Developing a Search Engine for Social Networks

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ABSTRACT

This paper describes the development of a search engine especially designed for retrieving information from social networking sites. The users of social networking sites, such as Facebook, post large number of texts, photos, and videos on their accounts. However, there are limited tools available for information retrieval from the large amount of data. We developed a search engine to allow the users to search the status updates, photos, albums, videos, notes, and news feeds, from the accounts that are accessible by the users, taking into consideration the privacy settings of their accounts and their friends' accounts. We implemented and tested our search engine on Facebook, using Facebook Query Language and Graph API to access the user data. We compared the search results produced by our search engine with the results produced by Facebook search and by Bing and concluded that our search engine produced more comprehensive and better results, which could be useful in connecting with friends having similar interests and enhancing the social networking experience.

CCS CONCEPTS

• **Information systems**; • **Web search engines**;

KEYWORDS

Social Network, Search Engine, Information Retrieval, Social Search

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1 INTRODUCTION

Social network is one of the most popular online tools on the internet. People use social network to get connected with their friends, family, or person of interest. Social network is the platform provided to the user to share and upload the data in different formats like text, video, image, etc. Millions of users upload volumes of data to the social networks daily. Hence, it is very important to have an operational tool to browse among these data. There are searching tools associated with most of the social networks, but they are still not convenient enough. The main objective of this research is to provide an effective searching tool for the social network users so that they can get quick access to their data as well as their friends data, depending on their search key word. For this research we use Facebook users' data as the test case. This will also enable us to make effective use of the database management system of the social network and develop an optimized search algorithm for social networks, which can process the queries at higher speed or can provide ease of use when compared to the existing search algorithms.

Facebook, which is the most popular social network website since Feb. 2004, has over 1 billion active users who upload huge amounts of data to the website daily. In the period of over ten years, it has gathered massive amounts of user data. Facebook has its own search feature which helps the user to search for a person by name, location, work, and education. Also with Facebook search, keyword search can be done on posts by friends, groups and public which give only recent data in search results. So, if the users have to search old data which was published years ago, then they have to manually locate it by browsing through their timeline. Although users can download their own Facebook data from their account, it is still in very raw form, and it will take many efforts on their part to locate the desired data.

Hence, in this research, we develop a searching tool named SEARCHY which will use Facebook users' data, and its main purpose is to overcome above limitation and allow users to search their data thoroughly as well as the data of friends considering all privacy rules.

By using SEARCHY, users can do keyword search and the results will be displayed in the categories like status, photos, albums, notes, videos, and news feed, or depending on what option they select. The accessibility to the friend's data will be dependent upon the friend's privacy settings. Data can be used from the friend only if he or she has made it visible to people in his or her friend list or to the public. Figure 1 displays the graphical user interface of SEARCHY. It is easy to use, and users can select options according to their search needs. We have provided enough user validation to guide users if they are not selecting options properly. Figure 2 displays the search results for the keyword "Florida".

It can be seen from the above search results that a user can find information in an organized way. We have displayed the results in such a way that users can differentiate between theirs and their friends' posts. We also provided a link to the Facebook page where the post was originally posted when the user clicks the search results. Table 1 compares the type of Facebook features searched by SEARCHY, Bing social search, and Facebook Graph Search. It can be noticed from the table that our system provides search options on more Facebook features when compared to Bing and Facebook itself. Hence, with this searching tool, we help users to look for their common interests among their friends and can further help them to socialize based on their similar likings.

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Figure 1: SEARCHY graphic user interface.

The remaining of this paper is organized as follows. Section II outlined the related research. Section III provided the details of designing a search engine for social networks. The search engine has been implemented and tested. Section IV described the testing and the comparison with other works. Section V gave the conclusion and outlined the future research.

2 RELATED RESEARCH

In this section we review the related research in the field of social search and its application. This work is related to general purpose search engine such as the one developed in our lab [11]. It is in generally related to the research area of knowledge engineering the Web [12]. As the proposed system is developed using a Facebook user database, we will discuss in-depth about Facebook's built-in search known as Facebook Graph Search. Apart from this we will also discuss other applications implementing a search on a Facebook users' database based on Facebook graph API.

2.1 Social Search

Social search can be defined as search based on the social network interaction as well as common interests shared between user and his/her friends in the social network. There can be many motivations behind social search, i.e. providing searching tool to the social network users, giving web search results based on the users' social network activity in order to satisfy their information requirements, in monitoring trend as an insight into the areas that appeal the attention of a large section of users [13], and targeting users with advertisements based on their interests by searching and mining their social network data.

For searching micro-blog posts like Twitter for a given topic of interest, Massoudi et al. implemented a language modeling approach which was custom-made to the characteristics of micro-blogging. To enhance their model, they used the quality indicators like length of the post, the existence of hyperlink, followers, emotions, repost, shouting, recency, and capitalization. They also suggested a query expansion model which retrieves the dynamics of topics in a social network platform. According to them, these enhancements were specially designed to help address the challenges of microblog posts search like rapid language evolution and limited within-document language re-use. They matched the contribution of their models both independently and jointly on Twitter data and established that when all models are combined, they have a substantial affirmative influence on microblog post retrieval efficiency [19].

Social network data has a property of having rich sets of fields linked with content which is offered in the form of semi-structured documents. Exploring this structure can be useful for refining retrieval performance as well as studying features of the field. In their research, Lee et al. used Doctrack and MemRecap to retrieve known items queried from real users. They found that by blending the language models along with field distribution, approximation can be effective for social network data, with definite fields such as the name of the picture being mainly significant [18].

