Chapter - 5

Outcome of the model and Performance Analysis

5.1 INTRODUCTION
This chapter gives brief about outcome of a new model of the meta-search engine. It also describes in brief user-side search functionalities and administrator side control functionalities. It provides performance analysis for the sample data sets for various existing meta-search engines including this new model of meta-search engine using various tools.

5.2 OUTCOME OF A NEW MODEL OF META-SEARCH ENGINE MODULE-WISE
5.2.1 End-user module
This phase of model enables user to search the web using various search options like Default aggregate search, Selection search, LIKE search and Direct search.

5.2.1.1 Default aggregate search
This is default search facility in a newly developed model of the meta-search engine. When user runs this web based model, then user will get user interface with default search facility named aggregate search. This module of a model takes user input search text, number of links wants to display after search and check option, to specify whether user wants to consider all input words including stop words or not. If check box is selected then stop word elimination process will not be performed, and performs live search on N search engines and display resultant links. Otherwise, model performs first stop word elimination process. Then, it retrieves and displays required number of search results from merged database based on newly introduced ranking formula if similar words are found in merged database with no stop words. And if they are not found in merged database then model sends request to N number of individual search engines to retrieve required number of search results page wise and store them in N search engine wise.
database first, where \( N \) is total number of search engines listed in search engine databases. Then, it merges all these databases and form merged database. After that it displays required number of search results with paging facility.

### 5.2.1.2 Selection search

This is an alternate search facility in a newly developed model of the meta-search engine. When user runs this web based model, then user will get user interface with this search option facility named **selection search**. This module of a model takes user input search text, number of links wants to display after search and check options for all \( N \) number of individual search engines. This check option allows user to select search engine for searching results. This module of a model performs stop word elimination for all user inputs. Then, it retrieves and displays required number of search results from merged database based on combined key using newly introduced ranking formula if similar words are found in merged database for selected search engines. And if they are not found in merged database then model sends request to \( N \) number of individual search engines to retrieve required number of search results page wise and store them in \( N \) search engine wise databases first, where \( N \) is total number of search engines in search engine database. Then it merges all theses \( N \) database and form merged database. After that, it will display search results on screen for selected number of search engines based on combined key with paging facility.

### 5.2.1.3 LIKE search

This is an alternate search facility in a newly developed model of the meta-search engine. When user runs this web based model, then user will get user interface with this search option facility named **LIKE search**. This module of a model takes user input search text and number of links wants to display after search. This module of a model performs stop word elimination for all user inputs. It retrieves and displays required number of search results from merged database based on newly introduced dynamic
user input ranking formula (like/unlike) if similar words are found in merged database without stop words with paging facility. And if they are not found in merged database, then model sends request to N number of individual search engines to retrieve required number of search results page wise and will store them in N search engine wise databases first with default rank 0, where N is total number of search engines in search engine database. Then it merges all these N databases and form a merged database. After that, it displays search results on screen based on **like count** with paging facility.

### 5.2.1.4 Direct search

This search facility is provided in a newly developed model of the meta-search engine. When user runs this web based model, then user will get user interface with default search facility named **direct search**. This module of a model takes user input search text, number of links wants to display after search and check option, whether user wants to consider all input words including stop words or not. If check box is selected then stop word elimination process will not be performed else model performs first stop words elimination process. In direct search, user search expression will be directly sent to N search engines. After that, it retrieves and displays required number of search results on screen, where N is total number of search engines in search engine database.

### 5.2.2 Administrator module

Administrator side module enables administrator to have control on meta-search engine databases.

### 5.2.2.1 Search engine URL (Uniform Resource Locator)s management

This module of a new model of meta-search engine enables administrator to manage search engine URLs dynamically using database concept. Administrator can perform operations like addition, deletion, updation and view for search engine’s main URLs as well as their sub URLs.
5.2.2.2 Stop words management
This module of a new model of meta-search engine enables administrator to manage various stop words dynamically using database concept. Administrator can perform operations like addition, deletion, updation and view on stop words.

5.2.2.3 Database updation
This new model of meta-search engine uses database concept for storing search URLs / Links. Since, communication between meta-search engine and database will be faster than meta-search engine and the Web. To increase reliability, database should be up-to-date, i.e. it should be updated periodically. This module of a model allows administrator to perform updation of database by clicking on single button. This module first performs updation in search engine wise database and then updates merged database for related records.

5.2.2.4 Database merging
This module of a new model of meta-search engine allows administrator to create merge databases for storing merged records related to keywords and URLs / links available in search engine wise databases.

5.3 PERFORMANCE ANALYSIS OF NEWLY DEVELOPED MODEL OF META-SEARCH ENGINE
To measure the performance of developed model of meta-search engine, various tools have been used.

5.3.1 Use of webwait tool
Webwait is an online tool used to test response time of meta-search engine, which shows average response time after five continuous runs.

