Domain-Specific Search Engine Optimization using Healthcare Ontology and a Neural Network Back-propagation Approach

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Abstract
Search engines are a dime a dozen today. Trawling the net for content with specific keywords and using particular algorithms reduces search time. The existing search engines work only by means of related keywords, and their success largely depends on the weight of the keywords in question. As a general rule, however, search engines lose the connect between the semantic relationship of the keyword and the content. Our proposed method concentrates on creating an ontology for a healthcare system. A neural network back-propagation algorithm is used to retrieve content for keywords, during that retrieval, it deals with healthcare ontology. This methodology deals with a comprehensive approach to the contents of the system. For application purposes, this method is constructed by means of a semantic relationship with a decision tree. It underlines the explicit relationship between the keywords and their corresponding contents.

Keywords: Decision Tree, Healthcare Ontology, Neural network back-propagation, Search Engine.

Introduction

The internet, in recent years, has enormously influenced the media and challenged traditional journalism. Basic journalistic work practices like gathering news, producing news and its distribution, as well as the way people guzzle news, have changed entirely. While new technologies are developing rapidly, different news sources have surfaced together with search engines, social networks and citizen journalism stepping up to the plate. The progress of the World Wide Web from its initial years to Web 2.0, alongside new internet technologies and the proliferation of modern search engines over the last few years have brought noteworthy changes in web content such as user-generated content, metadata or the social web. Also, search technology in itself has changed over the past few years.

Undeniably, the internet is, at present, one of the most accepted sources of news and the preferred choice of many. A large portion of internet traffic depends to a great degree on search engines, and many use them as a basic tool for navigation and a filter for news. Users generally choose results only from the first page of search results. As more websites are indexed by search engines and contend with each other, it's obvious that factors such as the highest ranking and top-of-the-results-page become ever more vital for an online media business and, consequently, for online articles.

A site's visibility through web searches has become an essential ingredient for the survival of the site. The conversion to digital journalism has put journalists on a different platform. On the internet, with a wealth of news websites, the swift distribution of information and the survival of a "culture of the click," the aim of a story is to find readers through search engines and news aggregators. Alongside, journalists are writing to be read and today that means ensuring that their stories are found by search engines.

Media associations and journalists should be conscious of web technologies and, at the same time, react to new information-consumption habits so as to make online news sites better and offer them a superior chance of being read. The purpose of this paper is dual: on the one hand, to make media scholars, journalists and digital news workers understand what search engine optimization is and its effect on online journalism; and on the other hand, it is to outline a general framework of guidelines that will help media professionals create and distribute the news in a synchronized and more efficient manner. The fundamental approach is related to the possibility provided to news organizations through the use of search engines and web search in a broad spectrum. As the marketplace evolves, there is a constant need for new reviews of current thought and practice. The aim of this paper is to focus on the lack of corresponding work in the academic literature to facilitate a better understanding of media work processes in newsrooms.

The goal of ontology is to open up a pool of common and shared knowledge that can be spread between people and among application systems.

Therefore, ontologies play a key role in achieving interoperability across organizations and on the Semantic Web, as they tend to occupy domain knowledge and their function is to generate semantics clearly in a standardized way, providing the foundation for agreement within a domain. Thus, ontologies have become a popular research topic in assorted communities.

This paper is organized as follows. Section 2 deals with a review of literature, while Section 3 explains the proposed work. Section 4 focuses on the working principles for search engines using ontology. Section 5 shows the results and implementation of ontology creation in the healthcare system. Section 6 concludes the concept.

Literature Survey

A new algorithm known as the Innovation Engine is discussed. Built on a novelty search, it replaces human-crafted behavioral remoteness with a deep neural network (DNN) that can distinguish exciting differences between phenotypes, and is done at an abstract level. A long-term vision, involving several technical challenges which remain to be solved, is described here. A basic version of the algorithm is implemented which helps to arrive at an understanding of certain of its key motivations. The results prove that Innovation Engines can automate exciting solutions in any field [1]

An assumption model based on ontology is built, in tandem with a Bayesian network to ascertain the likelihood of becoming dejected. A prototype using a mobile agent platform as a proof-of-concept in the mobile cloud is implemented. An ontology model, based on the terminology used to explain depression, is developed and a Bayesian network to understand the possibility of becoming depressed is used. A system that uses multi-agents running on the Android platform is implemented and thus demonstrates the possibilities of this method. Different implementation issues are also addressed. The results show that the method might be helpful in understanding the diagnosis of depression [2]

A focused crawling framework based on ontology is proposed to address the issue of maintaining a stable harvest rate during the crawling process. An ANN (artificial neural network) was built using a domain-specific ontology which is applicable to web page classification. The experimental results prove that this approach outperforms the breadth-first search crawling approach, the simple keyword-based crawling approach, the ANN-based focused crawling approach, and the focused crawling approach that utilizes only a domain-specific ontology [3].

A hybrid classification model - combining a case-based reasoning method, a fuzzy decision tree (FDT), and genetic algorithms (GAs) to build a management system for classifying data in different database applications - is presented. The model is mainly based on the idea that a traditional database can be transformed into a smaller case base, together with a cluster of fuzzy decision rules. Therefore, the model can more precisely react to the existing data from instructions issued by these smaller case- based fuzzy decision trees. The average hit rate of our suggested model is the highest when compared to others [4].

