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"RESEARCH PAPER ON NLP APPROCH FOR CONTEXT EXTRACTION BASED ON DATA MINING"

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***Abstract*—** Understanding meanings and semantics of a speech or natural language is a complicated problem. Inorder to get exact content for the web browsers when searching for some information we have a an implemented algorithim known as Natural Language Processing an Artificial Intelligence concept. Information Extraction is a process which develops methods for fetching structured information from natural language text. The extraction of entities and relationships between entities is the best example of structured information. INFORMATION EXTRACTION is typically seen as a one-time process for the extraction of a particular kind of relationships of interest from a document collection .The purpose of information extraction (IE) is to find desired pieces of information in natural language texts and stores them in a form that is suitable for automatic processing.This paper gives the information that how the NLP is used to analyze text, allowing machines to understand how human's speak. This human-computer interaction enables real-world applications like automatic text summarization, sentiment analysis, topic extraction, named entity recognition, parts-of-speech tagging, relationship extraction, stemming, and more. NLP is commonly used for text mining, machine translation, and automated question answering. The main goal of the project is to develop a tool creating additional relations between entities based on internal analysis of object property values in the e-learning ontology. Authors present results of automated analysis of links between lecture terms and tests.

Keywords—(E-Learning, E-Resource,Natural Language Processing,Lingk Prediction Algorithim)

Introduction

Nowadays reusing educational resources in the Internet becomes one of the most promising approach for e-learning systems development. A good example of using semantics for making education materials reusable and flexible is SlideWiki system [1]. The key feature of an ontology-based e-Iearning system is the possibility for tutors and students to treat elements of educational content as named objects and named relations between them. These names are understandable both for humans as titles and for the system as types of data. Thus educational materials in the e-learning system thoroughly reflect the structure of education process via the relations between courses, modules, lectures, tests and terms. E-learning is the education via the Internet, network, or standalone computer. E-learning is essentially the network-enabled transfer of skills and knowledge. E-learning refers to using electronic applications and processes to learn. The growth of e-resources scenarios aided in designing key system requirements [1] and then developed Web-based learning, computer-based learning, virtual classrooms and digital collaboration and so on. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM.E-learning was first called "Internet-Based training" then "Web-Based Training" Today you will still find these terms being used.
E-Resource i.e. electronic resource is any information source that the library provides access to in an electronic format. The library has purchased subscriptions to many electronic information resources in order to provide you with access to them free of charge. E- Resource portal offers a reservoir for the online training and resource. It offers materials and links for the resources in terms of training and learning. The importance of automatic methods to enrich knowledge bases from free text is acknowledged by the knowledge management and ontology communities. Developing a domain knowledge base is an expensive and time-consuming task, and static knowledge bases are difficult to maintain. This is especially true in the domain of online training. Generally split into e-learning, adaptive educational hypermedia, and Intelligent Tutoring System (ITS) communities, the online educational community lacks common views, methods, and resources to build a knowledge base [10]. In fact, integration and cooperation between the e-learning and the ITS communities can only benefit all groups. On one hand, e-learning-based environments focus on the reusability of learning resources. However these resources are not adaptable to suit learners' needs, they fail to use explicitly stated instructional strategies, and they lack rich knowledge representations. On the other hand, ITSs exploit rich knowledge structures, provide adaptive feedback, and implement pedagogical strategies.

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2. E-Learning

E-learning ontology describes relations between educational resources (course, module, lecture, task, term), Use semantics to make education materials reusable and flexible, The developed E-Learning ontology allows to create interdisciplinary relations between courses a system may advice to repeat terms not only from the current course, but from the previous courses also (e.g., term "Vector" has links to courses "Vector algebra" and "Physics"); When terms are linked to tasks (via "hasTerm" property), it is possible to get the data like - which terms present only in lectures, but not in tasks (teachers add new tasks), - which terms present only in tasks, but not in lectures (teachers add new explanatory content).

Goal of E-Learning

1. To develop the test ontology,
2. To convert tasks from XML to RDF,
3. To extract terms from tasks,
4. To map tasks with ontology domain terms via extracted terms.

3. E-Resource

The E-Resource reservoirs provide all-embracing and meticulous information and relevant links for varied types of online training modules, which makes the search more convenient and trouble free. The home page of the eLearning portal is also named as dashboard, which provides a list of recommended courses, upcoming events and links to resource libraries. In some portals we come across search functionality within the portal, features offered for ratings and social networking features as well. E-Resource portal is the portal under which engineering student can find all the required resources he is in need with no time. E-resource portal provides with all the required study material for all the departments of engineering disciplines. Such was not the case before, there was the sharing of materials and other time consuming methods for getting the study materials which were not that feasible and convenient. To overcome these problems, E-Resource portal is designed which not only facilitates the students but is also helpful for professors of respective departments for uploading the E-Files helping students from various aspects and getting the E-Files run-time.E-Resource Portal is designed using NLP algorithm for text mining along with Link prediction for recommendation purpose which is helpful to greater extent.

