A Survey for Recommendation System for Freelancing Websites

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Abstract — Freelancing is evolving as a distributed problem-solving and business production model in recent years. In freelancing paradigm, a company’s production cost can be greatly reduced by distributing the tasks to networked people to complete. In general, we observe that there has been research into specific aspects of freelancing, but relatively less. The main aspect of any freelancing website is to select an appropriate recommendation system. This paper report on a literature survey of freelancing research, focusing on different appropriate algorithms for recommendation system on freelancing sites.

Keywords — Data Analysis, freelancing, Recommendation algorithms, Recommendation system, Task recommendation.

I. INTRODUCTION

A freelancer is a person who self-employs himself with the help of skills at which he excels (Pritesh Pawar[1]). There are various types of freelancing jobs which don’t even require your degree. It just requires skills. In recent years, the explosive growth in the amount of data have created a potential challenge of information overload which hinders the access to items of interest for the people. The same can be applied for freelancing sites. The data gathered from these sites can be used to improve the recommendation by analysing the patterns and using appropriate algorithms. Based on the user profile recommender system predicts whether a particular user would prefer an item or not. For both workers and task providers, recommendation systems have proved to be beneficial. Decision making process and quality have also proved to improve through recommendation systems.

Under complex information environments recommender system is defined as a decision making strategy for users. The perspective of E-commerce as a tool that helps users search through records of knowledge which is related to users’ interest and preference was also defined from recommender systems. To make choices when there is no sufficient personal knowledge or experience of the alternatives, recommender system were defined as a means of augmenting and assisting the social process of using recommendations of others. By providing them with personalized, exclusive content and service recommendations recommender systems handle the problem of information overload that users normally encounter.

By providing them with personalized, exclusive content and service recommendations, recommender systems handle the problem of information overload that are normally encountered by users. Various approaches for building recommendation systems have been developed recently, which can utilize either collaborative filtering, content-based filtering or hybrid filtering. Despite the success of these two filtering techniques, several limitations have been identified. Some of the problems associated with content-based filtering techniques are limited content analysis, over specialization and sparsity of data. Collaborative approaches also exhibit cold-start, sparsity and scalability problems. These problems usually reduce the quality of recommendations. In order to have proper and more qualitative recommendation appropriate algorithm must be used.

For any freelancing site a recommendation system is useful in various ways. It helps the recruiter get best applicants for their task. Also, the worker based on their skill set would be advised to the appropriate task. It would reduce the job of companies to try and find freelancers based on manual assessment of the profiles. There are numerous sites that use recommendation systems like Amazon M-Turk, Fever, freelancer.com, upwork, etc.

The techniques studied in this paper are classification, recommendation system and many other. Also the summary of the tools useful for recommendation system has been given along with their functions, associated data analysis techniques.

II. LITERATURE REVIEW

Mejdil Safran and Dunren Che et al.[2] have proposed two real-time recommendation algorithms for freelancing systems: (1) TOP-K-T computes the top-k most suitable tasks for a given worker and (2) TOP-K-W computes the top-k
best workers to a requester with regard to a given task. In TOP-K-T recommendation system, workers instantly find best matching task and help requesters to quickly identify the best workers for their task at hand. By this algorithm, the cold start problem is handled quite better. New workers have to face a cold start problem, which means the matching scores of these workers are not available. As a solution, for new worker we count only on the similarity scores. Recommendations based on similarity scores reflects the workers expertise, skills and personal preference only. In TOP-K-W recommendation system, requester find the best appropriate worker suitable for the task as per the workers skill set. By using this algorithm, the problem of worker not available is solved. This problem is solved by increasing the workers set, so that more options are available for choosing the next best worker. There are some limitations to these algorithms, that is scalability issues like it records all interactions between workers and system and yet it’s matrix is expanding rapidly which makes relearning of matrix much harder to handle. Another issue is, it is difficult to obtain workers task searching history since it is only accessible to cloud sourcing systems administrators. The future work is to take workers rewards and preferred work time as additional factors into the recommendation framework in order to make the recommendation more appealing to both worker and requesters.

Kumar Abhinav et al.[3] have proposed multidimensional assessment framework which evaluates freelancers on several dimensions. The proposed framework, not only uses the current information about the freelancers, but also utilises the past jobs the freelancer has performed. The key objective of every client, while recruiting, is to hire competent freelancers, who can do high quality work. Freelancers with the required capabilities and self-motivation are key to successful completion of job in stipulated time. The dimensions are based on the aspects, a hiring manager would like to consider while hiring a freelancer. In order to measure these dimensions objectively, we have further proposed a set of metrics for each dimension. Personal Characteristics: This metric measures freelancer’s characteristics which are independent of the posted job. Personal characteristics are directly observable. We consider overall rating of the freelancer (Past Rating), total work experience (Work Experience), educational background (Education), rating on the recent job (Recent Rating), total hours worked on the platform (Total Hours), etc. Freelancer-Job compatibility: Metrics used to measure this compatibility while selecting freelancers are availability, skill Fitness, similar Job experience and Profile Overview. Freelancer-Client compatibility: High level of compatibility ensures highly committed and satisfied workers. This can be measured using various parameters such as jobs completed by the freelancer for the client, overlapping working hours between the client and the freelancer, etc. Freelancer-Team compatibility: Metrics to calculate Freelancer-Team compatibility are team collaboration, Timezone match, etc.

Man-Ching Yuen et al.[4] have created an algorithm for task matching which utilise past task preference and performance of worker to produce list of available task in order of best matching with worker during its task selection stage. Freelancing task domain which includes the relationships among requesters, workers and tasks on a freelancing platform is defined. Next, the worker performance record of a worker to elict the worker’s interest and performance is defined. Then, a mathematical description of Task Rank which is used to sort the available tasks in the order of best matching with a worker is provided.

