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A SURVEY OF DEEP LEARNING ALGORITHMS FOR PREDICTION OF DISEASE

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Abstract—

An area of machine learning (ML) called deep learning is used to tackle hard issues and find clever answers. Deep learning uses artificial neural networks (ANN) to examine data and generate predictions. Deep learning has made it possible to apply computer assisted technologies in the health sector. To anticipate and identify the illness. In this work, we provide a thorough analysis of deep learning algorithms and their application to the prediction and diagnosis of numerous diseases in the healthcare industry.

Keywords— Deep learning, Healthcare, Algorithms, Disease

I. Introduction

A subset of machine learning is thought to include all forms of deep learning (ML). Due to the fact that machine learning (ML) is an Artificial Intelligence (AI) technology, it has the capacity to learn and grow without being explicitly programmed. While deep learning deals with Artificial Neural Networks (ANN), which are taught to analyze, understand, and react to complex situations more quickly than humans, machine learning focuses on simple concepts. Speech recognition, image categorization, and language translation were made easier by deep learning. It can be utilized to resolve any form of pattern recognition issue without the need for human intervention.

ANN is made up of multiple layers, each of which is capable of performing complicated operations like representation and abstraction that allow it to understand text, pictures, and sound.

II. Deep Learning Overview

Similar to how neurons make up the human brain, layers of nodes make up neural networks. Each layer's nodes are connected to those in the layer below it. The depth of the network is measured by the number of layers. The human brain's neuron receives many impulses from other neurons. Similar to an ANN, signal travels between nodes and corresponding nodes are given weights. A node with higher weights will have a greater impact on nodes in the layer below it. The output is produced after compiling the weighted input.

Deep learning systems can analyze enormous amounts of data and produce accurate results. Artificial neural networks analyze input data by answering a series of binary true or false questions that call for incredibly abstract mathematical formulae. For instance, a facial recognition algorithm can be trained to recognize edges and lines of faces, then progress to

learning to recognize more crucial features of the faces, and finally faces as a whole. Similar to how it trains itself at each stage, the programme increases the probability of accurate responses. In this instance, facial recognition software has gotten better over time in correctly identifying faces.

Deep learning systems demand powerful hardware since they handle a large amount of data and carry out several intricate mathematical operations.

III. Deep Learning Algorithms

Deep learning techniques rely on artificial neural networks (ANNs), which mimic how the brain processes information, even if they also use self-learning representations. During training, algorithms employ unidentified components in the input distribution to extract properties, organize objects, and identify relevant data patterns. Using the method, this occurs at several phases, much like instructing robots for self-learning.

Both supervised and unsupervised learning are frequently utilized in various applications. In supervised learning, the algorithm analyses the training set to provide an estimated function that can be applied to fresh data. Unsupervised algorithms draw conclusions from the data itself, grouping or summarizing it so that we can base decisions on that information.

Huge volumes of data are generated every day in our digital age via technologies like social media, IoT, cloud computing, etc. It is possible to find representations in contemporary learning techniques that are used to automatically extract thoughts from factual data[1]. Deep learning algorithms are an example of representations of learning techniques that transform unprocessed input data into more complex features that allow the identification of novel patterns [2].

Several algorithms are used by deep learning models. It's critical to have in-depth understanding of all Deep learning algorithms in order to select the one that will work best for a given task.

The taxonomy of the deep learning algorithm is shown in Fig.1

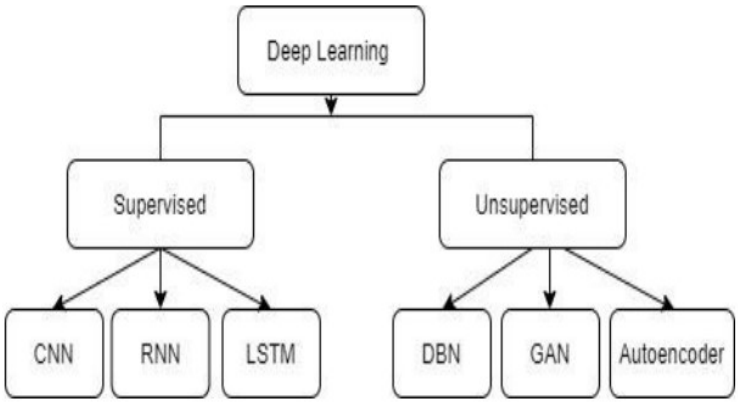

Figure 1 Taxonomy of the deep learning algorithm

Deep learning algorithms, their characteristics and applications are summarized in table 1

