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A Study on Deep Machine Learning Algorithms for diagnosis of diseases

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Abstract

The disease identification through advanced machines would be lifesaving, when we are living in a spot that is very long away from a medical clinic or don't have adequate cash to conceal the medical clinic charge or need more an ideal opportunity to take off work. For identifying different infections like Cancer, Heart Diseases, Lung Diseases, Liver Disease and Dengue Disease. Scientists had implemented various artificially intelligent detection algorithms. Artificial neural networks layers having interconnected nodes are used by deep learning, in which whenever if new information is there then it will rearrange themselves. This type of method does not require the involvement of human programming in which it allows the machines to learn on their own. This paper centers on recent improvements in AI which have had huge effects in the location and finding of different infections.

Keywords

Machine Learning, Artificial Intelligence, Computer Aided Diagnosis, Artificial Neural Network

INTRODUCTION

There is indeed a constantly rising exciting field of studies with in healthcare sector whereby identification of disease can even be found using powerful computers. Researchers significantly enhanced the accuracy of awareness and diseases prediction in the Data Science sector. Computers are given the capacity to think through learning and improving knowledge. Machine Learning Techniques are being used to categorize datasets and

come in a variety of forms[1, 2]. Supervised, Unsupervised Semi-Supervised, Reinforcement, Evolutionary learning, and Deep learning calculations are among the methodologies [3].

Supervised learning-In supervised learning, the Machine Learning model takes input data as well as accurate output data, and algorithms react appropriately to all possible inputs based on the training set. Learning through examples is another term for Supervised Learning[4].The category of Supervised Learning includes regression and classification.

Unsupervised learning-The said approach allows designers to detect patterns in the data input and identifies the information based on such similarities. Density estimation[5] is another name for this. Clustering is a feature of unsupervised learning that creates groupings based on similarity. This type of technique mainly uses unlabeled data.

Semi-supervised learning is a supervised learning approach that falls within the category of semi-supervised learning. This approach also employs unlabeled dataset to train [6]. This method of learning is halfway between supervised and unsupervised learning (unlabeled data) (labelleddata).

Reinforced technology is a process of learning that is aided by the use of humanistic psychology. Once the response is incorrect, an algorithm is notified, and it is not notified of how to remedy it. It must investigate and test numerous options until it discovers the correct solution [7]. Learning with a critic is another term for it. It makes no suggestions for improvement.

Biological Evolutionary Learning-This biological evolution learning may be thought of as a learning process similar to how biological organisms adapt to increase their survival rates and chances of having offspring [8]. This model may be utilised in a computer with the fitness concept to assess the correctness of the answer.

Deep learning—In this strategy, back propagation learns all of the model parameters at the same time to optimise the task's output [9]. It employs a deep graph with several processing layers comprised of a variety of linear and nonlinear transformations.

VARIOUS MACHINE LEARNING TECHNIQUES FOR DETECTION AND DIAGNOSIS OF DISEASES

The monitoring of disease development during medical therapy may be done automatically and continuously using biomarkers [10, 11]. Increased sensitivity and dependability in medical therapies might aid in the creation of more effective illness management. This also helps to decrease on the number of people needed in medical tests. Cancer, Lung Illnesses, Heart Diseases, Liver Disease and Dengue Disease are among the diseases studied in this study.

A.DEEP LEARNING IN DETECTION OF CANCER

Biological specimens from sufferers obtained by pathologist's findings are frequently used as benchmark for analysis in the detection of a variety of disorders. One of the really common breast cancers is cancerous tumours mass. When malignant tumours are entrenched in and hidden by varied densities of parenchymal tissue structures, mammography might be harder to identify directly.

Smita Jhajharia created a breast cancer prognostic method based on the neural network and processed information using principal component analysis (PCA). To construct a prediction model in this model, a multivariate statistical method was used with an artificial intelligence based learning mechanism [12]. PCA pre-processes data and extracts characteristics in the most relevant manner before training an artificial neural network. For the categorization of new occurrences, the ANN learns patterns in the data. Experimental assessment shows that the accuracy is 96 percent.

