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A Survey on Selected Algorithm –Evolutionary, Deep Learning, Extreme Learning Machine

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Abstract — the aim of this paper is to discuss the concept of the evolutionary and machine learning strategies. The genetic Algorithm is a satisfactory procedure for training multi-layer Feed Forward Neural Networks. The MLFF neural network is a one way signal made of multi layers which has the best trade-off between speed and accuracy. It also deals with pattern classification problems. The RSM predicts the mass transfer parameters which are compared with capabilities of ANN model. To assist the network to perform efficiently the learning mechanisms DL and ELM have been implemented for knowledge accuracy. This paper summarizes Multi-layer feed forward (MFNN) using recent evolutionary Algorithms (GA), Response surface methodology (RSM) for predicting the actual capability of the network and to assist the dataset modulation learning mechanisms like Deep Learning (DL), Extreme Learning Machine(ELM) were used.

Keywords — Multi-layer Feed Forward Network (MLFN); Genetic Algorithm (GA); Deep learning (DL); Extreme learning machine (ELM); Resource surface methodology (RSM).

I. INTRODUCTION

Artificial Neural Network (ANN) is an information processing system that is inspired by the way human brain process information. ANNs learn by example like people. Hence ANNs are trained rather than programmed. The evolutionary computing has become the most challenging deal in current technology.

II. RELATED WORK

A) CLASSIFICATION:

A new regularizing technique called hyper-spectral reflectance imaging of 400–1000 nm is used to detect chill damage in peaches. Peach quality factors, such as cold injury (CI), firmness, soluble solids content (SSC), extractable juice, titratable acidity (TA) and chlorophyll content changed with the development of cold injury during post-harvest storage. When the fruit is stored at 0 _C the quality seems better than when it is stored 5 _C. Based on the Cold Injury index, peaches stored at 5 _C for 1 week and those at 0 _C for 2 weeks remained normal, while peaches in other groups became cold-injured. Eight optimal wavelengths (487, 514, 629, 656,774, 802, 920 and 948 nm) were determined by an artificial neural network, according to normalized importance (NI) values of each variable (wavelength).Hyper-spectral reflectance imaging accurately identified cold-injured peaches during post-harvest cold storage.

Hopfield networks are trained on noisy binary time series obtained from recordings of spontaneous spiking cortical activity using minimum probability flow (MPF). The underlying parameter estimation algorithm is to minimize a convex function over the data. After training, we find that the number of memories in these networks is remarkably larger than possible with fitting random patterns. Moreover, a robust near-exact linear relationship between window size and entropy exists. Hopfield networks could prove a powerful tool for the efficient discovery of salient structure in noisy binary data, including cortical spiking activity. In wireless communication providing recommendations to mobile operators about the activation or deactivation of base stations, using data gathered from users' traffic in base stations. The system architecture for collecting necessary data from base stations, and for running the machine learning algorithms in order to provide recommendations to mobile operators about base stations that can be activated or deactivated on specific time periods of the day. Three different learning algorithms are chosen based on neural networks, they are: Multilayer Perceptron, SVM and PNN in which the PNN outperforms the other two proposed algorithms, as it gives predictions with high accuracy.

The process of silver cutting operation of bamboo is done better with RSM model. There are numerous mathematical models developed with dimensional analysis for different sizes of split bamboo which can be effectively utilized for bamboo processing operations. The computed selection of sliver Cutting process parameters by dimensional analysis provides effective guidelines to the manufacturing engineers so that they can minimize E, Tp and tp for higher performances. Indian industries use the data for calculating cutting forces and power estimation for bamboo processing machines. RSM model can be also utilized for estimation of maximum and minimum values of response variables. To overcome the limitations that exist in traditional K-NN, a novel method called G-KNN has been introduced to improve the classification performance. K-NN using Genetic Algorithm (GA) classifier is applied for classification and similar k-neighbors are chosen at each iteration process for classification by using GA, the test samples are classified with these neighbors and the accuracy is calculated for different number of K values to obtain high accuracy; hence the computation time of K-NN is reduced from the obtained results in this method. To carry out the classification on CT lung image the MATLAB image processing toolbox is well suitable.

B) EVOLUTIONARY:

K-means genetic algorithm is used for solving the multi objective optimization problem. In contrast to conventional multi-objective genetic algorithm, FS-NLMOGA maximizes two objective functions also minimizes an objective function simultaneously. These functions are optimized simultaneously using feature selected criterion. Here the quality of the cluster

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is increased. There is no weighting parameters set for the optimization. The cluster result shows higher accuracy than NLMOGA. The performance of the proposed algorithm is tested with several real life benchmark data sets. The results indicate that the algorithm can simultaneously optimize the chosen objectives by minimizing the intra-cluster distance and maximizing the inter-cluster distance with high accuracy.