TABLE I. Deep learning Characteristics and applications

Algorithm	*Learning*	*Behaviour*	*Applications*
Convolutional Neural Networks (CNNs)	Supervised	Useful for high-dimensional data, Keeps spatial information	Process medical images, predict time series and identify anomalies in satellite images
Long Short Term Memory Networks (LSTMs)	Supervised	Long-term dependencies are learned and memorised.	Music composition and speech recognition
Recurrent Neural Networks (RNNs)	Supervised	Stores temporal information and Captures time dependencies of data	Time-series analysis, machine translation, Image captioning, natural-language processing and handwriting recognition
Generative Adversarial Networks (GANs)	Unsupervised	Make new data instances that look like the training data	Develop realistic and animated figures,
Autoencoder	Unsupervised	inputs size are reduced to make a smaller representation	Image scanning, pharmaceutical invention, and popularity forecast
Deep Belief Networks (DBNs)	Unsupervised	Without a lot of preprocessing, it's possible to get appealing results from raw data	Image and video recognition and motion-capture data

IV. Deep Learning In Healthcare

In recent years, deep learning has been applied in healthcare systems. It is supporting countless medical analysts and specialists in learning important information from clinical data and bettering medical facilities. Delivering individualized healthcare and determining a patient's likelihood of forecasting an illness are important research areas. It is currently frequently utilized for drug development and identifying life-threatening conditions including cancer and diabetic retinopathy using a medical imaging method.

Deep learning algorithms have already been used extensively in research to anticipate the disease. The algorithms and their diagnostic accuracy are discussed in this section. It will be important for the researchers to select the best algorithm quickly for the prediction and diagnosis of disease.

V. Review Of Literature

Recently, Farman Ali et al. [3] developed a system that uses gradient algorithms and back propagation techniques to forecast cardiac disease before a stroke or heart attack can happen. The veracity of the suggested

system (98.5%) is demonstrated to be superior than the current system by comparison with conventional classifier models [13].

The random forest classifier algorithm, which provides the highest accuracy at 94.9% among other classification algorithms, including SVM, DT, RF, and LR to predict the heart disease, is the ideal machine learning algorithm in another Heart disease identification system[4].

The univariate feature selection and Relief are used to choose crucial characteristics from the dataset [14–15].

A system that predicts cardiac illness has been created by Tülay Karaylan and Zkan Klç[5] utilising artificial neural networks and the backpropagation technique. The outcome is 95% accurately confirmed using the input of thirteen clinical features.

A model for classifying navel diabetes based on convolutional long short-term memory has been created by Motiur Rahman et al. [6] for the review of diabetic illness prediction (Conv-LSTM). The suggested model has a maximum accuracy of 97.26 percent over the Pima Indians Diabetes Database when compared to other well-known models as CNN, Conventional LSTM, and CNN-LSTM[16-18] (PIDD).

Using CNN and CNN-LSTM deep learning networks and 5 fold cross validation, Swapna G et al. [7] built an automated diabetes detection system that had the greatest accuracy of 95.1%. of the current automated diabetes diagnostic techniques.

Safial Islam Ayon et al.[8] produced promising systems for the prediction of diabetes using deep neural networks by training its features in a five and ten fold cross validation method, with prediction accuracy of 98.3 percent and 97.11 percent.

The suggested device segments the Optic Cup (OC) and Optic Disc using two separate CNN architectures to produce a more accurate result (OD). The segmentation accuracy of this model, which was trained and verified on the publicly available DRISHTI-GS database, is 98 percent for the optic disc and 97 percent for the optic cup.

