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Adverse Drug Reaction Detection System On the basis of Clinical Data

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***Abstract*— Adverse drug reactions (ADRs) is a big challenge in drug development process. Medicines are designed to cure, treat, or prevent diseases; however, there are also risks in taking any medicine.Particularly short term or long term ADR's can cause serious harm to patients. ADR's are the harmful reactions of the drugs caused to humans due to allergies, overdose, chemical reactions between two chemicals in the medicines, etc. Discovering unknown ADR's in post-marketing surveillance as early as possible is of great importance, as it save lives and prevent harmful consequences. We will be using data mining technique Naive Bayes classifier for classification of ADR's. Timely safety surveillance after a drugs release on the market is therefore an urgent goal of public health systems. We are going to propose software system approach for proactive monitoring and detecting potential ADR's using clinical records.**

Index Terms*— *Adverse Drug Reaction (ADR), Post-marketing surveillance, Naïve Bayes,Association Rule Mining (ARM).

I. INTRODUCTION

ADRs represent a major world-wide problem [1]. They can complicate a patient's medical condition and contribute to increased healthiness, even death. An adverse drug (i.e. Medical product) reaction is a "response to a drug which is Noxious and unintended. All medical products are required to be safe. Safety does not mean zero risk. A *safe product* is one that has reasonable risks, given the magnitude of the benefit expected and the alternatives availableA Drug is less "Safe" if and only if it is used in a way that decreases foreseeable benefit and increases the risk. So monitoring the drugs or any medical product plays vital role, and following are the methods used for monitoring the drugs and there effects.

Practices used for ADR detection:

A. Pre-Marketing Surveillance:

Pre-Marketing Surveillance is the practice of collecting the data throughout the phases of clinical drug development until product approval. In Pre-Marketing we design the trials which contributes to adequate assessment of relatedness. This trials based on the Causality assessment i.e. drug relationship to adverse events .And active or positive control studies of drugs. Data contributing to the pre marketing is collected through trials on the animals, clinical pharmacology, controlled and uncontrolled clinical trials, studies for other indications, epidemiological data, drugs with similar mechanism of action or populations.

B. Post- Marketing Surveillance:

Post- Marketing Surveillance is the practice which used the technique of collecting the data following the approval of a drug. Post marketing technique handles issues like low frequency reactions, previously unrecognized serious events, long term effects of particular drug, confusion with product name, labelling, packaging, etc. All above issues are monitored on the basis of signals generated. This signals are generated using reports from regulatory database, literature publications, monitoring of AERs crude data. There are some special signals like life-threatening, hospitalization, persistent disability, death, etc. Data contributing to the post marketing is collected through spontaneous reporting, health care professionals, drug manufactures, etc.

II. PROCEDURE FOR PAPER SUBMISSION

A. *Review Stage*

Submit your manuscript electronically for review.

B. *Final Stage*

When you submit your final version, after your paper has been accepted, prepare it in two-column format, including figures and tables.

C. *Figures*

As said, to insert images in *Word*, position the cursor at the insertion point and either use Insert | Picture | From File or copy the image to the Windows clipboard and then Edit | Paste Special | Picture (with "Float over text" unchecked).

The authors of the accepted manuscripts will be given a copyright form and the form should accompany your final submission.

III. LIMITATIONS

Limitations:

For pre-marketing surveillance or assessment size of patient population studied is big very big concern or limitation. Such narrow population indicates the exclusion of certain disease

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states as well as it does not shows how eventually it gets used in practice.
For Post-marketing surveillance, as it is continuous/spontaneous monitoring so maintaining consistency in monitoring is major issue or limitation. As it is passive surveillance so underreporting may occurs for various drugs. There may be concern about existence of bias reporting. As it depends on the reports so quality and completeness can be questioned.

Our solution to above problems:
If we compare the above two practices its observed that post marketing strategy is far more reliable than that off pre marketing. So we are going for post marketing surveillance. The idea behind the our work is to minimize the occurrence of ADR's by processing the past medical data by using Naïve Bayes and Association Rule Mining. On the basis of above mention algorithms we have design the system to solve the real world problem.