Recently, it has become crucial for real time indexing of the search results in social networks because of the incapability of search engines in performing indexing and fetching the enormous quantity of social networking data as soon as they are generated. This problem is further extended by the growing attractiveness of micro-blogging sites like Twitter where millions of tweets are created every day. Chen et al. developed Tweet Index system which is a real time search implemented in Twitter micro-blogging website. Tweet Index implements an adaptive indexing scheme by decreasing the update cost. Indexing is done on new tweet only if it is in the topmost results of some cached queries having high probability, or else it is clustered with former trivial tweets. Then a batch indexing scheme is applied to lessen the indexing dormancy. They

Table 1: Comparison Searching features on social networks.

Post Type	SEARCHY	Bing	Facebook
Status	✓	✓	✓
Photo	✓	✓	✓
album	✓	´	´
video	✓	´	´
note	✓	´	´
newsfeed	✓	✓	✓*
comments	´	✓	´
Links shared	´	✓	´
Likes	´	✓	´

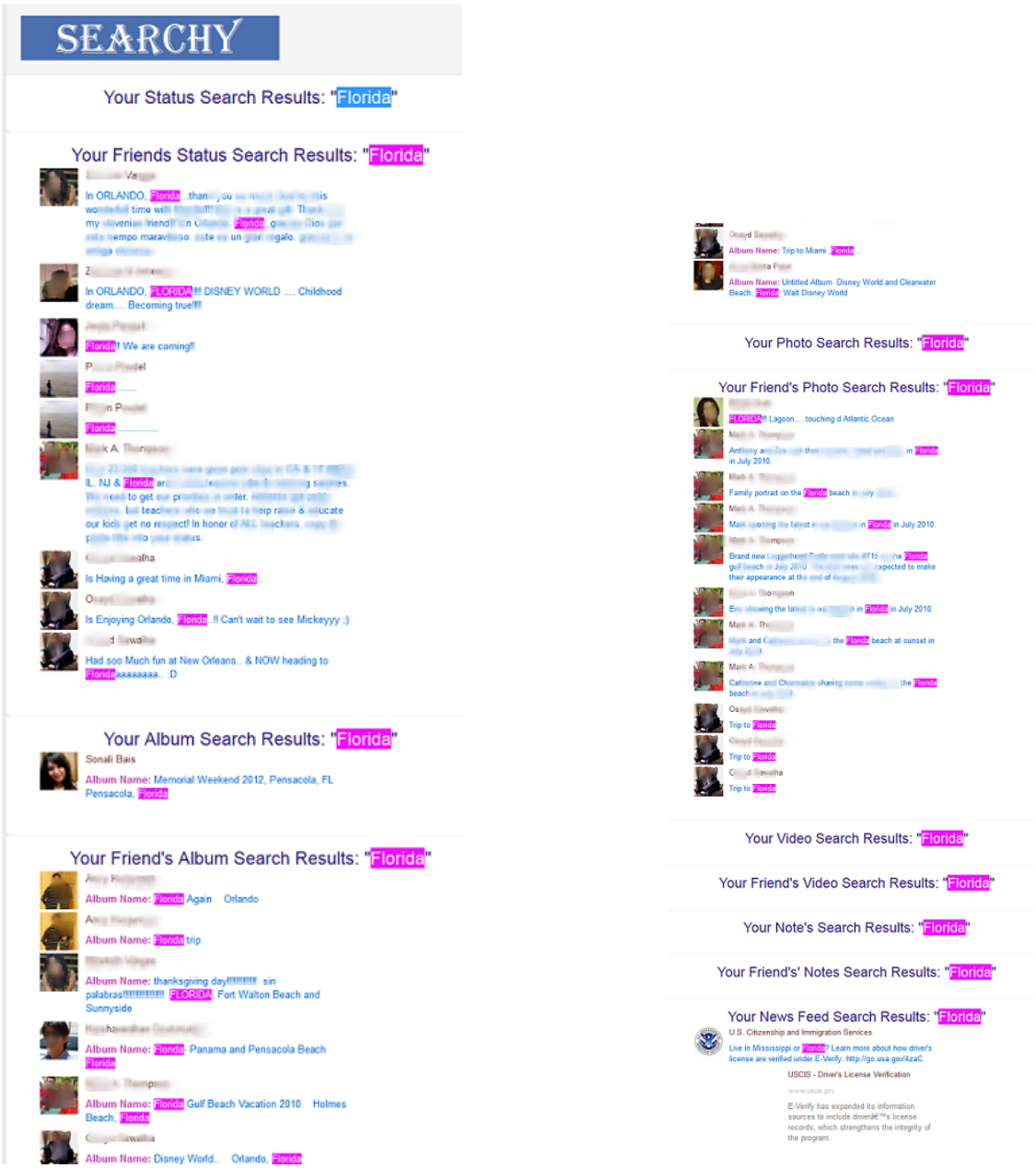

Figure 2: SEARCHY search results for keyword Florida.

also projected a cost effective and efficient ranking model by using the user's query, the popularity of topics, the time, PageRank, and the resemblance between the data taken into consideration [10].

Horowitz et al. developed a social search engine called Aardvark in which the user asks the questions in various forms like email, voice, web input, text message, or instant message. Aardvark will route the question to the person who has the best answer in the user's social network. The main component of Aardvark are crawler and Indexer for finding and labeling the resource which holds information, ranking function for selecting the best available resource to give the needed information, query analyzer to understand the requirement of the user, and user interface to give the required info in an interactive and manageable way. Generally, web search engines provide the user with the desired information in the form of documents. Horowitz et al. devised Aardvark's social search engine to find the right person in the user's social network for providing the user with the required information [15]Horowitz et al., 2010).

