A Clustering Approach for Optimization of Search Result

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Abstract—With the massive increase in the use of internet and web data, retrieval of relevant information quickly is very important, and some efficient technique is required for data analysis. Grouping of objects may be helpful for data analysis, where clustering is useful. Clustering on-line result is a challenging technique. Search option is excessively used in almost every website. The study proposes a hybrid clustering algorithm to optimize search result of the website. The domain of the website is medical. Matrices will be used to analyze user behaviour. User trust will be measured. Clustering of search result will facilitate users to get the relevant information in a quick manner.

Index Terms—clustering, analytics, cross validation, Euclidean distance

I. INTRODUCTION

Search results are presented to users in a list, which contains title and snippet. Most of the results are not relevant to the user for many reasons such as one word can be used for various purposes. Select relevant information from the list is not easy as well as time consuming. Results are clustered in meaningful folder will facilitate user to search relevant result in a quick manner. Web Analytics is the field concerned with understanding and optimizing the Web usage. “Web Analytics is the measurement, collection, analysis and reporting of internet data for the purpose of understanding and optimizing web usage” [1]. Web Analytics can be classified in two categories: one is off-site web analytics and the other is on-site web analytics. Website’s potential audience, visibility and commencing that are happening on the internet as a whole are measurements, used for off-site web analytics. On-site web analytics measures a visitor’s use for a website that is owned or maintained by an organization or an individual. Clustering is the process of partitioning a set of data (or objects) in a set of meaningful sub-class called clusters. Clustering organizes data items into clusters, such that items within a cluster are more similar in nature than they are to items in the another cluster [2].

Cluster analysis is being used in various applications, such as data analysis, pattern recognition, image processing and business purpose [3].

A. Motivation

There is a massive increase in the use of internet and web data; hence, Web Analytics plays an important role. For the web data, data analysis is required in various ways. It is needed to group these data or objects for effective analysis, where clustering is very useful. Clustering occurs in every aspect of our daily life. People encounter a large amount of information store, and analyzes it for various uses. Grouping these data into a set of clusters is one of the important tasks [1]. Clustering is an important procedure in a variety of fields, yet cluster analysis is a challenging problem, as many factors play an important role. Same algorithm with different parameters, using different presentation or using different similarity measure may generate different output.

II. RELATED WORK

Rui Xu [4] presented survey of various clustering algorithm, its applications, and various proximity measures used for similarity checking between a pair of objects, object and cluster. They also discussed cluster validation.

A. K. Jain et al. [5] presented a review of data clustering methods. They also covered some applications of clustering algorithms such as informal retrieval, image segmentation and object recognition. Different approaches of clustering are explained in the paper.

P. Rai and S. Singh [6] provided survey of various clustering techniques used in data mining. Cluster can be expressed in various ways depending upon the clustering technique used such as: Any object can belong to only one cluster. An object may belong to more than one cluster. Object may belong to each cluster with a certain probability i.e. they may be probabilistic.

Ugo scaiella et al. [7] proposed a novel labelled-clustering algorithm, to move to graph-of-topic paradigm based on the spectral properties of a graph from big-of-words. Search engine returns clustering of short text into a list of folders, summarize the context of the searched keyword within the result pages.

M. Granitzer et al. [8] proposed an interactive system WebRat that is for visualizing and refining search result sets. Documents matching a query are clustered and visualized as a counter map of islands. Thematic clusters were built, analyzed and visualized in real time. It can be
used to interactively visualize and refine queries by selecting from the keywords and presented clusters.

S. Khy et al. [9] proposed a novelty based document clustering method. Higher weight is assigned to recent documents, and generate cluster that focus on recent topics.

T. Rui et al. [10] aims to find out the method of applying other nature-inspired optimization techniques such as bats, and cuckoos for clustering to use for web intelligence data. Experiments were conducted over four data sets.

N. Yang et al. [11] proposed a new clustering method by extending K-means. It combines the links and in-snippets together. The attached short text to in-link is valuable information and is helpful to reach high clustering quality.

Md. Ezaz Ahmed et al. [12] addresses the applications of data mining tools Weka by applying K-means clustering from huge data sets. They improve the quality of websites by grouping similar websites in the group for which they use clustering.

Rani Qumsiyeh et al. [13] proposed query-based cluster, which generate concise clusters of documents covering various subject area.

Hector Menendez et al. [14] presented a strategy to reduce the dimension of the attribute. A. K. Sharma et al. [15] presented a technique for search result optimization that is based on historical query logs. The technique first clusters query in query logs and after that captures the sequential patterns of clicked web pages in every cluster using an algorithm. All queries are considered to be unassigned to a cluster. Each query is tested and if the similarity value is above the prespecified threshold value, then the query is placed in the cluster. This process is repeated until all the queries are placed in some cluster. Search result list is re-ranked finally.

Larry Kim [16] proposed a system that generate the database such as compilation, manipulation and segmentation analysis for search engine optimization and marketing tool.

S. Kohli et al. [17] presented a web analytics tool, “Keyword Similarity Measure Tool” (KSMT). The tool aims to take care of the limitations of similar keywords in the report and improves the data accuracy, thus optimizing the report. It aims to provide a consolidated view and content analysis, by combining the matrices like bounce-rate, visits for the similar content analysis. KSMT algorithm was used to measure keyword similarity and combine keyword based on factor of similarity.

