TRIBHUVAN UNIVERSITY
Institute of Science and Technology
A Proposal Report on
"Job Recommendation System through Recommendation Algorithms(Cosine Similarity)"

Submitted to CSIT Department
Bhaktapur Multiple Campus

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Chapter 1

Introduction

In this era of Science and technology , Information and Technology has vast influence on almost every fields and aspects. The modern computer technology and the use of mathematics and algorithms have redefined the working system of almost every oraganization/entity. Job Recommendation is an online system that allows individuals to explore jobs according to their qualifications,experience and expertise and requirements, and also recommends the jobs best to their abilities and qualifications. This system provides various options and large range of job opportunities from which the user can choose the best option for them. that allows individuals to manage their own health and wellness by providing access to a range of tools and resources. It is designed to support people in maintaining their overall health and well-being, as well as managing specific health conditions.

Job Recommendation system provides the registration form and takes the users/job seekers informations and their academic qualifications , experiences, skillsets, subject of interests and on the other hand, takes all the requirements and post for job from the job providers and by matching the similarities between both the provider and seeker parties, system suggests jobs for them .

Job Recommendation system uses the cosine similarity algorithm that measures the similarity between two vectors of an inner product space (texts in our case).

Cosine Similarity is a method of calculating the similarity of two vectors by taking the dot product and dividing it by the magnitudes of each other. It is measured by the cosine of the angle between two vectors and determines whether two vectors are pointing in roughly the same direction. In this system, texts taken as input are converted to vector and the same logic mentioned above is applied .

Chapter 2

Problem Statement

Looking at the present context , despite the fact that there are certain job finders/providers agencies and systems are available for a some time now, they still are unable to comply the needs and satisfaction of the users since they donot seem to comprehend the factors like unique characteristics of Nepalese job markets, geographical and cultural diversities, economic and political factors. Following traditional way , people have to visit companies to companies taking there degrees and qualifications to look out for the right job and job providers also faces difficulties and expenses in resources which cost both the parties in terms of time and economy. Also they seem to have a very few limited options available which can cause them to miss out opportunities that could be best and beneficial for them. Sometimes people are unaware about the availability of the jobs . They might not know certain jobs exists and have a scope in it , It is never a good idea to ask for the availability of each item in the restaurent/hotels if there can be provision of better menu system.

Chapter 3

Objectives

The main objective of this system is to showcase the available jobs to the users and recommend the jobs best to their abilities ,experiences and expertise. However thorough set of objectives are listed below:

1. Personalization: To provide personalized job recommendations to job seekers based on their skills. Experience, and preferences. This will help job seekers to find job opportunities that are relevant to their career goals and aspirations.

2. Accuracy: To provide accurate job recommendations that match the job seeker's skills and qualifications with the job requirements and qualifications provided by the employer which will increase the chances of successful job placements for both job seekers and employers.

3. Efficiency: To provide and efficient platform that connects job seekers with potential employers, reducing the time and effort required to find suitable job opportunities.

4. Diversity: To consider the geographical and cultural diversity of Nepal and cater to the needs of job seekers and employers from different regions and ethnicities.

5. Compliance: To comply with the Nepalese labor laws and regulations and provide job recommendations that comply with them.

6. Learning and Improvement: To continuously learn and improve based on user feedback and interactions with the platform , ensuring that the recommendations become more accurate and relevant over time.

7. Accessibility: To make the system accessible to all job seeker regardless of their location or socioeconomic status, ensuring that everyone has an equal opportunities to find suitable job opportunities.

Chapter 4

Methodology

4.1 Requirement Identification

4.1.1 Literature Review

Recommender Systems have become an important research field since the emergence of the first paper on collaborative filtering in the mid-1990s. In general, these systems are stated as the support systems which help users to find content, products, or services (such as books, movies, music, TV programs, and websites). By gathering and examining suggestions from other users, which means reviews from various establishments, and users.