To maintain the privacy of user's data, most of the social network's implements access control. This extensive access control

makes the search for the content a difficult problem since each user gets a distinctive subdivision of all the data. Bjorklund et al. research is based on creating indexes and to filter out unreachable results in a search system based on social network having access control. They developed a model which returns search results in social network with access control, based on the recency, i.e., they ranked recent posts higher compared to older posts, and then they obtained the top results [6].

2.2 Facebook Graph Search and Bing Social Search

In this section we discuss Facebook's inbuilt searching tool. In February 2013, Facebook introduced its own social search engine called Facebook Graph Search (the beta version), which is only supported for the English language and mainly focuses on four main areas: people, places, photos, and interests. Before this the traditional Facebook search was about searching for friends, places, pages, and applications. It also performed keyword search in newsfeed, posts by friends, posts in groups and posts by public which only displayed limited recent data approximately of two weeks. Facebook also integrated Microsoft's Bing search engine into Facebook search to give web results.

According to Stocky et al., Facebook Graph Search is different from web search, as web search is about taking some keywords and providing the best probable results which match with those keywords while Graph Search is about associating phrases together for getting information like "people from my city who like racquet ball" that retrieves a set of people, photos, places, or other contents on Facebook social network. Also, Facebook implements access control to provide privacy to user data. Due to this the search results obtained has its own audience which is different from general web search results as most of the content is not public [25]. Graph Search implements semantic search algorithm, which performs search based on intended meaning of the search keywords.

We used Facebook's Graph API and FQL to get access to the Facebook user's data for the SEARCHY. Other commercial applications which also performs search on the Facebook user's data using Facebook's application development tools are Greplin, which helps users in searching their Facebook inbox, Openbook does keyword search on Facebook public posts, and Social Mention helps a company to track desired information trending on Facebook among users. These above-mentioned applications cannot be customized further according to the user's needs and the same information can be made available by using Facebook's inbuilt search.

Among popular search engines, Microsoft's Bing search engine also performs social search on Facebook along with web search giving limited Facebook user data search results. Bing searched Facebook's features like status, newsfeed, photos and pages liked by the user and their friends. With the help of Bing's keyword search, the user can search his/her data as well as a friend's data, but while analyzing Bing search, it has been noticed that it does not thoroughly search the data and it gives limited search results. Also, it does not provide searching on important Facebook features like videos, notes, and albums.

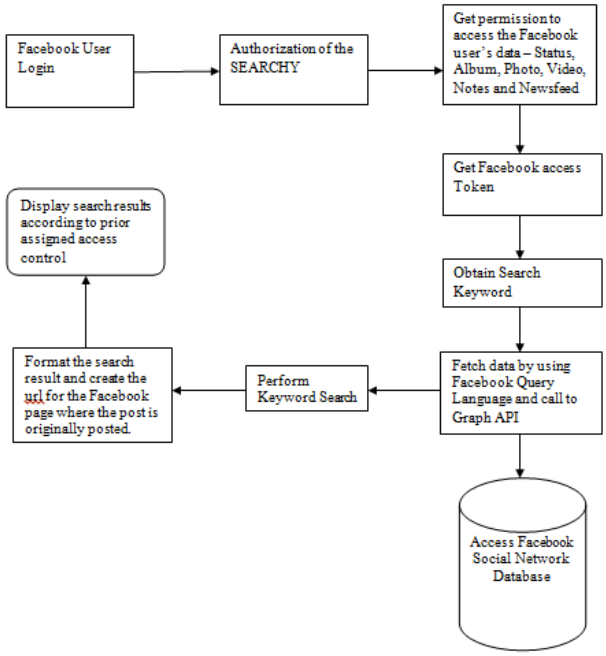

Figure 3: Overall experimental concept.

3 DESIGNING A SEARCH ENGINE FOR SOCIAL NETWORKS

In this research, we develop social network productivity software SEARCHY, which assists in searching a user's data and his/her friends' data by navigating the user to the desired status, album, photos, notes, videos, and newsfeed information with the help of keyword search. We used real social network data for the implementation of our software from Facebook social network website. The overall methodology used in developing the SEARCHY software is shown in Figure 3. The only way to access Facebook social network data is to develop it on Facebook platform in the form of Facebook application. Figure 4 describes the client server architecture of the SEARCHY.

The components mentioned in Figure 3 are described below:

- **Facebook User Login:** We are using Facebook Login for the authentication of our application.
- **Application Authorization:** We provide App ID and App secret for Facebook to identify our application.
- **Facebook Data Access Permission:** Before performing a search on the user's data, our application explicitly asks for the data access permission from the user.
- **Facebook Access Token:** Facebook access token is retrieved for the user in order to make a call to Facebook graph API and use Facebook Query Language.
- **Retrieve Keyword:** We then store the search keyword entered by the user.
- **Facebook API:** Facebook API is the gateway which helps in getting access to the Facebook user's database.

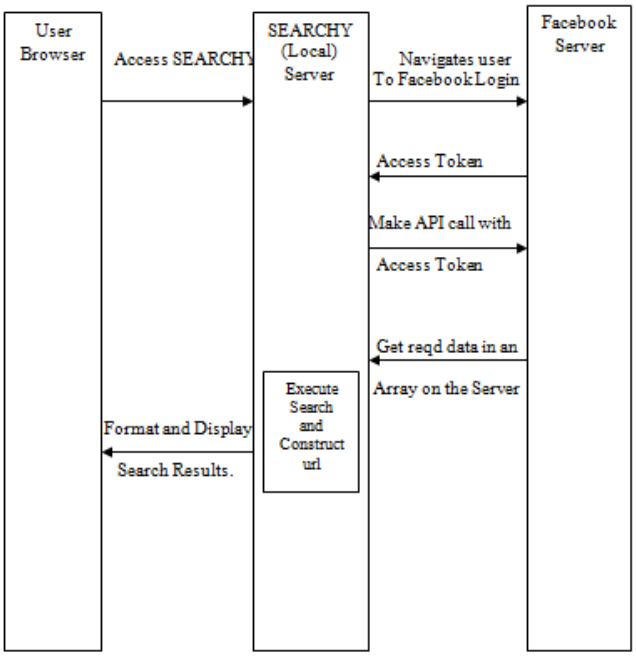

Figure 4: SEARCHY Client Server Architecture.