Man-Ching Yuen et al.[5] have proposed task recommendation framework based on unified probabilistic matrix factorization aiming to recommend task to workers in dynamic scenarios. First, connect worker’s task preferring information with worker’s category preferring information through the shared worker latent feature space. Second, connect worker’s task preferring information with tasks category grouping information through the shared task latent feature space. Third, connect worker’s category preferring information with tasks category grouping information through the shared category latent feature space. The extend the worker prefer to work the task can be measured and provide output that is accepted by requesters by using a worker-task preferring matrix.

Gediminas Adomavicius et al.[6] have usually classified recommendation method into: content based, collaborative and hybrid recommendation approach. It also describes various limitation of current recommendation system methods and discuss possible extensions that can help improve recommendation capabilities. Based on how recommendations are made, recommender systems are usually classified into the following categories: (1) Content-based recommendations is where the user will be recommended items or tasks similar to the ones the user preferred in the past. (2) Collaborative recommendations is where the user will be recommended items or tasks that people with similar preferences and tastes liked in the past. (3) Hybrid approaches is where these methods combine collaborative and content-based methods. Recommender systems, can be extended in several ways that include improving the understanding of users and items, incorporating the contextual information into the recommendation process, supporting multi-criteria ratings, and providing less intrusive and more flexible types of recommendations.

Eman Aldhahri et al.[7] presents a critical study of the state-of-the-art in recommendation systems that are ubiquitous among freelancing and other online systems to highlight the potential of best approaches which could be applied in freelancing system. They present a critical review of the works. They classify them based on their main contribution in the technologies and methodologies associated with the recommendation system. In the reviews, they
have presented a general summary of each, identify the main contribution, and evaluate how they address the questions formulated in the paper. They have explored some of the online system’s recommendation systems. They tried to include diverse online systems.

Robin Genuer et al.[8] propose the paper focusing on random forests, the increasingly used statistical method for classification and regression problems. This paper investigates classical issues of variable selections. Random forest is a popular and very efficient algorithm for both, classification and regression problems. This paper illustrates RF variable importance behaviour, especially in presence of groups of highly correlated explanatory variables. It proposes an ascending procedure for two classical variable selection problems starting from an initial ranking based on the random forest score of importance. It also examines some experimental results, by focusing mainly on high dimensional classification datasets and in order to illustrate the general value of the strategy, it is applied to a standard (n >> p) regression dataset. Finally it opens discussion about future work.

F. O. Isinkaye et al.[9] explores the different characteristics and potentials of different prediction techniques in recommendation systems in order to serve as a compass for research and practice in field of recommendation systems. There are various phases of recommendation process which include information collection phase, learning phase and recommendation phase. In information collection phase there are three types explicit feedback, implicit feedback and hybrid feedback. In learning phases the algorithm is used to filter the users need using the feedback gathered. In recommendation phase various filtering techniques are used like content based filtering, collaborative filtering and hybrid filtering.

Debarshi Basak et al.[10] presents BruteForce, a framework that simplifies experiments with commercial human computation platforms, while offering task recommendation system features based on rich and extensible set of worker and task properties. W.r.t. existing works, they focused on the problem of task assignment and recommendation by incorporating a rich set of worker and task properties. More than the traditional metadata like title, description, etc, a task can described by: 1) task media type, e.g. image, text, audio, video and surveys; 2) task operation type, e.g. tagging, summarization, classification, ranking and comparison; and 3) task topic, selected among one of the 10 high level topics from Open Calais document categorization service. Workers can be modelled according to three dimensions: 1) explicit information coming from external sources (e.g. social networks), gathered with the consent of the worker during registration to the platform; 2) implicit information logged during the worker,s activities on the platforms; and 3) feedbacks provided by task requesters.

III. PROPOSED METHODOLOGY

Fig. 1 Proposed Recommendation System for Freelancer Website

1. First requester needs to put job on the freelancing platform. Requesters will define required skill set for the job so the system can recommend particular worker on the basis of requesters defined skillsets.
2. Workers will also create a profile describing their skills on the freelancing platform. The profile includes the workers skill set for the task they desire to perform.

3. The list of applicants are forwarded to the assessment system for further processing. The various categories of workers are grouped together so that the assessment system can easily map the worker to its desired task.

4. The freelancer assessment system will assure the quality of the worker and create a list of highly qualified workers which will forwarded to requester for manual assessments. The quality assurance will be done on the basis of worker’s personal characteristics like their motivation, team compatibility, job compatibility, client compatibility, experience, quality of work.

5. The requesters will select the best suited worker for their posted job. The worker is then notified about the job for which they are selected.

6. The worker then accepts the offer to perform the task they are allotted. If the worker is not available for the task then the task is reassigned to the next best applicant. If the worker is not interested in the task the feedback is given to the requester.

IV. CONCLUSIONS

In this paper, we presented different kinds of variations in recommendation systems proposed in various reference papers. We explained the system architecture of the proposed recommendation system for freelancing website. We can evaluate from this paper that there already exist many appropriate algorithms that can be used for an efficient recommender system. In case of recommendation systems for freelancer sites the two algorithms TOP-K-T and TOP-K-W which suits very well for the proposed architecture. Also, there were two algorithms surveyed which were Job Similarity and Hot Skill Opportunity algorithm. Based on the above research a suitable algorithm can be selected or modified for the proposed freelancing system. For the future scope the modified algorithm can be used on any crowdfunding or crowd-sourcing site.

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