This work addresses the management of energy in micro-grids, in light of economic and environmental constraints, through (a) the growth of an operational tactic for energy management in micro grids, and (b) the establishment of categories with diverse capacities of distributed generation (DG) sources as well as a capacity for optimization-based storage devices (SD). An NPV-based objective function is proposed and the optimal solution, maximizing the objective function, is obtained using a hybrid optimization technique which includes the quadratic programming (QP) and particle swarm optimization (PSO) algorithms to include the best capacity of the sources as well as the appropriate operational strategy for the micro-grid [5]

A semantic-based approach to the combined representation of healthcare domain knowledge and patient data for realistic clinical decision-making applications is examined. A four-phase knowledge engineering cycle is implemented to grow a semantic healthcare knowledge base constructed on an HL7 reference information model, including an ontology-to-replica domain knowledge, patient data, and an expression repository to encode clinical decision-making rules and queries. The proposed solution has been successfully validated in the case study as providing clinical decision support at high precision and approval rates. The assessment results demonstrate the technical feasibility and application prospects of our approach [6]

Ontology for the care of chronically-ill patients is introduced, implementing two personalization methods and a decision support tool. The first process acclimatizes the contents of the ontology to the specifics observed in the health-care record of a given actual patient, automatically providing a personalized ontology that only holds the clinical data relevant for healthcare professionals to manage the patient in question. The second process uses the personalized ontology of a patient to automatically alter intervention plans describing healthcare general treatments into individual involvement plans. Finally, the ontology is also used as the knowledge base of a decision support tool that aids healthcare professionals detect abnormal circumstances [7].

A concealed semantic indexing classifier, merging link analysis with text content to retrieve and index domain-specific web documents, is built . Our execution presents a different approach to focused crawling and aims to overcome the restrictions inflicted by the need to offer initial data for training, while maintaining a high recall/precision ratio. We evaluate its efficiency with other familiar web information retrieval techniques.[8]

A commitment-based report of the concept of service taken in the core reference ontology called the UFO-S is proposed. We address the obligations created between service providers and customers, and show how such commitments affect the service lifecycle. Furthermore, we demonstrate that the commitment-based account can serve to harmonize different notions of service in the literature [9]

The purpose of this study is to present a system to ease the interpretation and automate the semantic transformation of XML healthcare data into the OWL ontology (STrans), which allows an easier and better semantic communication among hospital information systems. Based on XML schemas (XSD or DTD), we extract the document structure with added explanations for XML elements. Also, to classify the semantic level of duplicate elements in an XML schema, we suggest novel metrics to determine the similarity between them. Experimental results show that the proposed method reliably forecasts semantic similarity of replicas and produces a better quality OWL ontology [10]

A new financial time series-forecasting model by evolving and clustering a fuzzy decision tree for stocks in the TSEC (Taiwan Stock Exchange Corporation) is discussed. This model integrates a data clustering technique, a fuzzy decision tree (FDT), and genetic algorithms (GA) to develop a decision-making system based on historical data and technical indexes. The set of historical information is separated into k sub-clusters by adopting a K-means algorithm. A GA is then applied to evolve the number of fuzzy terms for each input index in the FDT. A different forecasting model is generated for each subcluster. The hit rate is applied as a performance assessment and the suggested GAFDT model has the best performance, with an 82% average hit rate when compared to other models used in the TSEC [11].

This study comprises three stages. First of all, an encoding methodology using the SCT is proposed. Secondly, this methodology is used to encode case-based knowledge. Third, all the used SCT concepts are collected in a reference set, and the OWL2 ontology of 550 pre-coordinated concepts is proposed. A diabetes diagnosis is selected as a case study for our proposed framework. The SCT is used to provide a pre-coordination concept coverage of 75% for diabetes diagnostic terms. The resulting OWL2 ontology will be used as a domain knowledge representation in diabetes diagnosis CBR systems. The proposed model is tested by using 60 real cases [12].

A contribution in terms of improving the management and use of medical items in hospitals, through developing an ontology-driven solution that manages and explains clearly-associated knowledge, is discussed. A prototype is developed to evaluate the ontology after various stages of ontology-based system development. Our proposed ontology-based system provides a comprehensible and planned solution to capture knowledge in regard to item administration and usage. It addresses the integration challenges of health catalogs while offering a framework for collaborative sharing and knowledge acquisition among clinicians [13].

A model is formalized that decomposes inter-organizational electronic health information flow into derivative concepts like range, size, quantity, structure, consistency and connectivity using Protégé 4, an open-source OWL web ontology language editor and knowledge-based structure. The ontology was populated with data from a regional health scheme and the flows assessed. The properties of individual cases were inferred from their class associations, as determined by their data and object property rules. Finally, we demonstrated how linked ontologies were used to identify rational inconsistencies in self-reported data for learning purposes [14].

