

## **TRYWORK: INTERNSHIP RECOMMENDER SERVICES AND MANAGEMENT SYSTEM UTILIZING FUZZY SEARCH ALGORITHM**

Kristine Grace B. Estilo, MSIT - kgb.estilo@gmail.com  
Rosicar E. Escobar, Ph.D. - rose\_escobar@yahoo.com  
Polytechnic University of the Philippines - Open University System  
Polytechnic University of the Philippines  
Sta. Mesa, Manila, 1016, Philippines

### **ABSTRACT**

The purpose of the study was to develop an online internship recommender services which addresses the challenges in matching skills requirements needed for internship training of a Host Training Establishments with an Intern. The study uses Fuzzy Search Algorithm which serves as the intelligent component in order to offer a fast, reliable and efficient Internship Recommendation Services. Furthermore, the study aimed to provide a better administrative management in internship training that served as a bridging gap between Interns, State Universities and Colleges and Host Training Establishments. Fuzzy Search Algorithm works by applying different methods in identifying the minimum edit distance of strings such as insertion, deletion and substitution. Once identified, Fuzzy Search Algorithm will then generate what are the possible closest strings (list of skills requirements) matches to its target string (intern's skills). With the utilization of this algorithm, TRYWORK can now provide what are the possible recommended job trainings or Host Training Establishments that are available for each intern. Descriptive – Developmental method of research was used by the researchers. The researchers use Stratified Purposeful Sampling and Slovin's Formula to determine the sample size of respondents from the identified population. The respondent's level of acceptance towards the developed system in terms of Functionality, Usability, Reliability, Efficiency and Security is Highly Acceptable with a rate of 4.64. Furthermore, the researchers concluded that the TRYWORK has solved the issue by offering recommendations for both Host Training Establishments and Interns. Also, the study provides a map suggesting to an intern what is the nearest distance between a Host Training Establishment and intern and be considered to apply for internship training. TRYWORK provides solution in producing internship reports and analytics which helps in providing better accomplishments within Higher Education Institutions in achieving their desired target goals.

**KEYWORDS** – Fuzzy Search Algorithm, Internship, Internship Recommender Services, Internship Management System, Descriptive-Developmental Research

### **INTRODUCTION**

Modern Technology gives enormous benefits in the world. Communication and modern tools helps people to accomplish tasks more effectively and efficiently. Without a doubt, Modern Technology of this Era brought the society to a new level of advancement.

Higher Education Institutions are converging with modern technologies to address the needs of every student in order to become better professionals of the future. Internship is one of the missions of every Higher Education Institutions to adapt with modern technologies in providing students opportunity to acquire practical knowledge, skills and desirable attitudes in Industries. With the goal of enhancing the students' work competencies and discipline, internship is the key as they relate to people in the workplace, promotes competitiveness, provide opportunities to learn from and network with experienced professionals.

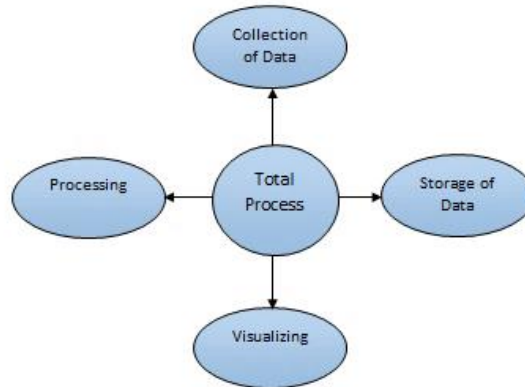
However, a wrong mindful use of modern technologies can sometimes lead to mishap. One example is a mismatched of skills requirement of a Host Training Establishment to an Intern. In addition, the difficulty in looking for a Host Training Establishment that will suit for the academic program of an Intern can be challenging. These are just few of the reasons why there is a need for bridging the gap between Host Training Establishments and Interns as well as administering internship training by the OJT Personnel.

In order to overcome these challenges, the system entitled “TRYWORK: Internship Recommender Services and Management System using Fuzzy Search Algorithm and Distance Matrix Application Program Interface” addresses the needs for internship training and management. It is a recommender solution for both Interns and Host Training Establishments. It also addresses the basic needs for administering internship training by On the Job Training Personnel.