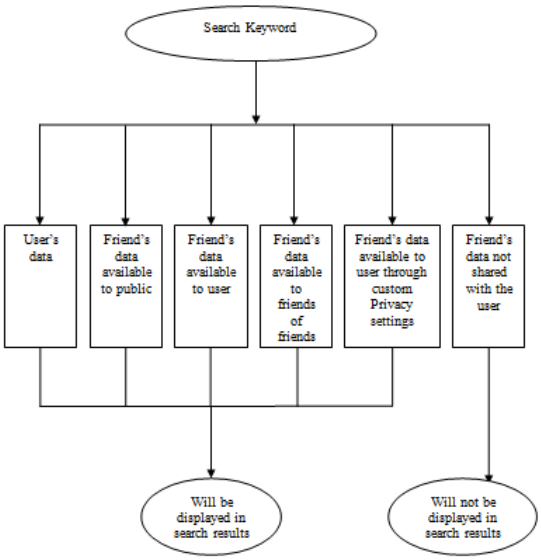

Figure 5: Privacy model used in this project.

- **Facebook User Database:** We store the user information regarding status, album, photo, video, notes, and newsfeed from the Facebook user's database.
- **Search Keyword:** We implement our search algorithm to perform a search on the data obtained from the Facebook user's database.
- **Display Results:** We display the results containing search keyword wrapped in a link whose source is the Facebook page where the post was originally posted so that the user can see likes and comments associated with the post.

3.1 SEARCHY Login and Data Authorization

SEARCHY is developed using Facebook's PHP SDK. It is implementing the server-side login method by saving App ID, App secret key and app URL which contains the code, into PHP variables. Then it creates the PHP session which will allow SEARCHY to capture the requested object to be used to complete the Login Flow.

The first step performed by SEARCHY is to distinguish between three types of the user: i.e. the user who is logged into Facebook and also authorized SEARCHY, the user who is logged into Facebook and not authorized SEARCHY, and the user who is not logged into Facebook [4]. To get the above information, it makes an API call to get the user's Facebook account ID via getUser() method into a variable named as userinfo. So if the userinfo has a value, it means that the user is already logged into Facebook and has also authorized his/her data to SEARCHY, and it will directly take the user to the SEARCHY home page. If the userinfo variable has no value, then it means that the user is logged in but has not authorized his/her data to SEARCHY; hence, they will be prompted with a data authorization dialog box. If the user is not logged in, then he/she will be asked to log into SEARCHY with his/her Facebook account credentials and will be prompted with a data authorization box. If the user gives permission to SEARCHY for accessing his/her data, then it will direct the user to the SEARCHY home page or else it will not allow the user to get access to SEARCHY.

3.2 Privacy Model

Privacy is always the biggest concern among the users of social network. Generally, all the social networks give users the facility of privacy control over their data. The users can control the sharing of their status, photos, videos, etc. to the people based on a variety of access control criteria. Large amounts of data are daily accumulated inside the social network. It is very important to limit the flow of private information across a social network based on privacy settings. Facebook has implemented a very secure privacy model on the user's data to make sure that only those people see the data to whom users have made visible. SEARCHY inherits the Facebook privacy model and thus displays search result according to the prior privacy settings of the user on his/her data. Figure 5 describes the privacy model which show how search results will be displayed depending on the user's and his/her friend's privacy settings. Also, our application takes the users' permission before using their data.

3.3 Using Facebook API

Facebook has provided many official SDK's like JavaScript SDK, PHP SDK, iOS SDK, Android SDK, etc. We have used their PHP SDK in creating SEARCHY. The Facebook PHP SDK offers a rich set of server-side functionality for getting into Facebook's server-side API calls, which includes the entire feature of Facebook Query Language and Graph API [2]. We have used PHP for the server-side scripting to develop our application. For client side scripting and graphic user interface, we have used JavaScript, CSS and JQuery.

As SEARCHY is developed as a local app, we have used XAMP's Apache web server.

To ensure the experimental setup, instead of using the experimental dataset, we have used real social network dataset which will also help to see the performance of the search algorithm. Facebook provides very useful tools like Graph API and Facebook Query Language to access the user's data. In our application, we are using both the methods to get the search results. In order to get access to the Facebook user's data through our application, we have to fetch the access token for the user who is authenticated by our application. This step is very important, as the application needs an access token for all communications with Facebook platform, and without it, Facebook will not allow any kind of data access to the application. Access Token is just like password for the application user and is always exclusive for every user on every application; hence, it is very important to store it into the application as soon as the user is logged into it through his/her Facebook credentials. The Access token is retrieved from Facebook through the application with the help of getAccessToken() method. Once the access token for the user is obtained from the Facebook, we can make Graph API calls using api() method and execute Facebook Query Language queries to fetch data from the Facebook database.

We have used Graph API for searching the newsfeed. Newsfeed is the collection of posts, links, albums, photos, videos, notes, and status as shared by the users and their friends on the homepage of the user. Facebook makes only two weeks of newsfeed data available through Graph API and there is no newsfeed table in Facebook Query Language. Facebook Graph API offers a simple, consistent view of Facebook's social graph which homogeneously denotes the objects in the graph and the connections between them. We can access the user's data by making graph paths. With the help of the graph path, the access token and GET method, we can get information from Facebook database. We can also use POST method along with the access token to post or update information on behalf of the user through the application [1].

