



# Designing of Fair and Accurate Reviewer Assignment in Peer Review

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**Abstract**—One of the normal issues looked in allocating recommendations submitted to the conferences, journal publications and so forth is the assignment of the proposition to the suitable reviewers. This is likewise named as the reviewer assignment issue. Here, where the skill level of a reviewer who is engaged with reviewing a proposal ought to be streamlined to ensure the choice of the best reasonable proposal. Picking a suitable reviewer includes the mastery as well as thinks about assorted variety and irreconcilable circumstances among them. Toward this path, various arrangements have been given by researcher previously, yet a portion of the issues continues in this field. The proposed system features a review on the current strategies proposed by the analysts to tackle the reviewer assignment issue and different keyholes in the current situation alongside the potential arrangements.

**Keywords**— *Information Retrieval, Journals, Conferences, Reviewer Assignment*

## I. INTRODUCTION

The way toward doling out a reviewer to a proposal is considered as a troublesome and testing task for different research organizations and associations. The procedure is for the most part named as Reviewer Assignment Problem (RAP) whose initial step is to send calls for recommendations accommodation. The proposal is submitted to the calling associations. The fair assignment of accommodation to reviewers is finished utilizing the most broadly utilized CMS (i.e., Conference Management Toolkit and Easy Chair) which relegates the papers dependent on reviewer offering inclinations.

In any case, the significant downside of this approach is that specialists for the most part adhere to the directions and guidelines of the financing organization for reviewing the proposition and don't offer significance to titles and modified works by and large. In light of the review done, certain collection techniques are utilized to arrange the outcomes according to their rankings Sun et al., 2008. Prior, the errand of appointing the papers to the reviewers was taken care of by a little board of trustees of individuals physically. The manual assignment of proposition takes additional time and overhead. It is an emotional methodology and is focused principally on the choice and assessments of the individuals from the board of trustees.

The improvement of assignments was a difficult errand as every one of the imperatives couldn't be considered productively. A total scope of research points and subtopics is determined before the accommodation procedure starts, and all reviewers are solicited to indicate their territory from skill. Likewise creators are additionally approached to determine the space to which their paper applies. This built up an affiliation connect among reviewers and papers. It can once in a while bring about wrong coordinating from the meeting points also, can be deluding as for the real point of their proposition. In this way, to battle the circumstance, it is required to make the procedure of assignment of recommendations automated to decide the paper points naturally as opposed to physically.

The problems faced in traditional methods gave rise to an automatic mechanism for the reviewer assignment. Dumais and Nielsen in 1992 addressed the problem by using Latent Semantic Indexing (LSI). As the complete idea of modeling the reviewer assignment is quite large in its stature, different and all kinds of learning methods are used to solve problems efficiently.

## II. RELATED WORK

Huanli Pang<sup>1</sup>, Le Liu<sup>2</sup>, et. al.[1] Proposed a system, peer review as an evaluation of paper quality of "Science paper Online", it is an important link of its quantity. Due to the peer review is natural language, use semantic neural network quantized peer review is put forward in this paper. That, parsing the surface semantic analysis of peer review to establish the semantic neural network, and the deep-seated semantic computing of peer review, wins the quantized result finally.

Haifeng Li, Ning Chen, et. al. [2] proposes a topic Peer review expert selection is an important link of fund project review; it can not only improve the matching accuracy of domain experts and projects, but also improve the appraisal quality in fund project review. This paper mainly studies the peer review expert selection method in fund project review. With the actual experience of fund project management, based on the author's knowledge set theory, paper analyzes deeply knowledge set representation of expert knowledge, improves the similarity calculation of expert and project knowledge, builds the peer review expert selection method, and gives the actual example.