A new semi-automated method for evaluating the concept coverage and accuracy of biomedical ontologies by complementing expert knowledge with knowledge automatically taken from clinical practice instructions and electronic health records is discussed, minimizing reliance on expensive domain knowledge for the generation of gold standards. A bacterial clinical infectious disease ontology (BCIDO) is developed to assist clinical infectious disease treatment decision support. Using a semi-automated system, we integrated diverse knowledge sources, including publicly existing infectious disease rules from international repositories, electronic health records, and expert-generated infectious disease case scenarios, to draw up a compendium of infectious diseases and use the knowledge to assess the correctness and coverage of the BCIDO [15].

A hybrid model is built by integrating a case-based data clustering method and a fuzzy decision tree for classifying medical data. Two datasets from the UCI Machine Learning Repository are employed for the benchmark test. To pre-process the dataset, a case-based clustering method is applied initially to pre-process the dataset so that a more homogeneous data within each cluster is achieved. A fuzzy decision tree is then applied to the data in every cluster, in tandem with genetic algorithms (GAs), to build a decision-making system based on the selected traits and diseases thus identified. Finally, a group of fuzzy decision rules is created for each cluster. Thus, the FDT model can precisely react to the test data by means of inductions obtained from the case-based fuzzy decision tree [16]

A domain-ontological representation of organizing knowledge in the heterogeneous domain of embedded devices, alongside an intricate healthcare mechanism, has been explored. We followed METHONTOLOGY instructions during ontology development, while we used Protégé in the assessment phase to check for inconsistencies. The ontology has the possibility to become richer as stakeholders throw in their two bits' worth of new knowledge. This work provides the conceptualization for knowledge in emergency management, and the demonstration of a device entity along with its attributes, that can enable information and knowledge interoperability between other systems.

Evaluation results show the consistency and feasibility of our ontology [17].

A healthcare information mechanism based on the ontology method is studied. In particular, safety and privacy challenges are examined in the recommended ontology-based healthcare information system. Emergency medical services (EMS) are a kind of emergency service committed to providing out-of-hospital acute medical care, as well as transport to perfect care. Furthermore, a practical infrastructure plan is provided to exhibit the unification between the suggested application architecture with the Internet of Things and ontology hierarchy [18].

The use of ontologies for modeling the e-learning process of organizing educational information in Healthcare Human Resource Management in Romania (HHRM) is examined, so as to use existing health workforce data and information systems for decision-making and human resource management and support. The proposed model's particularity consists in the implementation of domain-specific ontologies using Protégé and appropriately adapted, applying a personal methodology in line with a given student's knowledge profile. The student's profile is identified by integrating static and dynamic models. As a result of this methodology, students will be able to receive learning material through an e-learning system, according to their personal level of knowledge, preferences and interests [19].

A new approach in developing a healthcare knowledge base using semantic technologies, with the semantic healthcare knowledge ontology (SHKO) built on it, based on the HL7 reference information model (RIM), as well as the semantic healthcare expression repository (SHER), was built into the Jena rule arrangement and simple protocol and resource explanation framework query language (SPARQL). The recommended solution is authenticated in a case study of the management of patients with Type 2 diabetes mellitus to reveal its technical feasibility [20].

The outcome of a systematic literature review in the domain of SEA with the aim of structuring prior work and identifying directions for future research is reported. This research reveals that there is a gap in the literature, at present, in terms of integrating and synthesizing the findings of prior research in each SEA research topic. Based on this finding, we plan to expand the current study and to more thoroughly examine our set of primary sources to provide a framework which organizes the latest findings of these SEA studies [21].

To recognize efficient methods used in Web Search Engine Optimization (SEO), multifarious approaches are analyzed. Different from previous relevant research, an intelligent metasearch engine which aggregates results from miscellaneous search engines and ranks them, based on numerous vital SEO parameters, is developed in this study. The research attempts to ascertain that the use of additional SEO parameters in ranking algorithms aids in retrieving better search results and, thereby, increases user satisfaction. Primary results created from a metasearch engine outperformed existing search engine in terms of better obtained search results, along with high precision[22].

Proposed Work

Many search engines are available nowadays. Searching the content for the specific keyword in the search bar by following many more algorithms reduces the searching time. The existing search engines are working by means of keywords related only. According to the weight of the keyword, it will work successfully. Mostly it will lose the semantic relationship of the keyword and the content. Our proposed method concentrates on creating the ontology for the health care system. A Neural network back propagation algorithm is used to retrieve the content for keywords. During that retrieval, it deals with Healthcare Ontology. This methodology deals the comprehensive approach for the content of the system. To apply, this method is constructed by means of semantic relationship with the decision tree. It provides the explicit relationship between corresponding content to the keywords.

Ontology is a data model that represents a group of concepts within a domain and the connection between those concepts. When the crawler finds a new page, it analyzes the relevance of the web page (i.e. it compares the content of the web page with ontological knowledge).

- If the analyzed relevance is more than a predefined relevance, the web page is said to belong to a specific domain.

If the web page belongs to a domain, it is stored it in the page repository along with the relevance scores for further use.

