

Development of Job Recommender for Alumni Information System

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Abstract:- Today, online jobs web portals have become the main venues for alumni to find jobs. The web platforms have saved a lot of time and money for alumni and other job-seekers and organizations who want to hire people. However, traditional information retrieval techniques may not be appropriate for any job seeker. The reason is that the number of results returned to a job seeker may be huge, necessitating alumni job seekers to spend a significant amount of time reading and reviewing their options. This study aimed to develop a system that allows can search for job from different job portals and can recommend them to a group of registered alumni. Furthermore, the newly developed system will provide a one-stop venue for alumni for job seeking. Evaluation of the newly developed system was made by the 50 randomly selected pilot users using the ISO 9126 software evaluation tool. The results show that the system performs excellently in terms of functionality, reliability, usability, efficiency, and portability. The system can be a big help to all registered alumni of the school, especially in the job-seeking activity.

Keywords:- Alumni Information, Job-Recommendation, Job Matching, Job Portal, Information System.

I. INTRODUCTION

Nowadays, the Alumni information system is currently implemented in many schools. One of the benefits of the Alumni information system is being able to keep track and enhance the records of their alumni. In schools and universities, an alumni information system was already implemented. The generally implemented alumni information system offers services such as instant messaging, information update management, and other services. There was various research in the field of information systems that aim to improve the services it provides. Job announcements and postings can be one of the major functions of the alumni information system. The researcher aims to improve the job quest of alumni by improving the traditional online alumni system using a new feature, a job matching system. This will enable an alumnus to find a job that will fit his/her qualification. Furthermore, the system will consolidate available employment in specific job portals and display these postings on the alumni website. The system will help the alumni to save time and money in job seeking. A job seeker may browse jobs that are posted in the system. Notification

will also be sent through their account and registered e-mail address. Moreover, this system is designed to increase the chances of an alumnus getting a job that will fit their course and skills.

II. FRAMEWORK

This study adopted the job recommender systems framework. The framework has become popular since it successfully reduced information overload by generating personalized job suggestions. Further, the framework is composed of three stages: data collection, data preparation, and recommendation [1].

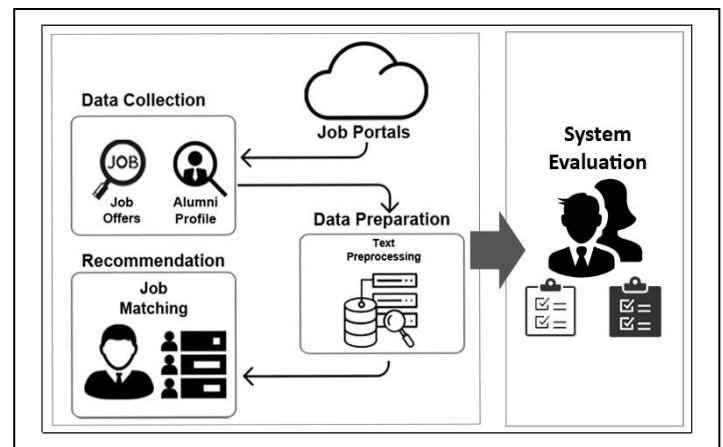


Fig 1:- Schema of the Study

- Data Collection is the phase where data is collected from different job portals. Web scraping techniques implemented with PHP source code will be used to gather data from selected job portals.
- The Data Preparation phase is where the data are initially filtered, transformed, and summarized. Text preprocessing is the stage where HTML text will be stripped through the elimination of HTML tags and other non-important texts. Data from scraped websites will then be stored in a secured database.
- The Recommendation is the phase where the data are processed. A job matching algorithm will be used to recommend a job to a particular group of users.

III. OBJECTIVES

Many open-source online alumni information systems are available nowadays. However, there is no available job recommender system that is already embedded. Due to this circumstance, the researcher aims to develop a job recommender designed for the alumni information system. Specifically, this study aims:

- To identify the tools and resources in the development of the system.
- To design alumni information web-based application software that will collate and recommend job postings from various job portals.
- To evaluate the newly developed system in terms of functionality, reliability, usability, efficiency, and portability.

IV. TECHNICAL BACKGROUND

A. Alumni Information System (AIS)

AIS was used by many institutions to monitor its alumni. AIS contains the information to maintain the details of the students after their graduation. The use of web applications has facilitated and made the collection of data faster for alumni profiling. In addition, it allowed for the complete data gathering of vital information about the alumni by enforcing data integrity constraints in the web application. With electronic data, its cleaning has become easier. With the integration of statistical data analysis in the system, decision-makers can get real-time information through real-time data analytics. This information serves as input to decision-makers on how to better engage with the alumni, for instance, in fostering academic and industry linkages with the latter [2].