3. Topic Model

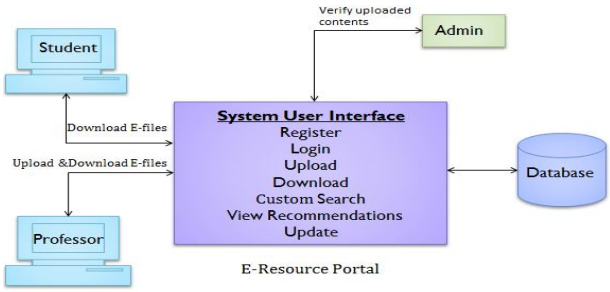

Figure 1. Conceptual Flow Diagram of Proposed System

The Figure1. shown previously portrays the Conceptual flow of the proposed system. The Dashboard of the system acts as junction for all the operations and database functions. The users such like student, professor can login to their respective accounts from E-resource dashboard (Homepage). After the login, the system user interface extends functionality, and helps in searching, fetching results, as well as get recommendations, update Profile, etc. On the backend the database is accessed for the storage & retrieval of data by the different rolled users like students and professors. Student data consist of login details, accessed files, whereas the professor details consist of login info & uploaded files information.

For any professor newly joining the system, they must be registered with the system, and thus from the dashboard they must go to the login page, and then signup there. After the successful login the professor is allowed to upload the document, or search any document. If the professor chooses to upload the document, he/she can provide the category details for that file if they want to.

For any student newly joining the system the same process must be followed to get registered and then after the successful login the student can get access to its personalised portal. Here the user can search for the documents, lookup for recommendations, or predictions, and lastly can edit his own profile related information. For admin the very basic role is to verify the newly uploaded contents on the portal. The portal provides the direct access to the documents uploaded by date, where the user can view them.

4. Natural Language Processing

Natural Language Processing (NLP) refers to AI method of communicating with an intelligent systems using a natural language such as English. Processing of Natural Language is

required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc.The field of NLP involves making computers to perform useful tasks with the natural languages humans use. The input and output of an NLP system can be −

1. Speech
2. Written Text

NLP is used to analyze text, allowing machines to understand how human's speak. This human-computer interaction enables real-world applications like automatic text summarization, sentiment analysis, topic extraction, named entity recognition, parts-of-speech tagging, relationship extraction, stemming, and more. NLP is commonly used for text mining, machine translation, and automated question answering.The amount of natural language text that is available in electronic form is truly staggering, and is increasing every day. However, the complexity of natural language can make it very difficult to access the information in that text. The state of the art in NLP is still a long way from being able to build general-purpose representations of meaning from unrestricted text. If we instead focus our efforts on a limited set of questions or "entity relations," such as "where are different facilities located," or "who is employed by what company," we can make significant progress.

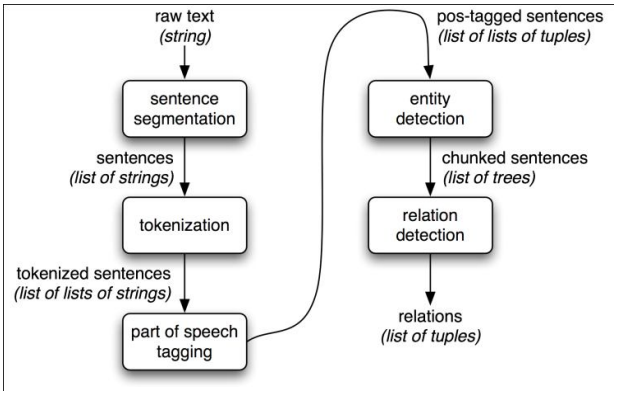

Fig2: Simple Pipeline Architecture for an Information Extraction System

5. NLP ALGORITHIM FOR PROPOSED SYSTEM

Natural Language Processing belongs to the AI background and has wide spread area, used for the text analysis which includes topics like Information Retrieval, Text mining, recognition of pattern, text understanding and machine learning. Natural Language Process, or NLP for short, is a field of study focused on the interactions between human language and computers. It sits at the intersection of computer science, artificial intelligence, and computational linguistics. We have concentrated on a subset: Information Extraction, which processes a body of text so that it can be entered into a relational database or analyzed using data mining.

In Information Extraction a body of texts is input. The output is a closely defined data format that is suitable for a database or data mining application and data manipulation application. The inflexible format for the final result means that only a part of the data is relevant. Understanding or meanings are useful in only a limited way to disambiguate the input. Information Extraction systems may be used to process large bodies of information, so performance may be important. The major tasks in NLP include Automatic Summarization, Co-Reference Resolution, Discourse Analysis, Machine Translation, Morphological Segmentation, Etc.

What are we using Natural Language Processing For?

- **Extraction**

Information comes in many variable shapes and sizes. Information extraction is a task of automatically extracting structured information from unstructured or semi-structured data. The generalized goal is to perform computation of unstructured data.

