ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 5| May 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

ALUMNI INFORMATION COLLECTION FOR ALUMNI TRACER USING WEB SCRAPING

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ABSTRACT

This research is Quasi Experimental research that aims to develop a method on how to scrape profile data and information that is publicly available in Social Media sites specifically Facebook to help the Alumni Affairs and Placement Services Office in gathering data for the Alumni Tracer. The research focuses on the assessment of data of Alumni of the College of Computer Studies from the Laguna State Polytechnic University that are needed by the Alumni Services and Placement Office for the year 2022 & 2023. The collected data using the Web Scraper will only be collected through the publicly available data in their respective webpage/platform using proper methods and means. The research was developed using the Kanban software development methodology and the program used Zhang and Shasha's Algorithm and Tree Pattern Matching Algorithm in developing the program to use in web scraping. The researcher tested and tried different approach and techniques in scraping publicly available data and were tested by its accuracy and functionality. The acceptability of the research is also determined by conducting a survey in terms of Functionality, Reliability, Usability, Efficiency, Maintainability, Portability and Compliance. The acceptability of the web scraping program got an Overall Mean of 4.37 and an Overall Standard Deviation of 0.65 that is translated as Highly Acceptable.

KEYWORDS: *Web scraping, social media scraping, Alumni tracer study, Alumni information collection, Data collection, Text mining*

INTRODUCTION

Graduate and past students make up an alumni association. Colleges and Universities rely on alumni to mentor students, which enables current students to connect with graduates to learn about numerous job prospects, including industry trends, industrial events, internships, scholarships, and more. To actively participate in registering, searching for, and managing the alumni information to receive more updates, this project handles the freshmen and old graduate students with their individual information. The establishment of an online alumni interface helped students who at some point lack the knowledge to advance in their careers by providing them with the appropriate advice from knowledgeable people that graduated in in their following Colleges and Universities.

Universities, colleges, and academies can benefit from tracer studies, as can organizations that offer scholarship, job opportunities from the government, businesses, and other organizations. Alumni are tracked using tracer studies, which can be used to assess how well goals, curricula, and educational procedures relate to the circumstances of today's alumni. To reach out and get alumni to volunteer their time to complete the tracer studies, there are a few challenges in the distribution process such as not willing to answer the tracer study and leaving behind important information.

As technology advances, data is needed in every aspect of a person's life, supporting the automation of data in areas such as acquaintance communication in a timely, accurate, and understandable manner. With the development of cutting-edge technology for information technology, new capabilities have emerged, such as the quick retrieval of data. For commercial and academic research initiatives, automatically retrieving data from the Web—a process known as "web scraping"—is becoming accepted practice. To make Web Scraping easier, many tools and technologies have been developed. The goal of this study is to solve this issue by gathering the information needed in compiling the necessary data from social media platforms, including employment, workplaces and current professions using the alumni data which scrap from social media platforms. With this in mind, the researcher wanted to create an Alumni Information Collection for Alumni Tracer using Web Scraper.

Research Objectives

The study aimed to develop a method on how to scrape profile data and information that is publicly available in Social Media sites specifically Facebook in order to help the Alumni Affairs and Placement Services Office in gathering data for the Alumni Tracer. Specifically, this study sought to find out the following: 1. to develop a web scraping program for Alumni Affairs and Placement Services where it can scrape for publicly available information in a Social Media platform like Facebook without violating the terms and conditions of the platforms/sites. 2. to test the functionality and accuracy of the developed web scrapping method in getting the correct alumni information to be listed in the Alumni Tracer. 3. to know the acceptability of using the Web scrapping method.

METHODS

Research Design

The researcher used experimental research design in the study. During the preliminary investigation, the researcher used the

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experimental research design to collect data in the Alumni Services and Placement Office of the Laguna State Polytechnic University through interviews and observations.

The researcher utilized the Developmental Research technique to study the Program-developmental, descriptive developmental described as the systematic procedure creating, developing, and assessing that must meet the criteria of the program effectiveness.

Data Collection Instruments

The researcher employed various methodologies during the data collection to better understand the research topic. These methodologies were instrumental in identifying and shaping the requirements of the study and the proposed system. The methods used by the proponent includes Internet research and Interview to gain an in-depth understanding of perceptions or opinions on the topic, the researcher conducted an interview with Chairperson of the Alumni Services and Placement Office of the Laguna State Polytechnic University to learn more about the process on how they collect data from the graduates of the said University. Upon interviewing Dr. Liza Bartolome, the researcher was given a Spreadsheet (Excel file) that contains information of the alumni from the College of Computer Studies for the year 2022 and 2023.