3.4 Using Facebook API to Access Data

We have used Facebook Query Language tables to search status, albums, photos, notes, and videos. Facebook Query Language is having a similar kind of SQL-style interface to query the data wide-open by Graph API, and it also shares SQL characteristics like having the same type of query construct, indexing, data types, etc. By using api() method, we can execute Facebook Query Language queries. We have used Facebook Query Language, method to access most of the data. The reason behind this is that Graph API does not provide all the information needed and it only gives access to limited data. With the help of Facebook Query Language we can execute multiple queries in one call, which gives more freedom in writing complex queries whose results cannot be obtained with the help of Graph API. For example, getting status information for all the friends of the user at once is not possible through Graph API as it gives information for one user at a time while in Facebook Query Language we can obtain by writing multiple queries. Below we have mentioned the Facebook Query Language tables used in the development of SEARCHY. We have made sure to use as many fields possible for the keyword search so that we can get more refined search results.

3.5 Pseudocode for Performing Keyword Search

In this section we outline the Pseudocode for implementing the logic behind SEARCHY. The logic flow of below Pseudocode can also be visualized with the help of Figure 6, Figure 7, and Figure 8. The Pseudocode is written in the form of structured English to give an easy understanding of the code.

// Pseudocode for Performing Keyword Search:
Input: Search Keyword.
Output: Search results for the given keyword.

1. Check whether the user is logged in or not by providing App ID and App Secret to getUser() method.
2. If there is no information provided by getUser() method, then it means that the user is not logged in; hence, redirect the user to the Facebook Login Page.
3. Check whether he has given permission to the data needed by SEARCHY.
4. If the user gives permission to get access to his data, then go to the SEARCHY home page and also create session for the user.
5. Obtain access token for the user by using getAccessToken() method and store it into the variable.
6. Store the search keyword entered by the user into a variable on the server.
7. Store the value of the options selected by the user into some variables on the server.
8. If the user has requested to search his friend's data, then fetch Facebook Ids for all friends by using Facebook Query Language and access token. Store this information into an array on the server.
9. Depending on the options selected, execute the Facebook Query Language queries and calls to the Graph API with the help of access token obtained before.
10. Save the above information in an array on the server.
11. While searching the user's data, compare the given search keyword with the data stored in an array containing the user's data.
12. While searching the friend's data create a loop for the entire Facebook user ID stored into the array and append it to the Facebook Query Language queries to get information for a particular id. Save the query results into an array and perform simultaneously keyword search on it.
13. As soon as the keyword match is found, create a link which takes the user to the Facebook page where the post was originally posted.
14. Display the search results back to the client browser.
15. Repeat step 9 to 14 till all the options selected by the users have been searched.

The above mentioned Psuedocode and flowcharts give an overall idea about the logic used in building SEARCHY. We have stored the user data in a temporary array variable on our server instead of saving it into a database to avoid redundancy. Duplication of the Facebook social network user's data will also result into space

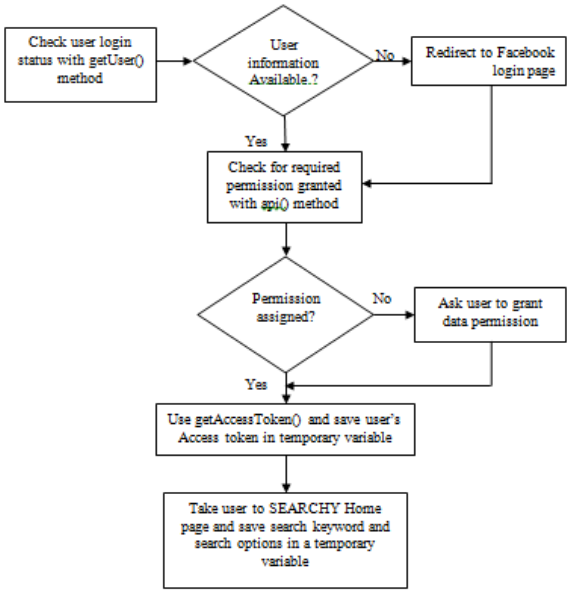

Figure 6: SEARCHY Login Module.

complexity. Apart from space complexity, updating the user's data will need additional resources. Another reason behind not saving the data into the database is to preserve privacy on the Facebook user's data.

3.6 Formatting the Search Results

SEARCHY provides search results in a categorized and organized fashion. Users can easily distinguish between their data and friends' data. This way of displaying the results helps users easily find what they are looking for. When displaying search results for photos, albums and videos, we display search results in the textual form, which contains enough needed information, in order to save search page loading time. We also embedded the search results with the url, which takes the user to the Facebook page where the post was originally posted so that he/she can also find more details of the post like the time it was posted, likes, comments, shares, etc. We created a url by analyzing the original Facebook url and retrieving the parts of the url from the related Facebook Query Language table. With the help of PHP string functions, we created the required links. Hence, displaying results in such a way saves processing time and also provides the user's need.