IV. IMPLEMENTATION

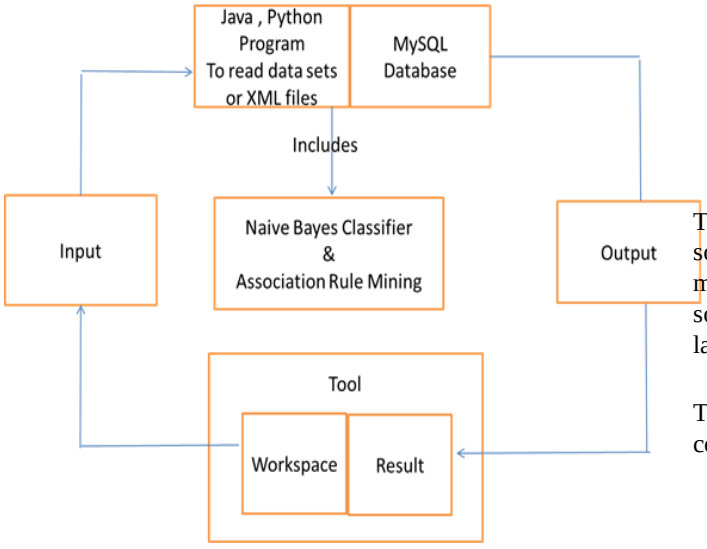

Fig.1 System Model

Features:

- Data classification in various attributes
- Fast searching
- Easy implementation
- Alternate Rule generation

Prerequisite:

1. OS: Windows 7/8
2. Software: Eclipse, Xamp server, web browsers
3. Database: MySQL
4. Algorithms: Navie bayes, ARM

Installation Process:

1. Eclipse kepler Installation**:**
Starting the download:
   1. Go to http://www.eclipse.org/downloads/packages/eclipse-ide-java-ee-developers/mars2
   2. In the upper right area of the page, select the download button.
   3. Click the Download button for the download option that you want to install.
   4. Save the installer file to your system.

2. MySQL Installation Steps:

1. Download the MySQL database from the MySQL site http://www.mysql.com by clicking on the download tab.

2. Unzip the setup files and execute the download MSL file.

Plug-in:

1) JDK 1.8
2) MySQL JDBC Driver-mysql-connector-java-5.1.13.bin.jar
3) JavaLib.jar

Tomcat Server v7.8

V. WORKING

The patient's data is an important aspect of the system which is a source of information required for processing of the data. Here, mining potential ADR signals is done through an extensive data source that contains administrative data, pharmacy, and clinical laboratory data.

The proposed model consists of the following important concepts:

a) Acquisition of data
b) Preprocessing
c) Naïve Bayes based classification
d) Detection and Prediction
e) Association Rule mining

a) Acquisition of data:

We are going to collect the data (i.e. medical history of patient, percentage compositions of elements of medicine, etc) from the likes of pharmacists, MR's, Doctors, etc. The collected data maybe in the structured format or unstructured format.

b) Preprocessing:

In preprocessing step, semi structured or unstructured data will be converted into the structured format by organizing the data according to appropriate attributes.

c) Classification:

The Naïve Bayesian model is simple and easy to build. It has no complicated parameters which makes it useful for large datasets. We are using Naïve Bayes classification for classifying data. This classification was named after the Thomas Bayes (1702-1761) who proposed Bayes theorem. The Bayesian classification provides practical learning algorithms and prior knowledge and observed data can be combined [2].

d) Detection And Prediction

By using Naive Bayes, we process patient's medical data to detect whether he/she is having ADR or not. By using Association rule we predict the appropriate rules to prevent the ADR [4].

e) Association Rule mining :

Association Rule mining is also easy and simple to execute. It was initially used for market basket analysis which included relating the customer purchases [3]. In several data mining tasks, frequent pattern mining plays an important role in generating association rules.[6]

VI. SYSTEM TESTING

1. Adding records and GUI testing:

Fig.2 Test 1

Above screenshots shows us the how the records had been added in database and algorithmic implementation.

2. Algorithmic Testing:

Fig.3 Test 2

Above screenshot shows us the navie bayes classification.

Fig.4 Test 3

Above screenshot show us the rule generation by using association rule mining.

VII. FUTURE SCOPE

Acquisition of data, Pre-processing, a, Naïve Bayes classifier and association rule mining, Detection and prediction. The component will be designed as functional unit and will be implemented as classes.

VIII. CONCLUSION

Adverse drug reactions have implications not only for the patient, but for the entire health care system. Reporting of ADRs provides clinicians and health care companies valuable insight into the toxicity profile of an agent. We are detecting the patients is having the ADR or NON ADR.If patients is having ADR then we are giving the suggestions to use this disease.

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