

MEDICATION SYSTEM BASED ON HEALTHCARE DATA

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ABSTRACT

In most of the hospitals and clinics, each doctor follows practice maintaining medical notes to keep patient's history handy. These notes contain symptoms, diagnosis, diseases and treatment related information like drug names, doses etc. These clinical notes are used as a source of healthcare and utilized to provide proper medication and treatment to patients. In this research paper, medication system has been developed based on medical record (clinical notes) of a patient with implementation of Nonnegative Matrix Factorization (NMF) clustering algorithm. NMF used to extract symptoms of patients from available medical history and advise appropriate medication to recover patient from illness.

Keywords: Clinical notes, Healthcare, Clustering, NMF

I INTRODUCTION

A lot of information is available in clinical notes, medical records, medical reports etc. Information is spread in two forms: First medication condition like symptoms, injuries, disease etc. Second is response to patients like diagnosis, medicines, drugs, procedures etc [1]. To improve the public health, clinical notes play very useful role of superior source. From the clinical notes one can extract symptoms and medications and utilize it for better decision making and treatment. The symptoms can be collected from different clinical notes which are in unstructured format which becomes challenging task to extract apposite symptoms from clinical notes. Medications are also available in clinical notes with name of drug, dosage etc. So there is need to use this source of healthcare information in the form of clinical notes and find better medication.

1.1 CLUSTERING

Clustering is very popular technique in data mining. Available data is assembled into meaningful sub-modules referred as clusters [2]. One cluster has number of elements which has natural similarities [3]. Clustering can be generally used in mining, prediction etc. There are many clustering algorithms are used for mining the data. Following figure shows algorithm used for clustering [4].

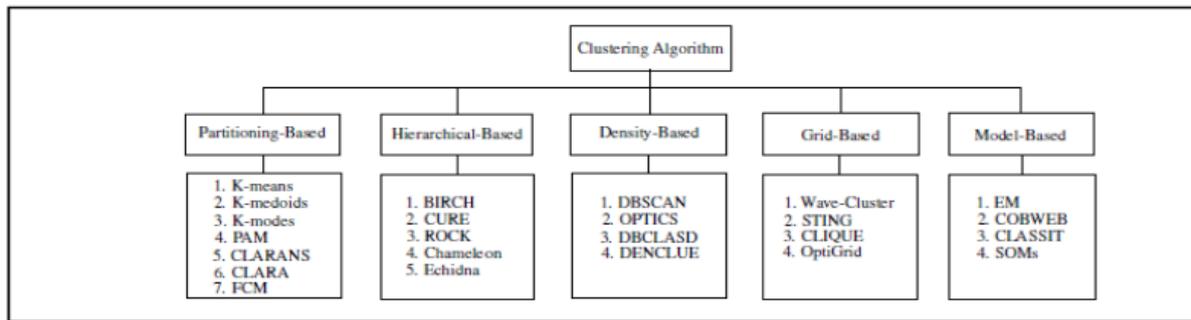


Figure1. Clustering Algorithms [4]

NONNEGATIVE MATRIX FACTORIZATION (NMF):

This is a method of factorization in which

Nonnegative matrix A: $n \times m$

Nonnegative Matrix W: $n \times k$

Matrix H: $k \times m$

And is denoted as using Euclidean Distance as

$$\text{Min } \|A - WH\|_2$$

Where, WH is product of nonnegative matrix $n \times k$ and $k \times m$ [1].

PROBLEM STATEMENT

To implement system with the clustering algorithm and various rules to medicate on the basis of symptoms collected out of relevant clinical notes.

II PROPOSED WORK

Clinical notes are used as health data. After preprocessing of data author have implemented clustering algorithm. Different clusters are created out of which different symptoms and medications are extracted.