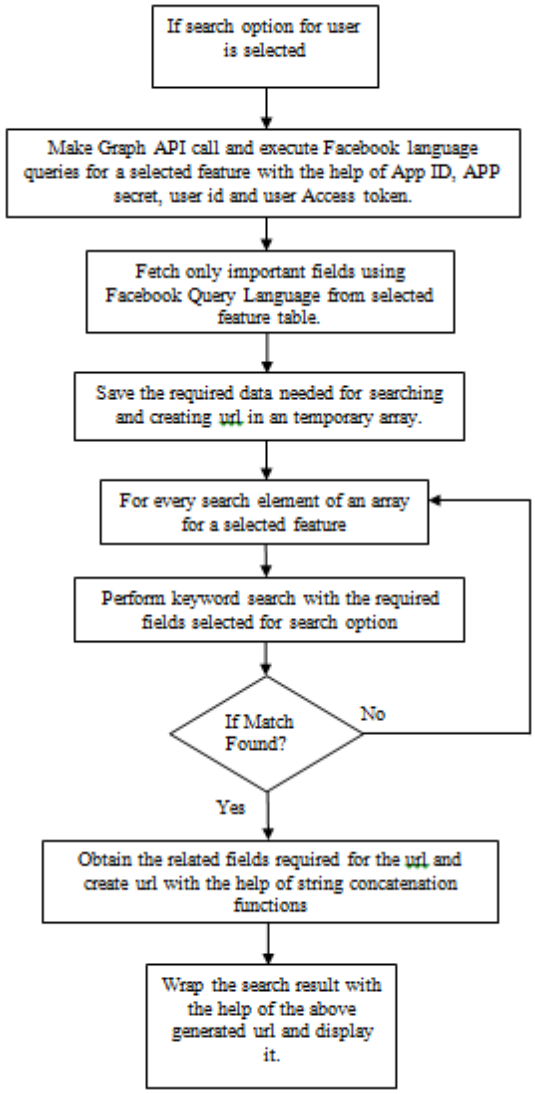

Figure 7: User search module.

4 TESTING AND COMPARING WITH OTHER WORKS

4.1 Testing SEARCHY

We have performed different testing methods on SEARCHY to make sure that it works as anticipated and sees the necessities that directed its design and development. White box testing [17] at unit, integration and system levels has been done on SEARCHY. Unit testing has been done on single modules, for example, testing code for searching status separately on user's and his friend's data. To verify the interface between all the modules in SEARCHY, integration testing was performed. Then we tested the working of the overall software for system level testing. We have performed API testing by using real social network user data with the help of Facebook graph API and then comparing the search results with the Bing social search results, which also uses the same API. For the graphical user interface of the SEARCHY user validation was implemented by using JavaScript to make sure that the user has selected options in a correct way and has given the search keyword as an input.

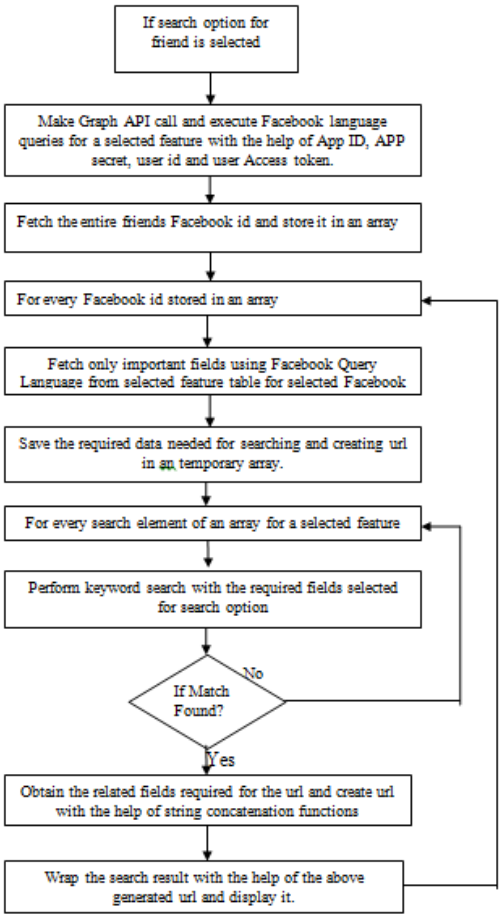

Figure 8: Friend search module.

4.2 Comparing Results with Bing Social Search

In this section we describe the testing and the comparison of the search results obtained from SEARCHY with the Bing social search. We had used screen shots of the search results from SEARCHY and Bing search engine for the comparison of the search results. Also, it should be noted that the search results also depend on how the users have provided information associated with their post. For example, a photo having a good description, or a title will show up in the search result but if there is no information provided with the photo, then it will not appear in the search results. Hence, social search also depends on information attached with the post by the user.

With the help of SEARCHY, one can find the status posted by all friends who have been to Florida (for example), which helps to know how they feel about the place. By using SEARCHY album and photo search, the user can also see the pictures posted by the friends while they were in Florida. This also helps the user to get the visual description of the place. Microsoft's Bing search engine also gives social search results along with the web search.

By comparing search results from SEARCHY and Bing, from Table 2, it can be seen that SEARCHY gives more relevant and thorough search results when compared to Bing social search and Facebook Graph Search.

When comparing the SEARCHY search results with Bing search results and Facebook Graph Search as shown in Table 3, it can be seen that SEARCHY is able to provide a wider search.

When we compare SEARCHY search results with that of Bing social search and Facebook Graph Search as shown in Table 4, for "Halloween" keyword, it can be seen that SEARCHY provides better and more organized search results.

Hence, from the above comparison for all three cases, it can be seen that SEARCHY provides comprehensive search results when compared to Bing. Also, SEARCHY finds search results from a larger number of friends compared to Bing. SEARCHY searches all the friends of the user thoroughly and give search results respectively, while on the other hand, after analyzing Bing's social search results, it has been noticed that it searches only eight friends maximum including the user if applicable.

4.3 Comparing Results with Facebook Graph Search

Facebook launched the Beta version (in February 2013) of Facebook Graph Search for searching the Facebook user Data. Facebook Graph Search does not always perform keyword search. For instance, if you type keyword "IPhone", then it won't return any search results. Facebook Graph Search implements a semantic search engine, which means searching is based on the projected meaning of what the user types [25]. For example, to see the pictures of friends taken in Florida, one has to type "photo of friends taken in Florida". Facebook provides a better search mechanism when looking for the pictures. However, when you need to know about trends among friends, this information is still not easy to locate. Also, with the help of Facebook Graph Search, one cannot do keyword search on notes and videos. The older version of Facebook search used to search recent newsfeed by the user and friends, but this feature is not accessible in the new Facebook Graph Search.