Kay Berkling, et. al. [3] proposes a technique to perform Peer Reviews between students in higher education is the topic of this paper. By integrating this instruction method into university classroom activities, students train meta-skills and self-reflection, encouraged not only through giving constructive feedback to others but also by reflecting critically on received feedback for their own projects. Methodically, we analyzed over 500 peer reviews

in a project-based two semester long Software Engineering class. First, the gamified set-up of the class design is described because the peer review constitutes an integral part thereof. The process of peer reviewing is then reported in detail, including a transcript of an interaction. Finally, we look at the content of peer reviews that are used to improve homework and estimate the number of improvements in the final project hand-in. It can be shown that the peer review contributes in a positive way to students' learning experience and the quality of their final hand-in.

Dr. Kunwar Singh Vaisla ,et.,al.[4] proposes a This paper dive into various methods for providing solutions to assignment of experts to proposals using different techniques. As the reviewers have varying levels of expertise in different domains which can be the reviewers having different degrees and levels of expertise in different domains combine to form a crisp set which can in turn give incorrect or misleading information. We have also observed that it may not lead to matching of exact expertise of a reviewer with that of the proposal submitted. RAP itself is a complex and complicated task. Finding an appropriate journal for the proposal is even more cumbersome. A comprehensive study is presented here for the methods that have been proposed earlier with issues that are challenging in this field. A clear understanding of the challenges is, thus, necessary to solve such problems.

odriguez MA et, al.[5], In RD project selection, experts (or external reviewers) always play a very important role because their opinions will have great influence on the outcome of the project selection. It is also undoubted that experts with high expertise level will make useful and professional judgments on the projects to be selected. So, how to assign the most appropriate experts to the relevant proposals is a very significant issue. This paper presents a hybrid knowledge and model approach which integrates mathematical decision models with knowledge rules, for the assignment of experts to review of RD project proposals. The approach can be applied to government funding agencies in China and other countries.

Pazzani MJ, et. al,[6] "Sciencepaper Online" as only issued and spread channel by means of Internet, the whole procedures carry on in the network environment, example, contributing, reviewing, editing and publishing, reading, even reader feedback. And searching, browsing, printing and download have been achieved. It's belong to pure network periodical. All links of this network periodical connected by electronic data, as metarial and medium by network. The short cycle of editing and publishing, the change of review mechanism, the freedom of periodical's publication, everyone is periodical's producer, thus lead to a series of problems such as periodical quality, influence acceptable levels for its academic authority, affect authors' intention for contribution. Therefore, it's imperative for control the quality of periodical.

Nielsen J, et. al.[7], proposes The process of assigning a reviewer to a proposal is considered as a difficult and challenging task for various research agencies and organizations. The process is generally termed as Reviewer Assignment Problem (RAP) whose first step is to send calls for proposals submission. The proposals are submitted to the calling organizations. The fair assignment of submission to reviewers is done using most widely used CMS (i.e., Conference Management Toolkit and Easy Chair) which assign the papers based on reviewer bidding preferences.

Sun YH, et.al.[8] proposes a study on Peer-reviewed have two key factors in determination of evaluation standards and peer designed domain experts, and the election of the domain expert is very important and very difficult work, especially like technology project evaluation, project, the project of large quantity, scattered experts widely, but also related field many questions are the frontiers of science question which specially selected domain experts more difficult. Peer review experts selected process is the rational matching process between projects and domain experts, we can use knowledge set method for said for projects and domain experts matching.