These systems are broadly classified into collaborative filtering (CF) and content-based filtering (CB). Content-Based recommender system [1] tries to guess the features or behavior of a user given the item's features, he/she reacts positively to.

In 2008 [2] Kleanthi Lakiotaki, Stelios Tsafarakis, and Nikolaos Matsatsinis proposed UTA-Rec. UTARec is a Recommender System that incorporates Multiple Criteria Analysis methodologies. The system's performance and capability of addressing certain shortfalls of existing Recommender Systems is demonstrated in the case of movie recommendations. UTARec's accuracy is measured in terms of Kendall's tau and ROC curve analysis and is also compared to a Multiple Rating Collaborative Filtering (MRCF) approach. Juan A.

Mucheol Kim Sang Oh Park [3] in 2011 proposed an intelligent movie recommender system with a social trust model. The proposed system is based on a social network for analyzing social relationships between users and generating group affinity values with user profiles. In experiments, the performance of this system is evaluated with precision-recall and F-measures.

In 2012 Punam Bedi, Ravish Sharma [4] proposed a Trust based Ant Recommender System (TARS) that produces valuable recommendations by incorporating a notion of dynamic trust between users and selecting a small and best neighborhood based on the biological metaphor of ant colonies.

Along with the predicted ratings, displaying additional information for explanation of recommendations regarding the strength and level of connectedness in the trust graph from where recommendations are generated, items and number of neighbors involved in predicting ratings 4can help active users make better decisions. Also, new users can highly benefit from pheromone updating strategy known from ant algorithms as positive feedback in the form of aggregated dynamic trust pheromone defines ''popularity'' of a user as recommender over a period of time. The performance of TARS is evaluated using two datasets of different sparsity levels viz. Jester dataset and Movie Lens dataset (available online) and compared with traditional Collaborative Filtering based apps convince users about the product. It is an agent-based recommender system. It combines a hybrid recommender system with automated argumentation.

Recommender system is one of the application which is being used by many vectors and online service providers to believe the necessity of online users. Thus, the recommender system is presented as an intelligent system, which identifies the user category on the basis of user information and then user interest analysis. Once such information is obtained, in the second stage, the analysis is performed to obtain the similarity group respective to necessity products and services. To perform such an analysis there are some existing techniques such as content based as well as collaborative recommender systems.

In the context of Nepal, a study by Adhikari et al. (2019) investigated the challenges and opportunities of online job portals in Nepal. The study highlighted the potential of job recommendation systems to improve

the efficiency and effectiveness of the job search process in Nepal.

4.1.2 Requirement Analysis

Requirement analysis is the process of identifying, documenting, and evaluating the needs and expectations of stakeholders in a particular system or project. It is an important step in the development of any system or product, as it helps to ensure that the final product meets the needs and expectations of the people who will be using it.

Functional Requirements

Functional requirements are the specific features or capabilities that a system must have in order to fulfill its intended purpose. In the context of a job recommendation system, some possible functional requirements might include:

1. **User Registration:** The system should allow job seekers to create an account and fill out a profile that includes personal information, work experience, education, and skills.
2. **Job Search:** The system should allow job seekers to search for job opportunities based on keywords and job type.
3. **Job Matching:** The system should use algorithms and data analysis techniques to match the job seeker's qualifications with the job requirements provided by the employers.
4. **Employer Registration and Job Posting:** The system should allow employers to register and create a profile that includes information about their company and job opportunities. Employers should be able to post job openings, including job requirements, qualifications, and job descriptions.
5. **Feedback and Evaluation:** The system should allow job seekers and employers to provide feedback and evaluate the job recommendations and job placements.

Non-Functional Requirements

Non-functional requirements are not directly related to the functions performed by the system. Simultaneously, non-functional requirements may relate not only to the software system itself: some may relate to the technological process of creating software.