4.4 Comparing Type of the Social Network Features being Searched

In this section, we discuss the type of Facebook social network features being searched. SEARCHY is a prototype social search engine designed to search Facebook social network features which are originally posted by user like status (thoughts shared by users), album (album posted by users), photo (photos in album or photos posted on Facebook Timeline), video (videos posted by the users), notes (semi-blog written by users), and newsfeed (content of the Facebook homepage of the user). Table 1 (in Section 1) gives an idea about what Facebook social network features are being searched by SEARCHY, Bing social search, and Facebook Graph Search. Bing searches features like comments, links shared and likes which we have not implemented in SEARCHY. It is easily seen that all three search engines give photo and newsfeed search results. The status and newsfeed search was implemented in the older version of Facebook search. By analyzing Table 1, it can be seen that Bing social search and Facebook Graph Search do not provide the option of

Table 2: Comparisons of search results for keyword Florida.

Post Type	SEARCHY		Bing		Facebook	
	No of friends	Post	No of friends	Post	No of friends	Post
Status	6	9	0	0	1	2
Photo	3	11	1	9	1	6
album	7	9	0	0	0	0
video	0	0	0	0	0	0
note	0	0	0	0	0	0
newsfeed	1	1	0	0	0	0
comments	0	0	0	0	0	0
Links shared	0	0	0	0	0	0
Likes	0	0	2	3	0	0
Total	12	30	3	12	2	8

Table 3: Comparisons of Search results for keyword IPhone.

PostType	SEARCHY		Bing		Facebook	
	No of friends	Post	No of friends	Post	No of friends	Post
Status	9	13	3	4	0	0
Photo	1	1	0	0	0	0
album	1	3	0	0	0	0
video	1	1	0	0	0	0
note	0	0	0	0	0	0
newsfeed	0	0	0	0	0	0
comments	0	0	1	1	0	0
Links shared	0	0	4	4	0	0
Likes	0	0	0	0	0	0
Total	11	18	8	9	0	0

Table 4: COMPARISON OF SEARCH RESULTS FOR KEYWORD HALLOWEEN

PostType	SEARCHY		Bing		Facebook	
	No of friends	Post	No of friends	Post	No of friends	Post
Status	5	5	5	5	0	0
Photo	5	6	2	3	4	8
album	3	4	0	0	0	0
video	0	0	0	0	0	0
note	0	0	0	0	0	0
newsfeed	0	0	0	0	0	0
comments	0	0	1	1	0	0
Links shared	0	0	3	3	0	0
Likes	0	0	0	0	0	0
Total	12	15	8	12	4	8

searching important Facebook features like video, note and album, but this can be made available for search by SEARCHY.

4.5 Comparing the Appearance of the Past User Social Network Data in the Search Results

The important motivation behind developing the SEARCHY was to provide a search engine which helps in navigating through the old data posted by a Facebook user and his/her friends. For instance, if users want to search something posted by them or their friends few years back, instead of navigating manually through the timeline, it would be better to have access to a tool that search the needed information. Table 5 demonstrates the ability of SEARCHY, Bing social search and Facebook Graph Search to display past user and friend data in their search results. We have not compare the newsfeed feature as Facebook API only gives access to two weeks

Table 5: Comparison of past social network user data in the search results.

Post Type	SEARCHY	Bing	Facebook
Status	✓	´	×
album	✓	´	´
photo	✓	✓	✓
video	✓	´	´
comments	´	✓	´
Links shared	´	✓	´
Likes	´	✓	´

of the recent newsfeed information. It can be seen from the comparison that SEARCHY, Bing social search, and Facebook Graph Search do search old posted photos. SEARCHY makes it possible to search the past social network data by retrieving entire status, album, photo, video, and note information with the help of Facebook Query Language and implement keyword search algorithm on it. While experimenting with Bing social search and Facebook Graph Search, it was noted that due to its limited searching, older data may or may not appear into its search results.

SEARCHY is a productive software developed for the Facebook users to get access to their data in a convenient and easy way. It not only helps users in searching their own data but also their friends' data. From the above comparison with the Bing social search and Facebook Graph Search, it can be seen that SEARCHY provides simple, easy to use, organized and a more thorough search for important Facebook social network features to users. It also provides searching options for more Facebook social network features which contain original user generated posts when compared to Bing social search and Facebook Graph Search.

5 CONCLUSION AND FUTURE RESEARCH

In this research we developed SEARCHY, which is implemented on Facebook, and served a social search engine that provides a thorough search to the user and friends' data. Test results showed that our search engine produced more comprehensive and better results than Facebook search and Bing. With the help of SEARCHY, the user can easily locate his/her data that was posted a few years back, which eliminates the need of manually searching by going through the Facebook timeline. It is a known fact that privacy is very important for the users using social network. SEARCHY inherits the Facebook user's privacy settings, and it maintains privacy in the search results. Hence, SEARCHY is following the data privacy rules and the user can only see the information that his/her friends have allowed to him/her into the search results. Apart from searching the social network, SEARCHY can help the user to see the trends among his/her friends and engages the user to become more socially involved with those friends who share the same interests as he/she. Hence, SEARCHY is not only a social search engine, but also an important social network feature that enrich as the social network experience.

Social networking is becoming an essential part of the information society. Having more and more people engaging in social networking and more and more data being uploaded, searching the big data of the social networks is becoming an important future research area.