Building the Ontology: Ontology is defined as a specification of concepts and of the relations between them. In ontology, ideas of the domain are characterized by "classes". The character and attributes of the concept are explained by "properties or slots". Jointly with "instances", which are individuals of a class, it constitutes the knowledge base of the domain. Classes are a major focus in ontology, and can be subclassed to explain more specific features of a class. For example, if we define a class as Diseases, it includes all the disease classes in the disease domain. The disease class can be subclassed to stipulate more specific diseases such as clinical and etiological. Instances are individuals related to the same class. Fig.1 shows the ontology created for cancer. For example, cancer is an individual in the class, Disease. Slots or properties can be created to explain the attributes of a class. For instance, we can define a property termed the "attacking organ" of a particular disease class or instance. The properties involved have to do with the following:

1. Defining the notions of the domain as classes.
2. Defining the entities of the class as instances.
3. Defining the features of the entities as properties.

Filling the property values for the instances.

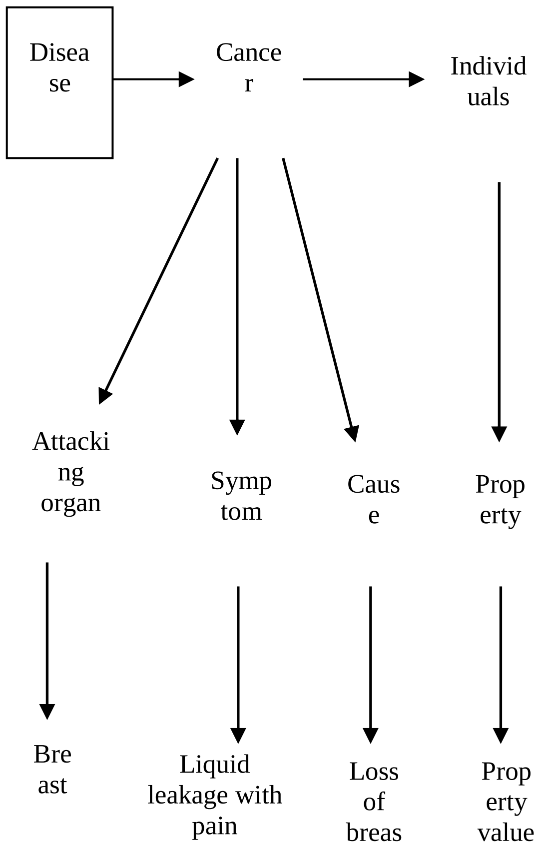

Figure 1: Creating an Ontology

To Create Relation and concept for ontology: IF “RULE 1” THEN “ACTION 1” IF “RULE 2” THEN “ACTION 2” IF “RULE 3” THEN “ACTION 3” IF “RULE 4” THEN “RULE 1”

This can be represented in business model as: IF symptom()==”breastpain”

IF causes<=”loss of breast”

IF gender()==”female”

THEN disease()==”Brest Cancer” The same rules can be represented as axioms in the Ontology as: Disease.

The ontology was created by using Protégé tool in Web Ontology Language (OWL) format. OWL is a super-class to RDF. RDF stands for Resource Description Framework. For example,

"PREFIX URI: <http://www.owl-ontologies.com/Cardiology.owl#>
PREFIX RDFS: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX OWL:
<http://www.w3.org/2002/07/owl#> PREFIX XSD:
<http://www.w3.org/2001/XMLSchema#>
PREFIX RDF:
SELECT DISTINCT ?x
WHERE{?x URI:Has_LabResult URI:Low_sao2, URI:High_bp, URI:Low_ci}".
http://www.w3.org/1999/02/22- rdf-syntax-ns#

Complexities during the Creation of an Ontology: Linguistic similarity: This involves the composition of a string being compared with other, equivalent terms. Synonym database tables are taken into consideration during the evaluation.

Definition similarity: The definition of two terms is compared to find the similarity value. The technique uses a text classification algorithm between two terms.

Neighbour similarity: Parents and children of two terms are compared. The probability of obtaining similarities when neighbours are compared is very high. The algorithm uses the metrics discussed above and specifies the formulae for obtaining the similarity value.

$$Similarity(a,b) - \frac{\sum_{j-1}^{n}(Similarity(a,b) x\ wi}{n}$$

Where $\sum_{j-1}^{n}(wi) - 1$

Ontologies are developed and defined to share knowledge among researchers working in the same domain.

The basic rules to be followed when developing an ontology are:

1. There are many ways to define the same working domain. The solution invariably depends on the application deploying the ontology.
2. The development of ontology is a repetitive process.

Prior to ontology development, the working domain range is to be specified so as to provide the scope of the ontology.

Working Principles For A Search Engine Using Ontology: Fig.2 illustrates the working principles for a search engine using ontology. Search engine options are limitless these days. Using countless algorithms will cut down the search time searching the content for a precise keyword in the search bar. Current search engines are functioning based on relevant keywords. Search work will be successful based on the relevance of the keyword used or it will lose the linguistic relevance between keyword and content. The recommended method focuses on generating the ontology for health care system. A neural network back propagation algorithm is used to fetch the content for keyword and the fetch process accords with health care ontology. This procedure is an inclusive approach formulated through linguistic relationship with the decision tree. It also offers clear correlation between analogues content to the keywords.

Step 1: Give the user name and password.
Step 2: After log in, the automatic keyword comes into play.
Step 3: Change the keyword according to the domain.
Step 4: This application has 3 options: search video, image, and web link for the given keyword.
Step 5: This is a user-dependent application
Step 6: Given the user name and password, the application first travels through the database from which it extracts the history of the user’s browsing history and extracts old URL pages.