This step extracts the content from the uploaded file. Here the uploaded file can be termed as an unstructured data for which we wish to extract and perform structural transformation.

- **Lexical analysis : Tokenization**

This can be thought of as automatic summarization. It creates readable chunks of text summary. This tokenizes each word from the paragraph and sentence so that each word can be handled separately.

The file uploaded which is considered as unstructured data will go through the extraction process and then after the extraction it comes onto the tokenization process. This indeed divides the whole text chunk into words separated by comma. Later to this, each word can be handled separately, viz. independent of other words. Those words can be used in future to determine the consent of the data chunk.

- **Lexical analysis: Morphological segmentation**

This finds the individual morphemes from the words and identifies the classes of morphemes. Basically this transforms the text chunk into minimal meaningful language unit. It is said that those unit can't be divided into further smaller units.

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Morphing removes the special characters and numeric values from within the tokenized content.

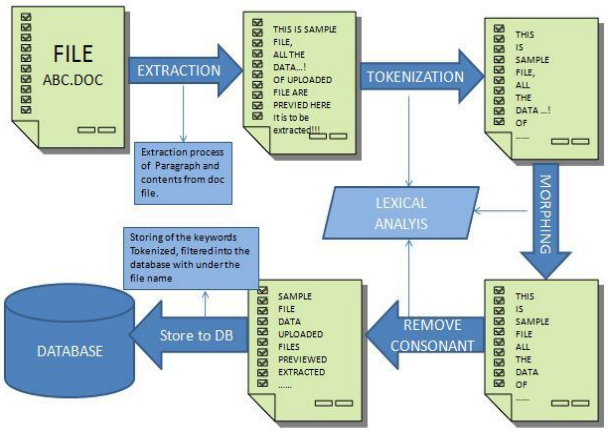
This returns with the very meaningful consent of the tokenized words.

- **Lexical analysis: Removing consonant.**

In this analysis the consonant associated with the words in the sentences are removed.

The consonant single letters other than vowels such like and, or, if, for, is, etc are eliminated for the cause. As these words can be used for the semantic or sentiment analysis but currently have nothing to do with the extracted meaningful words.

The consonant single letters other than vowels are removed.



The Figure.3 NLP process with respect to the proposed system

7. NLP ALGORITHM FOR PROPOSED SYSTEM

Step 1 : Start

Step 2 : Read file through the upload component .

Step 3 : Extract file contents, more likely the textual data only and remove the numerical and expressional values.

Step 4 : NLP parsing - tokenize the extracted content i.e. split each words so that each word can be handled separately.

Step 4.1 : Remove stop words for the precise words filtration out of large chunk of words.

Step 4.2 : Performing stemming over the words, to generate the proper form of verbs, nouns etc

i.e. to generate V(verb), VP(Verb Phrase).

Step 4.3 : POS tagging on the tokenized data, i.e. to determine which part-of-speech does the grasped word belongs to.

Step 5 : Determine the repeated words and assume those as one.

Step 6 : Store the filtered words to the database so that, they can be used for the keyword search by the user.

Step 7 : Stop

Using the NLP procedures & algorithm as given above, In our proposed system, we draw out the useful text out of large chunk of code.If Given a sentence, it determines the part of speech for each word. Many words, especially common ones, can serve as multiple parts of speech. For example, "book" can be a noun ("the book on the table") or verb ("to book a flight"); "set" can be a noun, verb or adjective; and "out" can be any of at least five different parts of speech.

6. LINK PREDICTION ALGORITHIM

The problem to predict the likelihood of a future association between two nodes, knowing that there is no association between the nodes in the current state of the graph. This problem is commonly known as the Link Prediction problem. So basically the link prediction algorithm predicts the future links within the system graph on the basis of the current connections (links) between the nodes. The link prediction observes for the current state of associations of the entities within the system. This depicts the linked relation of the entities which may be based on their attributes or needs.

Considering the prediction problem, the link prediction is likely work seeking for the new connections which can be generated on the basis of the previous state.

Within the proposed system the entities (nodes) and relations (links) are used to represent whole system and to solve the recommendation problem Link Prediction is applied. The proposed system uses collaborative based filtering approach for recommendation which exploit the similarity of links from the user nodes, so that the new users can get the recommendations of documents previously accessed.

• Given are the clusters/group of nodes depending on either they are the user or it is a document as shown in the Fig 4.