Paper	Description	Analysis	Performance measure	Comparison
Julián Mestre.[1]	In this paper we have studied the problem of assigning papers to referees. We identified several desirable objectives for these assignments and designed efficient algorithms for them. Some variants can be solved optimally in polynomial time. In other cases, the problem is NP-hard and so we gave approximation algorithms. Our next goal is to perform a thorough experimental evaluation of our algorithms and eventually incorporate them into conference management software such as Easy Chair.	Fair assignment Rank- maximal matching's Leximin principle	Data mining techniques have been applied to the task of inferring goodness of match between a referee and a paper based on keyword analysis.	In these there is no used of machine learning concept but in our paper we used , data mining techniques
Marko A. Rodriguez.[2]	The peer-review process is the most widely accepted certification mechanism for officially accepting the written results of researchers within the scientific community. An essential component of peer-review is the identification of competent referees to review a submitted manuscript. This article presents an algorithm to automatically determine the most appropriate reviewers for a manuscript by way of a co-authorship network data structure and a relative- rank particle-swarm algorithm. This approach is novel in that it is not limited to a pre-selected set of referees, is computationally efficient, requires no human-intervention, and, in some instances, can automatically identify conflict of interest situations. A useful application of this algorithm would be to open commentary peer-review systems because it provides a weighting for each referee with respects to their expertise in the domain of a manuscript. The algorithm is validated using referee bid data from the 2005 Joint Conference on Digital Libraries.	Data mining, Feature extraction, Optimization Information retrieval,	In Artificial Intelligence, data mining techniques have been applied to the task of inferring goodness of match between a referee and a paper based on keyword analysis. In Theoretical Computer Science and Operations Research, combinatorial optimization tools have been used to produce "good" assignments.	In these there is used of machine learning concept but not used new concept that is leximin i.e. token generator
Richard Zemel.[4]	We have developed a framework for paper-to- reviewer assignment in the context of scientific conferences. We showed how by eliciting only a small subset of scores from reviewers and inferring unobserved scores, using one of several learning methods, we are able to determine high quality matchings. Interestingly, in the field of collaborative filtering, side-information is often perceived to be useful only in the cold-start condition, where few or no scores are available. The performance of both LM and LR, which leverage word-level features from reviewers and submitted papers, show that this is not the case in our domain. We also explored the trade-off between matching quality and paper load balancing, which helps one avoid the need to manually set limits on the reviewer load. Finally we showed that using the realistic assumption that utility is non-linear in suitability score, we discover better matches using the same nonlinear transformation in the learning objective. Given how matching benefits from an interaction with learning, we are developing ways to strengthen this interaction by making the learning methods sensitive to the final matching objective. We have obtained good results using this approach in an active learning setting where the system chooses which reviewer scores to query.	language model (LM) linear regression (LR) Bayesian probabilistic matrix factorization (BPMF).	We articulate several different criteria that may influence the definition of a "good" matching and explore different formulations of the optimization problem that can be used to accommodate these criteria.	In these there is no used of data mining techniques concept only uses machine learning but in our paper we used data mining techniques