A novel optic disc and optic cup segmentation technique for the diagnosis of glaucoma has been developed by H.N. Veena et al. To segment the optic disc (OD) and tic cup (OC) in the proposed system, two distinct CNN architectures were applied, yielding results that were more precise. This model is trained and tested on the publicly accessible DRISHTI - GS database, and it achieves a segmentation accuracy of 98 percent for the optic disc and 97 percent \sfor the optic cup.

A novel CAD tool that accurately detects glaucoma using deep learning methods has been proposed by U Raghavendraa et al. [10]. With 98.13 percent accuracy, an 18 layer convolutional neural network (CNN) was effectively trained to extract strong features from digital fundus images.

By combining a support vector machine classifier and a correlation neural network, N.Bhaskar et al[11] .'s technique for detecting chronic renal illness had a 98.6% accuracy rate (CorrNN).

When trained using US screening data, the Lung Cancer Prediction Convolutional Neural Network (LCP-CNN) created by Marjolein A. Heuvelmans et al.[12] can classify benign lung nodules with a 94.5 percent accuracy.

Table 2 displays a summary of various disease detection or prediction results.

VI. Conclusion

Deep Learning is a branch of machine learning that helps provide intelligent answers to challenging issues. Artificial neural networks are used in deep learning to analyse the data and provide predictions. Several academics and medical professionals are using deep learning techniques to extract useful information from healthcare data and enhance the quality of society's medical services. In the healthcare industry, deep learning has made it possible to use computers to diagnose and predict diseases. Based on prior research, the deep learning algorithms and their efficacy for disease prediction are explored and described in this study. In the future, it will be helpful for researchers and medical professionals to quickly determine the optimum algorithm for disease prediction.

Table 2. Summary of Disease Detection Or Prediction

Ref.	Year	Cases	Algorithm	Accuracy
3	2020	Heart attack Prediction	Feed-forward network - utilizes back propagation techniques and gradient	98.5%
4	2020	Heart disease identification	SVM, DT, RF and LR	94.9%.
5	2017	Heart disease prediction	Artificial neural network back propagation	95%.
6	2020	Diabetic Detection	Convolutional Neural Network (CNN), Traditional LSTM (T-LSTM), and CNN-LSTM	97.26 %
7	2018	Diabetic Detection	CNN and CNN-LSTM - 5 FC layers	95.1%
8	2019	Diabetes Prediction	Deep neural network and five-fold and ten-fold cross-validation fashion	98.35%, - 5 FC 98.80% - 10 FC
9	2021	Diagnose glaucoma	Deep learning Convolutional neural network	98% - optic disc 97% - optic cup seg.
10	2018	Diagnosis of Glaucoma	Eighteen layer convolutional neural networks (CNN)	98.13%
11	2020	Prediction of Chronic Kidney Disease	Support Vector Machine (SVM) classifier is integrated with the CorrNN	98.67%.
12	2021	Lung cancer prediction	Convolutional Neural Network (LCP-CNN)	94.5 %

References

1. [Bengio Y, Courville A, Vincent P. Representation learning: a review and new perspectives. IEEE Trans Pattern Anal Mach Intell. 2013;35(8):1798–828..

2. LeCun Y, Bengio Y, Hinton G. Deep learning. Nature 2015;521(7553):436–44.

3. Farman Ali, Shaker El-Sappagh, S.M. Riazul Islam, Daehan Kwak, Amjad Ali et al., "A Smart

Healthcare Monitoring System for Heart Disease Prediction Based On Ensemble Deep Learning and Feature Fusion",Information fusion, Volume 63, November 2020, Pages 208-222