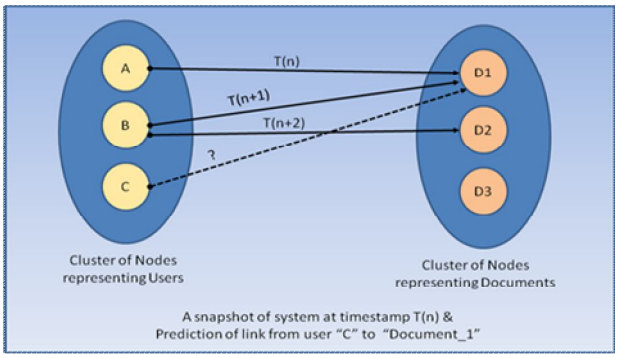


Figure No 3.3.2 Link Prediction within proposed system

The simple structure considered for recommendation in our proposed system is as shown, where user access the document at any given timestamp t(n), t(n+1), t(n+2), etc. Here the document "D1" is assessed by users A & B, thus increasing its hit count more than others , Therefore the same document is also recommended to the third user "C" which would like to access the same document as other users did.

Thus by using Link prediction algorithm, The problem to predict the likelihood of a future association between two nodes, knowing that there is no association between the nodes in the current state of the graph, The Link Prediction problem is solved.

8. LITERATURE REVIEW

1. **Anup Das, Tanmay Saha [1]**

E-resources as one of the most important information carriers are useful resources for libraries and information centers. Librarians are responsible for information organization and retrieval and they must corporate in designing search engines and portal to offer subscribed e-journal searchable for users. Portals are one of the tools that can be used for accessibility e-journals to users. Portals as website are windows and World Wide Web and often have a search engine, links to useful pages, news and their services. Portal source and deliver bespoke service solutions on research and education. The result is a simplified, low risk and cost effective approach. At Portal we think service. More importantly, the various users who access the different applications with different roles may prefer to have a single access point to all of them over the Internet. They almost prefer to personalize the applications and furthermore, to have the coupled applications coordinated. All these would be achieved through portals.

2. **Akshi Kumar, M.P.S. Bhati, Rohit Beniwal [2]**

We characterized that the relation between the Web and Requirements Engineering (RE) can be interpreted in two ways. As a process for Web application development, a need for more extensive and detailed requirements engineering is identified to bring the current chaos in web application development under control, minimize risk, and enhance its maintainability and quality

3. **Jimmy Rosales Huamani , José Castillo Sequera , José Miguel Cañamero, Fabricio Puente Mansilla , Gustavo Boza Quispe [3]**

In this work, authors proposed the design of an e-learning platform prototype, that using semantic meaning, helps in the solution of interoperability problems. As the fast growing of Internet has started the need for the regulation and interoperation of these platforms. Problems may appear in their design and implementation because of the lack of interoperability among educative platforms contents. For that reason the work have been proposed by the authors.

4. **Enayat Rajabi, Kostas Vogias, Salvador Sanchez-Alonso, Ilias Hatzakis [5]**

In this paper, the authors have described a workflow in which a large number of eLearning metadata, were collected from several repositories, processed, cleaned, evaluated and finally imported into a learning portal. And then filtered out the metadata with broken links and empty titles, and finally imported the cleaned data into the portal.

5. **Rohit C. Joshi 1 , Ratnamala S. Paswan [6]**

In this paper, authors have presented a survey on analysis of personalized recommendation techniques based on clustering and collaborative filtering. it also gave an overview of different approaches of clustering and collaborative filtering. It is a new area of research. It has provided a new way to generate recommendations in an effective manner with relatively good accuracy and low cost.

6. **Feng Xie , Zhen Chen, Jiaxing Shang , Xiaoping Feng , Jun Li [7]**

The authors as named above proposed a link prediction based item recommendation method, CORLP. Using a complex representation for link weights in a graph, result in five contributions. First, CORLP can distinguish similar and like links efficiently, enabling the convenient reuse of previous link prediction approaches without any modifications. Second, experimental results indicated that CORLP outperforms state-of-the-art algorithms for the MovieLens and AppChina datasets for the hits rate and coverage metrics. Third, experimental results verified that recommendation is more efficient with shorter path lengths, and several methods were provided for aggregating the results from different path lengths to achieve better recommendations.

7. Dr.K.Anandakumar, K.Rathipriya, Dr.A Bharathi [8]

This paper surveys the methodologies adapted for designing personalized e-learning recommender systems. Firstly they introduced the baseline behind recommender systems, the terminology and the approaches used to build a recommender system. Secondly authors have focused on describing the various methodologies used in constructing a recommender system along with the objectives and contributions to recommend learning resources to learners based on several factors in the e-learning context.

8. Arfan Shahzad, Wan Hafizi Abd, Ghani Golamdin [9]

The Author have studied and determined the student behaviour pattern when using E-learning portal and then develop a conceptual model by using navigation techniques for E-learning system. The result is expected to give a better solution when students use the proposed system in the learning process.

9. Wei Chen & Zhendong Niu & Xiangyu Zhao & Yi Li [10]

In this paper, authors proposed a hybrid learning resource recommendation algorithm, which combines CF and SPM together. Several adaptations are made for the proposed approach to be suitable for the e-learning environment. paper also apply the proposed approach to a P2P learning environment for resource pre-fetching. Experiments are carried out and the results show good performance of the proposed approach.