Yong-yao Zhuang[3]	This paper presents an approach based on the framework of research analytics to solve the reviewer recommendation problem in funding agency. The proposed approach integrates three dimensions (relevance, connectivity, and quality) into a systematic model to facilitate reviewer recommendation. We also develop a prototype system to support the decision making task. For future research, we will investigate how the proposed approach can be used to recommend reviewers in a specific context. And we will evaluate the proposed approach using a case study.	reviewer recommendation, research analytics, peer review	Approach based on optimization uses theory, modeling and algorithms to formulate and solve the reviewer finding problem from mathematical or operational research methods	In these there is no used of data mining techniques and machine learning algorithm only uses mathematical methods concept but in our paper we used data mining techniques ,mathematical method and machine learning algorithm
ChengXia ng Zhai[7]	We proposed two general algorithms for solving this problem, including greedy algorithm and ILP algorithm. We systematically tested the algorithms with previously created review-assignment data set. Experiment results show that the ILP algorithm is effective for increasing the coverage and confidence of topic aspects in committee assignment task, and outperforms the greedy algorithm significantly. The ILP algorithm is also sufficiently efficient to handle a large number of submissions in a normal conference.	Topic Models Review Assignment Algorithms Combinatory-al Optimization Evaluation Metrics	main idea for solving the CMACRA problem is to cast it as a tractable optimization problem A straightforward way to solve the CMACRA problem is to use a greedy algorithm	In these there is no used of data mining techniques, machine learning algorithm and mathematical methods concept but in our paper we used data mining techniques ,mathematical method and machine learning algorithm as well as CMACRA.
Ngai Meng Kou.[8]	By this demonstration, we show the functionality of our advanced Reviewer Assignment System (RAS), which simulates the reviewer assignment processes for conferences and Paper Pool Add A New Paper k Paper Workload Figure 6: Journal Editorial System journal submissions. The primary goals of the demonstration is to illustrate the benefits of (1) automatically extracting profiles of reviewers based on their publication records instead of asking reviewers to bid for papers and (2) using the group weighted coverage of the paper topics by the expertise of reviewers as the assignment objective instead of simply accumulating the quality of individual reviewerpaper pairs. The demonstration offers realistic features to the user (selection of reviewers and papers, fine-tuning of the reviewer expertise to the extracted topics, comparing assignments by alternative models and approximation algorithms). The feedback from VLDB attendants will definitely help us to move forward toward integrating our prototype system into real systems.	SDGA-SRA. NP-hardness of WGRAP. Greedy Algorithm (SDGA)	By this demonstration, we show the functionality of our advanced Reviewer Assignment System (RAS), which simulates the reviewer assignment processes for conferences and Paper Pool Add A New Paper k Paper Workload Figure 6: Journal Editorial System journal submissions. The primary goals of the demonstration is to illustrate the benefits of (1) automatically extracting profiles of reviewers based on their publication records instead of asking reviewers to bid for papers and (2) using the group weighted coverage of the paper topics by the expertise of reviewers as the assignment objective instead of simply accumulating the quality of individual reviewer paper pairs.	In these there is no used of data mining techniques and mathematical methods concept but in our paper we used data mining techniques ,mathematical method and Greedy Algorithm.

<p>Xinyue Chang.[3]</p>	<p>The mismatch is found between the industry needs and the market supplies in terms of effectively handling irregular shaped shipments. The ambiguous of defining regular and irregular shape is pointed out and set as one of the research problem. Also, the idea of simplifying the container loading problem when dealing with irregular shape by using topological concepts is raised for exploration. The literature review provides in depth analysis into the current research condition regarding on container loading problem with irregular shaped shipments. Previous researches involving irregular shaped shipment are reviewed carefully reviewed and evaluated to understand the ability of the algorithm and methodology from those 141 works. Methods or algorithm from container loading problem with regular shaped shipment and from other industrial fields are also evaluated and mutated for potential approaches that may inspire new algorithms. The procedure of shipping SKD modules oversea is observed and analyzed. More comprehensive list of constraints in container loading problem is investigated, such as easiness of loading and unloading SKD modules onto pallets and compatibility between SKD modules. Meanwhile, the relationship between import tax and commodity code with the ability of assembling SKD modules is created. The evaluation system combined with key performance indicator and force decision matrix is applied to the search pattern for optimal shipping configuration. One of the features of this evaluation system is that the configurations can be evaluated at each step during the process of searching optimal, instead of evaluating all configuration at the end of searching. Invalid shipping configurations is filtered out at each step, which truncates invalid configuration branches. Topological representations to irregular shapes and container loading problem are proposed as exploratory research for applying the concepts from topology to optimization problems.</p> <p>Representing with topological concepts helps the meta heuristic approach to perform actions such as envelop shape for three-dimensional shapes, dealing with constraints before placing, construction of pallet modules, and sextuple-tree model for guided local search, as well as constraint oriented seeding search. The topology-based guided local search, generated valid shipping configurations and warehouse optimization layouts that are not able to obtained with existing methods with the large number of constraints to fulfill. The significant savings by using proposed meta heuristic approach to multiple types of container loading problems make one believe that simplification of container loading problem by adopting topological concepts is feasible and worth of future developments.</p>	<p>CLP - Pattern recognition and machine learning</p>	<p>Key performance evaluation system is constructed in order to rank the suggested shipping layouts by the key performance indicator (KPI). The KPI is calculated based on the quantified criteria that are formulated by the engineers, considering the actually situations in the particular project</p>	<p>In these there is no used of data mining techniques and mathematical methods only used machine learning concept. but in our paper we used data mining techniques ,mathematical method and machine learning concept.</p>
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### III. ANALYSIS AND PROBLEM FORMULATION

