Editorial

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Future Trends in Utilization of Deep Learning Techniques for Disease Recognition and Classification

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IN today's era, due to emerging growth of computation and automatic disease recognition capability of deep learning facilitates human life easier. Variety of deep learning models like convolutional neural network (CNN), autoencoders (AE), deep belief networks (DBN) etc. facilitates automated machine health monitoring and provides better diagnostic results than clinical practitioners. Evolutionary computing techniques for vision, document analysis, pattern and image analysis, image synthesis and syntactic recognition.

In [1] authors introduced vision driven multi model deep learning techniques for diagnosis of neuromuscular disorders. In [2] and [3] authors introduced convolutional neural network for identification and classification of diseases from seasonal crops and classify sound signals using tensor stack network to identify music patterns. In [4] authors proposed evolutionary driven machine learning techniques for red blood cell classifications. Similarly, in [5] authors adopted crow search algorithm for diagnosis of Parkinson disorder through image synthesis and analysis. In [6] and [7] multi kernel driven Support vector technique utilized by authors for classification of thyroid disease and perform segmentation over region of interest. In [8] and [9] advanced deep learning and vision techniques utilized for blood cells detection and grey wolf technique for Parkinson disorder.

To address machine health monitoring systems variety of deep learning architectures utilized in different applications which required less human labor and expertise to solve complex problems. Beside these criteria, some of the potential future research directions and trends are summarized as follows:

- *Data Set Quality and Nature:* As due to large model complexity involved behind deep learning models and architecture, performance of model entirely depends on data scale, dredging and quality. Like for image recognition CNN model is used as benchmarked one for classifying millions of images. It comprised of several hidden layers therefore the database design should be meaningful to publish in large scale repository.
- *Crucial Domain Knowledge:* The importance of domain knowledge is crucial in deep learning. It successfully applied in various sectors like manufacturing, cell diagnosis, blood cell type detection which enabled deep learning techniques to provide effective and higher precision results. Like usage of effective penalize weight decay, activation functions, drop outs, regularization strategy for different monitoring systems boost the final performance of available predictive classifiers.
- *Deep model visualizations:* The internal structural representation and model computation is black box which becomes very difficult to explain. Effective visualization techniques like box plots, contours enable deep insights of layered interaction among neurons presents in different layers and reduce the overall computational overhead. Regularized optimization is way to achieve visualization produced through

activation at each layer for data classification and diagnosis.

- *Impact of Transfer learning:* The transfer learning is way to apply knowledge learned from one domain to another related domain in distinguished sectors. Like in health sector, identification and diagnosis of cervical cancerous cell detection is done through Google net, ALEXNET, INCEPTION. These transfer learning deep architectures provides better classification and recognition accuracy in comparison to conventional machine learning architecture. Once features being transferred to another domain the data dimensionality should be preserved.
- *Class Imbalance problem:* The balancing of skewed data belonging to few classes is crucial task in machine learning domain. Variety of enhanced models like bagging, bosting and support vector machines proposed to handle class imbalance problem in disease diagnostic health care systems. In age of big machine-driven data combination of boot strapping and CNN models overrides missing data and class imbalance problem with good precision and accuracy rate.
- *Emergence of Capsule and GAN:* The Capsule architectures comprised of variety of distinguished neurons which routes information from one layer to another. Such futuristic model enable brain to work in several directions at once. Similarly, generative adversarial networks generate the image in first phase and evaluate the same in another phases. The evaluator tries to distinguish the generated images from the true distribution.
- *Hidden layer selection:* There is no specific procedure for the selection of number of hidden layers. The depth of a network is only changed according to the variation of final output. Therefore, the depth of network is still a question although its construction is crucial.
- *GPUs Utilization:* Due to enormous requirement of high-end GPUs sometimes health monitoring is challenging. Complex models training required machine clusters which enhanced cost of deep learning techniques and their effective utilization is still questionable among researchers.

Dr. Deepak Gupta is a high-spirited academician and researcher with twelve years of teaching experience and two years in industry. PhD (CSE) from Dr. APJ Abdul Kalam Technical University (AKTU), M. E. (CTA) from Delhi College of Engineering (Now DTU), B.Tech. (IT) from GGSIP University, and GATE qualified. He is a postdoc research fellow (PDF) in Internet of Things research Lab at Inatel, Brazil. He is currently at Department of Computer Science and Engineering, Maharaja Agrasen Institute of Technology, GGSIP University, Delhi, India. He has authored/Edited 31 books with National/International level publisher (Elsevier, Springer, Wiley, Katson). He has published 47 scientific research publications in reputed International Journals and Conferences including 23 SCI Indexed Journals of IEEE, Elsevier, Springer and Wiley. He has been guest editor in 9 special issues including SCI indexed journals like ASoC (Elsevier), NCAA (Springer), Sensors, and CAEE (Elsevier) etc. Invited as a Faculty Resource Person/Session Chair/Reviewer/TPC member in different FDP, conferences and journals. His research area includes Human-Computer Interaction, Intelligent Data Analysis, Nature-Inspired Computing, Machine Learning, and Soft Computing. He is the convener and organizer of 'ICICC' springer conference series. He has also started a research unit under the banner of "Universal Innovator". He is also appointed as Editor-in-Chief of OA Journal - Computers. He is also associated with various professional bodies like ISTE, IAENG, IACSIT, SCIEI, ICSES, UACEE, Internet Society, SMEI, IAOP, and IAOIP etc.

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