S. K. Jayanti et al. [18] proposed and implemented an algorithm WESPACT, which use the genetic algorithm to classify the web pages as spam. Decision tree's output is the result of the algorithm. Study used WEBSPAM 2007 dataset for experiment.

Ela Kumar et al. [19] designed spamizer that detects spam host or page. System analyzes and improves currently given five link algorithms. It generates spamizer spamicity score by combining spamicity score of the used algorithm merge the result obtained.

Cailing Dong et al. [20] proposed a web browser plug-in to support online web spam detection. Spam pages are filtered on the client side, i.e., web browser. They developed an ensemble learning framework for detection of online web spam.

Ian Grout and Abu Khari Bin A’ain [21], work to extend an on-line tutorial system to analyse how user experience for tutorial for education context. Postgraduate students are taken as target audience. They used PHP to create web pages for tutorial. Paper considers four key aspects: 1) Key metrics are identified for analyzing the use of tutorial. 2) Data and user actions are identified to generate and present the metrics. 3) Implementation and integration of script into already existing system. 4) To enhance the learning experience of student, analyze and modify the tutorial system.

Jose G. Moreno and Gael Dias [22] performed analysis over frequently used algorithm for web search result clustering and evaluation metrics. They used data set OPD-239 and Moresque for experiment. Initially, paper provides the result of the algorithm by using best parameter setting. Then they showed that a simple strategy of the algorithm can lead to a scalable and real world solution. Finally some conclusion is drawn about evaluation metrics and their bias to the number of output clusters. Set of web result collected for each query, and classified manually into the disambiguation Wikipedia pages, which formed the reference clusters.

Jinxiu Yu et al. [23] suggested a new form of metric that measure web search results in satisfaction encompassing user behaviour. They introduced the user behaviour, click-through rate that measure the performance of search engine. Users are college students and graduates and data collected from various search engine users.

Rana Forsati et al. [24] proposed an algorithm to optimize K-means algorithm by integrating harmony clustering with K-means, which is less dependent on the initial parameters such as randomly chosen initial cluster centres. This method combines the speed of K-means with the power of HSCLUS.

### III. Research Gaps

- The selection of distance measure
- Choosing the initial clusters
- High Dimensionality

In addition to it, following research gaps can be identified:

- Page ranking manipulation, which effect the search result and user trust as well.
- There is no clarity in discrimination of the keyword of that domain.

### IV. Problem Statement

The clustering techniques developed so far need some improvement for web. It is to be developed keeping in mind the research gaps in the techniques. As noted in the previous section, the techniques proposed so far suffer from the problems of scalability, high dimensionality,
loosely structured, complex attributes, selection of initial
clusters and distance measure. Research is required to
come up with a technique efficient in terms of one or
more of above criteria for the web such as search result as
it is used excessively in almost every website.

V. OBJECTIVES

- Improve search result of a medical website. That
  will take care of large volume of data as well as high
dimensional features.
- Clustering short text fragment returned in the
  result of keyword given using hybrid approach.
- Use keywords to make folder labels.
- Analyze user behaviour using some metrics such as
  visit characterization, engagement term and
  conversion terms.
- Measure user trust.

The above mentioned task will be accomplished
keeping in mind the requirements of clustering for web
search result. The principal behind search result
clustering is to group results into distinct clusters so that
the user can choose relevant document in an efficient way.

VI. RESEARCH METHODOLOGY

A. Literature Survey

A comprehensive review will be conducted to understand
different aspects of the clustering algorithm used for web elements.

B. Pre-Processing

Data is to be pre-processed such as missing values are
to be filled with common values.

C. Design and Implementation

For clustering K-means, algorithm combined with a
genetic algorithm will be used. As K-mean algorithm works well for large datasets but lack global perspective,
need to define k initially and sensitive to outliers. It
seems a hybrid algorithm that combines the features of
both techniques can result in an algorithm that
outperforms either one individually.

The proposed algorithm will be implemented using
MATLAB language. Spam detection to improve search result accuracy. Web spam can significantly deteriorate
the quality of search result.

D. Experimental Focus for Evaluating the Technique

- Cross-Validation technique is to be used for
  conducting the experiments.
- Experiments will be conducted.
- Evaluation parameters: Relevancy and speed are
to be taken into consideration.

Following test will be performed:
- Precision
- Recall
- F-Measure item True negative item True negative
- User evaluation to see the satisfaction

VII. ARCHITECTURE OF SEARCH RESULT OPTIMIZER SYSTEM

- Similarity Analyzer will measure the closeness
  between objects using Euclidian distance.
- Clustering Tool will group the search result, to
  improve visualization and fast access.
- Analysis tool will be developed to measure user
  behaviour and user trust.

VIII. CONCLUSION

Use of electronic data and internet is increasing day by
day. Thus, Web Analytics plays an important role.
Clustering of web element is useful for grouping of data
and objects in various ways for efficient analysis.
Clustering is an important unsupervised technique, which
is being used for research work in various fields. We feel
proposed system will improve search result visualization
and length time keeping in mind the relevancy of the
keyword. User trust is also an important factor, which is
taken into consideration.

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