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ARTIFICIAL INTELLIGENCE BASED APPLICATION FOR PERSONALIZED MEDICINE

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ABSTRACT
Due to the excellent performance of ML models when using complicated big data, the rise of machine learning (ML) applications has significantly accelerated the deployment of personalised medicine techniques for better health care over the past ten years. Precision medicine applications in clinical research and practise show significant promise when new ML approaches are used to the clinical investigation of chronic inflammatory illnesses. In this study, we emphasise the clinical uses of different ML approaches for prognosis, diagnosis, and prediction. Big data and ML algorithms can be used to identify the precise medicine for each individual based on their clinical, laboratory, nutrition and lifestyle-related data.The main objective of this invention is about creating an application that suggest the precision medicine to the patients. This application will really helpful is finding a best medicine to the patients based on their body condition and their genomics. This application will reduce the risk of trial and error by finding the best medicine for every individual.
KEYWORDS --Big data, ML algorithms, genomics, trial and error.

1.INTRODUCTION:

Precision medicine, which is frequently also referred to as precision health, is a novel approach to understanding health and disease based on patient-individual data, including medical diagnoses, clinical phenotypes (disease severity, degree of functional impairment, etc.), biologic investigations, including laboratory studies and imaging, as well as environmental, demographic, and lifestyle factors. These data are regarded as multi-modal when combined since they contain information from other areas. The exponential growth in the amount of biologic data that can now be gathered for each individual patient, which is largely attributable to the introduction of new technologies in the fields of medicine, genetics, metabolism, and imaging, among others, has had a significant impact on the development of precision medicine. The breadth and depth of diagnostic procedures available results in an astounding.

2.BENEFITS:

1. This can highly reduce the use of trial and error usage of medicine.
2. Help in finding the medicine for each individual in an effective drug level.
3. Big data helps finding the most accurate medicine for each individual.
4. ML technologies is capable of finding the hidden patterns in the dataset that can help us in prevent many future diseases.
5. Every individual will get customisable medicine that reduce the failure of results.

3. CHALLENGES:

3.1 QUALITY AND QUANTITY DATA:

As ML algorithm works mainly based on the dataset we put into train, the quality and size of the data need to be really high. Dataset should contain effective features and size of the data should be large. When we use a dataset that contain only few amount of data's then it will lead to the overfitting of the model and the accuracy of the prediction will be really poor. When we train a model with the under representative features then then it will lead to false prediction.

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3.2 EXTERNAL VALIDATION IN MACHINE LEARNING:

Since the model is being trained using the given dataset. Model gets trained based on the given data's and predicts based on the data. So sometimes splitting of data's can lead to poor prediction and lead to overfitting of model. This will lead to false prediction on the real time problems. To get high performance model, avoid splitting of data can be done . overfitting of model in ML usually means the trained data is being reproduced and it tends to fail in independent data.

4. IMPLEMENTATION IN REAL WORLD:

After transforming a well-defined model into clinical practise has been a challenge. The clinical impact of potentially promising ML models requires careful evaluation before considering implementation in clinical settings.

4.1 Data privacy:

The wide range of real time data's we use to train a model contains lots of personal information. De-indentification of data can be done for privacy purpose. But using re-identification we can get the personal information from the dataset. Which is one of the major concern in dataset. Thus rigorous data handling techniques should be used by companies and institutions to maintain the privacy of data.

These are some of the real time problems that should be taken care while preparing a ML based personalized medicine.

5. METHODOLOGY:

5.1 TOOLS USED IN MACHINE LEARNING:

Some important tools that can used by ML for personalised medicine are Classification, Regression and Clustering.

CLASSIFICATION:

Logistic Regression and Naive Bayes are the most common supervised learning classification algorithms.

REGRESSION:

Linear Regression is the most common supervised learning regression algorithm.

CLUSTERING:

K-means Algorithm, Mean Shift Algorithm, and Hierarchical Clustering are the common algorithms. These are all unsupervised, i.e. target variable is not available.

CLASSIFICATION AND REGERSSION COMBINED:

Support Vector Machine (SVM), Decision Tree, Random Forest, and K-Nearest Neighbors are types of supervised ML algorithms that are applicable in both classification and regression predictive problems.

6. WORKFLOW:

First step is data collection, then preprocessing of data, cleaning of data, feature classification, feature crossing…. Then data is processed using ML tools as mentioned above like classification, regression, clustering and so and so. Then the data is splitted into training, validation and test dataset and later it is trained by the model using the ML algorithms and then customized medicine is predicted for the independent data given by the patient.