Zheng L created an approach for detecting masses in mammograms that integrates numerous artificial intelligence approaches with the discrete wavelet transform (DWT). Fractal size evaluation, multiresolution Markov random field, and the dogs-and-rabbits method are among the AI approaches [13]. The fractal size evaluation is used as a pre-processor to determine the approximate locations of the spots in the mammogram that are suspect for most malignancies. To stimulate segmentation on the LL subband of a three-stage DWT decomposition of the mammography, the dogs-and-rabbits clustering technique is utilised. Finally, a tree-kind categorization technique is used to determine whether or not a certain location is suspect for most malignancies. The suggested method seems to have a sensitivity of 97.3%, according to the verification findings and the number of false positives per picture is 3.92.

Table 1: Techniques used for the detection of cancer

Machine Learning Techniques	Author	Year	Disease	Accuracy
PCA,ANN	Smita Jhajharia	2016	Cancer	96%
Fractal dimension analysis ,DWT, Markov random process, Dogs-and-Rabbits algorithm	Zheng L	2014	Cancer	97.3%

B. ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN DETECTION OF LUNG DISEASES

Artificial Intelligence (AI) is being utilised to improve the efficacy of lung disease detection. Machine learning employs a variety of strategies that may study from it and analyse information in order to make predictions.

Juan Wang devised a deep learning technique for detecting cardiovascular diseases.

A 12-layer convolutional neural network was used to distinguish BAC (breast arterial calcifications) from non-BAC and place it according to a pixel-by-pixel, patch-based BAC detection approach. Free-response receiver operating characteristic (FROC) analysis and calcium mass quantification analysis are used to assess the machine's overall performance [14]. The deep learning technique which performs FROC analysis reaches a degree of detection similar to the human experts. The calcium mass quantification examination shows that the inferred calcium mass is close to the ground truth, with a coefficient of determination of 96.24% after a linear regression between them.

Shubhangi Khobragade presented a method for detecting major lung illnesses automatically. ANN is used to segment the lungs, extract lung characteristics, and categorise them for the identification of lung diseases such as lung cancer and pneumonia [15]. The intensity-based approach and the discontinuity-based method are used to detect lung borders. Feed forward and back propagation techniques are used for image categorization. The accuracy has been judged to be 86%.

Table 2: Machine Learning Techniques used for the automatic detection of lung diseases

Machine Learning Techniques	Author	Year	Disease	Accuracy
FROC,ANN	Juan Wang	2017	Lung Disease	96.24%
Feed forward and Back propagation Neural Network	Shubhangi Khobragade	2017	Lung Disease	86%

C. AUTOMATIC DETECTION OF HEART DISEASES

Machine learning algorithms can aid in improving the accuracy of heart disease detection.

Otoom et al presented a method for detecting and analyzing coronary artery disease. Three methods are used to analyse performance: Bayes Net, Support Vector Machine, and Functional Trees FT [16]. The accuracy given

by Bayes Net technique was 85. 5% of correctness, The accuracy given by SVM technique was 85. 1% accuracy and the accuracy given by FT classify technique was 84. 5% correctly.

Vembandasamy et al.[17] proposed a method for diagnosing cardiac illness using the Naive Bayes algorithm. The accuracy given by Naive Bayes technique was 42%

Chaurasia and Pal[18] devised a method for detecting cardiac disease. The accuracy of Naive Bayes is 85 .31 percent. J48 has an accuracy rate of 84.35 percent. Bagging has an accuracy of 85. 03 percent.

Parthiban and Srivatsa [19] created a machine learning system that employs a variety of approaches to diagnose cardiac illness. The Naive Bayes Algorithm achieves a 74 percent accuracy rate. SVM has the highest accuracy, with a score of 94. 60%.

Tan et al. [20] presented a hybrid strategy in which two machine-learning algorithms, the Genetic Algorithm (G.A) and the Support Vector Machine (SVM), are effectively combined utilising the wrapper approach. After using a combination GA and SVM method, 84. 07% accuracy is attained in the identification of cardiac disease.