10. M.Ikonomakis, S.Kotsiantis & V.Tampakas [14]

In this paper, authors proposed a text classification problems , there is typically a considerable class distribution angle, and it worsens as the problem size scales up. For example, in selecting news articles that best match one's personalization profile, the positive class of interest contains many fewer articles than the negative background class, esp. if the background class contains all news articles posted on the Internet worldwide. For multi-class problems, the skew increases with the number of classes. For example, in an information retrieval setting, the user may possess only a single positive example to contrast against a large database of presumably negative training examples.

11. R. Suguna, D. Sharmila [11]

In this paper web usage mining is considered as the major source for web recommendation in association with Collaborative filtering approach, association rule mining and Markov model to recommend the web pages to the user. Web recommendation systems assist the users to get the exact information and facilitate the information search easier. Web recommendation is one of the techniques of web personalization, which recommends web pages to the user based on the previous browsing history. It is done either content based approach or collaborative filtering approach.

12. Frank Loll Niels Pinkwart [16]

The authors presented such a collaborative rating algorithm which is similar to the reciprocal review system of SWoRD and PG, but differs in few respects it also depicted that Collaborative filtering, a technology that has great potential for eLearning applications – which allows the construction of tools that enable learners to read and critique peer solutions (which not only disburdens the teacher, but also at the same time has positive effects on learning) and to get recommendations of good solutions for tasks that they may have problems with.

9. SYSTEM IMPLEMENTATION OF PROPOSED SYSTEM

9.1 Implementation of the system

Proposed system is basically the Web Application that provides the end user with the E- resource material that is beneficial to the end user. Proposed system works on the several Modules that gives the option to end user for uploading and downloading the E-file. Thus several modules are described below in details and its flow.

MODULE 1: HOME PAGE:-

Home page many a times referred as inception is an entry point for the E-resource system. The home page provides with the login buttons for the different user roles. The user such selects the student login if he/she is a student, and selects professor login if he/she is a professor. The home page moreover describes about the system in the next frame. In addition shows up the latest details related to documents. Covering the basic functions, the homepage displays about the details of system developers, so that if any more changes are required the developers can be contacted.

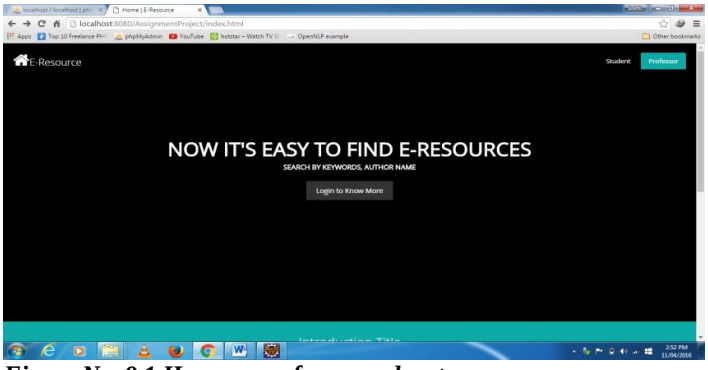


Figure No. 9.1 Homepage of proposed system

The primary goal as of E-resource portal is to make users find their needs easily. So being easy and intuitiveness the

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need, the home page is designed with lot more simplicity and kept to match with the flamboyant rich buds.

MODULE 2: LOGIN CONTROL :-

(A) Professor Login Page:- The professor login page is the initiation of professor's portal. From here the professor can get access to its dashboard. The dashboard consisting of the file uploads section, file search section, and file review section has been provided. The login page requires the email_ id, password that professor has provided at the time of registration. The login page are made up with validations such as email_id format is needed to be in correct form.

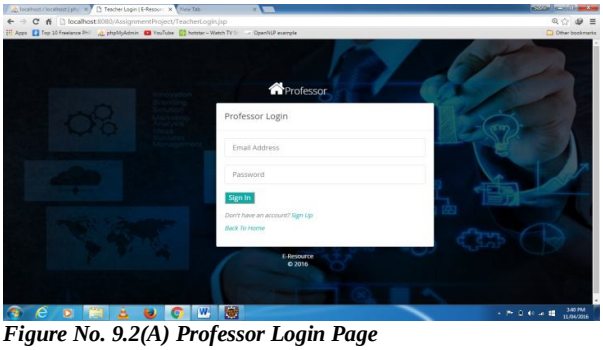

Figure No. 9.2(A) Professor Login Page

(B) Student Login Page:- The student login page is the initiation of student's portal Student can enter the user name & password for successful login. After Login student can search the E-files by either keywords or author name thus resulting in the results of the search. With the search results displayed in the tabular form student can download the particular E-file by just clicking the download button.

