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A Review of Machine Learning Techniques and Applications for Health Care

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Abstract- Some of the greatest successes of artificial intelligence and machine learning have been in the field of computer vision. Computer vision focuses on the medical imaging and objects or pattern recognition. Machine learning is a subset of artificial intelligence techniques that refers to the ability to learning form the past data or experience then improve the accuracy or prediction ratio for the particular datasets, deep leaning is very popular in the health care sectors and for the electronic health record. In this paper we review the machine learning and deep learning techniques for the health care sectors, with some key features, In this review we mentioned the machine learning techniques will be provided for the variety of applications, then review about the previous author work in health care sectors and highlight some important diseases with their feature extraction techniques and accuracy.

Keyword: HealthCare, Machine learning, Deep Learning, Diseases, Supervised Learning.

I. INTRODUCTION

Now a day's maximum peoples are suffering from the some diseases, it is very important to identify these diseases among the patients, to identify the diseases we need some classification algorithms to classify the patients into high risk zone and no risk zone. Machine learning algorithm is an emerging filed which is applied to large datasets, complex datasets and with unstructured datasets to extract the exact information or some hidden concepts and relationships among the different attributes. Machine learning employs a variety of task such as prediction, learn from past data and detect useful pattern from large and unstructured datasets. These algorithms includes several application such as junk e-mail filtering, health care, education, marketing, pattern recognition, network intrusion detection etc. machine learning algorithms plays a significant role in health care sector in recent years, diseases identification and prediction is major challenging task now a days, by using machine learning techniques we can enhance the performance of used algorithms and improve prediction and classification ratios for the particular diseases. In this paper the main focus with the review of various machine learning algorithms for the diseases identification and prediction and compare their performances.

Recently there have been hybrid techniques also proposed for the disease identification and prediction. These hybrid methods is combination of machine learning algorithms done their work into two stage, in first stages is feature selection, which select the subset of features according to respective diseases and the second stage is the selected features used as the trained datasets and build the classification models.

Machine learning algorithms have some types like supervised algorithms, unsupervised algorithms and reinforcement algorithms. In Supervised learning method, class label is defined. The model is trained to test the data and predict the outcomes based on a predefined class label. In unsupervised learning method, class label is not defined. After developing the model, model is used to find patterns and relationships in the dataset. In reinforcement learning, it gives the ability of an agent to interact with the environment and find the best outcome using hit and trial method.

The rest of this paper as organized as follows, in section I introduced about the artificial intelligence techniques overview and their applications in health care, in nest section described about the machine learning and deep learning techniques and their review, In section III discuss about the feature extraction, In next section we mentioned the classification techniques for the diseases diagnosis, in the next section we discuss about the literature work for the various machine learning techniques with health care application and showed the respective author accuracy.

II. MACHINE LEARNING

Machine learning techniques play a significant role in training the computer or system for further prediction and decision making process in an efficient manner. Machine learning is the field of scientific and computational experimental study that concentrates on the design and different applications of techniques that can learn from databases. It has shown great success in building model for pattern recognition and prediction in medical sciences. Its domain ranges from computer vision to speech recognition to speech understanding. In addition, we can use the deep learning model, which is also a type of machine learning that empowers systems, to gain more facts and ideas. It's

evident that the artificial intelligence techniques is a set of machine-learning and deep-learning and these fields create intelligence models for the prediction and pattern recognition of a specific dataset for the number of applications. The following figure depicts the set of artificial intelligence algorithm which is an asset of the machine earning and deep-learning techniques.

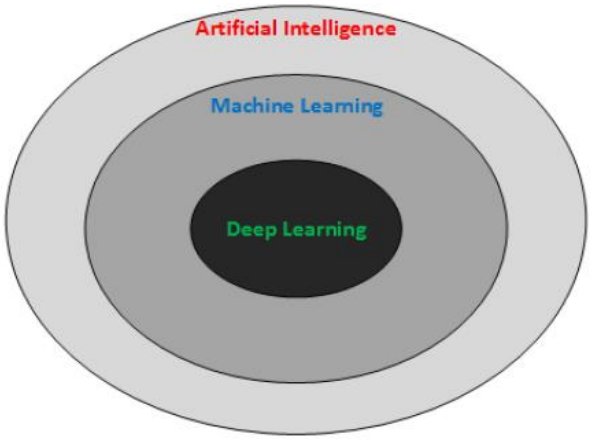

Fig 1: Machine learning subset of artificial intelligence techniques.