Table 3: Machine Learning Techniques used for the automatic detection of heart diseases

Machine Learning Techniques	Author	Year	Disease	Accuracy
Bayes Net SVM FT	Otoom	2015	Heart Disease	85.50% 85.10% 84.50%
Naive Bayes	Vembandasamy	2015	Heart Disease	42%
Naïve Bayes J48 Bagging	Chaurasia Pal	2013	Heart Disease	85.31% 84.35% 85.03%
SVM Naive Bayes	Parthiban and Srivatsa	2012	Heart Disease	94.60% 74.00%
GA,SVM	Tan	2009	Heart Disease	84.07%

D. MACHINE LEARNING TECHNIQUES FOR LIVER DISEASE

The liver patients are classified using a variety of sophisticated approaches. The following are some recent techniques:

Support vector machine and Naive bayes Classification methods were used by Vijayarani and Dhayanand to predict liver illness [21]. SVM achieves 79.66 percent accuracy, whereas Naive Bayes achieves 61.28 percent accuracy.

P. Rajeswari has used different Data Mining Algorithms to analyse liver disease [22]. Correctness is 96.52 percent with Naive Bayes. The FT tree achieves a precision of 97.10 percent. The K star method correctly classifies the occurrences 83.47 percent of the time.

Table 4: Machine Learning Techniques used for the automatic diagnosis of Liver disease

Machine Learning Techniques	Author	Year	Disease	Accuracy
SVM	Vijayarani and	2015	Liver Disease	79.66%
Naive Bayes	Dhayanand			61.28%
Naive Bayes	Rajeswari and Reena	2010	Liver Disease	96.52%
K Star				83.47%
FT tree				97.10%

E.MACHINE LEARNING TECHNIQUES FOR DENGUE DISEASE

Dengue fever is a disease spread by mosquitos that is caused by viruses. For the identification of dengue disease, many machine learning approaches have been developed.

For dengue illness prediction, Fathima and Manimeglai utilised the SVN data mining method [23]. SVM achieves a level of accuracy of 90. 42 percent.

Ibrahim presented a Multilayer feed-forward neural network algorithm for dengue illness prediction [24]. MFNN has a 90 percent accuracy rate.

Table 5: Machine Learning Techniques used for the automatic diagnosis of Dengue disease

Machine Learning Techniques	Author	Year	Disease	Accuracy
SVM	Fathima and Manimeglai	2012	Dengue Disease	90.42%
MFNNN	Ibrahim	2005	Dengue Disease	90%

CONCLUSION

This paper gives an overview of modern artificial intelligence systems that can be used to identify and diagnose various diseases. The system examines relevant medical images and related point data to provide a conclusion that can assist a physician in making a clinical decision. The AI system only acts as a conduit for clinical image flow and archival image data. Application-specific engineering is not required to use the AI system. The use of AI systems for different illness diagnosis can speed up decision-making and reduce false-positive rates. It is apparent from the study that different AI algorithms improve the accuracy of illness diagnosis.

REFERENCES

[1] C. K. Shie, C. H. Chuang, C. N. Chou, M. H. Wu, and E. Y. Chang, 2015, "Transfer representation learning for medical image analysis," in IEEE Conf Eng Med Biol, pp. 711–714.

[2] Meherwar Fatima, Maruf Pasha, 2017, "Survey of Machine Learning Algorithms for Disease Diagnostic", Journal of Intelligent Learning Systems and Applications, pp.1-16.

[3] D. Yu, and L. Deng, 2011, "Deep learning and its applications to signal and information processing," IEEE Signal Process. Mag., vol. 28, no. 1, pp. 145-154.

[4] J. Shi and J. Malik,2000, "Normalized cuts and image segmentation," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 22, no. 8, pp. 888–905.

[5] A. Kumar, J. Kim, W. Cai, and D. Feng, 2013, "Contentbased medical image retrieval: a survey of applications to multidimensional and multimodality data," J Digit Imaging, vol. 26, no. 6, pp. 1025–1039.

[6] N. Tajbakhsh, J. Y. Shin, S. R. Gurudu, R. T. Hurst, C. B. Kendall, M. B.Gotway, and J. Liang, 2016, "Convolutional neural networks for medical image analysis: Full training or fine tuning?" IEEE T Med Imaging, vol. 35, no. 5, pp. 1299– 1312.