Reflecting Peer Reviews in Inquiry Based Learning Scenarios, Group dynamics and clear schedules are other important factors for the students to effectively improve their papers and learn from each other, Many times experts have multidisciplinary research areas, with varying degree of significance. Sometimes, experts are not able to give complete information about their different areas of expertise manually.

Boosting Student Performance with Peer Reviews; Integration and Analysis of Peer Reviews in a Gamified Software Engineering Classroom, This system will describe the process of peer reviews in a Software Engineering classroom at the Cooperative State University. Random selection of keywords from the given proposal may sometimes lead to ignorance of some of the important keywords which are not directly present in the paper.

Peer Review Expert Selection Method Research Based on Knowledge Set Theory, improves the similarity calculation of expert and project knowledge, builds the peer review expert selection method, and gives the actual example. In RAP, the assignment of appropriate journal for the paper is rarely studied. The reviewer can be associated with various journals having different scope, so even after assigning the reviewer to proposal, the suitable journal not matches.

Quantized Peer Review Based on Semantic Neural Network, parsing the surface semantic analysis of peer review to establish the semantic neural network, and the deep-seated semantic computing of peer review, win the quantized result finally. No certain techniques to redefine the query can be applied to expand the set of keywords which can lead to inclusion of some additional and relevant keywords to the bag of selected keywords.

### IV. PROPOSED METHODOLOGY

#### A. Architecture

Knowledge base Knowledge rules are designed for classification of discipline areas, external reviewers and proposals, avoidance of conflicts of interests and improvement on the effectiveness of reviewer assignments.

Model base Decision models are mainly designed for the following two tasks: identification of the expertise level of external reviewers, and assignment of external reviewers to proposals.

Database There are two major categories of data stored in the database: human resource data, and proposal data. Human resource data consists of those for Internal Manager, External Expert, and Applicant. Internal Manager consists of Top Manager, Department Manager, and Division Manager. External Expert consists of External Reviewer, and Panel Expert. Applicant consists of Individual Applicant and his/her affiliated Organization. Each Individual Applicant should have an affiliated Organization. Individual Applicants submit proposals through their affiliated Organizations to the funding agency. Internal Manager maintains a list of External Experts for different decision-making tasks.

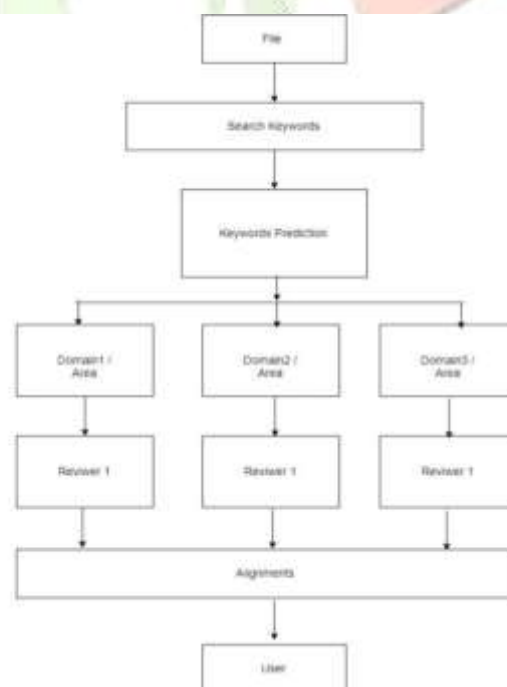
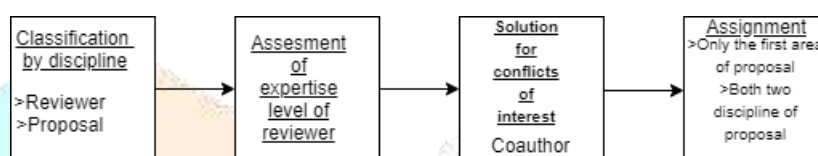