**LITERATURE REVIEW**

**Big Data**

Sahu, Jacintha, and Singh (2017) found that the scalability of increase in volume, velocity and variety of data in an organization will be benefited by selecting appropriate big data technologies. Appropriate selection of tool will be the basis of global competition result in optimum investment in big data analytics and production growth. Big Data’s perspective is to provide assistance to number of industries to extract data into high-quality information for in-depth approach into their organization status. Big Data Analytics tool made the entire data management cycle technically and economically feasible from collection and storing of larger data sets to analyse data in order to provide new and valuable insights. Big Data Analytics tool process involves the data flow from collection of data from the larger dataset to provide valuable information for decision making. These includes: Collection of data, Storage of data, Processing, and Visualizing. [1]

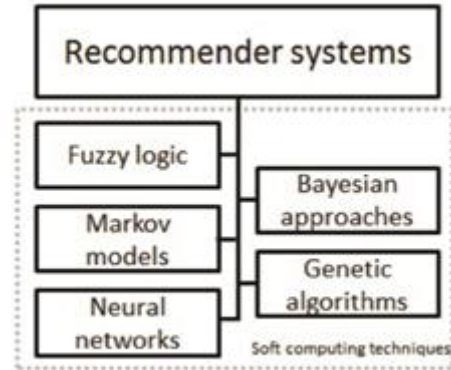


**Figure 1. Big Data Analytics Tool**

**Fuzzy Search Algorithm**

Fuzzy Matching Algorithm is a special case of record linkage that is used in computer-assisted translation. It works by finding correspondents between two segments of text entries in a database of previous translations with approximately matching of less than 100% perfect (Megter, 2016). [2]

According to Yera and Martinez (2017), user’s preference plays an important main role in recommendation generation process. This serves as the basis on what particular algorithm to be used for a recommender system that will completely boost the filtering process of suggesting data. Based on their study, there are different algorithms which are used for recommender systems that are considered as techniques. These are the soft computing approaches such as: Fuzzy Logic (Fuzzy Search), Markov Models, Neural Networks, Bayesian Approaches, and Genetic Algorithms. [3]



**Figure 2. Algorithms used for Recommender Systems**

### **Distance Matrix API**

Google Distance Matrix API is one of the latest Map-Related API services that ever released. According to Google (2011), Google Distance Matrix API is a service that provides distance and time for a matrix of origins and destinations.

Based on the study of Wang and Xu (2011) entitled "Estimating O-D travel time matrix by Google Maps API: implementation, advantages, and implications", the researchers develop a desktop tool for implementing the task by calling the Google Maps Application Programming Interface (API). By doing so, the tool was able to tap into the dynamically updated transportation network data and the routing rules maintained by Google and obtain a reliable estimate of Origin-Destination (O-D) travel time matrix. [4]

## **METHODOLOGY**

### **Developed System**

#### **TRYWORK system Architecture**

TryWork System Architecture encompasses the overview components as well as the communication technology used that work together to implement as an overall system. TRYWORK is composed of the following layers namely: Roles and Actors, Business Services, Business Process, Application Services, Application Components and Services, Technology Services, and Technology Components that work together to implement as an overall system.

