

Prevasive Healthcare and Machine Learning Algorithms

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Abstract— In Healthcare, prevention and cure have seen diverse advancement in technological schema. Chronic care and prevention care both stand on equal level with the same advancement in technology. We propose PREVASIVE method towards healthcare diagnosis. The word 'EVASIVE' means 'something which is intended to come'. The prosing word 'PERVASIVE' is to mean prevention against the one which is intended to come. In medical history, technology contributes towards diagnosis through machine learning algorithms. Machine learning algorithms are also applied for prediction towards prevention of various diseases and this in course help for cure for specific disease. We propose diagnosis of health through inheritance traits and surroundings the person inhibits from. For knowledge, inheritance traits, history of the person is collected as PHR (Personal Health Record). The GPS (Global Positioning System) module is used to see where the person inhibits. Location and movement of person is taken into consideration to know if the region has the history of any specific diseases' and GPS module applied with appropriate machine learning algorithms can help us determine diagnosis for diseases which are intended to come towards the specific person.

Keywords—Machine learning algorithm, PHR, Healthcare, dengue, swine flu, heart disease.

I. INTRODUCTION

Evolution of humankind has brought about many changes that we can see in this world today. Communication being the first on list of invention and healthcare in continuity. Communication's progress can be seen in development of today's technology. Healthcare has contributed towards human wellbeing. Invention of computers and its progression to mobile computing has played bigger part in development for communication. These communications now as data can be stored retrieved analyzed for the futures prediction. Machine learning plays a vital part in bringing all this together. Healthcare on other part has made development with help of these technological trends and equipment's. this enhanced Healthcare contributes to diagnosis, cure but also to prevention.

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We propose diagnosis of health through inheritance traits and surroundings the person inhibits from. For knowledge inheritance traits, history of the person is collected as PHR (Personal Health Record).

The GPS module is used to see where the person inhibits. Location and movement of person is taken into consideration to know if the region has the history of any specific diseases. PHR and GPS module applied with appropriate machine learning algorithms can help us determine diagnosis for diseases which are intended to come towards the specific person.

II. RELATED WORK

The healthcare system collects a huge amount of data which is not properly structured and not put to the optimum use. With incorporation of PHR (Personal Health Record) contribution towards health history of person is properly maintained [6]. There is also ongoing research in medical diagnosis which can predict the diseases of the heart, lungs and various tumors based on the past data collected from the patients.

In [1], the author proposes Heart Disease Prediction System using Machine learning algorithm, viz. MLP provides its users with a prediction result that gives the state of a user

leading to CAD. Due to the recent advancements in technology, the machine learning algorithms are evolved a lot and hence the author use Multi Layered Perceptron (MLP) in the proposed system because of its efficiency and accuracy.

In [19], the author has given broader view for analysis and forecast of cardiovascular disease using Scalar Vector Machine (SVM) and Random forest in R software. Chronic disease like swine flu [14] and dengue [20] also collaborate with machine learning algorithm to give analytical results [10]. Rare advancement like classifying ear disorder also have used Machine learning algorithms [7]. In most advance method, the author uses SVM and Random Forests for the disease called 'Apnea' in Neonate [9].

III. COMPONENTS OF MEDICAL RECORDS

Almost everyone on the planet born in a hospital has a medical record of some sort. A medical record is simply a record of a patient's health and medical history. Depending on the level or need of care a patient has, records may vary, but all medical records will contain some common information. The following is a list of the most common types of information.

Table 1. Components of Medical Records

Serial No	Components	Attributes
1	Personal Identification Information	a) Aadhar No. b) Name c) Age d) Sex
2	Medical History	a) Prior Diagnosis b) Medical care c) Medical Treatments d) Allergies e) Immunization
3	Inheritance History	a) Family Members Health History b) Heart Attack c) Cancer d) Diabetic
4	Medication History	a) Medicines
5	Location	a) Address b) Society c) GPS

IV. HEALTHCARE DIAGNOSIS

Our concept takes diagnostic in healthcare as dependent on inheritance traits and the location at which person is residing. Inheritance traits can be detected from PHR given by the person and documented properly. GPS module can be used to bring all the PHR in location together to see similarities to detect contagious disease. Diagnosis is done for Inheritance Disease and Contagious Diseases.

A. Inheritance Disease

Inheritance disease are hereditary disorder which are passed down from the parents' genes. Some of these disorders are listed as

- Heart Disease,
- High Blood Pressure,
- Alzheimer's disease,
- Arthritis,
- Diabetes,
- Cancer,
- Obesity.

B. Contagious Disease

A contagious disease is transmissible diseases, which are transmitted to other persons, either by physical contact with the person suffering the disease, or by casual contact with their secretions or objects touched by them or airborne route among other routes.

- Swine Flu
- Dengue
- Tuberculosis.
- Flu.
- Cholera
- Measles

V. METHODOLOGY

Machine Learning has been subject of interest for healthcare diagnosis as stated above. We propose basic machine learning method in which we use classification and clustering. Classification is applied to category of inheritance disease and clustering is applied to contagious disease.