1. **Usability:** The system should be easy to use and intuitive for both job seekers and employers, with clear navigation and user-friendly interfaces.
2. **Performance:** The system should provide fast response times and be able to handle a high volume of traffic and user data.
3. **Security:** The system should be secure, protect user data, and prevent unauthorized access or breaches.
4. **Scalability:** The system should be able to handle a growing number of users and job opportunities without sacrificing performance or user experience.
5. **Reliability:** The system should be reliable, available 24/7, and minimize downtime or system failures.
6. **Accessibility:** The system should be accessible to all users, including those with disabilities, and support multiple languages.
7. **Compatibility:** The system should be compatible with multiple web browsers, operating systems, and devices.
8. **Compliance:** The system should comply with Nepalese labor laws and regulations and provide job recommendations that comply with them.
9. **Maintainability:** The system should be easy to maintain and upgrade, with clear documentation and efficient code.

4.2 Feasibility Study

A feasibility study is an evaluation of a proposed project or system to determine whether it is practical, viable, and worth pursuing. In the context of a job recommendation system, a feasibility study might consider a range of factors, including technical, economic, operational, and legal considerations. Various feasibility analyses are discussed below:

4.2.1 Technical

From a technical perspective, a job recommendation system is feasible as long as the necessary technologies and infrastructure are available or can be developed. Since this system is able to handle large amounts of data and traffic, use similarity algorithms and data analysis techniques, and provide fast response times and reliable performance, this is technically feasible.

4.2.2 Operational

Operational feasibility refers to whether the job recommendation system can be integrated into the existing business processes and workflows. The system is easy to use and intuitive for both job seekers and employers, and provide support and training as needed. The system cab also be made compatible with other relevant systems or applications, such as applicant tracking systems or social media platforms.

4.2.3 Economic

The economic feasibility of a job recommendation system depends on the cost-benefit analysis. The system development and implementation costs, maintenance costs, and other associated costs should be justified by the benefits that the system provides. The benefits may include improved job seeker-employer matching, increased efficiency and productivity, and reduced recruitment costs for employers. This system can atleast self sustain and is economically feasible

4.2.4 Legal Feasibility

Since this recommendation system comply with Nepalese labor laws and regulations, including data protection and privacy laws, and provide job recommendations that comply with them, It can be seem to be feasibl legally as well. Legal feasibility also includes ensuring that the system does not discriminate against any specific group of people based on race, gender, religion, or other characteristics.

Overall, a job recommendation system is feasible as long as the necessary resources are available, and the system meets the technical, economic, legal, and operational requirements. The benefits of such a system can be significant, providing a more efficient and effective way to match job seekers with suitable job opportunities.
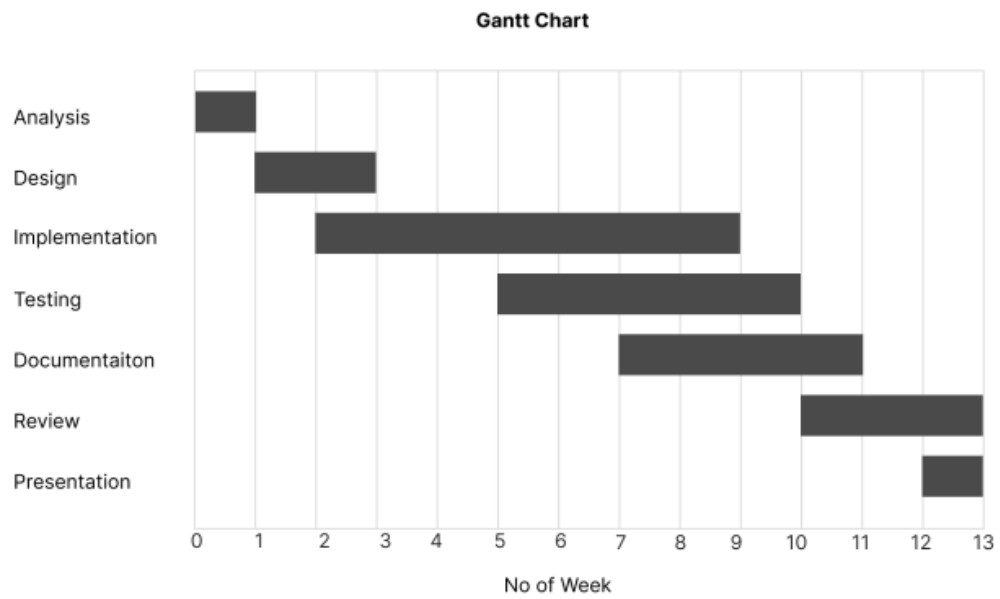
4.2.5 Schedule