III EXPERIMENT CONDUCTED

Different clinical notes are selected as data set and clean data by removing the words like a, and, is, to, all, the, his, or, of, are etc defined term as Stemming. Figure 1 shows the stemming. Then nonnegative matrix factorization clustering algorithm is implemented and data is separated in different clusters. This is shown in Figure 2 and Figure 3. From the clusters information related to symptoms and medication has been found out using which the medication for appropriate symptoms has been recommended.

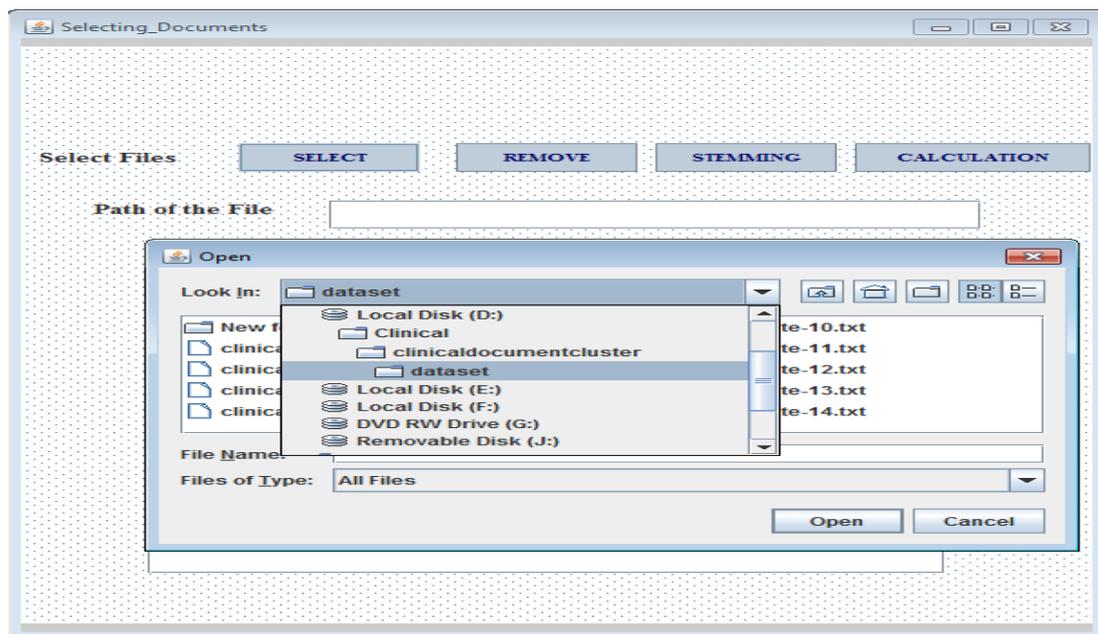


Figure 2. Stemming

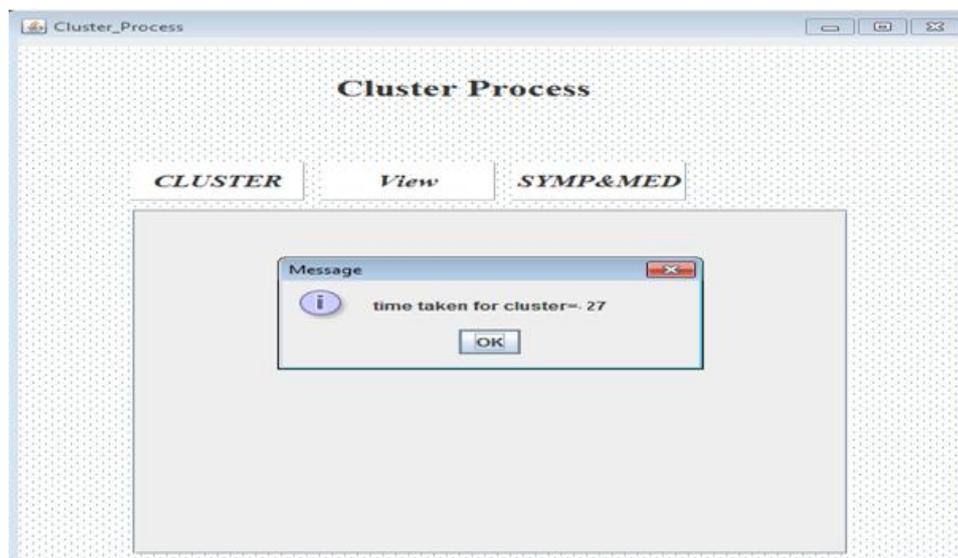
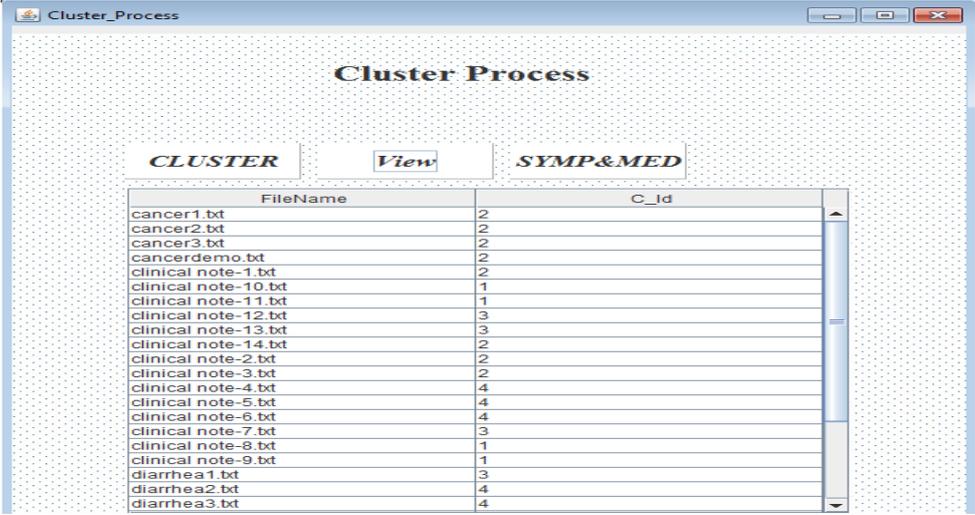


Figure 3. Time Taken for Clustering



The screenshot shows a window titled "Cluster_Process" with a table of clusters. The table has two columns: "FileName" and "C_Id". The data is as follows:

FileName	C_Id
cancer1.txt	2
cancer2.txt	2
cancer3.txt	2
cancerdemo.txt	2
clinical note-1.txt	2
clinical note-10.txt	1
clinical note-11.txt	1
clinical note-12.txt	3
clinical note-13.txt	3
clinical note-14.txt	2
clinical note-2.txt	2
clinical note-3.txt	2
clinical note-4.txt	4
clinical note-5.txt	4
clinical note-6.txt	4
clinical note-7.txt	3
clinical note-8.txt	1
clinical note-9.txt	1
diarrhea1.txt	3
diarrhea2.txt	4
diarrhea3.txt	4

Figure 4. Clusters



The screenshot shows a window titled "Query_Search" with a search interface. It features a dropdown menu for "SYMPTOMS" with "Shortness of breath" selected. Below this is a text input field containing "Shortness of breath" and a "Search" button. Underneath, the "MEDICATION" section displays the following text:

Beta blockers slow the heart and make it beat with less contracting force, so blood pressure drops and the heart works less hard. They are used for high blood pressure, chest pain, and to prevent repeat attacks. Nitrates (nitroglycerin) relax blood vessels and stop chest pain

Figure 5. Suggested Medications

IV RESULTS

From this experiment the clustering algorithm is implemented, symptoms are collected out of relevant notes and suggested proper medications to recover patient to fit.

V CONCLUSION

Nonnegative Matrix Factorization Clustering Algorithm can be applied on structured, non-structured data, extract required data and utilize it for better decision making process.

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