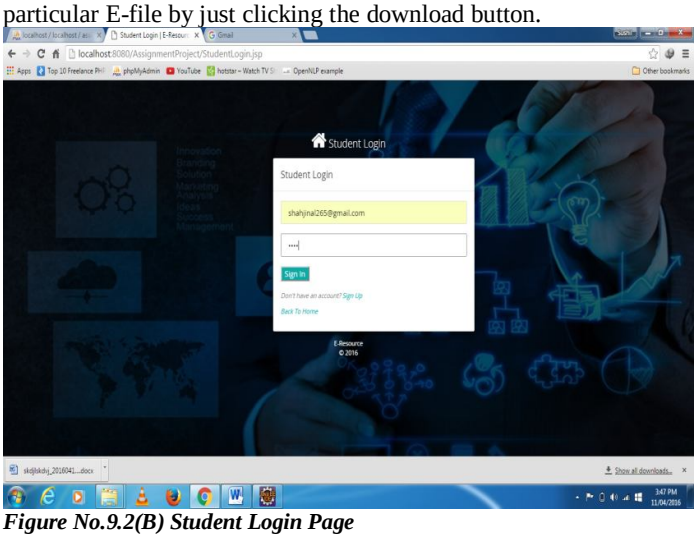

Figure No.9.2(B) Student Login Page

MODULE 3: PROFESSOR (END USER):-

One End user of the proposed system having an additional right of uploading a file.

MODULE 3.1: UPLOAD A E-FILE:-

Professor can enter the user name & password for successful login after which dashboard is provided to the professor. The dashboard consists of panels for searching, uploading & reviewing list.

On the dashboard the form shows the name of the logged in professor, the list of documents uploaded by the same. From the list the professor can delete the uploaded content if they think it isn't useful with students referral point of view.

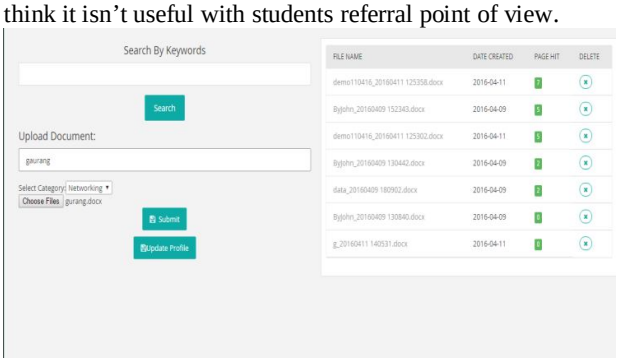

Figure No.9.3.1 Professor Upload Page

MODULE 3.2: AFTER UPLOADING A E-FILE:-

After uploading the various types of E-files or Documents they can be searched by keywords or author name as keyword. The contents of uploaded file are extracted in the background and then filtered to support the keyword search. The extracted contents are operated to remove redundancy, and remove all consonants out of text. So that the final remaining input is directly saved to database, and can be used for search latterly.

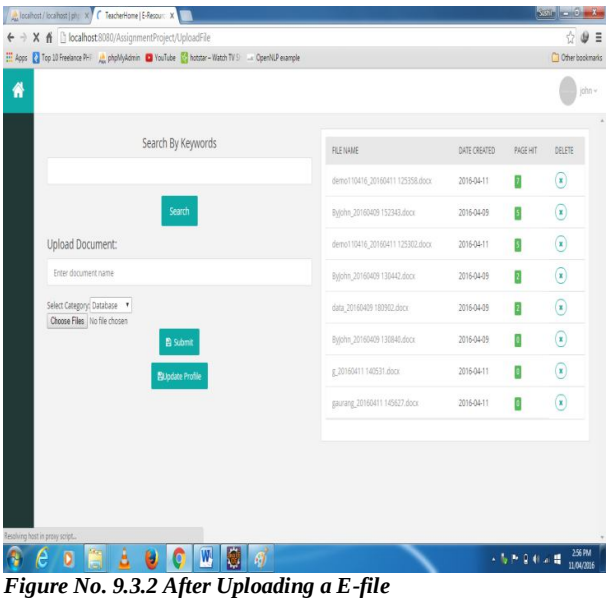

Figure No. 9.3.2 After Uploading a E-file

MODULE 4: PROFESSOR UPDATE PROFILE:-

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Professor can update profile which includes change in contact no. and password. The contact number can be changed if the professor wants to keep their details updated. Once the account is created edit to the profile is also important which shows the important feature that are provided by the particular application is included in our Web application. As shown in the Figure No. 5.4 it ask the same to the end user of system for any required updation of the system.

