

A Review on Exploring the Deep Learning Concepts and Applications for Medical Diagnosis

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Abstract - Deep Learning (DL) benefits significance among researchers, from both academia and Industry. DL algorithms show the facility to learn and model very large-scale data sets. Deep learning techniques have gained wide acceptance in performing different task especially in bioinformatics, medical analysis and drug discovery. In the recent years, DL theory in the field of artificial intelligence, neural network structure, optimization and natural language processing has seen exponentially growth and attention. This paper explores the knowledge representation of various methods and their applications of DL for disease prediction in the medical field.

Keywords: Artificial Neural Network, Convolution Neural Network, Deep Learning, Medical Diagnosis, Machine Learning, Recurrent Neural Network

I. INTRODUCTION

It consists of machine learning algorithm using a study to the structure of a neural network, which classifies the objects from sound, image and texts. The neural network uses a flow of tiers for processing different components. It extracts useful features from a lot of data to predictive data analysis. Through neural networks includes two or three layers, while deep networks consist 100s of layers. DL classification predictions are in the form of probability values.

A. Architecture of Deep Learning

The RNN is a DL method it different from CNNs, where the outputs from previous status are fed as inputs to the current status. This concept is called back propagation. Existing neural network produces prediction based condition in the current layer and CNN are multiple array structure. DBN are models which employ unsupervised learning and probabilities to generate outputs. It consists of binary latent variables and both undirected layers and directed layers. Each layer in DBN learns the entire input and works worldwide and regulates each layer consecutively. The DSN are each network have own hidden layers and deep convex networks as shown in Figure 1.

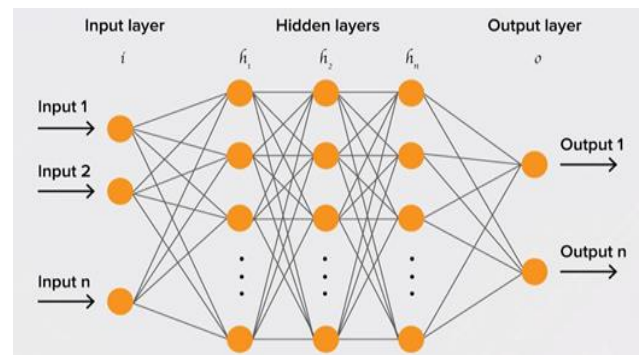


Fig.1 Deep learning architecture

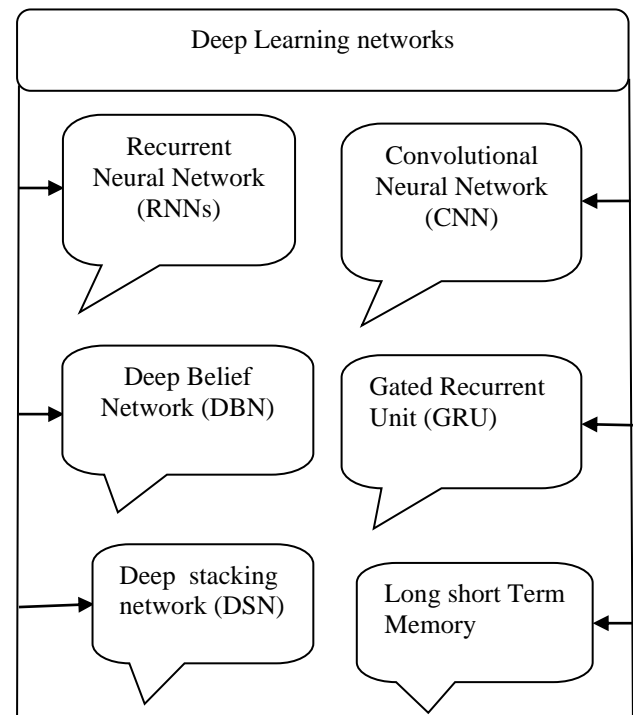


Fig.2 Type of deep learning network model



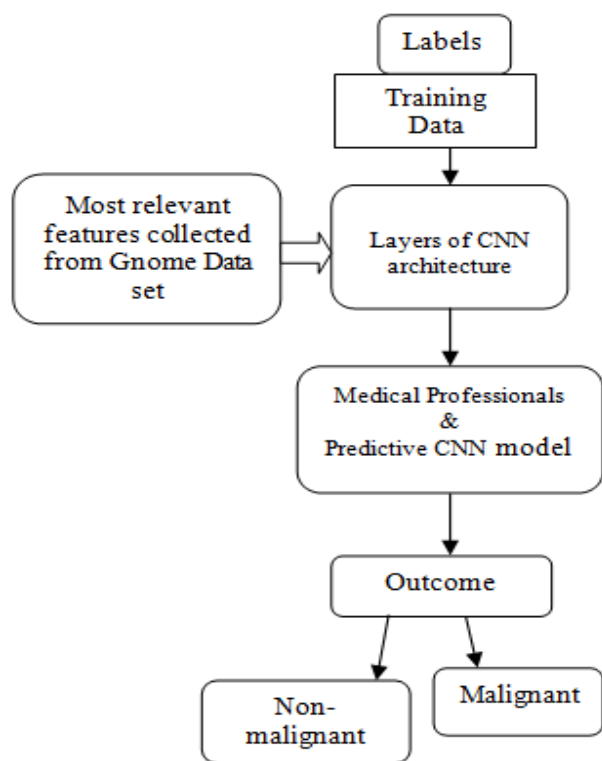


Fig.3 Classification model using deep learning in genomic data for medical diagnosis

In medical diagnosis, DL plays a vital role and produces significant results. This solution is very informative for medical practitioners. The outcome of the predictive analysis using DL gives the maximum throughput in multi-genomic data. In Figure 3, the most relevant features collected from gnome data sets is given to deep learning predictive model to classify the cancer and non-cancer patients.