REFERENCES

[1] "Facebook Query Language (FQL) Reference," Retrieved on February 27, 2013d, from https://developers.facebook.com/docs/reference/fql/

[2] "Facebook SDK for PHP," Retrieved on February 25, 2013c, from https://developers.facebook.com/docs/reference/php/

[3] "Login Architechture," Retrieved on February 25, 2013a, from https://developers.facebook.com/docs/concepts/login/login-architecture/

[4] "Login for Server-side Apps," Retrieved on February 20, 2013b, from https://developers.facebook.com/docs/howtos/login/server-side-login/.

[5] Backstrom, L., 2011. "Anatomy of Facebook," Retrieved on March 5, 2013, from https://www.facebook.com/notes/facebook-data-team/anatomy-of-facebook/10150388519243859

[6] Bjorklund, T., Gotz, M., and Gehrke, J., 2010. "Search in social networks with access control," Proceedings of the 2nd International Workshop on Keyword Search on Structured Data (KEYS' 10).

[7] Bjorklund, T., Gotz, M., Gehrke, J., and Grimsmo, N., 2011. "Workload-aware indexing for keyword search in social networks," Proceedings of the 20th ACM international conference on Information and knowledge management (CIKM' 11).

[8] Bjorklund, T., Gotz, M., Gehrke, J., and Grimsmo, N., 2011. "Workload-aware indexing for keyword search in social networks," Proceedings of the 20th ACM international conference on Information and knowledge management (CIKM'11), pp. 535-544.

[9] Carmel, E., Zwerdling, N., Guy, I., Ofek-Koifman, S., Ronen, N., Uziel, E., Yogev, S., and Chernoc, S., 2009. "Personalized Social Search Based on the Uers's Social Network," Proceedings of the 18th ACM conference on information and knowledge management (CIKM '09), pp. 1227-1236.

[10] Chen, C., Li, F., Ooi, B. C., and Wu, S. 2011. "TI: an efficient indexing mechanism for real-time search on tweets," In Proceedings of the 2011 international conference on Management of data, pp. 649-660.

[11] Choi, B., 2006. United States Patent # 7,134,082 "Method and Apparatus for Individualizing and Updating a Directory of Computer Files" issued on November 7, 2006.

[12] Choi, B., 2021. "Knowledge Engineering the Web," International Journal of Machine Learning and Computing (IJMLC), Vol. 11, No. 1, pp. 68-76, Jan. 2021.

[13] Cvijikj, I. P., and Michahelles, F., 2011. "Monitoring Trends on Facebook," IEEE ninth international conference on Dependable, Automatic and Secure computing (DASC' 11), pp. 895-902.

[14] He, Y., Lee, R., Huai, Y., Sha, Z., Jain, N., Zhang, X. and Xu, Z., 2011. "RCFile: A Fast and Space-efficient Data Placement Structure in MapReduce-based Warehouse Systems," 2011 IEEE 27th International Conference on Data Engineering (ICDE'11), pp. 1199-1208.

[15] Horowitz, D., and Kamvar, S. D. 2010. "The anatomy of a large-scale social search engine," In Proceedings of the 19th international conference on World wide web (WWW '10), pp. 431-440.

[16] Kaufman, C. J., Rocky Mountain Research Laboratories, Boulder, CO, personal communication, 1992.

[17] Khan, E., Mohd, 2011. "Different Approaches to White Box Testing Technique for Finding Errors," International Journal of Software Engineering and Its Applications, pp. 1-6.

[18] Lee, C. J., Croft, W. B., and Kim, J. Y. 2012. "Evaluating search in personal social media collections," In Proceedings of the fifth ACM international conference on Web search and data mining, (WSDM, '12), pp. 683-692.

[19] Massoudi, K., Tsagkias, M., Rijke, M., and Weerkamp, W., 2011. "Incorporating Query Expansion and Quality Indicators in Searching Microblog Posts," Advances in Information Retrieval, pp. 362-367.

[20] Matsuo, Y., Mori, J., Hamasaki, M., Nishimura, T., Takeda, H., Hasida, K., and Ishizuka, M., 2006. "POLYPHONET: An advance social network extraction system

from the Web," Proceedings of the 15th international conference of world wide web (WWW '06), pp. 397-406.
[21] Nicole, R. "Title of paper with only first word capitalized," accepted for publication in IEEE Trans. Broadcast Technology.
[22] Royce, W., 1970. "Managing the Development of Large Software Systems," Proceedings of IEEE WESCON (WESCON '26), pp. 1-9.
[23] Sakaki, T., Okazaki, M., and Matsuo, Y. 2010. "Earthquake shakes Twitter users: real-time event detection by social sensors," In Proceedings of the 19th international conference on World wide web (WWW '10), pp. 851-860.
[24] Stieglitz, S., abd Kaufhold, C. 2011. "Automatic Full Text Analysis in Public Social Media–Adoption of a Software Prototype to Investigate Political Communication," Procedia Computer Science, pp. 776-781.
[25] Stocky, T., and Rasmussen, L., 2013. "Introducing Graph Search Beta," Retrieved on February 18, 2013, from http://newsroom.fb.com/News/562/Introducing-Graph-Search-Beta.
[26] Sun, H., W. Kwok, and J. Zdepski, "Architectures for MPEG compressed bitstream scaling," IEEE Trans. Circuits Syst. Video Technol., vol. 6, no. 2, pp. 191-199, Apr. 1996.
[27] Teevan, J., Ramage, D., and Morris, M., 2011. "#TwitterSearch: A Comparison of Microblog Search and Web Search," Proceedings of the fourth ACM international conference on Web search and data mining (WSDM '11), pp. 35-44.
[28] Yorozu, Y; M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Jpn., vol. 2, pp. 740-741, August 1987 (Dig. 9th Annual Conf. Magn. Jpn., p. 301, 1982).