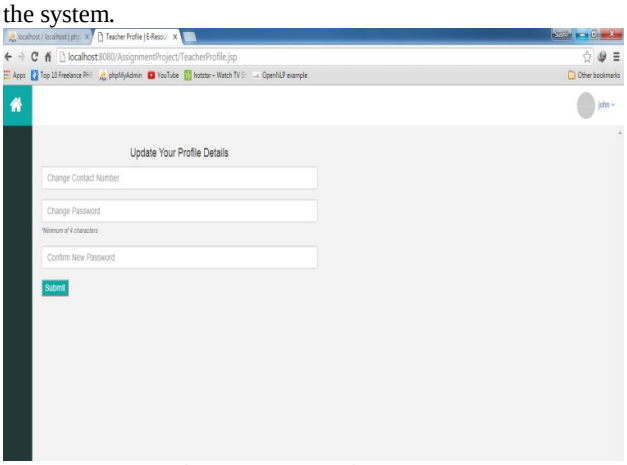

Figure No. 9.4 Professor Update Profile

MODULE 5: STUDENT (END USER):-

Another End user of the proposed system who can search, download the E-files and can get the recommendations for the E-files.

MODULE 5.1: SEARCH A E-FILE:-

After Login student can search the respective E-files by either keywords or author name thus resulting in the results of the search. With the search results displayed in the tabular form student can download the particular E-file by just clicking the download button.

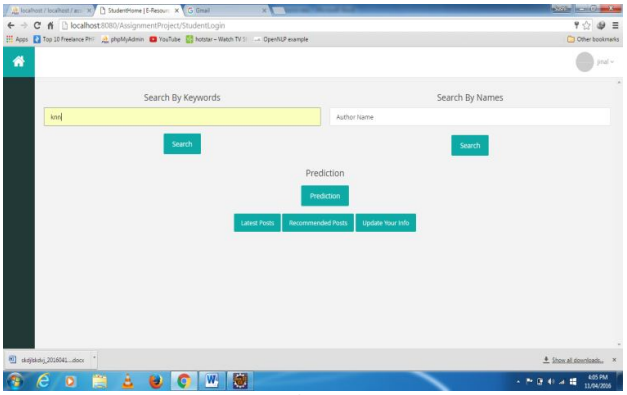

Figure No. 9.5.1 Student Page for Search

MODULE 6: STUDENT UPDATE PROFILE:-

Students can update profile which includes change in contact no., email address, password along with confirm password options. An Representation for the corresponding is shown as below.

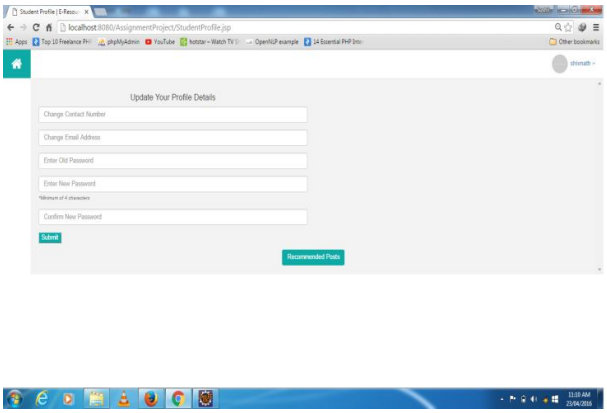

Figure No. 9.6 Student Update Profile

MODULE 7: SEARCH RESULTS:-

After clicking search button the search results are displayed in the tabular form thus student can download particular E-file by just clicking the download button. One Search result is given as demo that is displayed in the following screenshot in the tabular form.

Results can be obtained in three categories as per the End users need:

1. As per Link Prediction.
2. As per latest uploaded.
3. As per maximum access to particular E-file.

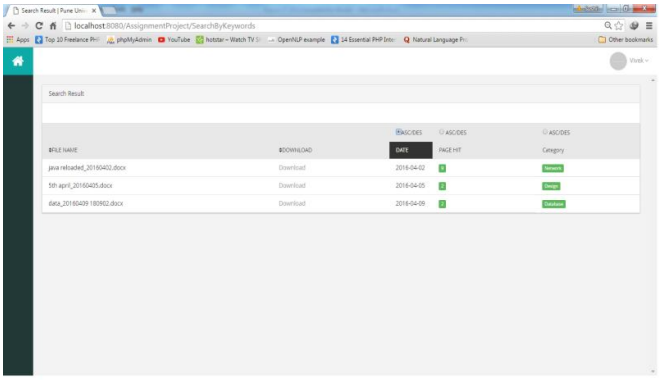

Figure No. 9.7.1 Search Results as per latest Uploaded.

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IMPACT FACTOR 1.719
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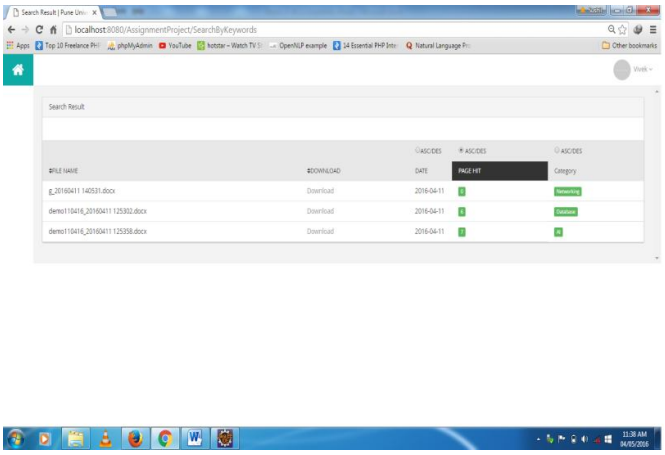

Figure No. 9.7.2 Search Results as per maximum access to E-files.