In machine learning, the interpretability is closely related with a subject that studies new predictive models. Depending on the time, when the interpretability is obtained, the interpretable machine-learning can generally be grouped into two categories - intrinsic (interpretability gain by restricting the complexity of machine learning model) and post-hoc (using techniques to examine the post-training model) interpretability.

Table 1: Machine learning applications.

Ref	Application	Machine Learning	Deep Learning	Classification Techniques	Optimization Techniques
[1]	Medical Science		✓		
[3]	Model Analysis	✓	✓		✓
[4]	Bio-metric Identification	✓			
[5]	Signal Processing for Hand Motion Patterns	✓		✓	
[6]	Agriculture Sector	✓		✓	
[7]	Medical Science			✓	
[9]	Medical Science	✓			
[10]	Medical Science		✓		
[16]	Medical Science	✓			
[17]	Medical Science	✓	✓		
[18]	Health Care	✓	✓		
[20]	Face Recognition	✓		✓	
[21]	Cancer Diseases	✓		✓	

III. FEATURE EXTRACTION

Object recognition is a process of identifying object basd on their features, fetaure extraction techniques is important for used in image classification for object recognition and pattern recognition. Fetaure extraction used with Image proceesing techiques to idetify and classify the any object based on their features and appearance. In this article we present the various classification schemes for the identify the diseases in helath care based on patient past history and their diagnosis and their features. As we know that each diseases have different symptoms and different history and different treatment, early identofication of any diseases is very helpful for thr patient treatment and as well as for doctors. Researchers calssify every diseases using their features such as the age, sex, blood group, blood presure,

alochol and cholostrol etc., In the below figure we present the efficient diseases detection flow graph and identify the health care diseases in earlier stage.