Figure 4.1: Gantt chart showing the project schedule
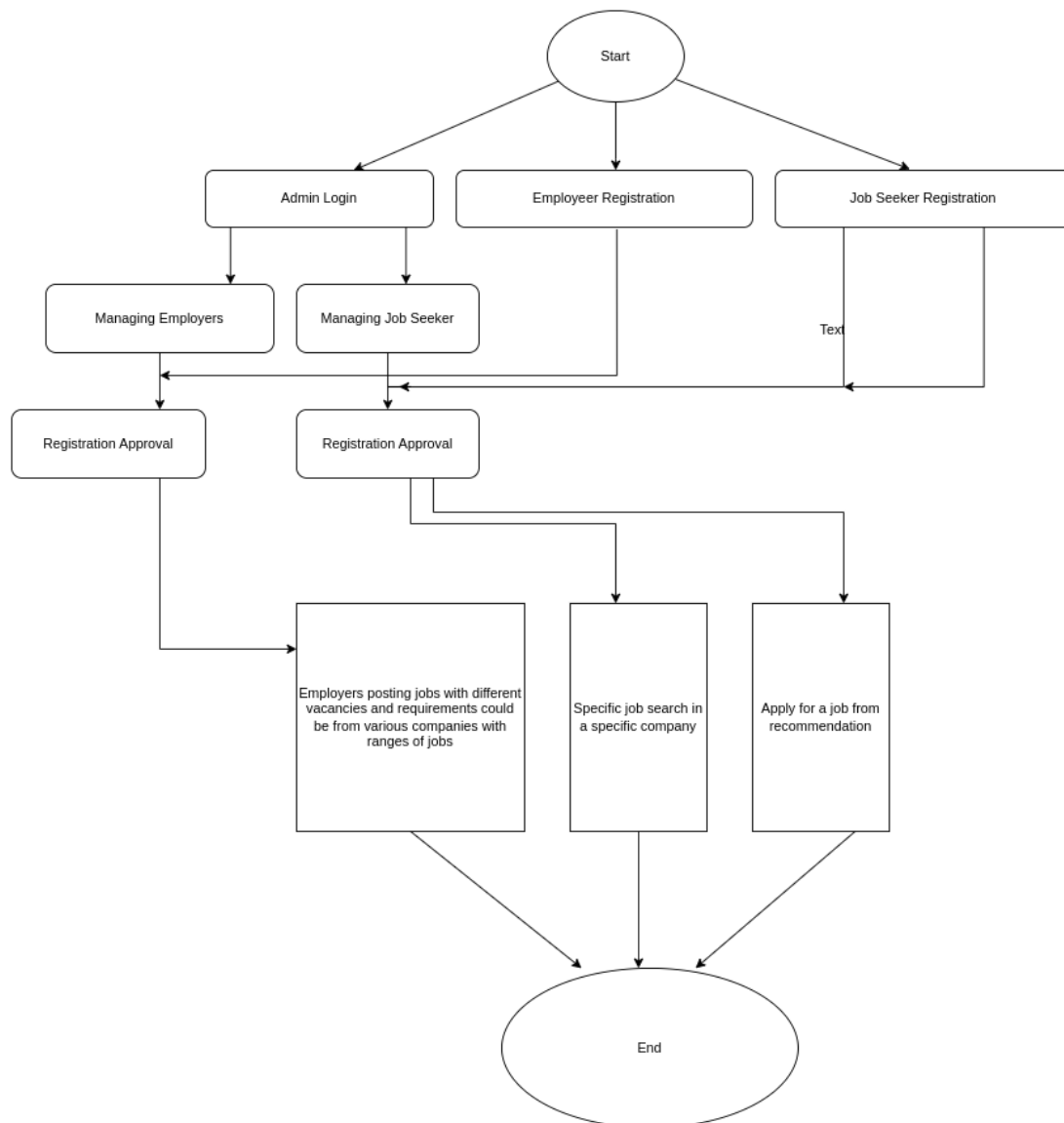
4.3   High-Level Design of System