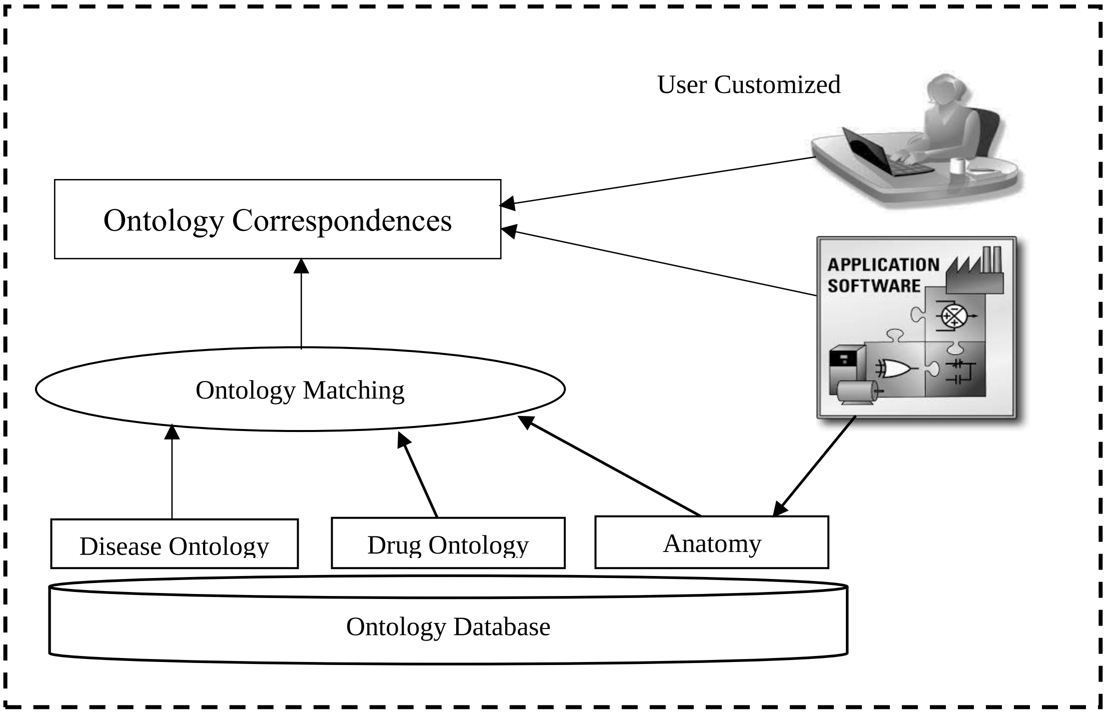

Figure 2: Working Principles for a Search Engine Using Ontology

Step 7: The old URL pages may throw up certain pages frequently referred to by the user, which may have been filtered.
Step 8: The application uses an ontology.
Step 9: The ontology has been developed, based upon the semantic relationship of the keyword.
Step 10: The ontology keyword corresponds to the URL indexing.
Step 11: The ontology is based on Jena API (jar files).
Step 12: The system ascertains the relationship between the keyword and the browsed page.
Step 13: It helps remove the URL with no semantic meaning.
Step 14: The back-propagation algorithm is used to find the user's most-wanted neighbourhood pages.

MySql db is used to store the indexed keyword and the user's priorities

Modified Neural Network Back-propagation Approach
Initialize weights (typically random!)

- Keep doing epochs
  - For each example e in training set do
    - forward pass to compute
      - O = neural-net-output(network,e)
      - miss = (T-O) at each output unit
    - backward pass to calculate deltas to weights
    - update all weights
  - end

Result and Implementation

This system is developed in Java. After a user logs in, using the system, the keyword for the search engine is automatically retrieved from the database. This is computed with the user's browsing history. During the searching, our search engine tokenizes all the words from the browsed page and finds the most frequent words from that page and calculates its weightage. We find the percentage of the coincidence between the searched keyword and the browsed page. After the keyword selection, we create an ontology for the healthcare system using the keywords, which may be entities or the main class of the ontology.

If we give the keyword fever (automatically or manually retrieved), the search engine shows up pages relating to CALPOL, body temperature, headache and likewise. Table 1 shows the syn table for fever, Table 2 illustrates the weightage table for fever, Table 3 displays the syn table for typhoid and Table 4 features the weightage table for fever.

Table 1
Syn Table for Fever

Ordinary fever	Wounded fever
Body temperature	swelling
Head ache	crosin
Disease	abnormal

Table 2
Weightage Table for Fever

Ordinary fever	**0.8**
Body temperature	0.6
Head ache	0.6
Fever	0.1

Table 3
Syn Table for Typhoid

Ordinary typhoid(initial)	**Typhoid (matured)**
Blood cells	Liver
Salmonella	bacteria
Gallbladder	Dried sewage

Table 4
Weightage Table for Fever

Ordinary typhoid(initial)	**0.8**
Blood cells	0.4
Bacteria	0.2
Gallbladder	0.1

- *Weight table* -> This is a table which is built using the given ontologies, with two columns: one column for ontology terms and the other for weights corresponding to the terms.
- For a term which belongs to more than one domain, we assign different weights according to the strength of the particular domains.
- The strategy of assigning weights to terms lies in that explicit terms will carry more weightage.
- Terms which are common to more than one domain have less weight.