B. Job Portals

Currently, alumni may search for available jobs manually in many job portals available on the web such as "Indeed", "Careerjet", "JenJOBS", "Jobstreet" and more. The task of seeking jobs may take time due to a huge volume of job listings available on multiple job portals. The process is inefficiently time-consuming when seeking the right job, which may yield inconsistent results. At present, job-seeking task is frequently done through the internet. Job seekers may find employment using many different job portals. Job portals can offer several advantages over traditional job search tools such as personal referrals, job fairs, direct employer contacts, public and private employment offices, and newspaper advertisements [3].

Numerous research and application tools are available in the open-source community that is open for innovation, especially from the academic perspective. SkillFinder is one of the tools that will extract and rank the skills of job seekers from their resumes to match job requirements posted by employers [4].

C. Data Collection using API

GitHub offers an API that can find job skills. Also, it can provide a feature that can search for jobs. With this, he developed a system that can identify the skills of software engineers from contributions done in the open-source

platform, GitHub, and matches them by comparing them to the skill requirements presented by a job description. The extraction of skills from the job description is done through an information extraction system built using a natural language processing technique. The results indicate that the existence of such an automated system is possible and is a scalable, efficient, and effective solution for the recruitment problems mentioned above [5].

V. METHODOLOGY

A. Research Setting

This study took place at Tagoloan Community College (TCC) during the Academic Year 2021-2022. TCC is a community-based institution established in July 2003 at the Municipality of Tagoloan, Misamis Oriental.

B. Research Setting

Software Development Life Cycle (SDLC) is a methodology for planning, designing, building, and maintaining information systems. There is a lot of SDLC model proposed by different researchers [6]. The waterfall model is an SDLC sequential model that comprises five phases. Figure 2 shows the Waterfall model which starts from analysis down to the maintenance phases. It allows returning to the previous stage when the need arises, but this provision should be used with care.

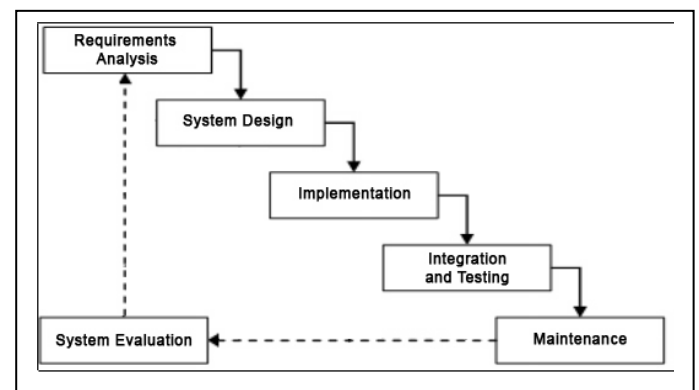


Fig 2:- The Waterfall Model

C. Requirements Analysis

The first phase includes gathering data from available resources and to understand the things needed in designing. This also includes the function, and purpose of the newly developed system. The Algorithm used in the system is also identified and studied during this phase and the specifications of the input and output or the final product, are studied and marked.

D. System Design

The requirement specifications from the first phase are being studied in this phase. This is where the designs of the system are prepared. The direction of System Design helps in identifying the hardware specification, and system requirements and helps in defining the overall system architecture. After all the designs are ready, the coding of the software will be followed.

E. Implementation

Based on the system design, the system is initially developed in small programs called units, and all the units were integrated into the next phase. Every unit is developed and tested for its functionality before it was implemented and tested as a whole system.

F. Integration and Testing

In the integrating and testing phase, all the units developed in the implementation phase are integrated into a system after testing each unit. The designed system needs to go through a series of software testing to find out flaws or errors.

G. Maintenance

In the maintenance phase, the system was monitored and supervised. It involved making modifications to the system or an individual component to alter attributes or improve performance. Modifications were based on users' suggestions. Upon completion of this phase, the first objective of this study was realized.

H. System Evaluation

To achieve the third objective of this study, the researcher initiated a pilot testing evaluation in an actual group of users. After the development of the system, it will be deployed on the web and will be evaluated. The researcher surveyed 50 randomly selected alumni members. Evaluation of the newly developed system was made by using the International Organization for Standardization (ISO) 9126 software evaluation tool [8]. The questionnaire contains a 4-way Likert scale to denote the degree of agreement (e.g., 4 = strongly agree, 3 = agree, 2= disagree, 1= strongly disagree). A simple mathematical computation was used to find the mean

VI. RESULTS AND DISCUSSION

A. Tools and Resources in the Development of the System

In the development of the system, PHP programming language was used as the primary tool to develop a Web-based Alumni Information System. PHP is an open-source server scripting language that is free but several big companies are using it for software development [7]. Besides, CodeIgniter Framework was used in this project. CodeIgniter is based on Model View Controller (MVC) that allows the developer to build dynamic websites with PHP.

