methods used; and the benefits of those techniques are highlighted in the following Table.1:

Table.1. Summary of Conventional Methods

Topic	Technique	Advantage
Optimizer having different sections by the implication of Kin order to develop a code for the accumulation of DNA. [1]	KMVO Algorithm	The basic intention behind their research work was to put in to place an Optimizer having different sections by the implication of Kin order to develop a code for the accumulation of DNA.
Proposed an ant lion method on the basis of spark. It will make factors of Random Forest optimal in the organization process of acknowledgment. [2]	Ant lion method on the basis of spark.	The basic intention behind their research work was to improve the authenticity of description in the method of random forest parameter tuning.
Usage of multiple sections for arranging transmission sex tension in power Systems. [3]	Multi-verse optimizer	Their main aim for which they carried out this research work was to contribute a use Optimizer which have different sections in order to solve TNEP in addition of safety weak points.
Text Feature Selection Technique which is reliant about Binary Multi-Verse Optimizer. [4]	Dual Optimizer having different sections	Latest application of MVO mechanism has been introduced. The objective is to improve performance. More over the focus is cost reduction of proposed algorithm along with computational time.
A percentile algorithm applied to Knapsack problems. [5]	Multi-Verse Optimizer	The advantage of their work is that they applied the ideology of percentage in the favor of world optimizer algorithm so as to give a solution to the problems of compound knapsack.
Self-ruling robot routes framework using evolutionary multiverse optimizer-algorithm. [6]	Multi-Verse optimizing Algorithm	This work has explained independent and automatic browsing system by using a life changing Multi-Verse Algorithm.
Learning of neural Network Structure on basis of dual coded Ant Lion Algorithm. [7]	Binary Coded Ant Lion Algorithm	Binary Coded Ant Lion Algorithm is used to determine the complicated problem.
Improve Ant Lion Optimizer having different target on basis of Quasi-oppositional and Levy Fly. [8]	Improve Ant Lion Optimizer having different target	The basic intention behind their effort is to provide a Improve Multi-target Ant Lion Optimizer Based on Quasi-oppositional and Levy Fly. It becomes very helpful for solving the maximization problem of two-objectives.
Reviewed a better removal system on the basis of these algorithms and techniques. [9]	Ant Lion Optimizer Algorithm and FP-Growth	They introduced a latest algorithm which is known in ant lion optimizer form. Exactly very optimal and powerful. Its intersection authenticity is high.
Optimized the PID controller in AVR frame work by utilizing subterranean in section streamlining agent calculation. [10]	A form of AVR in addition to Ant lion optimizer method	Optimizer connected with ant lion has been applied in order to perform fine tuning of PID controller parameters. It is made using simulation and testing of model.
Provided a comparison in the middle of Exchange Market Algorithm and Ant Lion Optimizer in support of maximum profitable transmission.[11]	Changed Market Method of Ant Lion Optimizer	Correlations in exchange market algorithm and Ant-Lion-Optimizer on the side of greatest profitable transmissions.

Collected an instant forecasting of wind power on the basis of BP Neural Network in the company of enhanced Ant Lion Optimizer. [12]	BP Neural Network and an improved quality of Optimizer of Ant Lion	Improved quality of Optimizer of Ant Lion method was introduced by them. This version will used for the maximization of BP neural network. In addition to this, They improved estimation accuracy of short-term wind power was also improved by them.
Expressed a better SVM classification device on the basis of optimizer which has multiple stop ford efficiency persistence of machine. [13]	SVM classifier	Expressed a better SVM classification device on the basis of optimizer which has multiple stop ford efficiency persistence of machine.
Examined a Design advancement of a SRM motor with the help of a nature inspired algorithm that is multi-verse optimization algorithm.[14]	Multi-verse optimizer	An examined Design advancement of a SRM motor by using Multi-verse optimizer is used.
Proposed Antlion optimizer strategy for ideal capacity or arrangement dependent on all out expense and force misfortune minimization. [15]	Ant lion optimization technique	Proposed Ant lion optimizer strategy for ideal capacitor arrangement dependent on all out expense and force misfortune minimization.

3. PROPOSED MODEL

During research, the possibilities of PSO equation have been explored initially. After deriving PSO equation, the MVO equation has been derived. Finally PSO integrated MVO equation has been derived. In this section, we deduce the equation in Support off Fundamental MVO.