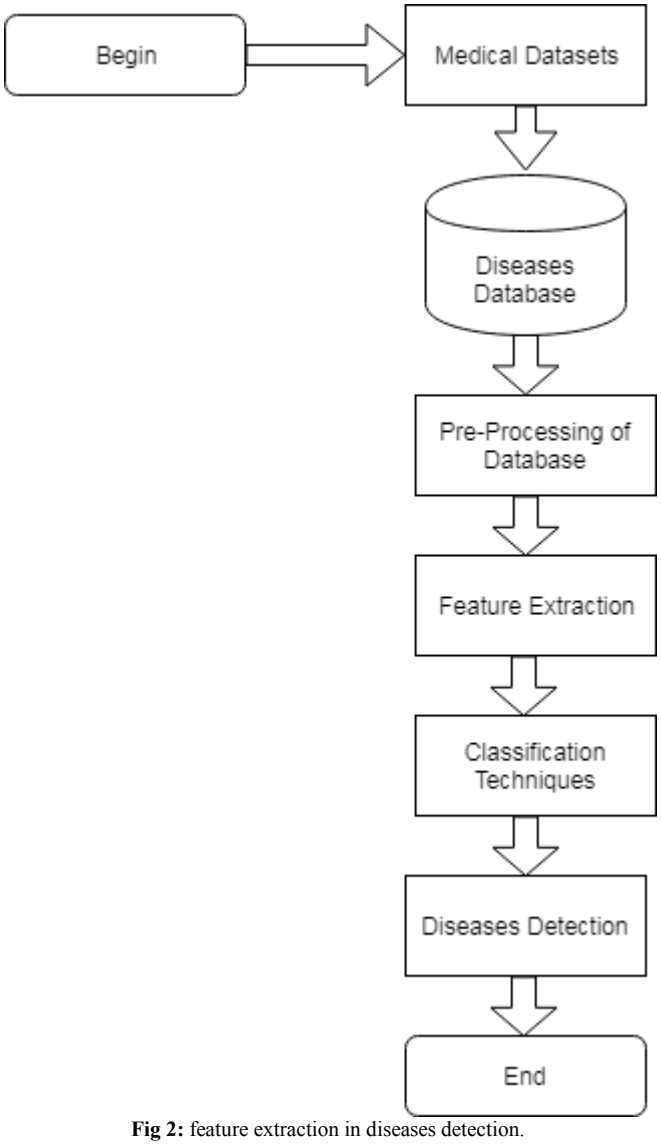

Fig 2: feature extraction in diseases detection.

IV. CLASSIFICATION

Classification is the task to divide the datasets into small parts based on their categories and characteristics, it is the methods of supervised machine learning types where we can set the target data and obtained results compare with the target output, if it is ok then no change otherwise the whole process again repeat until the obtained results are not satisfied. There are various techniques or classifiers are available to classify the data such as neural network, support vector machines, decision tree classifier and rule based classifier etc., in this article the classification techniques applied with the feature extraction, as we know that each datasets are having their own properties and their relevance class, here datasets are divided into their features class and then prepared the class or labeled for the proposed processing tasks.

In the below figure we present the classification process for the datasets, after the dataset obtained from the some reputed datasets repository such as the uci machine learning repository and kaggle datasets. After the importing datasets we also used the training and testing process for the datasets.

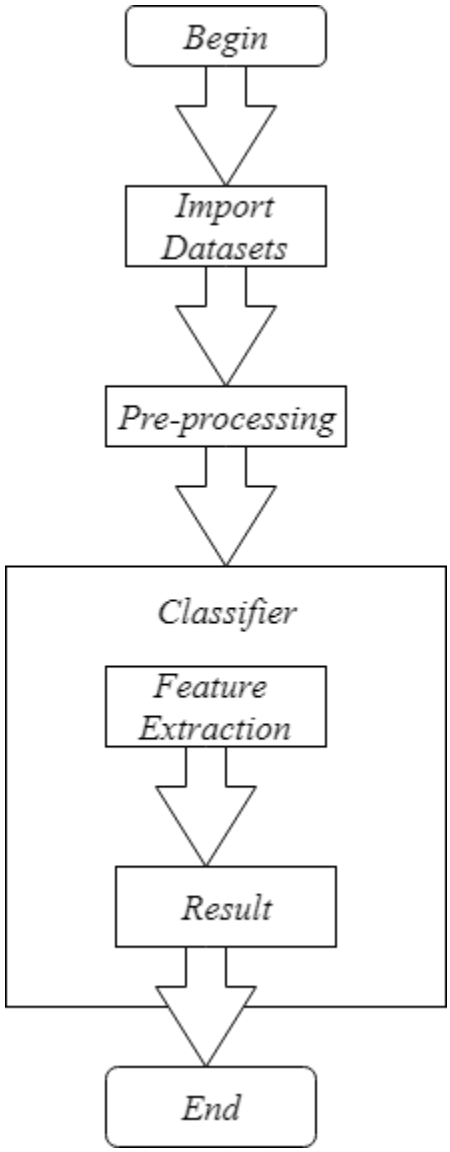

Fig 3: preprocessing of dataset and applied classification techniques.

V. RELATED WORK

[1] Depression is a mental illnesses influenced by some factors like any diseases, physical activates, financial loss and any other familiar issues. Here author present the deep neural network model to improve the prediction ratio of depression diseases by suing this model, the datasets are taken firm the korea national mental health care datasets,

here they compare the multiple regression model and deep neural network model with proposed model i.e. context deep neural network model, and proposed model gives better accuracy and less loss than the previous techniques.

[7] In this paper author proposed the hybrid model for the healthcare sector, here they proposed the combination of fuzzy model and convolution neural network with using the cancer and cleaveland datasets and find the comparative performance evaluation value like precision, recall and accuracy, their proposed method compare with the existing techniques and empirical results shows that the bet results than the existing techniques, as we know that the health care play a very key role in every person's life and by using classification and neural network techniques we can improve the prediction ratio of some diseases in early stage s ad save the human lives.

