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## Employee Task Assignment Problem Solutions Using Machine Learning

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### **Abstract:**

*In current era, that is post pandemic, employers emphasis on assigning job to skilled employees and get job done as early as possible. Here main focus of employers is to assign right job to skilled person without giving excess burden to employee, so that they maintain the quality and accuracy of work. Also complete the task on time. As number of employees increases and also increase in required skill sets, it is quite tedious task to assign exact task to employee so that no employee remain idle and on other hand noone is overloaded excess work. Here, Machine Learning algorithms plays important role. Various ML algorithms will help to find best possible solution for this Employee task assignment problem. This paper try to find out best possible assignment of employee with task so that each employee get assigned to atleast one task and each task is allotted to sufficient employee. For this author used KNN algorithm with supervised ML. Here, author has implemented KNN algorithm with supervised learning technique to solve task assignment problem.*

**Keywords:** Task Assignment Problem, ML, KNN algorithm, supervised ML

### **1. Introduction:**

Employee task assignment is normally known as Assignment Problem. It is basically consider with assigning available jobs to available machines. In this paper, we consider job or activity (normally used with software project management) to the human resources available. Here, author consider that there are m jobs and n employees with different skill sets. It is assume that every employee is skilled in atleast one task.

Machine Learning helps in finding best suitable assignment of job to employee. Machine

Learning is advanced part of AI which thinks like human and generates output based on various algorithms available in it.

## 2. Machine Learning:

Machine Learning is the process which accepts input from user or data available with its database, understands that with patterns or we can say algorithms in it and gives findings or best ways to sort our problem. For this it uses previous data as knowledge to perform new predications. Machine Learning proved helpful where data available is huge and we need to use specific part of it as per problem requirement. Its ability to learn by itself makes it through machine learning.

Whenever we write any program in ML, it is called as ML model. ML model includes algorithms along with data, which helps it to predicate solutions. Data used in ML is divided into two parts as; **training data** and **testing data**. **Training Data** is the data which is used to train the model while developing ML Model, whereas **Testing Data** is the data which is used to test the model.

### 2.1 Supervised Machine Learning:

Supervised Machine Learning means we already provided with trained data set which includes data points with right answers.

### 2.2 KNN (K Nearest Neighbor) Algorithm:

It is a supervised machine learning algorithm. It is used to match K sets (data point) with its nearest data points. It will compare with all available options with all available training data sets. Then algorithm will compare maximum matching points from each set and new K into it.

## 3. Job Assignment Problem:

Assignment problem means assigning task or work to employees as per their skill set. In this we must assign job to the employees so that every job get assign with employee and no employee is assigned to atleast one job. Finding an assignment of jobs to employees can be thought of as finding matching in the graph model [1].

Consider the example, in a software company, Java project for Press Management is being developed. For this required skill set is Java, SQL, CSS, HTML, javascript. Company has 4 employees as A,B,C,D. Each one is having a unique skill. A is expert in javascript, B is DBA, C is Java Full Stack Developer and D expert in Web Technologies. So here company can easily allocated each job to each employee and get work done smoothly. This is quite easy in small set up with limited employees and it is assumed that company can carry only one project at a time.

On the other Hand, company with multiple projects to be carried out simultaneously and having a considerable amount of professional people with different and multiple skill set, it is a tedious task to assign right task to right person. It is also need to look after that each employee must assign a job and each task must be allocated. The goal of the well-known Generalized Assignment

Problem [GAP] is to assign a task to employees such that the workload of employee does not exceed his capacity, while minimizing the cost[2].

#### 4. Role of ML in Job Assignment Problem:

Job Assignment Problem considers two data sets viz; *employees with skills, tasks*. We need a ML algorithm to train and test data. In training data, we provide employees skills, their current allotments and new tasks to be completed. With the help of this data, ML model will understand :

- a) How many employees are unassigned currently?
- b) How many employees are partially assigned?
- c) How many employees are fully assigned to other tasks with different projects?
- d) Exact duration when assigned employees will be available for new task?
- e) Which are new tasks to be allocated?

One common approach is to employ a parameter server (PS) architecture, in which training is carried out at multiple workers, while PSs are used for aggregation and model updates [3]. With the help of this model, we are able to list out expected allocations and number of jobs.

ML will apply test data to actual allocation of task to employees. This process will include following phases:

- 1) Identify Tasks
- 2) List available employees
- 3) Identify Employees Skill set
- 4) Match skill set with Tasks
- 5) Allocate suitable job or task to each employee.



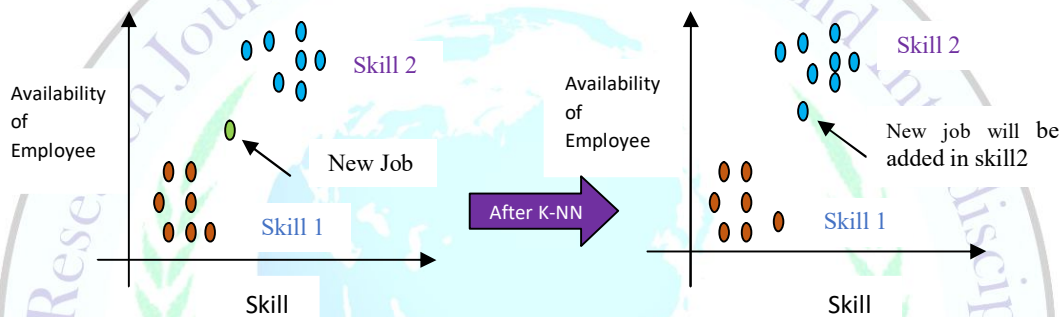
**Figure 1: Task Allocation Process**

Md. Ashikur Rahman Khan[4] in his paper titled ‘Appropriate Job Selection Using Machine Learning Techniques’, uses Logistic Regression for checking likeliness of job allocation to correct

candidate. They have also used Gaussian Naive Bayes (GNB) classification ML technique to find out dependency of employees on tasks.

With the help of KNN (K- Nearest Neighbor) algorithm, we can find most suitable jobs from job set and match it with employee set. The employee doing such job maximum times successfully will be allocated to some job. Thus we can assign best employee with best job. Also we can avoid giving excess burden to an employee.

Consider, an example of an organization having 'n' employees with 's' skills and 'p' projects. Then there should be need to match right skilled employee to be allocated to right job. Here, KNN algorithm will help to find match for job for skilled employee.



**Figure 2: Assigning Job with KNN algorithm [5]**

In above figure, consider 2 skill sets 1 & 2. When new job introduced, it will compare with both skill sets. Then it will be assigned to skill set with minimum distance.

## 5. Conclusion:

The ML algorithms and techniques are upgrading drastically. Also demand for allocation of suitable person for appropriate job so as to minimize cost and time required to complete task will be minimized, is increased. We can implement ML algorithms and techniques for Job Allocation Process. Here, author suggest that with the help of KNN algorithm job allocation can be possible. So that, industry will reduce its project completion time and also able to keep track that all employees get allocated to atleast one task. Also industry will get assured that no employee will have extra burden which affect his/her performance adversely.

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