3.1 PHASE 1: EXPLORE THE PSO POSSIBILITIES

Its working gets encouragement from general aspects of birds and fishes. It includes P_{best} , G_{best} . Arithmetic equations which not only refresh the locations, but also expedites the process are revised with change of directions given below:

$$v_{ij}^{t+1} = wv_{ij}^t + C_1R_1(P_{best}^t - X^t) + C_2R_2(G_{best}^t - X^t) \quad (1)$$

$$X^{t+1} = x^t + v^{t+1} \quad (i = 1, 2, \dots, NP) \text{ and } (j = 1, 2, \dots, NG) \quad (2)$$

where

$$W = W_{max} - \frac{(W_{max} - W_{min}) + iteration}{max\ iteration} \quad (3)$$

$W_{max} = 0.4$ and $W_{min} = 0.9$.

$v_{ij}^{(t)}$ and $v_{ij}^{(t+1)}$ already kept in mind speed of j member of i^{th} particle in loop form (t) in addition to ($t+1$). (Normally C_1 is equal to C_2 and C_2 is equal to two), r_1 in addition to r_2 becomes arbitrary variety (0,1).

3.2 PHASE 2: MVO

Black hole, white hole and wormhole are the alphabets from which MVO algorithm gets encouragement. All these alphabets are prepared inside an arithmetical form.

The complication of MVO methods totally depends upon the variety of changes, universes, roulette wheel mechanism, and universe organizing system. General difficulty in determining the computational complication is as follows:

$$O(MVO) = O(1(O(Quicksort) + n * d * (O(roulette_{wheel})))) \quad (4)$$

$$O(MVO) = O(1(n^2 + n * d * \log n)) \quad (5)$$

where, n represent amount of universes.

3.3 PHASE 3: DERIVING PSO WITH MVO

A group of PSO which is introduced here is the combination of PSO and MVO. In this PSO the combined strength of PSO and MVO are used in the direction of specific and best solution. It is replacing PSO P_{best} value to MVO universe value.

$$v_{ij}^{t+1} = wv_{ij}^t + C_1R_1(Universes^t - X^t) + C_2R_2(G_{best}^t - X^t) \quad (6)$$

4. RESULTS OF IMPLEMENTATION

The objective function has been considered to find the fitness values. The iteration is starting from 50 with interval of 50 to 500. It is observed that MVO is capable to find the best fitness value in lesser time when compared to PSO. Lower bond is set to from -5 to 0, upper bond is set from 10 to 15, and the considered dimension is 2.

4.1 TECHNICAL IMPLEMENTATION OF MVO

Simulation has been performed in MATLAB environment. The matlab script has been written where objective function is considered to simulate the result using MVO mechanism. The upper bonds, lower bond and iteration have been sent in MVO program to perform the simulation. Process of setting lower, upper bond and dimension is shown below:

$$lb = [-5,0]; ub = [10,15]; dim = 2;$$

The objective function used during simulation is:

$$\text{Function } o = F_{17}(x)$$

$$o = \left((x(2) - x(1))^2 * \frac{5.1}{4\pi^2} + \frac{5}{\pi x(1)} \right)^2 + 10 \left(1 - \frac{1}{8\pi} \right) \cos(x(1)) + 10$$

End;

As the iteration starts finding the best score it produces a convergence curve as shown in Fig.3. The best score obtained so far gets reduced according to iteration. The technical implementation of MVO is made in this section, and the best solution obtained by MVO is disclosed in Fig.2.

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Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.
At iteration 50 the best universes fitness is 0.39939
At iteration 100 the best universes fitness is 0.39883
At iteration 150 the best universes fitness is 0.39817
At iteration 200 the best universes fitness is 0.39792
At iteration 250 the best universes fitness is 0.3979
At iteration 300 the best universes fitness is 0.3979
At iteration 350 the best universes fitness is 0.3979
At iteration 400 the best universes fitness is 0.39789
At iteration 450 the best universes fitness is 0.39789
At iteration 500 the best universes fitness is 0.39789
The best solution obtained by MVO is : 3.1414    2.2745
The best optimal value of the objective function found by MVO is : 0.39789
    
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Fig.1. Best Solution Obtained by MVO