The ANN methodology has given the resultant PLN exhibiting high drug loading efficiency ANN fits the experimental data much better than RSM in this typical study attributable to ANN capacity to accommodate more complex and non-linear functional relationships. The combined application of factorial design, ANN and continuous GA in modeling and multi-objective optimization facilitates the growth of drug loading with desired properties.

C) DEEP LEARNING:

Deep neural network frame work enables multimodal integration learning of temporal sequences which includes visual, auditory, and also motion. Two tasks utilizing a humanoid robot in a real-world environment. The tasks consisted of object manipulation and bell-ringing tasks. Handling large amounts of training data with significant dimensionality proves good scalability. There are three applications of the acquired sensory motor integration model. First, cross-modal memory retrieval was realized. Utilizing the generalization capability of the deep auto encoder, our proposed framework succeeded in retrieving temporal sequences bi-directionally between image and motion. Second, robust behavior recognition was realized by utilizing the acquired multimodal features as inputs to supervised behavior classification learning. Third, multimodal causality modeling was realized.

A new possible architecture of self-learning and self-improving capabilities for laser welding system has been introduced. It is a simple form of industrially motivated intelligence. The system has the capacity to improve its own performance, due to the way that it optimizes the process in terms of goals rather than in terms of mechanisms. It therefore promises to addresses key requirements of modern industry, in that this architecture combines fast learning with the capability to work well under changing environments.

Deep neural networks are a powerful means of identifying characteristic patterns in a variety of data types which are often transferred over the Internet. This method can identify a challenging variety of data formats without numerous hand engineered features, while automatically adapting to new formats. The power spectral density and byte distribution capture the most variation between file types, and are superior to sliding window entropy. Combining these representations with sliding window entropy results in the most accurate and consistent classifier, with average 97.44% accuracy amongst several file types.

Deep architectures are suitable for solving complex problem statements in every day-business, as it out performed MLPs without pre-classification by RBMs, thus purely relying on learning strategies and intelligent weight initialization. Therefore, also complex ANN structures do not longer belong exceptionally to the scientific domain and will find application in data mining solutions in the near future. The DB-like ANN not only learned the presented test problem more accurately and in shorter time. Most importantly, the DBN-like approach outperformed any other approach in verification as the classification success on new datasets showed 100 % accuracy in the tests.

D) EXTREME LEARNING MACHINE:

An efficient learning mechanism for establishing advances in Big Data, Social Networking and Machine Learning and the various ways in which they converge with FR. We proposed a novel FR approach that can be more robust than the traditional non-cloud based mechanisms, due to the accuracy boost and performance improvement it can garner from the various properties tendered by the aforementioned systems. The FR framework was demonstrated for the task of Face Tagging in social networking systems operating on Big Data by employing the highly potent Extreme Learning Machines technique.

US-ELM algorithm performs better than other clustering algorithms on big data when tested on multiple datasets. The three distributed implementations of US-ELM lead to faster training times than the serial implementation, making them suitable for big data problems. The clustering performances were comparable and the choice of the most suitable algorithm was database dependent. Future enhancement can parallelize the matrix operations of the algorithm as well as investigate other clustering algorithms than k-means, FCM and GG.

ELM-LRF is a general framework for generic object recognition. Distinct merits exist for ELM-LRF compared with traditional methods. It is an efficient method for calculating connection weights. In the experiments, the general framework of ELM-LRF is evaluated on several generic object recognition tasks. And it presents superior accuracy with exceptionally high speed.

Training the Extreme Learning Machine based Single hidden Layer Feed forward neural network. The standard regularization approach minimizing the (Frobenius) norm of the network output weights corresponds to a uniform regularization of the ELM space dimensions and that the proposed regularization approach is able to appropriately weight the dimensions of the ELM space. The performance of can be tested in small, medium and large-scale face recognition problems in both closed and open-universe settings, where a satisfactory performance can be achieved without requiring additional costs in both training and test phases.

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TABLEI.