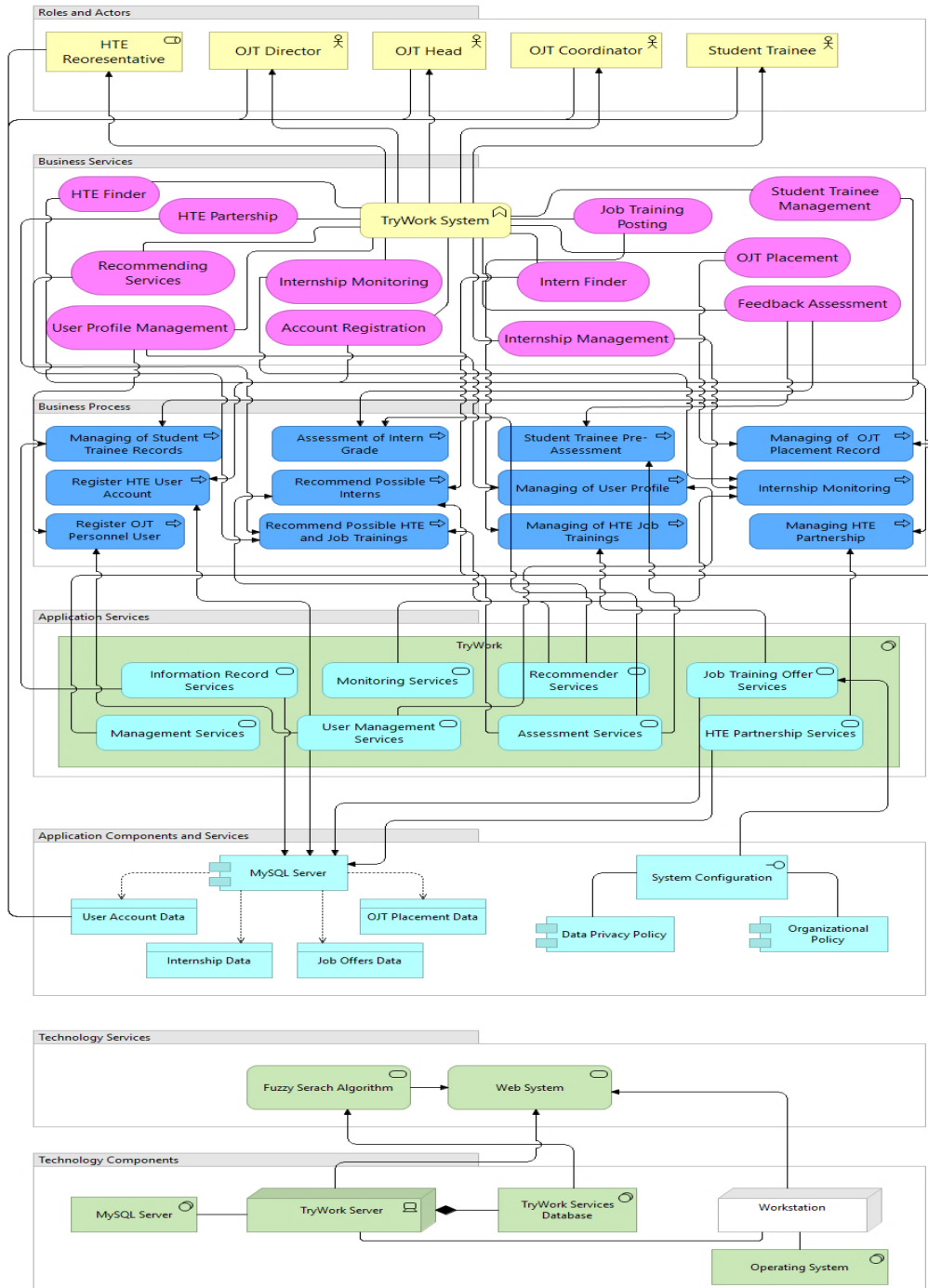
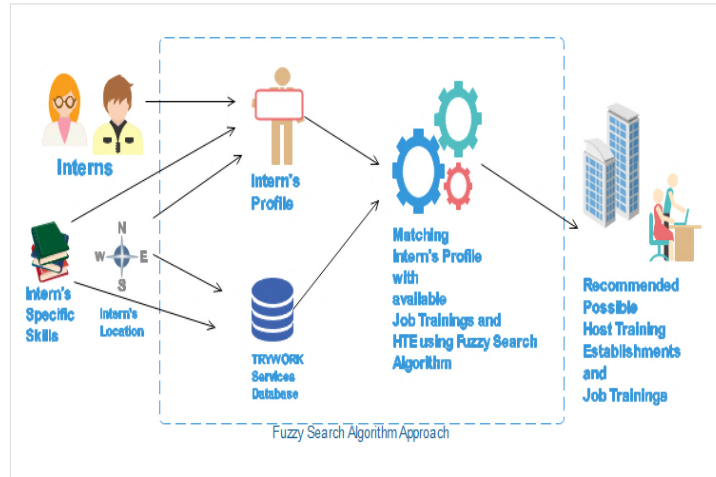