A. Classification

Classification is the process of predicting the class of given data points. Classes are sometimes called as targets/ labels or categories. Classification predictive modelling is the task of approximating a mapping function (f) from input variables (X) to discrete output variables (y).

Few of the terminologies encountered in machine learning – classification:

- **Classifier:** An algorithm that maps the input data to a specific category.
- **Classification model:** A classification model tries to draw some conclusion from the input values given for training. It will predict the class labels/categories for the new data.
- **Feature:** A feature is an individual measurable property of a phenomenon being observed.
- **Binary Classification:** Classification task with two possible outcomes.

- **Multi class classification:** Classification with more than two classes. In multi class classification each sample is assigned to one and only one target label.
- **Multi label classification:** Classification task where each sample is mapped to a set of target labels (more than one class).

The following are the steps involved in building a classification model:

- **Initialize** the classifier to be used.
- **Train the classifier:** All classifiers in scikit-learn uses a fit (X, y) method to fit the model(training) for the given train data X and train label y.
- **Predict the target:** Given an unlabelled observation X, the predict(X) returns the predicted label y.
- **Evaluate** the classifier model

Algorithm which can be used for classifier:

- **Random Forests:** Random forest classifier is a meta-estimator that fits a number of decision trees on various sub-samples of datasets and uses average to improve the predictive accuracy of the model and controls over-fitting. The sub-sample size is always the same as the original input sample size, but the samples are drawn with replacement.
- **SVM:** Support vector machine is a representation of the training data as points in space separated into categories by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall.

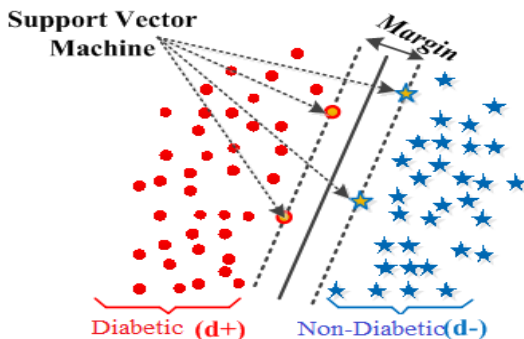


Figure 1: SVM for Classification

Application of SVM on PHR for Inheritance disease helps to carry out true false value for person to predict whether he is susceptible to inherited diseases. If father of person has history of diabetes, we can enumerate that the person can get the same disease by inheritance and thus do pervasive diagnosis for same.

B. Clustering:

Clustering is the task of dividing the population or data points into a number of groups such that data points in the same groups are more similar to other data points in the same group than those in other groups. The aim is to segregate groups with similar traits and assign them into clusters.

Types of clustering algorithms:

- Partitioning Method
- Grid-Based Method
- Density-based Method
- Hierarchical Method
- Model-Based Method
- Constraint-based Method

Algorithms which can be used in clustering:

- **K-means Clustering:** K-Means is a clustering algorithm used to classify or group the objects based on attributes/features that are partitioned into K number of groups where K is positive integer number. In this paper, k-means clustering algorithm can partition the dengue data set into k clusters. The grouping is achieved by minimizing the sum of squares of distances between data and the related cluster centroid. [8]

Application of K-means algorithm for contagious disease like dengue and swine flu can help make out the cluster of people more infected in the region and thus help for diagnosis.

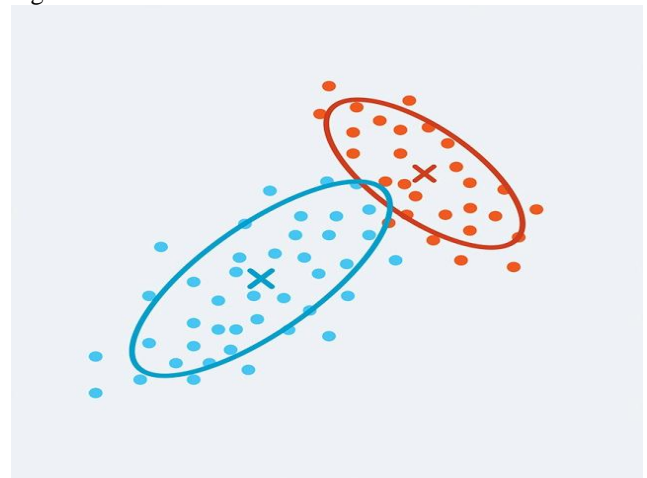


Figure 2 : K-means for Clustering

VI. OVERALL METHODOLOGY

PHR forms the identity of person which covers history as well the place he is residing. Applying classification to history of his PHR gives accuracy for deducting inheritance disease, the person might come forth to in coming years or decades. Applying K-means clustering with the area the person is

residing to disease the region is prone to will give perfect grouping of disease he may be suffering from when he comes for diagnosis and also, he can take some preventive measures to avoid the same.

VII. CONCLUSION AND FUTURE SCOPE

Thus, with help of intelligent machine learning algorithms we deduce its application on two separate entities with two separate algorithms for conclusive result. This results for Pervasive healthcare diagnosis as proposed.

With increasing stress and luxury life we are earning, future work can include diagnosis for LIFESTYLE LIVING and PSYCHOLOGICAL WELLNESS. Deep Learning Methods can be applied to Healthcare for the same.

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