# Creation of an IT Career Adviser using a Rule-Based System

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**Abstract – Finding a job in the IT industry can be a laborious process – the saturation of the job market, along with the ever-growing number of career paths in the IT sector, is making it more difficult to filter relevant career opportunities. Compounding this, many educational sources and unclear job requirements on online recruitment platforms, introduce additional challenges in navigating the job space. In this paper, we propose a rule-based recommendation system designed to match users with the most relevant job offers and help them prepare for the interview process by suggesting educational materials. The system performs the role of a domain expert in the field of professional orientation. It suggests job position/job offer recommendations that best suit a user's skills and career personality. The knowledge base is used by the Drools rule engine. A survey was conducted to rank the most desirable company benefits. Survey results were integrated into domain rules for ranking job offers in the user's recommendation list, alongside the rules on how much the user fulfills the job requirements. For the part of the preparation for the job interview, the system can offer educational materials that match the appropriate IT skill level of the user.**

***Keywords – expert systems, rule-based systems, Drools, career advice, job offer recommendation, interview preparation***

## I. INTRODUCTION

Choosing a career is one of the most important milestones in an individual's life – the quality of this decision significantly impacts a person's job satisfaction and professional growth [1]. On the contrary, improper selection of a career may cause poor job performance, social disregard, and declining mental health. Sociologist Parsons [2] developed the theory that an ideal career is based on matching personal traits with job factors. The better the fit, the higher the chance of success [3].

Technology today is evolving at a rapid pace, causing consistent demand for new software. The need for software engineers continues to rise – they're swiftly becoming an essential part of almost every industry. The U.S. Bureau of Labor Statistics projects that software engineers' employment will grow 22% – substantially faster than the 4% average for all careers [4]. However, it is not only technology trends that are evolving – a lot more has changed due to the outbreak of COVID-19 [5] – the pandemic has accelerated digitalization processes, with 92% of organizations increasing their cloud workloads [6]. Despite the global financial crisis, the IT sector saw a solid 5% salary increase and 54% of examined software engineers declared themselves as more productive when working remotely [6], which many IT companies state as a benefit. Therefore, this industry has proven to be resilient, which makes Information Technology one of the most popular careers currently.

In 2020 more than 50% of hiring positions were made up of roles related to IT, according to LinkedIn's Emerging Jobs Report for the United States [7]. Engineering isn't a new profession by any means, but engineering roles are still seeing tremendous growth [8]. Job seekers are frequently faced with the choice between multiple job offers – they often want reassurance that they are making the right decision. Benefits, compensation and the work environment should align with their personal values to reach their full potential at work [9].

This paper aims to help users who are trying to find a job offer in the IT industry that suits their skills and interests. Searching for jobs online can be a time-consuming activity caused by an increasing number of unclear job requirements and educational sources. It's important for candidates to not spend too much time seeking employment to avoid overthinking and potential discouragement.

The goal of this paper is to describe how to design a rule-based recommendation system [10] to match users with the most relevant job offers, as well as help them prepare for the interview process by suggesting educational materials. The system was developed as a web application. A survey was conducted to rank the most desirable company benefits – the results were incorporated as a part of the knowledge base that is used by the Drools rule engine. The purpose of this application is to make career advice accessible to its users so that applicants can feel confident about seeking and succeeding in the right career path.

We organize this paper in the following manner. In Section II, we define research questions and methodology. Section III presents related work. An analysis of already existing solutions can be found in Section IV. In Section V, we describe the survey and discuss the results. Section VI proposes the system design, while Section VII shows how Drools can be integrated into the system architecture and some parts of system implementation. In the last section, we conclude the research, indicate some of the limitations and future improvements.

## II. RESEARCH QUESTIONS AND METHODOLOGY

The research in this paper endeavors to answer the following questions:

- Is it possible to create a personalized system for job offer recommendations based on survey data collected from IT employees with experience and IT beginners?

- If so, can job offer recommendations be created by using a rule-based system where domain knowledge is stored in the form of some formally defined rules?

The methodology consists of the following:

- Review of related work concerning the expert systems that are designed to solve problems by mimicking the human experts in the context of professional orientation and job seeking process.
- Analysis of some of the existing popular online platforms that are used for the job seeking process.
- Collecting the expertise from the field of IT job seeking domain, by administering a survey – this will include setting a survey's objectives, setting the most appropriate survey design, and constructing the survey instrument with a focus on a self-administered questionnaire.
- Analysis of survey data to conclude whether there is a difference in sentiment regarding benefits and interview preparation methods, between IT beginners and IT employees.
- Choosing an appropriate rule-based system and incorporating the survey findings into a knowledge base.