II. RELATED WORK

O-Yeon Kwon et al [1] imitated subject-independent convolution neural networks for an MI-based brain-computer interface system. Modern Deep Neural Networks (DNN) [2] are containing a huge number of trained features. So, the researchers have used sparse weights and associates to compact DNN models by matrix factorization. Luis Felipe et al and others [3-9] have focused on common characteristics of Neural Networks, Autoencoders and Recurrent Neural Network. Dey Chaudhuri [7], study produced accuracy results of 79.28% the performance of noise in 50% training and 50% testing data.

Tulin Ozturk [10] planned a DL method for categorize COVID-19 patient from X-ray. It can perform 98.08% and 87.02% of accuracy for binary and multi-class respectively. The result of the system is evaluated through radiologists tested with high dimensional data. This approach able to utilize in remote location for COVID.

Valentina Bellemo et. al., [11] illustrated that the Artificial Intelligence method is helpful in finding eye related disease. This work deals with how the retinal images are confined by skilled humans. The researcher applied AI analysis of retinal images instead of the diabetic retinopathy screening. This model produced sensitivity of 89.21% and specificity of 83.33% and accuracy of 86.27% and categorized as COVID-19 and non-COVID-19 collections.

Deep learning has been used in nonmedical, medical fields [12-13], identifying diabetic retinopathy [14], malignant melanoma [15], discovering medical abnormalities [16], breast cancer testing [17], and diagnosing TB disease [18]. The medical diagnosis, examining and measuring relations are complex in medical images due to various parameters in patient data [19]. CheXaid produces clinician accuracy of 65% in TB diagnosis. The author has proposed the DL model for finding the cardiovascular chance [20-24]. These authors have used cross-sectional datasets from 236 257 retinal photographs collected from Seoul and South Korea from screening lab.

Ophthalmology is highly needed for technological growth and utilized in emerging field specifically acquiring image representation [25]. DL is superior at finding complicated compositions in large dimensional data and it can be applied in various medical domains [26]. The applications of DL, mainly focused in categorization of diabetic related diseases, lung segmentation and myopia growth finding [27-31]. ANN is inadequate in its facility to work out the over fitting difficulties and it can train the deep neural network [32-34] and make use of automation task.

Yu Li et al [35, 36] provided solutions and suggestions for implementing DL approaches in bioinformatics. The ensemble methods and DL methods have been used broadly in bioinformatics research [37]. By combining the two machine learning techniques, these authors have shown good accuracy in their work. The author points out challenges and in the perspective of bioinformatics research. Genomics research uses ML to confine need in data and build ups true hypotheses [38] and involves new significant machine learning models. In this situation DL is alternative solution. DL model suggested for the DNA elements analysis in human genome [39]. The cancer subtypes in genomic data have been discovered [40] using clustering and classification data mining techniques.

The next-generation sequencing can be used to perform metagenomic classification for health data diagnoses. In ML techniques are frequently used for DL approaches that used multilayered ANNs for supervised, semi supervised, and unsupervised learning [41]. Kushal proposed [42] DL annotations model for human complex diseases. DL models are great significant in predicting regulatory effects from DNA sequence and it can be extended to DL bio molecular property and function prediction [43]. Hard to improve the learning model when several databases with diverse websites proposed. To address these difficulties, one needs an efficient knowledge extraction approach that can produce collective

information to distinguish diseases issues by grouping mixed scientific I data resources. Hence, the authors investigated a therapeutic DL technique to offer disease diagnosis for authorized users[44]. Hafiz et al. [45] have illustrated the basic technologies used in DL, the histories of patients' diagnoses [46, 47], medications and liver transplantation.

For the prediction of novel drugs for liver disease authors can be focused the multi-source simulated annealing with random walk [48]. The study constitutes the application of DL to medical undertakings derived from EHR information [49, 50] and is used in data extraction, knowledge representation and classification. Wolfgang Kopp [51], focused Janggu, which contain more number of python library to reduced the programming cost in medical field. Zou Z et al. (52) suggested a model called mIDEEPre for envisage the results of multi-functional enzymes.

III. CONCLUSION

In this review article deep learning techniques have multiple layers with produce good and illustrated the competence of solving human diseases.

As information flows enormously in the field of health care, future studies will do well by investigating effective DL models.

These models will not only improve the accuracy and stability of the system but also do yeoman service in the arena of medical diagnosis.

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