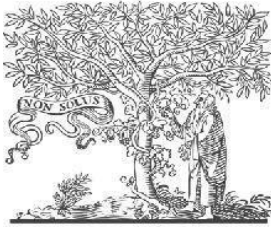


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## Upgrading Health Risk Prediction for Rheumatoid Arthritis using Deep Learning with Convolution Neural Network

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### Abstract

The main purpose of this paper is to discuss about several machine learning techniques employed for the study of rheumatoid arthritis prediction on the existing clinical data.

Rheumatoid is an autoimmune disease which affects primarily joints. An autoimmune disease is a type of illness in which our immune system affects its body incorrectly. In the case of Rheumatoid Arthritis, the primary mechanism involves the body's immune system attacking the joints. Due to this, the entire joints in the body may be affected and the chance of inflammation is more.

### Key messages

**Deep learning can help rheumatologists by infection grouping and forecast of individual sickness movement.**

**Artificial intelligence can possibly enable independence of patients, for example by giving individual treatment suggestions.**

**Automated image acknowledgment and normal language preparing will probably pioneer execution of man-made consciousness in rheumatology.**

### Introduction

Rheumatoid Arthritis is one of the autoimmune diseases, that starts from continuing tenderness and swelling around the joints. It occurs due to the inflammation of the muscle around the joints and in other organs in the body. It affects multiple organs in the body when our resistance is going down. But usually it is recognized in later stages; in that case, the patient must undergo a painful treatment. The predictive analysis is done based on the medical data which was available (Health records of the patients), the Hereditary influences, and along with ecological risk issues (the person with the following habits: smoking, drinking, deficiency of Vitamin D, eating of excessive red meat and no proper exercise etc.) Finally, the corresponding medication will be suggested by the concerned doctor. The storage

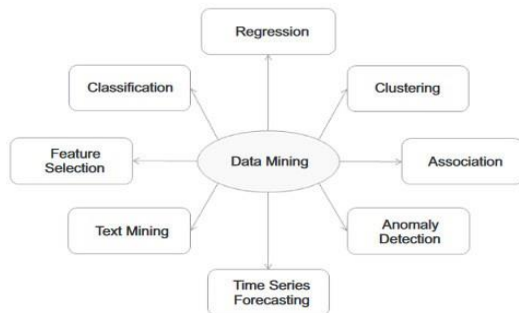
data related to the medical diagnosis, we can use it for analysis for any disease.

In current years, Data Mining becomes popular in the health field as there is a necessity of a well-planned investigative way to find out unidentified and valuable information in medical data. Medical related data is very vast and difficult to understand; it consists of hospital information, type of the insurance and health information of the patient, how much it costs for the treatment. If we can build the model to understand, analyze and predict the illness, it would be a benefit for the patient and medical practitioner. We can achieve better performance in terms of hospital and patient management.

Keyword's: Rheumatoid Arthritis, Deep Learning in Medicinal science, Prediction.

## Data Mining

Data Mining is one model that can handle huge volumes with many qualities & deploy complex algorithms to find out for patterns from the data. This can be divided in to two methods which will be used for analyzing the existing data & build up the models by relating the data based on some criteria and finally we will forecast the upcoming data.

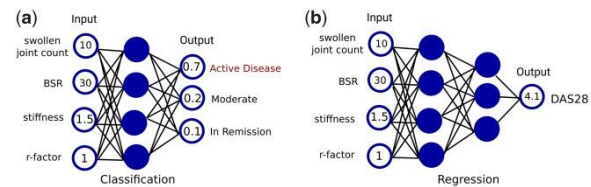


## Deep Learning Algorithms

In deep learning, data representations are learned automatically by deep neural networks. Deep neural networks can learn highly complex, non-linear mathematical functions. They consist of several sequential layers composed of many simple non-linear operations [3], so-called neurons. Historically, these operations were loosely inspired by (simplified) information processing principles in biological neurons: input signals coming from dendrites are integrated in the cell body, and once the membrane potential of the cell exceeds a certain threshold, it generates an action potential that is relayed to other connected neurons via its axon. In an artificial neural network, input features are fed into the first layer of neurons and are then propagated through the network to the output layer. Deep neural network architectures can deal with different types of input data (e.g. medical images, text or any other type of patient data). There exist different architectures for different types of input data, {e.g. fully connected neural networks convolution neural networks [3] and recurrent neural networks.

Convolution neural networks are typically used for images and other data with a grid-

like structure. They perform a mathematical convolution operation on every part of their inputs to learn increasingly abstract features in multiple layers. A typical example can be seen when convolution neural networks are trained on natural images. The features that arise through the training process in the first layers usually specialize in detecting contours and edges, and features in later layers are able to combine these earlier features to detect more complex objects, such as joints or hands.

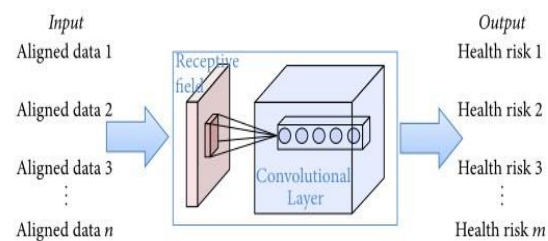


## Recurrent neural networks (RNNs)

It is one of the important categories of deep learning network where architectures are developed. RNN is a multi-layered neural network and it can store data in context nodes, permitting it to learn data classifications and output a number or another sequence.

## Convolution neural networks (CNN)

It is also a multi layered network and it is mainly used for image processing in real life scenarios. It is developed by taking an example of animal visual cortex. It developed by Yann LeCun: he initially developed a model to recognize the following things postal code and hand writing. In early stages of the recognition, each layer identifies the features, and in final stage all these features will be grouped and high-level correct input. In health care it is widely used in image processing.



## Impediments in deep learning

To train the system: it needs large amount of the data to analyze and anticipate some outcome. Generally, the training data can be millions and hundreds of millions and tens of millions.

Unable to get the accurate outcome in real scenario: Generally, we give training on certain type of data and get the outcome. These models remember the working out samples but does not acquire to simplify to new states and data set.

Requires high-performance hardware: Since it requires huge training data set to perform any task related to the real-world problem, the machine needs to be equipped with the efficient processing power. It required a large data centers and efficient processing units.

## Conclusion

Convolution neural network has ability to enhance the analytical accuracy of the training data. These models of CNN with deep learning are good approach to sort out the typical health care issues such as medical image analysis including sorting, discovery, and segmentation. The analysis results are used for diagnosing using computer and detection system as well. Considering the challenges in deep learning, the research should happen towards improvement areas so that we can achieve accurate and efficient results. As there is no exact reason for rheumatoid arthritis, Research scholars should consider genetically, clinical data of patient and current drastic environmental factors also need to be considered. Hence further research is also required to adopt the CNN with deep learning method to predictive analysis for rheumatoid arthritis.

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