The system requires the following hardware and software in developing the entire system. These includes:

Software:

- Apache 2.4.28 (PHP 7.1.14)
- MySql 5.3
- CodeIgniter 3.1.7
- Bootstrap 3.3.75

Hardware:

- Any CPU (Intel i5/ i7/ Xeon recommended).
- 16 GB of RAM, 40 GB HDD Free Space.

B. Design of the system.

This study aimed to develop a job recommender for an Alumni Information System. As illustrated in Figure 3, the system will be deployed on a cloud server. The system is maintained and operated by a System Administrator. It used a web scraping technology to get data from different online job markets and store them in the cloud database. The registered alumni can update their information anytime and if a registered alumnus is unemployed, the system will recommend a vacant job for application. The recommendation may be delivered via system notification or e-mail. The system was also designed for secured data collection.

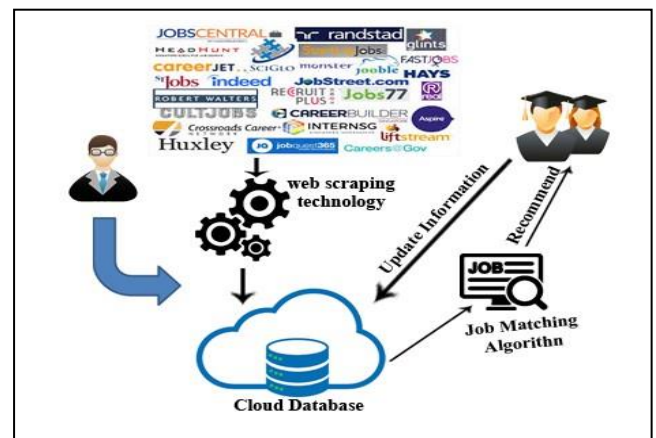


Fig 3:- System Design

C. Job Search API

Some job portals allow the use of the official API that they offer. However, the use of API is bounded by terms and conditions. In this study, the researcher used an API from a particular job portal. Careerjet is a job search engine that allows job postings from companies and organizations. The use of Careerjet API, allows developers to embed Careerjet job search results into other websites. Search results can be returned by keywords, locations, companies, industries, and other forms of data. Careerjet offers an API that can implement in PHP that is available to download from their website. The Careerjet_API can get the job posting from careerjet.ph using PHP script as shown in figure 4.

```
require_once "Careerjet_API.php" ;
$api = new Careerjet_API('en_PH') ;
$result = $api->search(array(
    'keywords' => '',
    'location' => 'Northern+Mindanao',
    'page' => $page ,
    'affid' => 'c6f47af3d8c196ab582828577bd09f2d',
));
```

Fig 4:- Careerjet API in PHP

To display the data found in careerjet.ph, the following code in figure 5 is implemented.

```

if ( $result->type == 'JOBS' ){
    $jobs = $result->jobs ;

    foreach( $jobs as $jobFound ){
        $job['job_title'] = trim($jobFound->title);
        $job['job_description'] = $jobFound->description;
        $job['job_company'] = $jobFound->company;
        $job['job_location'] = $jobFound->locations;
        $job['job_salary'] = $jobFound->salary;
        $job['job_date_posted'] = date('Y-m-d H:i:s');
        $job['job_link'] = $jobFound->url;
        $job['job_site'] = "Careerjet";
    }
}
    
```

Fig 5:- Displaying found jobs using PHP

D. Job Matching and Recommendation

One of the primary objectives of this project to develop a job matching and recommendation system. Figure 3.3 shows the process of job matching and recommendation.

If the system found new a job, a PHP script will be executed to process the newfound information. The system will use a keyword-based matching algorithm that will determine where the job will be recommended.

The keyword search-based algorithm form matching the job and the course qualification is based on the keyword for every course. The algorithm can be implemented as shown in figure 6.

```

foreach course in all_program{
    foreach keyword in course{
        if keyword exist in job_description{
            recommend(job,course);
        }
    }
}
    
```

Fig 6:- Keyword Search-Based Algorithm.