Figure 3. TRYWORK System Architecture

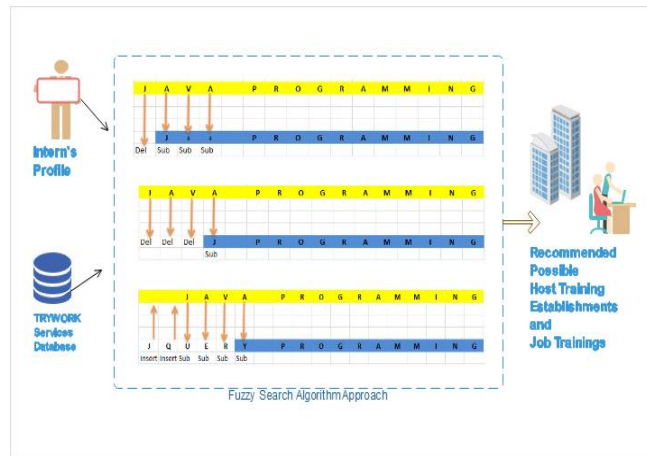
### TRYWORK Algorithm

The researchers applied Fuzzy Search Algorithm in TRYWORK to improve the efficiency and reliability of string-matching. The figure below represents the process flow of fuzzy search algorithm approach.



**Figure 4. Fuzzy Search Algorithm Approach Overview**

In order to execute string matching, there are several components needed: The intern (as a target), Intern’s specific skills, and Intern’s present location. These components play an important role to generate intern’s profile and other information such as intern’s skills and location which will be placed inside a repository known as TRYWORK services database. Fuzzy Search Algorithm works by simply finding set of strings that approximately match to intern’s specific skills, and location for a fast and reliable result. String match closeness is measured in terms of primitive operations to convert the string into an exact match such as: insert, delete or substitution. The system will then generate all the list of possible recommended Host Training Establishments and Job Training for an intern.



**Figure 5. Fuzzy Search Algorithm Process Flow**

The Algorithm works by applying the method of insertion, deletion and substitution first to measure the minimum edit distance. Once identified, Fuzzy Search Algorithm will then generate what are the possible closest strings matched to the target string and TRYWORK will provide what are the possible recommended Job trainings or Host Training Establishments for each intern.

**Research Design and Instrument**

Descriptive – developmental method of research was used by the researchers to the research entitled “TRYWORK: Internship Recommender Services and Management System using Fuzzy Search Algorithm”. The combination of the methods was specifically chosen by the researchers to see the desired result of the study.

Stratified Purposeful Sampling and Slovin’s Formula was used by the researchers to determine the sample size from a population. A total population size of 672 respondents was determined and was derived from the

calculation of both Slovin's Formula and Stratified Purposeful Sampling resulting to a desired sample size of 251 respondents. The formula below represents stratified sampling with proportional allocation:

$$n_i = \left( \frac{N_i}{N} \right) * n$$

Where:

$n_i$  = number of samples

$n$  = total number of samples computed from Slovin's formula

$N$  = total population

$N_i$  = population

The researchers used survey questionnaire to gather data from the respondents. It determines the feasibility and usability result of the developed system. Questions were composed of four parts: Part I: Respondent's Profile; Part II: Formal Questionnaire - Existing Internship Management Process; and Part III: Formal Questionnaire – Proposed System's Acceptability; Part IV: Formal Questionnaire - Recommendations.

### Data Case Analysis

The data that will be gathered from the respondents' evaluation through questionnaires will be systematically tabulated and processed to arrive at accurate information. Statistical tools used by the researchers are: Likert Scale and Weighted Mean.

Likert scale uses five potential choices. For Level of Acceptability, these are: (5) for Highly Acceptable (4) for Moderately Acceptable (3) Acceptable (2) Slightly Acceptable (1) Unacceptable. As for the Level of Agreement, these are: (5) for Strongly Agree (4) for Agree (3) Slightly Agree (2) Disagree (1) Strongly Disagree. The overall accomplishment level toward the subject matter is represented by the computed overall score.

Weighted mean is a method necessary to determine the corresponding weight of frequencies observed on the gathered data in order to give quantities being averaged in their proper degree of importance.