Fig. 3: represents the webpage graph representation.

INPUT: A set of web pages and their relevance scores for all domains.

OUTPUT: A weighted graph.
Step 1: Assign nodes for every ontology. Primarily all the databases are blank and all weights in the space edges are 0.
Step 2: Find web pages relevant to a single domain.

Table 5
User Access Ratio

Visitor Type	**Page Visit %**
new	17
old	83

Table 5 and Fig.4 represent the user access ratio. The graph depicts the percentage of new users, as well as old users, accessing our search engine.

Table 6
Query Processing Time

User Type	**Running Time for each Query in Seconds**
new	0.16
old	0.1

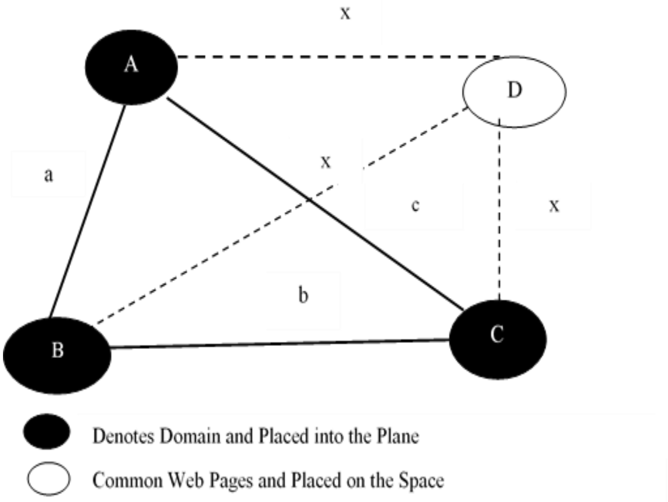

Figure 3: Webpage Graph Representation

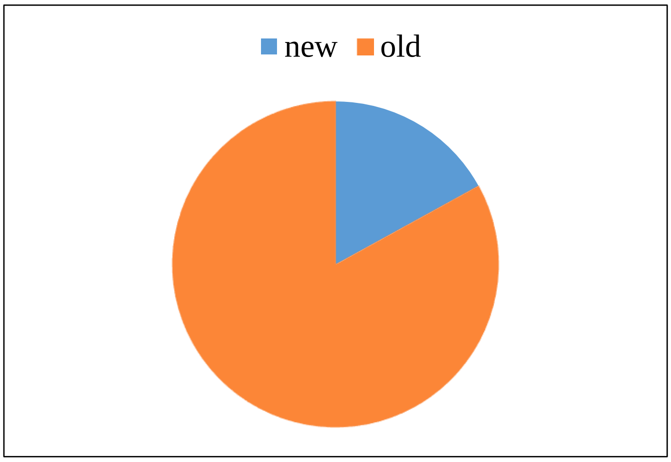

Figure 4: User Access Ratio

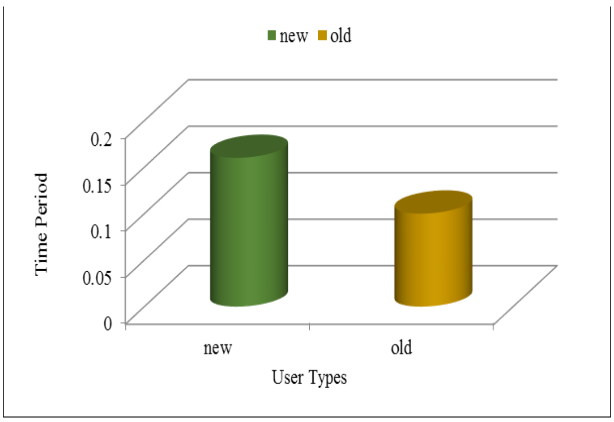

Figure 5: Query Processing Time

Table 6 and Fig.5 denote the query processing time. The graph explains the query processing time of old users and new queries. In actual fact, new queries have a slightly higher running time than old ones, given that the older queries are executed with the help of (inbuilt) ontology. New queries, however, search for matching queries from web pages.

Table 7
Keyword Extraction Percentage

User Type	Automatic key Word Generation %
New	0
10 time visit Search Engine	30
50 time visited	45
80 time visited	58
100 time	61
200 time visited	67
400 time visited	75
800 time visited	79
1000 time visited	82