Using webwait tool (URL: http://webwait.com), an experiment has been made and response time for searching common text using existing meta-search engine like, Dogpile, Mamma, Info.com, MetaCrawler, WebCrawler and new model have been measured.
Chapter – 5 : Outcome of the model and Performance Analysis

Figure 5.1 shows webwait home page screen with input URL for search input for a new model of meta-search engine.

![Figure 5.1: webwait home page screen with input URL of a new model](image)

Figure 5.2 shows screen with response time of resultant links for input URL for a new model of meta-search engine.

![Figure 5.2: Screen with response time for input URL of on a new model](image)
Figure 5.3 shows webwait home page with input URL of input search text on existing meta-search engine i.e. Dogpile.

![Figure 5.3: webwait home page screen with input URL on Dogpile](image1)

Figure 5.4 shows screen with response time for links retrieval using Dogpile.

![Figure 5.4: Screen with response time for input URL on Dogpile](image2)
Figure 5.5 shows webwait home page with input URL of input search text on existing meta-search engine i.e. mamma.

![Figure 5.5: webwait home page screen with input URL on mamma](image)

Figure 5.6 shows screen with response time for links retrieval using mamma.

![Figure 5.6: Screen with response time for input URL on mamma](image)

Designing Model for Meta-Search Engine
Figure 5.7 shows screen with response time of resultant links for input URL on a new model of meta-search engine from web server. (Input keywords: software analysis)

![Web browser displaying a meta-search engine response time](image)

**Figure 5.7: Screen with response time for input URL on a new model**

Figure 5.8 shows screen with response time of resultant links for input URL for a new model of meta-search engine, dogpile meta-search engine and mamma meta-search engine.

(Input keywords: software analysis)
Figure 5.8 Screen with response time for input URL on different meta-search engines including new model of meta-search engine

Figure 5.9 presents performance of various meta-search engines response time including a new model of meta-search engine using webwait tool. This shows that developed model of meta-search engine has minimum response time than existing meta-search engines.

Figure 5.9: Performance analysis of meta-search engines
5.3.2 Use of pingdom tool

Pingdom is an online tool used to test response time of meta-search engine. Using Pingdom tool (URL: http://tools.pingdom.com), an experiment has been made and response time for searching common text using existing meta-search engine like, Dogpile, Mamma, and new model have been measured.

Figure 5.10 shows screen with response time of resultant links for input URL for a new model of meta-search engine from web server. (Input keywords: software analysis)

![Figure 5.10: Screen with response time in milliseconds for input URL on a new model](image)

Figure 5.11 presents performance of various meta-search engines response time including a new model of meta-search engine using pingdom tool. This shows that developed model of meta-search engine has minimum response time than existing meta-search engines.
5.3.3 PHP code developed to measure response time of web page

To measure response time of web page of new model of meta-search engine, PHP code is also developed. Figure 5.12 shows the developed code for the same. This code measures response time of web page as in Figure 5.13.

```php
// Code at beginning part of PHP web page
$time = microtime();
$time = explode(' ', $time);
$start = $time[1] + $time[0];

// Code lines to get desired results on screen
// -----

// Code at end part of PHP web page
$time = microtime();
$finish = $time;
$total_time = round(($finish - $start), 4);
echo "<br>Page generated in $total_time seconds.";
```

Figure 5.12: Code developed for measuring response time of web page
Figure 5.13: Screen shot showing response time measured using PHP code

5.3.4 Use of firebug tool

Firebug tool is used to measure page performance of any meta-search engine. It integrates with Firefox to put a wealth of web development tools at your fingertips while you browse. It is used to test page performance of meta-search engine. [78]

Using this page performance of a new model of meta-search engine and existing meta-search engine Dogpile has been measured by giving same input. Figure 5.14 and Figure 5.15 represents page performance of a new model and Dogpile using firebug tool.
Figure 5.14: Page performance of a new model using Firebug tool

Figure 5.15: Page performance of Dogpile using Firebug tool
Figure 5.16: Page performance using Firebug tool

Figure 5.16 presents page performance of meta-search engine Dogpile and developed new model of meta-search engine. Figure 5.16 shows that new model has better page performance than existing meta-search engine like Dogpile.

5.4 SUMMARY
This chapter elaborates different search facility available to user. It gives brief about how does each of this facility work and what will be the output of each of it. It also measures response time of existing meta-search engines and new meta-search engine using webwait and pingdom tools. Also, it shows developed new PHP code to measure response time for search query by the new model. Moreover, it explains the use of firebug tool to measure load time performance of web page of existing meta-search engine and new meta-search engine. This analysis shows the performance of new model of meta-search engine is better than existing meta-search engines.
In a new model of meta-search engine two new ranking formulas are introduced. One of them is static and other one is dynamic. Dynamic formula works on change in like /dislike values. Introduced concept of using databases and indexing of searched keywords. Based on that improved efficiency of result retrieval. Moreover, it shows that database concept used in a new model of meta-search engine improves efficiency in retrieving results.