Fig (A) System Architecture

**Steps:**

1. Upload/Browse document or file into your system.
2. After uploading that file will be scan and generate Tokens of each word using Leximin principle using machine learning.
3. That token are stored into a database after that That tokens are match (create prediction) to Training database keyword.
4. That predicted tokens/keywords are pass to domain there are 3 type of domain.
  - I. Domain 1
  - II. Domain 2
  - III. Domain 3.
  - IV. These domains are performing their work using machine learning algorithms and artificial intelligence concept.
5. After finish work of domains that domain are pass that token and keyword to the receiver per domain has one receiver are present.
6. Receiver has observed the algorithm will work properly or not and find out accuracy of peer review technique using graph chart.
7. And send the document or file to user. The user has download or see that file in any format.

**B. System Working:**

Fig(B) System Design The data processing is mainly described in following 4 sections:

1. **Classifying reviewers and proposals according to discipline areas:**

As mentioned above, reviewers and proposals are classified by the discipline areas they belong to. Under each discipline area, there are corresponding reviewer and proposal sets. That is, we can classify reviewers and proposals through the discipline areas they declared. Figure illustrates the sample rules for reviewer classification. The situation is very similar for proposal classification.

2. **Assessing expertise level of reviewers:**

Determination of the expertise level of any reviewer in a specific area has been a research concept in the literature related with human science, education science and other similar areas. To determine the expertise level, NSFC asks all reviewers to fill in a form related with the discipline areas of their professional subject, and of their published papers. Then with a counting procedure, a level between 1 and 3 is assigned to each reviewer to indicate their expertise. Level three represents reviewers are very familiar with the corresponding area, level two familiar, and level one less familiar respectively.

3. **Solving conflicts of interests between reviewers and applicants:**

In order to obtain objective and fair evaluation of the proposed projects, the conflicts of interests between applicants and reviewers should be avoided. For example, the affiliation of the applicant should not be the same as that of reviewer. Applicants and reviewers should not be the coauthor which indicates that they had cooperated in research before. These knowledge rules can be abstracted from NSFC guidebook to form a rule base.

4. **Assigning reviewers to proposals:**

After three steps above, we have got the pool of qualified reviewers for proposals. Recall that the research problem is to let the most qualified referees to review proposals. That is, choose the assignment that maximizes the total expertise level of the reviewers. As mentioned above, different reviewers have different expertise levels in a discipline area, and a reviewer may declare several discipline areas; at the same time, each proposal is required to declare two discipline areas. Furthermore, both funding agencies and applicants hope that proposals can be evaluated according to their first discipline areas if possible, because the first area of proposals represents the highest degree of match between proposals and discipline areas. So, proposals should be assigned to reviewers according to their first discipline area firstly. In such case,  $ij_2c$  will be set as zero. Model (p1) will be used to find the solution. If there is no optimal solution, then slack the constraint, and let  $ij_2c$  restore their original value. Model (p2) will then be used to help solve this problem. If the optimal solution still doesn't exist, NSFC will invite new experts to enter the reviewer database and find the best solution once again.



## V. CONCLUSIONS

This system dive into various methods for providing different techniques. As the reviewers have varying levels of expertise in different domains which can. The reviewers having different degrees and levels of expertise in different domains combine to form a crisp set which can in turn give incorrect or misleading information. We have also observed that it may not lead to matching of exact expertise of a reviewer with that of the proposal submitted. RAP itself is a complex and complicated task. Finding an appropriate journal for the proposal is even more cumbersome. A comprehensive study is presented here for the methods that have been proposed earlier with issues that are challenging in this field. A clear understanding of the challenges is, thus, necessary to solve suchproblems.





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