



## TASK RECOMMENDATION METHODS IN CROWD SOURCING SYSTEMS : A REVIEW

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### ABSTRACT :

Recent years Crowd sourcing is trendiest where a particular people/organization can distribute tasks to large group of people through online in order to achieve a common goal. Task Recommendation will help workers to know their exact tasks sooner in the same to help requesters to receive best quality throughput earlier. In this paper, we have reviewed Task Recommendation framework methods that help to allocate tasks to workers to get quality output at the receivers end.



**KEYWORDS :** Crowd Sourcing / Task Recommendation / Matrix Factorization / Top k- T / Top k- W / Probabilistic Matrix Factorization .

### INTRODUCTION

Crowd sourcing is emerged as a online-distributed problem solving and production model in recent days. In this model, tasks are distributed to online people to achieve quality that an organizations production cost will be tremendously reduced[1]. Crowdsourcing system that seeks to address the challenge of determining the most efficient allocation of tasks to human crowd[2]. In Crowdsourcing systems, users(both requesters and workers) encounters the same problem to which a feasible solution via real-time recommendation. For many applications, recommendation is a personalized filter, used to either predict the interestingness of an items or to identify a set of items that are interesting to a user. Effective recommendation plays a critical role in such web-based systems and benefits users in multiple ways, finding similar information, reducing waiting time and increase productivity[3]. This paper describes some Task Recommendation methods to Crowdsourcing Systems which helps to find a specific task easier and the specific resource to the requester in an appropriate ways.

### LITERATURE SURVEY

Mejdl Safran et al.,[3] proposed two Real -time Recommendation algorithms for Crowd sourcing systems. Top-K-T algorithm computes the Top-K-T most suitable tasks for a given worker and Top-K-W Algorithm that computes the top-k best workers to a requester with regard to a given task. Their experimental results shown the efficacy of both algorithms.

Man-Ching et al.,[1] described a Task Recommendation framework based on a unified probalistic matrix factorization aiming to recommend tasks to workers iin dynamic scenarios. Their experimental results shows that their framework is efficient and is scalable to large datasets.

Mejdl Safran et al.,[4] proposed Top-N-Tasks Recommendation Algorithms for discovering the top-N most suitable tasks for a given worker and Top-N Worker Recommendation Algorithms for identifying the top-N best workers for a task requester.

## TASK RECOMMENDATION METHODS

### Top K-T / Top K-W Task Recommendation Approach

In Crowd sourcing Systems, categories function as effective mediators and provide “short-circuted”, but meaningful connections between tasks and workers that make real-time recommendations achievable. Top-K-T and Top-K-W were designed based on leveraging the mediation mechanism of categories.

Categorization of tasks is a pre-requisite for applications of this improved method. The latest approach is to use a text classification system to create filters which allow narrowing down the search results based on predefined filter categories. Categories as an effective mediation mechanism introduced in this method that helps to boost the recommendation performance and the quality of completed tasks.

Top K Task recommendation as computation of a restricted 1-to-k mapping from workers to tasks and in reverse the top- k worker recommendation s computation of a restricted 1-to-k mapping from tasks to workers. The motive of this method is to help workers to immediately find best matching tasks and to help requesters to quickly identify the best workers for their tasks at hand. Top-k-T, was designed to make recommendation of the top-K most suitable tasks for a worker at real-time speed.

Top-k- Worker method may face a situation where all the recommended K workers are busy doing other tasks or unavailable for any other reasons. This Top-K-W method solves this problem by taking the advantage of the already sorted list of workers stored in the index. This method periodically increases the value of K until one of the recommended workers starts working on the task. Instead of simply recommending alternative workers in the subsequent rounds of recommendation list in order to retain the opportunity of getting those high-ranked workers as their statuses may change soon[3].

### Task Recommendation with Matrix Factorization Method

Matrix Factorization is one of the leading models in Item Recommendation. The relationship between workers and categories (represented by the suitability matrix R) in Crowd sourcing systems are decided by a set of latent factors that are very specific to the domain [4]. The key purpose of using Matrix Factorization in their work is to reduce the dimensions of recommendation supportive data. (ie) the suitability matrix R, by decomposing it into the product of a low-rank worker factor matrix, and a low-rank category factor matrix, wherein the lower dimension represents a small latent factor space. Thus each worker is modeled as a vector of the workers affinity to the latent factors, and each category is modeled as a vector of the category’s relation also to the latent factors.

This method also studied how to effectively predict the missing matrix so as to provide related tasks to workers or to recommend workers for suitable tasks. And also proposed a way to infer user ratings from their interacting behaviors and a way for task recommendation by performing factor analysis based on probabilistic matrix factorization(PMF), the worker latent feature space and task latent feature space are learned. This approach can solve the cold-start problem which cannot be solved by the previously proposed classification based task recommendation approach [1].

## RESULTS AND DISCUSSION

Theoretical time complexity of Top-K-T method is  $O(\&+k)$ , where & is the number of workers categories and K is the number of tasks to be recommended. To evaluate the performance of this method, three different type of workers(Max/Avg/Min workers) were selected. Three different value of K namely 1,20,50 to see how different value of K would affect the performance of Top- K- T. Running Time of Top-K-T method is affected only by & and k which are typically very small numbers regardless of the data sizes. This computational study confirms the validness and the constant time performance of this method. Time

complexity of Top -K-W method is  $O(k)$  where,  $k$  is the number of categories that a given task belongs to and  $k$  is the number of workers to be recommended to the task requester [3].

In MF method the complexity is linear with respect to the number of observations in three sparse matrices. The complexity analysis shows that Task Recommendation can scale to very large datasets. To compare the prediction quality of this method with PMF, they used the mean absolute error(MAE) and the root mean squared error as the comparison metrics. In order to show the prediction performance improvements of Task Recommendation, they compared Task Recommendation with probabilistic matrix factorization(PMF), the state of the art approach for recommendation systems. Task Recommendation utilizes workers, task preferring information and tasks category grouping information to perform the prediction. In this method incorporate worker-task preferring matrix, worker-category preferring matrix, task-category grouping matrix together based on a unified PMF.[4]

## CONCLUSION

In this paper, we have discussed some methods of task recommendation approaches in Crowd Sourcing systems and their performance analysis and computations. Also this paper describes insights about how tasks are assigned to crowd of online people and how workers selecting their tasks as per their constraints. The experimental results shows this system effectively meets application requested demands, has low overhead, and is highly efficient a it improves the amount of tasks processed under the defined constraints compared than traditional approaches.

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