Weighted mean is computed by using the formula:

$$\text{Weighted Mean} = \sum fw / n$$

Where:

$f$  = frequency of each weight

$w$  = weight assigned to each value

$n$  = sample size

## RESULTS AND DISCUSSION

1. The difficulties and challenges the respondents encountered with the current OJT Program.

The difficulty in finding potential Host Training Establishments which will engage in On-The-Job Training for each State Universities and Colleges; and difficulty in finding a potential Intern or Student Trainee which will benefit the Host Training Establishments has a result percentage scale of 100%. The difficulty in finding the right OJT skills of an intern that match for a task requirement resulted to 75.71%. Last from the issues and challenges, the difficulty in finding a company that fits in the program per student resulted to 80.23%.

2. Respondents' Level of Acceptance towards the developed system

The respondents rated the system with a verbal interpretation of Highly Acceptable with a numerical rating of 4.64. It is revealed that the developed system is indeed feasible in recommending internship services and in operational tasks in internship training management.

3. Respondents' Level of Agreement towards recommendations to further improve the developed system.

The respondents rated the system as Strongly Agree with a numerical rating of 4.48. It reveals that the developed system meets the supposed given recommendations to each parameter such as: Process, TryWork Application, Reports and Technology Services.

## CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations were drawn by the researchers:

1. The researchers concluded that TRYWORK has solved the issue regarding difficulty in finding the right OJT skills of an intern needed by the host training establishments. The feature recommending services addresses the host training establishments' needs by suggesting qualified interns with specific parameters which can be absorbed.

With the combination of knowledge in recommending services system and internship management system, TRYWORK had addressed the challenges. Thus, it is recommended for future interns, Host Training Establishments, and School Administrators to use and serve as central part of activity in internship training.

2. The researchers concluded that TRYWORK has solved the issue in accordance with interns or Student-Trainee. The capability of TRYWORK to show the suggested Host Training Establishments that matched with their skills upon their course is addressed with the issue in difficulty of finding a company that fits within their course program. Moreover, TRYWORK provides solution of suggesting the nearest Host Training Establishments that matches with their specific location. It also provides a map suggesting what is the nearest distance between Host Training Establishments and intern and be considered to apply for internship training.

In terms of Level of Acceptability, TRYWORK was overall identified as Highly Acceptable. However, in system's reliability, it was identified as moderately acceptable. Thus, it is recommended for the system TRYWORK to improve the reliability function of the system, in particular, in providing system backup and recovery feature.

3. The researchers concluded that TRYWORK provides solution in producing Internship Reports and Analytics which helps School Administrators of Internship Training. These reports help in providing better accomplishments within a Higher Education Institutions in achieving their desired target goals within an academic school year.

As for technology services, a mobile application support is recommended for TRYWORK in order to be reach at hand by the intended users. It will be great benefit for TRYWORK as it will improve the form of communication within the users.

4. The Researchers concluded that TRYWORK had addresses the needs of intended users specifically, with the aim of bridging the gap of providing job experience for Interns to be work ready and providing competitive yet powerful interns that will benefit by most of the Organizations in the future.

The improve version of predicting the number of OJTs needed by each partner establishments will be a great help in determining not only the number of possible interns to be absorbed but the possibility of recruitment within their establishments.

## REFERENCES

- [1] S. Sahu, M. Jacintha, A. Singh, “Comparative Study of Tools for Big Data Analytics: An Analytical Study. International Conference on Computing, Communications, and Automation”, ICCCA 2017.
- [2] Megter, “Fuzzy Matching Algorithms to Help Data Scientists Match Similar Data”, Retrieved from Data Science Central – The Online Resource for Big Data Practitioners:”
- [3] R. Year, and Martinez, L., “Fuzzy Tools in Recommender System: A Survey”, International Journal of Computational Intelligence Systems, 2017, Vol. 10., Page 776-803.
- [4] F. Wang, and Y. Xu, “Estimating O-D Travel Time Matrix by Google Maps API: Implementation, Advantages, and Implications.”,2011, Annals of GIS, 199-209.

## ABOUT THE CONTRIBUTORS

Kristine Grace B. Estilo is a College Instructor in Information Technology and Computer Science courses at the Batangas State University ARASOF – Nasugbu. She received her Master’s Degree in Information Technology at the Polytechnic University of the Philippines – Open University System.

Rosicar E. Escobar, Ph. D. is a part-time professor at the Polytechnic University of the Philippines – Open University System and also connected with the National Grid Corporation of the Philippines.