The histogram representing the test function and convergence curve in the case of MVO is as follows:

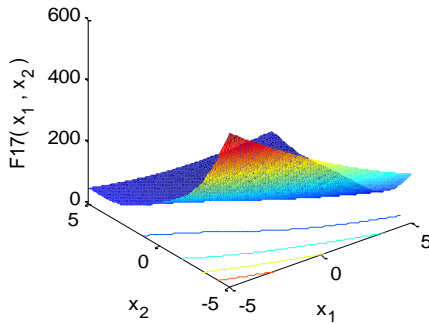


Fig.2. Test Function Histogram

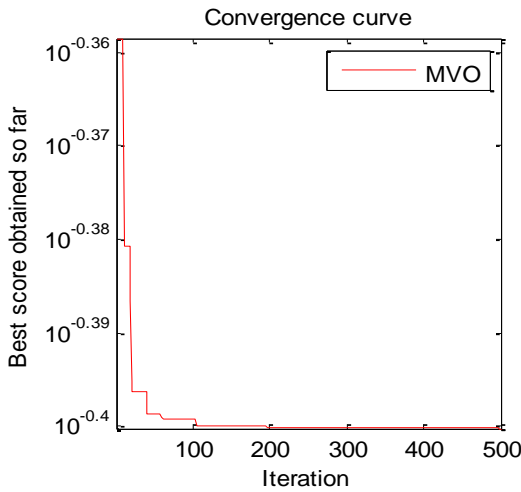


Fig.3. Test Function and Convergence Curve in Case of MVO

The fitness table showing its different best fitness value at different iteration level is presented in Table.2. The first column is representing the iteration and the second column represents the corresponding fitness value.

Table.2. Fitness in Different Iterations

Iteration	Fitness
50	0.40107
100	0.39939
150	0.3984
200	0.39797
250	0.39796

300	0.39796
350	0.39793
400	0.39791
450	0.3979
500	0.39789

A script is generated to plot the fitness value as per iteration from 50 to 300 at an interval of 50. The fitness curve is portrayed in the following diagram:

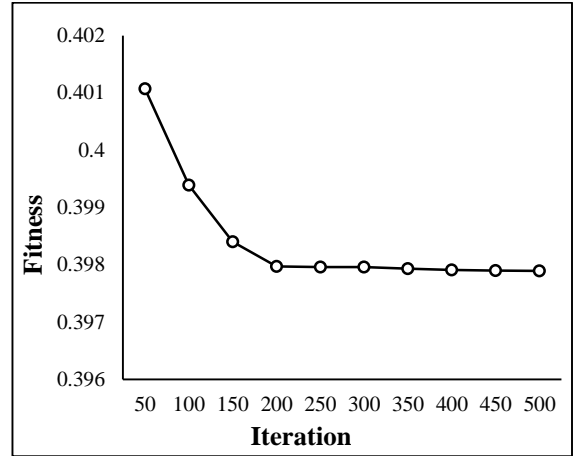


Fig.4. Fitness of Curve

The best solution retrieved is 3.1416 and 2.2755. The appropriate maximum value established, connected in the company of main function becomes: 0.39789.

5. CONCLUSION AND FUTURE SCOPE

In this paper, we integrated a deep learning approach in Big data and made use of MVO integrated PSO. Further, this research work discusses deep learning based systems from the perspective of their increasing demand. It is also inferred that the need for more number of researches in this stream is for coming up with more efficient proposals every day. In the process of providing the proposal of innovative and more efficient MSO integrated PSO based system, the paper highlights the loopholes in traditional and existing PSO based systems. Towards fulfilling the objective of furnishing the innovative and more efficient system, the research makes use of PSO and MSO.

The proposed system is an efficient and vast system and can be used in many fields. From the results obtained above, it is concluded that the integration of PSO with MSO has increased the productivity. This research is supposed to play a significant role in deep learning system. The processing of big data has been considered a big challenge.

However, this research has made use of MVO integrated PSO. But, in the future ALO could be used in the research, which could thus easily compare the performance of ALO, MVO, and PSO. Moreover the use of Ant Colony Optimization could also be performed. The use of fuzzy and neural network along with optimization techniques could boost the performance of the algorithm, thereby increasing the flexibility and productivity after the integration of neural network.

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