4. Hager Ahmed a, Eman M.G. Younis a, Abdeltawab Hendawi b,c, Abdelmgeid A. Ali, "Heart disease identification from patients' social posts, machine learning solution on Spark", Future Generation Computer Systems, Volume 111, October 2020, Pages 714-722
5. Tülay Karayılan; Özkan Kılıç," Prediction of heart disease using neural network", 2017 International Conference.
6. Motiur Rahman, Dilshad Islam, Rokeya Jahan Mukti, Indrajit Saha, "A deep learning approach
based on convolutional LSTM for detecting diabetes", Computational Biology and Chemistry, Volume 88, October 2020
7. Swapna G, Soman KP, Vinayakumar R , "Automated detection of diabetes using CNN and CNNLSTM network and heart rate signals" Procedia Computer Science, Volume 132, 2018, Pages 1253-1262
8. Safial Islam Ayon, Md. Milon Islam, "Diabetes Prediction: A Deep Learning Approach", I.J.
Information Engineering and Electronic Business, 2019, 2, 21-27
9. H.N. Veena, A. Muruganandham, T. Senthil Kumaran, "A novel optic disc and optic cup segmentation technique to diagnose glaucoma using deep learning Convolutional neural network
over retinal fundus images" Journal of King Saud University - Computer and Information Sciences , Available online 18 February 2021, in press
10. U Raghavendraa, Hamido Fujitab*, Sulatha V Bhandaryc, Anjan Gudigara, Jen Hong Tand, U
Rajendra Acharyad," Deep Convolution Neural Network for Accurate Diagnosis of Glaucoma Using Digital Fundus Images ",Information Sciences Volume 441, May 2018, Pages 41-49
11. N.Bhaskar, M.Suchetha, "A Computationally Efficient Correlational Neural Network for Automated
Prediction of Chronic Kidney Disease", IRBM, Available online 10 July 2020, In Press
12. Marjolein A. Heuvelmans et al.," Lung cancer prediction by Deep Learning to identify benign lung nodules", Lung cancer, Volume 154, April 2021, Pages 1-4
13. A.H. Nandhu Kishore, V.E. Jayanthi, Neuro-fuzzy based medical decision support system for
coronary artery disease diagnosis and risk level prediction, J. Comput. Theor. Nanosci. 15 (2018)
1027–1037.
14. scikit, Chi-squared statistic test, https://scikitlearn.org/stable/modules/ generated/sklearn.feature_selection.chi2.html, 2019.
15. A.U. Haq, J.P. Li, M.H. Memon, S. Nazir, R. Sun, A hybrid intelligent system framework for the prediction of heart disease using machine learning algorithms, Mob. Inf. Syst. 2018 (2018).
16. Muzaffar, S., Afshari, A., 2019. Short-term load forecasts using LSTM networks. Energy Procedia 158, 2922–2927
17. Zhu, G., et al., 2019. Redundancy and attention in convolutional LSTM for gesture recognition.
IEEE Trans. neural networks Learn. Syst.(June).

18. Rahman, S.A., Adjeroh, D.A., 2019. Deep learning using convolutional LSTM estimates biological age from physical activity. Sci. Rep. 9 (1 December), 1–15.
19. KumarA, KimJ, LyndonD, FulhamM, FengD. An ensemble of fine-tuned convolutional neural
networks for medical image classification. IEEE J Biomed Health Inform 2016;21:31–40.
20. SunM, SongZ, JiangX, PanJ, PangY. Learning pooling for convolutional neural network. Neurocomputing 2017;224:96–104.
21. Muruganantham Ponnusamy, Dr. A. Senthilkumar, & Dr.R.Manikandan. (2021). Detection of
Selfish Nodes Through Reputation Model In Mobile Adhoc Network - MANET. Turkish Journal of Computer and Mathematics Education, 12(9), 2404–2410. https://turcomat.org/index.php/turkbilmat/article/view/3720
22. Asraf Yasmin, B., Latha, R., & Manikandan, R. (2019). Implementation of Affective Knowledge for any Geo Location Based on Emotional Intelligence using GPS. International Journal of Innovative Technology and Exploring Engineering, 8(11S), 764–769. https://doi.org/10.35940/ijitee.k1134.09811s1
23. Santosh Kore, Vinayak Pujari, A Vision -Machine Learning And Deep Learning applications, Contemporary Research in India (ISSN 2231-2137): Vol. 11: Issue: 3 Sept., 2021 (www.contemporaryresearchindia.net)
24. Dr. Suvarna Mahavir Patil, Dr. Dhanashri Sahasrabuddhe, Mr. Vinayak Pujari, Understudies' Performance Prediction Usingdeep Neural Network, Contemporary Research in India (ISSN 2231-2137): Vol. 11: Issue: 3 Sept., 2021 (www.contemporaryresearchindia.net)