Figure 4.2: Flowchart for Doctor Recommendation System

4.3.1   Algorithms and Theoretical concepts involved in project

Cosine Similarity:

Cosine similarity is a widely used algorithm in job recommendation systems. It is a similarity measurement technique that measures the cosine of the angle between two vectors in a high-dimensional space. In the context of a job recommendation system, the vectors represent the job seeker's profile and the job requirements. The cosine similarity algorithm calculates the similarity between the two vectors and provides a score between 0 and 1, where 1 indicates that the vectors are identical, and 0 indicates no similarity.

Here is how cosine similarity algorithm works in a job recommendation system:

1. Job seeker profile creation: The job seeker creates a profile that includes personal information, work experience, education, and skills.
2. Job requirements definition: The employer defines the job requirements, including job title, job description, required skills, and education.

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3. Vector creation: The job seeker's profile and the job requirements are converted into vectors, with each feature of the profile and job requirements being a dimension of the vector. For example, if a job seeker has work experience of 3 years and a bachelor's degree in computer science, their profile vector would have two dimensions, one for work experience and one for education. Similarly, the job requirements vector would also have dimensions for required skills and education.

4. Cosine similarity calculation: The cosine similarity algorithm calculates the cosine of the angle between the two vectors and provides a similarity score between 0 and 1. A higher score indicates that the job seeker's profile is more similar to the job requirements, and thus, more likely to be a good match for the job.

5. Job recommendation: The job recommendation system recommends the job to the job seeker if their cosine similarity score is above a certain threshold.

The advantage of using cosine similarity in job recommendation systems is that it provides a simple yet effective way to measure the similarity between job seekers and job requirements. However, it is important to note that the algorithm has its limitations, such as not taking into account the context or the specific requirements of the job. Therefore, cosine similarity should be used in conjunction with other algorithms and techniques to improve the accuracy and effectiveness of the job recommendation system.

Chapter 5

Expected Outcome

The expected outcomes of a job recommendation system are as follows:

1. Improved job matching: The primary outcome of a job recommendation system is to improve the job seeker-employer matching process by recommending suitable jobs to job seekers based on their skills, experience, and education. The system should provide relevant job recommendations to job seekers, leading to higher job satisfaction and lower employee turnover rates.

2. Increased efficiency and productivity: A job recommendation system should streamline the job search process, reducing the time and effort required for job seekers to find suitable jobs. Similarly, the system should make it easier for employers to find qualified candidates, leading to more efficient and productive recruitment processes.

3. Cost savings: A job recommendation system can reduce recruitment costs for employers by reducing the need for expensive job advertisements, headhunting services, and recruitment agencies. Similarly, job seekers can save time and money by avoiding irrelevant job postings and focusing on jobs that match their skills and experience.

4. Data-driven insights: The job recommendation system can provide valuable insights into the job market and job seeker behavior. For example, the system can identify trends and patterns in job seeker preferences and job requirements, helping employers to adjust their recruitment strategies accordingly.

5. Competitive advantage: A job recommendation system can provide a competitive advantage to employers who use it by improving their recruitment processes and attracting high-quality candidates. Similarly, job seekers who use the system can gain a competitive advantage by finding better-suited jobs and advancing their careers.

Overall, the expected outcomes of a job recommendation system are improved job matching, increased efficiency and productivity, cost savings, data-driven insights, and a competitive advantage. The system should benefit both job seekers and employers, leading to a more effective and efficient labor market.

Chapter 6

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