MODULE 8: SHOWING LATEST UPLOADED E-FILES:-

This page shows the latest uploaded E-files in the tabular form for convince. Latest uploaded E-files are shown in this tabular form in the ascending order with latest shown as first.

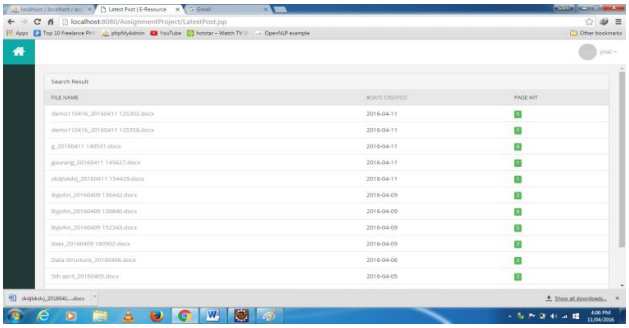

Figure No.9.8 Showing Latest Uploaded E-files

MODULE 9: PAGE SHOWING RECOMMENDED E-FILES:-

This page gives the display of list of recommended E-files. The same student can login next time to the system he gets the recommendations of the E-files which he may in search of and can prove helpful to student thus saving time.

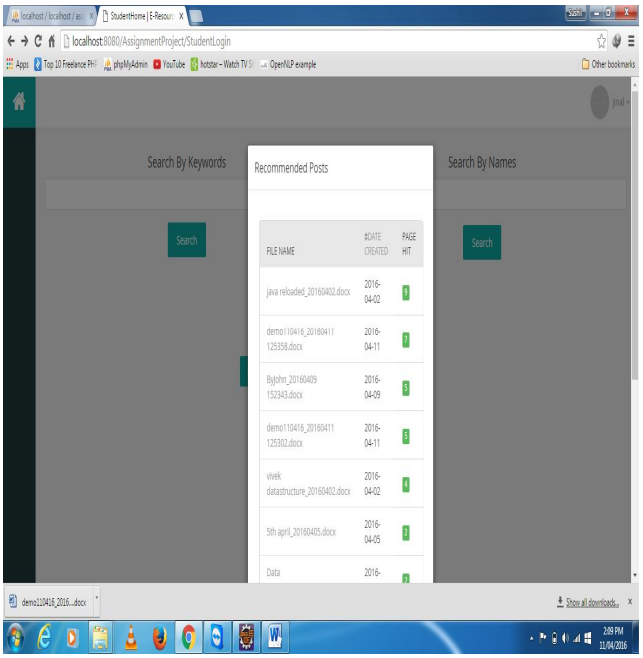

Figure No. 9.9 Page showing Recommended E-files

MODULE 10: SHOWING PREDICTED E-FILES:-

As many times as the end user of the system have accessed to his account all the activities within the access time is been recorded. Whichever file end user has accessed so far will be pertaining to certain category and similarly in future the documents from the same categories will be predicted which helps for the display and direct downloadable link of the E-file related to the documents. This helps save time of end user for searching any E-file. This is the important feature that differentiates the proposed system from the existing system.

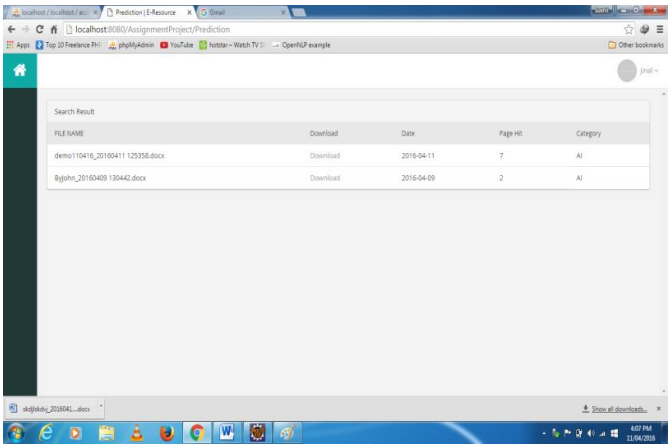

Figure No. 9.10 Showing Predicted E-file

10. CONCLUSIONS

In this paper, Proposed system gives appropriate E-resource result with the help of Natural Language Processing (NLP) and Link Prediction algorithm where NLP plays key role for extraction process and based on this extraction process system gives the efficient result to end user using link prediction. Using this link prediction, result displayed is filter oriented, link prediction on keywords, page hit count and also latest uploaded document. This use of filters help in optimizing the surfing time between the E-files and thus gives efficient result in terms of search.

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