Development Methodology

The researcher utilized a Software Development Life Cycle (SDLC) model in the development of the prototype and its web scraping algorithms. According to Igbal & Idrees (2017), SDLC models were used typically for improving the quality of software and overall development process. Martins (2022) describes Kanban as an Agile management approach based on the idea of continuous improvement, in which tasks are "pulled" into a continuous flow of work from a product backlog. Kanban boards are used to apply the framework; they are a type of visual project management. Tasks, shown as cards on a Kanban board, progress through work stages, shown as columns. In this manner, your team can view the status of work in real time. Software development, engineering, and product teams are among the groups that use Kanban the most. However, any company looking to create a more adaptable and dynamic workflow can employ them.

In a Kanban system, you use a Kanban board—either physical or digital—to represent tasks as cards. These cards move through different stages, which are represented as columns on the board. The key columns typically include: TO DO: This column contains tasks that need to be started. They haven't been worked on yet; IN PROGRESS: Here, you'll find tasks that are currently being worked on. They're in progress but not yet completed; TESTING: Tasks move to this column once they're done. They're being reviewed, tested, or validated; DONE: Finally, tasks that have been completed successfully end up in this column.

Applied Concepts and Techniques

The researcher has examined the challenges encountered throughout the data collection, design, and software development. The data for this study was gathered and verified through the implementation of the following methods.

Online Research and Technology Gap Analysis

The researcher used the internet to obtain data and information that aided in conducting the study. The researcher received a lot of concepts, theories and existing applications relevant to the topic. The internet played a significant role in the study since it contains a lot of helpful material that is beneficial to the study. The researcher used this information to build new ideas, theories, and concepts for developing a decision-making support system in developing the Alumni Information Collection for Alumni Tracer Using Web Scraping. Most of the studies that was found by the researcher came from Google Scholars, ScienceDirect, Scispace, Eric.ed.gov, Researchgate.net, etc.

Expert Consultation

This method helped the researcher acquire more information for developing the system and think of the best practices they should use throughout the program development process. The researcher consulted with the Chairperson of the Alumni Services and Placement Office of the Laguna State Polytechnic University to gain valuable input regarding the program of the Alumni Services and Placement Office.

Algorithm Analysis

This section shows and discusses algorithms that have been tested and analysed to determine the most suited to the study. Upon searching, these are the algorithms that can be used to create a decision support system:

Zhang and Shasha's Algorithm

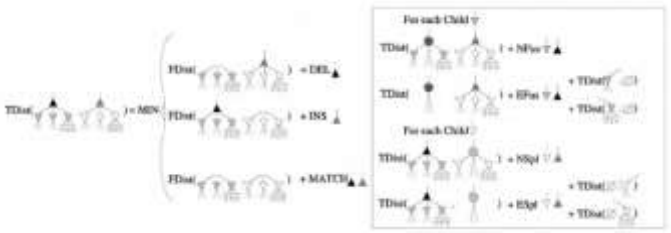

Figure 1. Zhang and Shasha's Algorithm

Figure 1 discusses the The Zhang-Shasha algorithm calculates the edit distance between trees by counting the minimum number of node insertions, deletions, and relabelings needed to transform one tree into another. This concept is analogous to the edit distance between strings but applied to tree structures. The algorithm was introduced by Kaizhong Zhang and Dennis Shasha.

The Zhang and Shasha algorithm is an effective dynamic programming algorithm that determines the tree edit distance between two trees (Cording, 2011). The bare minimum of node deletions, insertions, and replacements required to change one tree into another is known as the tree edit distance. Zhang and Shasha originally presented the technique in a groundbreaking

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work published in 1989. Since then, the tree edit distance has been extensively used in many domains, such as intelligent tutoring systems and biology.

The algorithm works by breaking down the problem of computing the tree edit distance into smaller sub-problems and solving each sub-problem recursively. The optimal solution to each sub-problem is stored in a table and used to solve larger sub-problems until the final problem is solved. The algorithm is efficient because it avoids recomputing the same sub-problems multiple times.