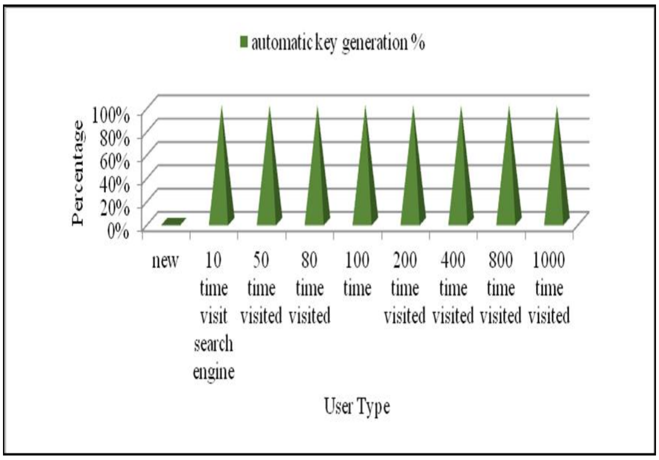

Figure 6: Keyword Extraction Percentage

Table 7 and Fig.6 show the keyword extraction percentage and explain it. Our search engine automatically extracts the keyword of the user's search query. If the user logs in to the search engine, the keyword text box gets filled automatically. If the user visits the search engine ten times, 30% of the keywords are correctly filled. The X–axis denotes how many times the user has visited the search engine and the Y-axis denotes the percentage of correct keywords. Keywords are easily extracted, depending on how many times the user uses the system.

Table 8 and Fig.7 show the page ranking percentage of up to 10 pages. The graph depicts the percentage of the page ranking algorithm for 10 pages using various search engines. The proposed page ranking percentage from our implementation, as well as those from other search engines, are checked using the page rank checker.

Table 8
Achieved Page Ranking Percentage of up to 10 Pages

Search Engine	Achieved Page Ranking Percentage up to 10 Pages
Google	88
yahoo	76
baidu	83
search	75
proposed	84

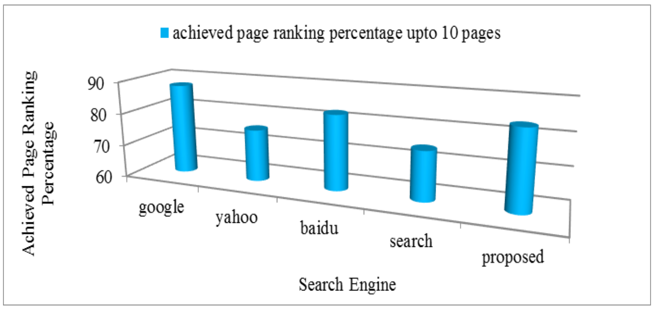

Figure 7: Achieved Page Ranking Percentage of up to 10 Pages

Table 9
User Percentage of New and Old Pages Visited

user type	new page visit %	old page visit type
new	85	15
old	45	65

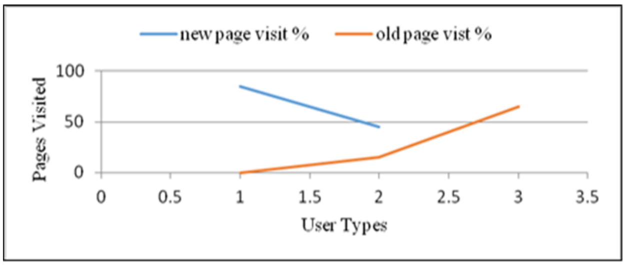

Figure 8: User Percentage of New and Old Pages Visited

Table 9 and Fig.8 represent the user percentage of new and old pages visited by new and old users. A maximum number of new users visit new pages while a majority of old users search old pages.

Performance Comparison: Parameter Definition: Time efficiency: It is defined as the average time required for searching web pages from a set of databases. Table 10 and Fig.9 shows a comparative performance of the semantic similarity algorithm with the proposed technique.

- Time efficiency is calculated as follows:

- Time Efficiency = Avg. time to search a web page/Total no. of web pages *100
- Accuracy: Accuracy denotes whether or not the page with the highest page rank is found on top, i.e., the system displays web pages according to the web page rank calculated.
- User Specific Page Generation: This parameter specifies whether or not the page display is in line with the user's interests.
- Relevance Ratio: It specifies what percentage of the content is relevant to the input query.
- High Relevance Ratio: It is the difference between a higher-ranked web page and a lower-ranked one.

Table 10
Performance Comparison

Parameter Technique	Semantic Similarity Algorithm	Proposed Technique
Time Efficiency	87	90
Accuracy	91	85
User Specific Page Generation	0	87
Relevance Ratio	92	93
High Relevance Ratio	41	50

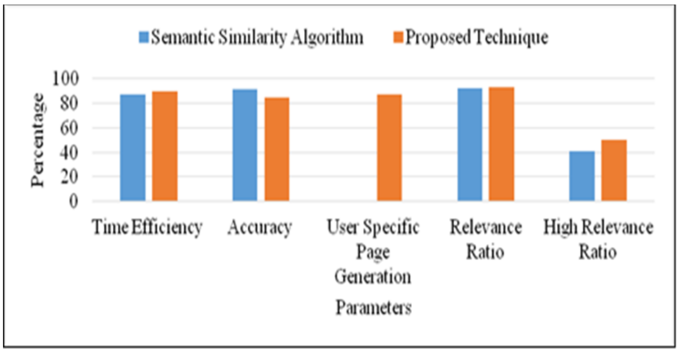

Figure 9: Performance Comparison

Conclusion

Search engine options are limitless. Using countless algorithms will cut down the time in searching the content for a precise keyword. Current search engines are functioning based on relevant keywords. Usage of relevant keywords leads to successful search or it will lose the linguistic relevance between keyword and content. The recommended method focuses on generating the ontology for health care system. A neural network back propagation algorithm that accords with health care ontology is used to fetch the content for keyword. This is an inclusive approach formulated through linguistic relationship with the decision tree. It offers clear correlation between analogues content to the keywords. Page repository saves web pages of various domains along with their respective scores for forthcoming usage. Graph search collates every bit of data related to search query so as to provide users with immediate feedback. It has a tolerance limit; which saves URLS of all the identified irrelevant pages in a different table and further eliminates them to provide relative search results. The search engine is accurate at single domain specific searches and its ability to retrieve data for multiple domain specific searches determines its powerfulness. At last, fetching relevant search results and saving user time by discarding irrelevant results makes the search engine unique.