[10] In this research work author compare the different classifier model for the heart diseases datasets and find the accuracy based on the features and applied model, author proposed here the deep learning model and compare with the existing classification model such as the decision tree classifier, naïve bays classifier and support vector machines. As we know that the deep learning model is based on the machine learning intelligence model and gives best accuracy than the existing model. Here author used the heart diseases datasets features value form the uci machine learning repository.

[12] Support vector machines a types of supervised learning techniques, here author proposed the support vector machines based model for the diabetic patients and improve the accuracy over the different model, here author describe the proposed approach implementation with the graphics processing units. Deep learning is a new methodology that is emerged from the data mining that is used to derive insights from data.

Table 2: Comparative performance of different machine learning and other techniques for the health care applications.

Ref	Year	Used Datasets	Name of Diseases Datasets	Used Techniques	Accuracy
[1]	2020	Koria national health datasets	Depression diseases	Deep Neural Network Model	0.945
[7]	2019	UCI machine learning repository	Cancer and Cleveland diseases	Neural Network and Fuzzy Model	0.854
[9]	2019	Kaggle	Diabetic diseases	Split Machine	0.856
		datasets	datasets	Learning	
[10]	2019	UCI machine learning repository	Cleveland diseases	Deep Neural Network Model	0.8547
[11]	2019	UCI machine learning repository	Cardiovascular diseases datasets	Artificial and Machine learning approach	0.9823
[12]	2019	Balanced datasets	Diabetic diseases datasets	Support Vector Machine	0.9456
[13]	2019	Real-life clinical text data hospital in Wuhan, China	General diseases	Recurrent convolution neural network	0.957
[16]	2019	UCI machine learning repository	Cleveland diseases	Machine learning techniques	0.8847

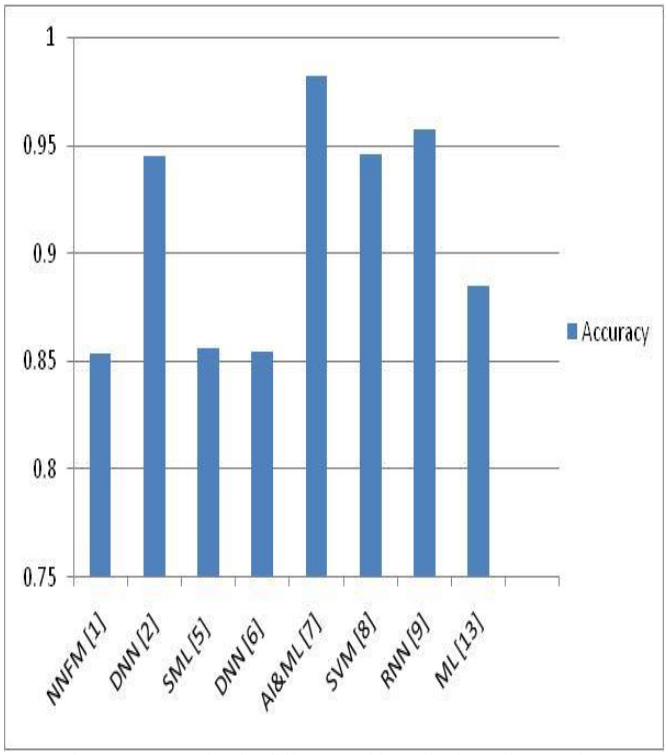

Fig 4: Accuracy for the different techiques in the review work.

VI. CONCLUSION

Deep learning is a subset of machine learning methods based on learning data representations. Neural network is the building block in deep learning, which is inspired by information processing and distributed communication nodes in biological systems. In the health care sector each disease must be identified in the earlier stage. In this paper we present the review of different machine learning algorithm for the heath care sector, here we also includes variety of diseases types and different diseases datasets comparative study based on their respective accuracy and other performance evaluation parameters value.

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