Tree Pattern Matching

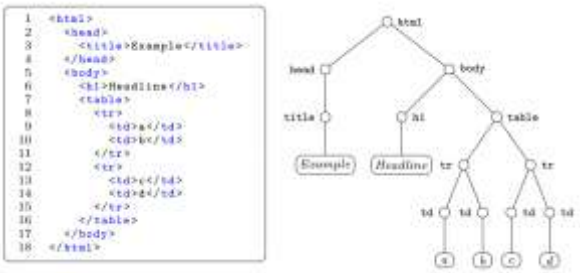

Figure 2. A HTML document and its tree model using Tree Pattern Matching Algorithm.

Hajiaghayi et.al (2021) stated that Tree pattern matching is a technique used to find a pattern in a tree structure. It is widely used in various fields, including XML query, compilers, and natural language processing. There are several algorithms for tree pattern matching, including the Zhang and Shasha algorithm. This algorithm is based on dynamic programming and is known for its efficiency. Another algorithm is the tree pattern matching algorithm called TreeMatch, which directly finds all distinct matchings of a query tree pattern.

For the second objective, to test the functionality and accuracy of the developed web scrapping method in getting the correct alumni information to be listed in the Alumni Tracer, the researcher used Accuracy, Recall, Precision, F-1 Score as the metrics to evaluate the performance of the algorithms were discussed.

Evaluation

The web scraping program was evaluated using the Likert Scale to measure acceptance and reliability. The rating scale is a tool that converts numerical values into descriptions to provide context for qualitative ratings given by the respondents. It converts scores into easily understandable categories, allowing a clear understanding of respondent sentiment. A rating of 5 indicates strong endorsement and support for the evaluated aspects, indicating high satisfaction and positive perception of the system or process. A rating of 4 signifies agreement, suggesting general approval or satisfaction with the evaluated elements. A rating of 3 indicates neutral stance, with no clear consensus or mixed perception. A rating of 2 indicates disagreement, indicating areas needing attention or improvement. A rating of 1 indicates strong disagreement, indicating apparent dissatisfaction or conflict with the evaluated elements, indicating urgent issues needing attention and resolution.

Statistical Treatment

The Likert Scale is displayed in Table 1. In order to gather information about participants' preferences or level of agreement with a statement or collection of assertions, surveys often employ Likert scales, which are psychometric answer scales. Using five or seven levels, respondents score quality from best to worst or from high to low. Likert scales are frequently used by researchers to evaluate behaviors, attitudes, and personality. It's a useful tool for expressing complex thoughts and emotions.

Rating	Description
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Table 1. Likert Scale

The terms "minimum" and "maximum" designate the smallest and biggest values, respectively, within a data set. These are basic ideas that give a fast overview of the range of the data in descriptive statistics. The value that is equal to or less than every other value in the data collection is the minimum. Assuming that all the data points are listed in ascending order, the first number would be the minimum. The value that exceeds or equals every other value in the data collection is the maximum. The last number in an ascending list of data points would be the maximum.

$$X' = \frac{X - Xmin}{Xmax - Xmin}$$

Skewness is a statistical measure that describes the asymmetry of a distribution around its mean. In simpler terms, it indicates whether the data points tend to cluster more on one side of the scale. Zero Skewness: If the distribution is symmetrical, like a normal distribution, it has zero skewness. The left and right sides of the distribution are mirror images of each other. Positive Skewness (Right Skewed): A distribution with positive skewness has a longer tail on the right side. It means there are several unusually high values. The bulk of the data is concentrated on the left. Negative Skewness (Left-Skewed): Conversely, a distribution with negative skewness has a longer tail on the left side. This indicates a bunch of unusually low values, with most data skewed to the right.

$$skewness = \frac{(x - \mu)^3}{\sigma^3}$$

Kurtosis is a statistical measure that describes the “tailedness” of a probability distribution. It provides insight into the shape of the distribution, particularly the thickness or heaviness of the tails. Understanding kurtosis is important in fields like quality control

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because it affects the interpretation of data and the statistical models used for analysis.

$$kurtosis = \frac{(x - \mu)^4}{\sigma^4}$$

RESULTS AND DISCUSSIONS

RESEARCH OBJECTIVE 1: to develop a web scraping program for Alumni Affairs and Placement Services where it can scrape for publicly available information in a Social Media platform like Facebook without violating the terms and conditions of the platforms/sites. When creating the web scraping program used by the researcher, as much as possible, the researcher follows laws and rules about web scraping from the Computer Fraud and Abuse Act (CFAA) in the United States and the General Data Protection Regulation (GDPR) in the European Union. These rules deal with unauthorized access to data and protecting people's privacy. It includes the following:

- The data being obtained from the website shall have public access or with explicit permission.
- Respecting the terms of service provided by the website.
- Avoid scraping private data and personal data without consent in compliance with international privacy laws.
- Implementing ethical considerations such as limiting the data being scraped to not overload the server.