S. No	*Comparison of different techniques with Evolutionary Strategies*			
	AUTHOR	**YEAR**	**CLASS MODEL AND CLASSIFICATION ALGORITHM**	**LEARNING MECHANISMS**
1	Leiqing Pan	2016	MPLANN model	Supervised learning
2	Alexandros Iosifidis	2015	K-means and ELM Algorithm	Extreme Learning Machine
3	Anusha.M	2015	K-Nearest Neighbor algorithm (K-NN), Genetic Algorithm (GA)	Supervised machine learning
4	Bhuvaneswari.P	2015	K-Nearest Neighbor algorithm (K-NN), Genetic Algorithm (GA)	Supervised machine learning
5	Christopher Hillar	2015	Lenz-Ising model maximum entropy model	Boltzmann machine Learning, Hopfield learning Mechanism
6	Jonathan A. Cox	2015	Deep learning algorithms	Deep learning Mechanism
7	Pavlos Kosmides	2015	SVM learning algorithm	Multilayer Perceptron, Probabilistic Neural Network (PNN)
8	Vinay A	2015	Deep Learning Algorithm, Extreme Learning Machines, K-Nearest.	Animetrics, BioID
S. No	***Comparison of different techniques with Evolutionary Strategies***			
	AUTHOR	**YEAR**	**CLASS MODEL AND CLASSIFICATION ALGORITHM**	**LEARNING MECHANISMS**
9	Yara Rizk	2015	Extreme learning machine(ELM) algorithm	Unsupervised machine learning
10	Yongqiang Li	2015	Genetic Algorithm(GA), Response surface methodology(RSM)	Supervised machine learning
11	ZuoBai	2015	Back-propagation (BP) algorithm	Extreme Learning Machine (ELM)
12	Florian Neukart	2014	SHOCID's	Deep Learning, Boltzmann Machine Learning.
13	Johannes Günther	2014	Deep learning algorithm, actor-critic reinforcement learning (ACRL) algorithm.	Deep learning, reinforcement learning,
4	Kuniaki Noda	2014	Hessian-free algorithm, Deep learning algorithm.	Deep learning, Multimodal integration learning.
15	Sakhale.C.N	2014	Response Surface Methodology	Experimental based Learning

TABLE II.

Reference	*Comparison of different techniques with Evolutionary Strategies*	
	SALIENT FEATURES	***ANALYSIS***
1	The prediction of quality parameters by using MLPANN models performed well	Examining the peach quality in cold storage using hyper spectral imaging system(spectroscopy + digital imaging
2	To appropriately weight the dimensions of the ELM space	Unconstrained face recognition problems can be easily solved.
3	The quality of the cluster is increased. Optimizes several objectives simultaneously.	Clustering show higher accuracy in multi objective optimization.
4	The computation time of K-NN is reduced from the obtained results in this method	The filtered image is given to K-NN which is optimized by GA
5	The technique is completely deterministic.	Denoising the data by grouping similar patterns in which eliminating patterns that occurs rarely.
6	Identifying a challenging variety of data formats without numerous hand engineered features	Recent cyber security process of identifying patterns is a challenging task it is done successfully using deep neural network

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Reference	*Comparison of different techniques with Evolutionary Strategies*	
	SALIENT FEATURES	***ANALYSIS***
7	Activation or deactivations of base stations are easily done.	The growth in base stations of wireless communication is harmful so undergoing dynamic activation and deactivation of BSs.
8	Layer Fuzzy Neural Network (SLFNN)very efficiently used in a linear system	ELM is well suitable for manipulating N samples with minimum error.

Reference	*Comparison of different techniques with Evolutionary Strategies*	
	SALIENT FEATURES	***ANALYSIS***
9	US-ELM lead to faster training times by using distributed implementation than the serial implementation.	For big data analysis US-ELM achieves faster training times rather than other learning algorithms.
10	The resultant PLN exhibited high drug loading efficiency (92%)	ANN model exhibits recognition and generalization capability of drug loading efficiency better than RSM model.
11	Comparing to CNN, it significantly reduces computational complexity and requirement for huge training set.	Classifying an unknown object without human intervention using ELM
12	Suitable for solving complex problem statements in every day-business	Like data mining deep networks extract knowledge using SHOCID.
13	The system has the capacity to improve its own performance, due to the way that it optimizes the process in terms of goals rather than in terms of mechanisms.	Implementing the idea of self-learning and self-improving to manage the control difficulties in laser welding systems.
14	Retrieving temporal sequences bi-directionally between image and motion.	Well used for both robot motion and image retrieval.
15	Can minimize E, Tp and tp for higher performances.	The process of silver cutting of bamboo utilizes RSM for better performance than ANN

III. CONCLUSION

This survey paper is all about the evolution of the Genetic algorithm which is a supervised learning method to train the ANN. It is known for its mathematical simplicity and accuracy. The genetic algorithm is the principal procedure for training multi-layer Feed Forward Neural Networks. This genetic algorithm has been proposed to find optimal parameter status. The MLFF neural network is a one way signal made of multi layers which has the best trade-off between speed and accuracy. It also deals with pattern classification problems. The RSM predicts the mass transfer parameters which are compared with capabilities of ANN model.

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