References

1. Nguyen, Anh Mai, Jason Yosinski, and Jeff Clune. "Innovation engines: Automated creativity and improved stochastic optimization via deep learning." Proceedings of the 2015 on Genetic and Evolutionary Computation Conference. ACM, 2015.

2. Chang, Yue-Shan, et al. "Mobile cloud-based depression diagnosis using an ontology and a Bayesian network." Future Generation Computer Systems 43 (2015): 87-98.

3. Zheng, Hai-Tao, Bo-Yeong Kang, and Hong-Gee Kim. "An ontology-based approach to learnable focused crawling." Information Sciences 178.23 (2008): 4512-4522.

4. Chang, Pei-Chann, Chin-Yuan Fan, and Wei-Yuan Dzan. "A CBR-based fuzzy decision tree approach for database classification." Expert Systems with Applications 37.1 (2010): 214-225.

5. Moradi, Mohammad H., Mohsen Eskandari, and Hemen Showkati. "A hybrid method for simultaneous optimization of DG capacity and operational strategy in microgrids utilizing renewable energy resources." International Journal of Electrical Power & Energy Systems 56 (2014): 241-258.

6. Zhang, Yi-Fan, et al. "Integrating HL7 RIM and ontology for unified knowledge and data representation in clinical decision support systems." Computer methods and programs in biomedicine 123 (2016): 94-108.

7. Riaño, David, et al. "An ontology-based personalization of health-care knowledge to support clinical decisions for chronically ill patients." Journal of biomedical informatics 45.3 (2012): 429-446.

8. Almpanidis, George, Constantine Kotropoulos, and Ioannis Pitas. "Combining text and link analysis for focused crawling—An application for vertical search engines." Information Systems 32.6 (2007): 886-908.

9. Nardi, Julio Cesar, Ricardo de Almeida Falbo, João Paulo A. Almeida, Giancarlo Guizzardi, Luís Ferreira Pires, Marten J. van Sinderen, Nicola Guarino, and Claudenir Morais Fonseca. "A commitment-based reference ontology for services." Information systems 54 (2015): 263-288.

10. Thuy, Pham Thi Thu, Young-Koo Lee, and Sungyoung Lee. "S-Trans: Semantic transformation of XML healthcare data into OWL ontology." Knowledge-Based Systems 35 (2012): 349-356.

11. Lai, R. K., Fan, C. Y., Huang, W. H., & Chang, P. C. (2009). Evolving and clustering fuzzy decision tree for financial time series data forecasting. Expert Systems with Applications, 36(2), 3761-3773

12. El-Sappagh, Shaker, and Mohammed Elmogy. "An encoding methodology for medical knowledge using SNOMED CT

14. McMurray, J., et al. "Ontological modeling of electronic health information exchange." Journal of biomedical informatics 56 (2015): 169-178.

15. Gordon, Claire L., and Chunhua Weng. "Combining expert knowledge and knowledge automatically acquired from electronic data sources for continued ontology evaluation and improvement." Journal of biomedical informatics 57 (2015): 42-52.

16. Fan, Chin-Yuan, et al. "A hybrid model combining case-based reasoning and fuzzy decision tree for medical data classification." Applied Soft Computing 11.1 (2011): 632-644

17. Zeshan, Furkh, and Radziah Mohamad. "Medical ontology in the dynamic healthcare environment." Procedia Computer Science 10 (2012): 340-348.

ontology." Journal of King Saud University-Computer and Information Sciences (2015).

13. Lasierra, Nelia, et al. "Towards improving usage and management of supplies in healthcare: An ontology-based solution for sharing knowledge." Expert Systems with Applications 41.14 (2014): 6261-6273.

18. Kumar, Vinoth. "Ontology Based Public Healthcare System in Internet of Things (IoT)." Procedia Computer Science 50 (2015): 99-102.

19. Bajenaru, Lidia, and Ion Smeureanu. "An ontology based approach for modeling e-learning in healthcare human resource management." Economic Computation And Economic Cybernetics Studies And Research 49.1 (2015).

20. Zhang, Y. F., et al. "An Hl7 Rim-Driven, Ontology-based Approach to Healthcare Knowledge Base Development." (2015).

21. Jafarzadeh, Hamed, et al. "A Systematic Review on Search Engine Advertising." Pacific Asia Journal of the Association for Information Systems 7.3 (2015).

22. Manral, Jai, and Mohammed Alamgir Hossain. "An Innovative Approach for online Meta Search Engine Optimization." arXiv preprint arXiv: 1509.08396 (2015).