RESEARCH OBJECTIVE 2: To test the functionality and accuracy of the developed web scraping method in getting the correct alumni information to be listed in the Alumni Tracer.

The researcher tested the web scraping program to see if the data from the Alumni Tracer for the Graduates of 2023 match with the scraped data from the Facebook Group where the scraper was used to know the functionality of the data extracted. The researcher selected 20 random names from the Alumni Tracer of the College of Computer Studies under the program Bachelor of Science in Information Technology, it is represented in the Table using their Last Name, then it is compared to the scraped data from the Facebook Group.

	Alumni Tracer	Scraped?	Match?
Alumni 1	Brofar	Yes	Yes
Alumni 2	Solis	Yes	Yes
Alumni 3	Cagayat	Yes	Yes
Alumni 4	De Luna	No	No
Alumni 5	Sorromero	Yes	Yes
Alumni 6	Corpuz	Yes	Yes
Alumni 7	Amolato	Yes	Yes
Alumni 8	Maquiling	Yes	Yes
Alumni 9	Jazmin	Yes	Yes
Alumni 10	Sapo	Yes	Yes
Alumni 11	Briz	Yes	Yes
Alumni 12	Yretarino	Yes	Yes
Alumni 13	Daya	No	No
Alumni 14	Alababa	Yes	Yes
Alumni 15	Combalicer	Yes	Yes
Alumni 16	Perez	Yes	Yes
Alumni 17	Bodino	Yes	Yes
Alumni 18	Abadines	Yes	Yes
Alumni 19	Dela Luz	Yes	No
Alumni 20	Babaan	Yes	Yes

Table 2 shows the random pattern matching used by the researcher to determine the functionality of the web scraper when compared in the alumni tracer provided by the Alumni Services and Placement Office.

Reason of Data not being scraped is due to the Alumni is not included in the Facebook Group where the data was extracted. Additionally, another reason is that the Alumni changed their name in their Social Media profile and can also because the Alumni is not really included in the specific batch.

RESEARCH OBJECTIVE 3: to know the acceptability of using the Web scrapping method.

The functionality of the web scraping program is one of the criteria evaluated in this study. Descriptive analysis of the data shows, that respondents *strongly agree* that the program can perform the task required (M= 4.46, SD = 0.58); scraping result is accurate (M= 4.50, SD = 0.54); data collected can be helpful to the people (M=4.78, SD=0.42), and can collect the data that is publicly available to other users (M=4.46, SD=0.58).

It can also be deduced from the table, that the minimum score given by the respondents is 3 and the maximum is 5. A negative skewness, in all the statements, likewise, shows that only small proportion of respondents rated low score, precisely 3 as it is the minimum and that majority ratings were high. Negative kurtosis on the other hand, shows that most of the ratings of the respondents are close or near the mean.

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Table 3. Acceptability of Web Scraping Program as to Functionality

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. Can the Web scraping tool perform the task required?	4.46	0.58	3	5	-0.50	-0.68	Strongly Agree
2. Is the result of scraping accurate?	4.50	0.54	3	5	-0.40	-1.05	Strongly Agree
3. The data / information collected through scraping can be helpful to people.	4.78	0.42	4	5	-1.39	-0.06	Strongly Agree
4. The web scraper can collect the data that is publicly available to other users.	4.46	0.58	3	5	-0.50	-0.68	Strongly Agree
Overall Mean	4.55						
Overall Interpretation	Highly Acceptable						

Table 4. Acceptability of Web Scraping Program as to Reliability

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. Can the problem/s with the web scraping program be eliminated over time?	4.26	0.78	3	5	-0.50	-1.16	Strongly Agree
2. Is the program capable of handling errors?	4.20	0.61	3	5	-0.11	-0.36	Strongly Agree
3. Can the web scraping program resume working after an error?	4.38	0.72	3	5	-0.73	-0.73	Strongly Agree
Overall Mean	4.28						
Overall Interpretation	Highly Acceptable						