A variety of technologies are used in precision medicine, a type of healthcare, to help patients receive specially tailored diagnoses and treatments. High performance computing (HPC) and massive biological datasets must be readily available for the deployment of a precision medicine route that has the potential to change healthcare. A series of computer algorithms that find patterns in multidimensional datasets and utilise those patterns to predict or optimise based on the availability of

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data on specific patients form the basis of this technique. In order to be able to anticipate from future datasets, artificial intelligence algorithms use learning methodologies based on categorization or pattern recognition to (multi-dimensional) input data.

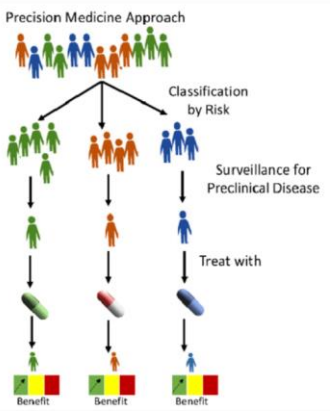

Fig 6.1 Precision Medicine Approach

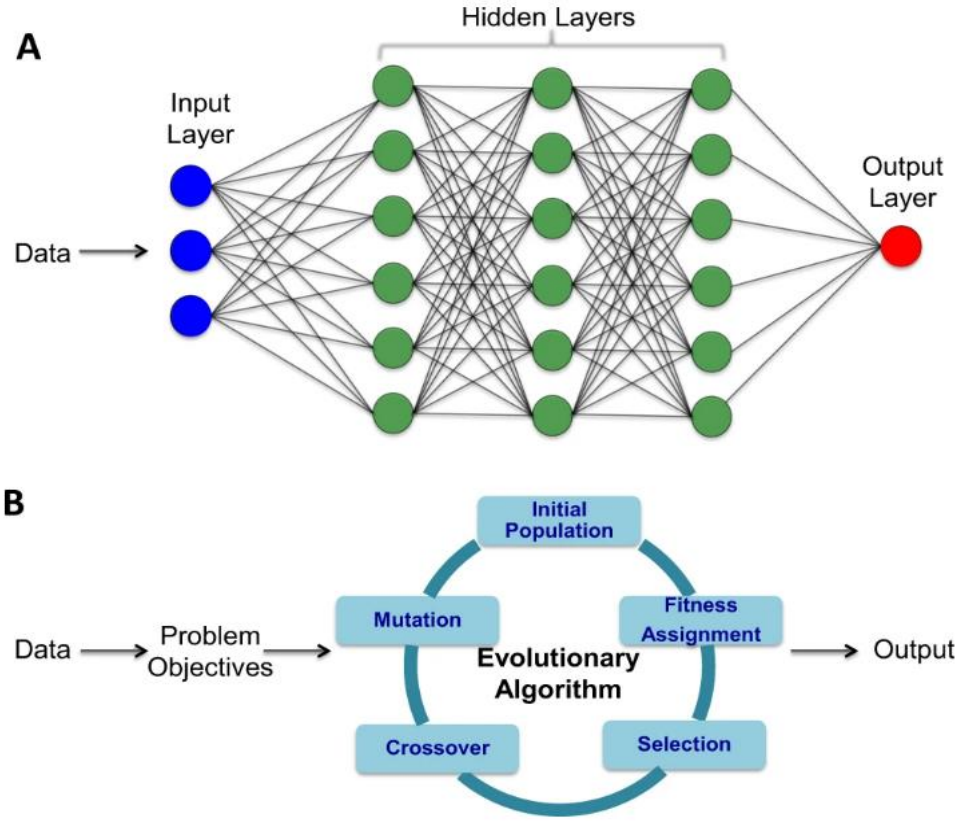

Fig 6.2 Programs Workflow

7. CONCLUSION:

The secret to maintaining and extending life is medicine. Since no two body systems are clinically identical, the drug must be tailored to the individual's body system. The current pandemic serves as a stark example of how a particular combination of medications, such as Remdisivir, Tocilizumab, etc., can effectively treat one category of patients while failing to stop the progression of another category of patients with nearly identical clinical parameters from a mild or moderate condition to a severe stage. This problem may be resolved by personalized medicine because of its more "customized" methodology. Other names for it include precision, individualized, and customized medicine.

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The goal of customized medicine is to choose and administer medicines specifically for each patient in order to provide the best results. Finding the best treatment is difficult because there are more and more potential predictors of good response, including genetic and other biomarkers, as well as treatment options.

Additionally, because the majority of clinical studies are based on average treatment outcomes, the same medications may become responsive for some people but non-responsive for others. The primary analysis of the COMBINE Study, one of the largest clinical studies examining alcohol dependence treatments in the USA, serves as an illustration in this regard. The study concluded that one of the potential pharmaceutical therapies, naltrexone, had an effect but that another, acamprosate, had no effect.

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