The program will loop in all registered courses in the system and for every course, there is a set of keywords that is being assigned as illustrated in Figure 7.

```

course1 = { kw1 , kw2 , kw3 ... kwn }
course2 = { kw1 , kw2 , kw3 ... kwn }
...
coursen = { kw1 , kw2 , kw3 ... kwn }

where:
kw = keyword
    
```

Fig 7:- Set of keywords in every course.

If one or more keywords are found in the job description, the *recommend ()* was executed. This function will let the system send a notification to the group of alumni with the same course as described by its set of keywords. By using this algorithm, job recommendations will be possible in the system.

E. Result Evaluation of System Performance.

The newly developed was also evaluated by a group of pilot users to determine to performance of the system in terms of functionality reliability, usability, efficiency, and portability. The data gathered from the group of students were interpreted according to the hypothetical measures in table 1.

Range	Indicator
3.50 - 4.00	Strongly Agree
2.50 - 3.49	Agree
1.50 - 2.49	Disagree
1.00 - 1.49	Strongly Disagree

Table 1:- Result Indicator.

Specifications	Mean	Indicator
The system can produce the expected results.	3.90	Strongly Agree
The system can interact with another system.	3.81	Strongly Agree
The system is equipped with acceptable security measures.	3.73	Strongly Agree
The system can meet existing requirements.	3.63	Strongly Agree
Weighted Mean	3.77	Strongly Agree

Table 2:- Data of the result of usability testing in terms of functionality.

Table 2 shows the functionality with a weighted mean of 3.77 which indicates that the system is functional as reviewed by a group of students.

Specifications	Mean	Indicator
Most of faults can be eliminated over time.	3.87	Strongly Agree
The system can handle errors.	3.77	Strongly Agree
The system can resume working and restore data.	3.73	Strongly Agree
The system can meet existing reliability standards.	3.91	Strongly Agree
Weighted Mean	3.82	Strongly Agree

Table 3:- Data of the result of usability testing in terms of reliability.

Table 3 shows the reliability with a weighted mean of 3.82 which indicate that the system is reliable as reviewed by a group of students.

Specifications	Mean	Indicator
The system can be understood easily.	3.73	Strongly Agree
The user can learn to use the system easily	3.73	Strongly Agree
The system can be operated with minimal effort.	3.87	Strongly Agree
The interface of the system is attractive.	3.83	Strongly Agree
The system can meet existing usability standards.	3.74	Strongly Agree
Weighted Mean	3.78	Strongly Agree

Table 4:- Data of the result of usability testing in terms of usability.

Table 4 shows the usability with a weighted mean of 3.78 which indicate that the system is usable as reviewed by a group of students.

Specifications	Mean	Indicator
The system can behave in a timely manner	3.80	Strongly Agree
The system can meet existing efficiency standards	3.77	Strongly Agree
The system can be adapted easily.	3.87	Strongly Agree
Weighted Mean	3.81	Strongly Agree

Table 5:- Data of the result of usability testing in terms of efficiency.

Table 5 shows the efficiency with a weighted mean of 3.81 which indicate that the system is as reviewed by a group of students.

Specifications	Mean	Indicator
The system can be installed easily.	3.77	Strongly Agree
The system can work with existing system/software	3.73	Strongly Agree
The system can be replaced with a similar product.	3.70	Strongly Agree
The system can meet existing portability standards.	3.83	Strongly Agree
Weighted Mean	3.75	Strongly Agree

Table 6:- Data of the result of usability testing in terms of portability.

Table 6 shows the functionality with a weighted mean of 3.75 which indicates that the system is portable as reviewed by a group of students.

VII. CONCLUSIONS

This research developed a model that can enhance the alumni information system of a school by integrating a job recommender into the existing traditional system. It can provide a venue for job seeking for the alumni of the school. Moreover, the newly developed system also can be a tool to gather the alumni of the school.

The system gives excellent and acceptable performance in terms of functionality, reliability, usability, efficiency, and portability. The system can be a big help to all registered alumni of the school, especially in the job-seeking activity.

RECOMMENDATIONS

Based on the findings the following recommendations are presented:

- The study suggests that the Job Recommender may be considered in every alumni information system.
- Expert evaluators suggest a series of system evaluations before the implementation of the system to minimize or even eliminate all the system errors.
- The study also suggests the development of a native version of a mobile application and the integration of SMS technology for notification.
- The security mechanism of the system may be improved to protect the privacy of the users.
- Further research may be conducted in terms of feedback on the developed system.
- Finally, future research may be conducted to make use of the results of this study for a deeper analysis of issues and concerns involving the maintainability and sustainability of the system.

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