Table 5. Acceptability of Web Scraping Program as to Usability

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. The user can understand how the web scraper program works.	4.32	0.59	3	5	-0.19	-0.58	Strongly Agree
2. The user can learn the function of the web scraper.	4.22	0.55	3	5	0.11	-0.09	Strongly Agree
3. The user can use the web scraper without help from others.	4.28	0.73	3	5	-0.49	-0.95	Strongly Agree
4. The user interface is easy to understand.	4.60	0.61	3	5	-1.26	0.62	Strongly Agree
Overall Mean	4.36						
Overall Interpretation	Highly Acceptable						

Table 6. Acceptability of Web Scraping Program as to Efficiency

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. The web scraper responds to the user's request.	4.52	0.61	3	5	-0.90	-0.13	Strongly Agree
2. The web scraper utilizes the computer's resources efficiently.	4.52	0.61	3	5	-0.90	-0.13	Strongly Agree
Overall Mean	4.52						
Overall Interpretation	Highly Acceptable						

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Table 7. Acceptability of Web Scraping Program as to Maintainability

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. The user can analyze the data gathered by the web scraper.	4.36	0.66	3	5	-0.55	-0.64	Strongly Agree
2. The web scraper can be modified to scrap other types of data.	4.32	0.59	3	5	-0.19	-0.58	Strongly Agree
3. The web scraper can still function correctly after the changes are made.	4.42	0.70	3	5	-0.81	-0.54	Strongly Agree
4. The web scraper can be tested easily.	4.18	0.60	3	5	-0.07	-0.25	Strongly Agree
Overall Mean	4.32						
Overall Interpretation	Highly Acceptable						

Table 8. Acceptability of Web Scraping Program as to Portability

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. The web scraper can be used in other usage.	4.24	0.74	3	5	-0.42	-1.06	Strongly Agree
2. The web scraper can be installed easily in a computer.	4.20	0.73	3	5	-0.33	-1.02	Strongly Agree
3. The web scraper complies with portability standards.	4.46	0.68	3	5	-0.88	-0.34	Strongly Agree
4. The web scraper can replace existing software like it.	4.30	0.65	3	5	-0.38	-0.65	Strongly Agree
Overall Mean	4.30						
Overall Interpretation	Highly Acceptable						

Table 10. Acceptability of Web Scraping Program as to Compliance

Indicative Statement	$\overline{X}$	SD	Min	Max	Skew	Kur	Remarks
1. The web scraper comply with laws and regulations of the webpages it was being used.	4.28	0.76	3	5	-0.52	-1.05	Strongly Agree
Overall Mean	4.28						
Overall Interpretation	Highly Acceptable						

CONCLUSION

Based on the findings of the study, the following conclusions and generalizations are drawn:

1. To ensure safety of both the computing device and social media platform account, the method to be used in scraping should follow the international laws and rules about data privacy and should only extract data from publicly available sources.
2. To use the scraper effectively, researchers should create a group for Alumni into their respective batches and program so we can limit the data being collected to the appropriate level as to not violate the social media site's terms and conditions.
3. The researcher can utilize the CSV file for data cleanup purposes to help in determining the employment status of the Alumni since a few of them displayed incorrect information.

RECOMMENDATIONS

Based on the conclusions and actual testing the researchers have reached the following recommendations:

1. For further improvement, the researcher recommends creating a better Graphical User Interface for the scraping program so it can be installed offline which can help if internet connection is not available and to make it more portable.

2.It is also recommended that there is another program to use for data cleanup for the maintainability of the files that was scraped using the program that can be used to compare results when scraped again if the Alumni has updated their profile.

3.Lastly, if budget constraints are not a concern, using a desktop computer with better specifications than that of what the researcher used would be preferable as to be able to use system environments that took up storage resources from the computer. The researcher suggests getting a more robust Central Processing Unit (CPU) such as the latest version of Intel Core i7 or i9 series / AMD Ryzen 7 or 9 series. Random Access memory should be a

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single stick of 16/32 GB RAM DDR4 or DDR5 for better performance when executing the program. In addition, a good Graphics Processing Unit (GPU) like RTX 4090 or Radeon 7000 series can offer a lot in training datasets and avoid hangs and freezing during scraping.

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ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 5| May 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

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