[7] Adriana Albu, Loredana Stanciu, 2016, "Benefits of using artificial intelligence in medical predictions," 1EEE, EHealth and Bioengineering Conference (EHB).

[8] M. Abedini, N. C. F. Codella, J. H. Connell, R. Garnavi, M. Merler,S. Pankanti, J. R. Smith, and T. Syeda-Mahmood, 2015, "A generalized framework for medical image classification and recognition," IBM J Res Dev, vol. 59, no. 2/3, pp. 1:1–1:18.

[9] C. Bishop, 2006, Pattern Recognition and Machine Learning. Springer-Verlag New York.

[10] Erol Gelenbe, Yongha Yin, 2016, "Deep learning with random neural networks", Neural Networks (IJCNN), 2016 International Joint Conference.

[11] Y. LeCun, Y. Bengio, and G. Hinton, 2015 "Deep learning," Nature, vol. 521, no. 7553, pp. 436–444.

[12] Smita Jhajharia , Harish Kumar Varshney , Seema Verma ,Rajesh Kumar, 2016, " A neural network based breast cancer prognosis model with PCA processed features", IEEE, International Conference on Advances in Computing, Communications and Informatics (ICACCI)

[13] Zheng L, Chan AK., 2001, "An artificial intelligent algorithm for tumor detection in screening mammogram", IEEE Trans Med Imaging, 20(7):559-67.

[14] Wang J, Ding H, Bidgoli FA, Zhou B, Iribarren C, Molloi S, Baldi P, 2017, "Detecting Cardiovascular Disease from Mammograms With Deep Learning", IEEE Trans Med Imaging, 36(5):1172-1181.

[15] Shubhangi Khobragade , Aditya Tiwari , C.Y. Patil , Vikram Narke , 2017,"Automatic detection of major lung diseases using Chest Radiographs and classification by feed-forward artificial neural network",IEEE,International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES).

[16] Otoom A.F., Abdallah E.E., Kilani Y., Kefaye A. and Ashour M, 2015, "Effective Diagnosis and Monitoring of Heart Disease" International Journal of Software Engineering and Its Applications, 9, 143-156.

[17] Vembandasamy K., Sasipriya R. and Deepa E, 2015, "Heart Diseases Detection Using Naive Bayes Algorithm", IJISETInternational Journal of Innovative Science, Engineering & Technology, 2, 441-444.

[18] Chaurasia V. and Pal S, 2013, "Data Mining Approach to Detect Heart Disease", International Journal of Advanced Computer Science and Information Technology (IJACSIT), 2, pp.56-66.

[19] Parthiban, G. and Srivatsa, S.K., 2012, "Applying Machine Learning Methods in Diagnosing Heart Disease for Diabetic Patients". *International Journal of Applied Information Systems*, 3, pp.25-30.

[20] Tan, K.C., Teoh, E.J., Yu, Q. and Goh, K.C., 2009, "A Hybrid Evolutionary Algorithm for Attribute Selection in Data Mining". Journal of Expert System with Applications, 36, pp.8616-8630.

[21] Vijayarani, S. and Dhayanand, S., 2015, "Liver Disease Prediction using SVM and Naïve Bayes Algorithms", International Journal of Science

Engineering and Technology Research (IJSETR), Vol.4, pp. 816-820.

[22] Rajeswari, P. and Reena, G.S., 2010, "Analysis of Liver Disorder Using Data Mining Algorithm", Global Journal of Computer Science and Technology", 10, pp.48-52.

[23] Fathima, A.S. and Manimeglai, D., 2012, "Predictive Analysis for the Arbovirus- Dengue using SVM Classification", International Journal of Engineering and Technology, 2, pp.521-527.

[24] Ibrahim, F., Taib, M.N., Abas, W.A.B.W., Guan, C.C. and Sulaiman, S., 2005, "A Novel Dengue Fever (DF) and Dengue Haemorrhagic Fever (DHF) Analysis Using Artificial Neural Network (ANN)", Computer Methods and Programs in Biomedicine, 79, pp.273-281.