## III. Related work

Searching for the right job often requires more than scouring for open positions and sending a resume to employers. Candidates need to make sure they're a good fit for the job and well-prepared to answer interview questions. There are also more aspects of the job offer which can be of considerable importance, such as company benefits. To aid users in job seeking, a variety of studies, algorithms and online platforms have been developed – some of which were a good starting point for the beginning of our research, thus are described in this chapter.

Expert systems are a branch of Artificial Intelligence in the form of software that uses science, facts, and thinking techniques to solve problems in special domains that usually require human expertise [11]. These systems consist of a knowledge base (a collection of facts and rules), inference engine (a search engine that matches user's query with the knowledge base), and user interface. The data in the knowledge base is added by humans that are experts in a particular domain. These systems are widely applied in various fields – including career guidance. Given the lack of development in the field of career guidance, rule-based systems provide an automized solution that brings expert knowledge to a wide audience of jobseekers [11].

Drools is a Business Rule Management System (BRMS) solution. It provides a rule engine that uses the rule-based approach to implement an expert system by processing facts and producing an output. The centralization of business logic makes it possible to quickly introduce changes. It also bridges the gap between the business and technical teams by providing a facility for writing the rules in a machine-readable format that is easy to understand [10], where rules are separated from application code and stored individually.

Paper [12] presents the design of a multi-expert system to help in educational and vocational guidance by using a multi-agent approach. The solution proposed in that paper consists of educational and career guidance where different types of knowledge come from five sources: pedagogical, psychological, sociological, economic, and coaching experts. These different experts use a collaborative knowledge base powered and updated through several sources of knowledge.

In [13], a career recommendation system driven by a fuzzy logic technique is proposed. The use of fuzzy rules and a knowledge base helps students by giving them career recommendations based on a career test. Many students have chosen their career paths without receiving appropriate advice from professional services. Therefore, it is important to build a recommendation system that provides direction and guidance to students in choosing the right career path.

In [14] a personalized system named *Proactive* which provides comprehensive information access for IT job opportunities is described. *Proactive* attempts to serve the whole spectrum of job seekers – users who are just starting to plan their future careers, and experienced job seekers. With the *Advanced Search* interface, users can specify various job parameters and retrieve a list of jobs that match parameters. The *Preferred Jobs* interface supports profile-based information filtering, where users can define their preferred job categories – multiple preferences for each facet are allowed. A job opportunity will be considered a fit if it matches at least one of the preferences in each aspect.

*CareerRec* described in [15], is a recommendation system that uses machine learning algorithms to help IT graduates select a career path based on their skills. The system was trained and tested using a dataset of 2255 employees in the IT sector. In order to collect data, a survey was designed - participants were asked to fill in 20 skills and to evaluate their level of knowledge. The authors conducted a performance comparison between five machine learning algorithms to assess the accuracy for predicting the best-suited career path. *XGBoost* [15] algorithm is chosen as it outperforms other models and gives the highest accuracy (70.47%).

## IV. Analysis of existing solutions

An overview of two popular online platforms for job seeking is done to determine the basic requirements and desirable features for the proposed solution. The analyzed websites are Monster.com [16] and Joberty.rs [17].

### A. Monster

Monster is an online platform that connects employers with job seekers. Employers can use Monster to post jobs as well as search its database for relevant resumes. Applicants are offered some general guidance for the job seeking process. Users can register to the website and update their profile with details about their levels of competence. Monster is trusted by millions of employers around the world to find and hire adequate candidates, but from the applicants' point of view, there is no personalized help from the system. Profile information is used for generating a resume and not for job offer recommendations. In reality, a job seeker often faces the message – *Thousands of most popular jobs are found nearby*.

### B. Joberty

Joberty is a Serbian online platform for exploring IT companies and job opportunities. Users can find general information about companies, as well as reviews about benefits, interview complexity, and salaries. Applicants can follow employers they find suitable and get notifications about active job offers. The information that the platform offers is valuable for users that know exactly what kind of job they are seeking, but the online platform is lacking personalized guidance.

### C. Summary

Both analyzed online platforms have the same goal – to seek a suitable job for the candidate. Different types of filtering help users to reduce the number of job offers and find the relevant ones. An automatic resume builder based on profile information is valuable for beginners because writing a professional resume can be difficult. A career adviser offers information and general guidance to job seekers. All these features are valuable for applicants, but candidates still have to manage a large amount of information on their own, and there is no personalized career guidance based on candidates' skills and competencies.

The system that will be proposed in this paper will address the previous observation in such a manner that it will provide the users with a recommendation system in two phases:

- Job position recommendation based on their resume – this will help candidates that are still unsure which career path suits them best.
- Job offer recommendation based on the job position defined in the previous phase and benefit score derived from the survey results.

The system will also offer information about the subjects where candidates lack knowledge and recommend educational material suitable for their needs and skill levels.

## V. Survey and Results

A survey is a comprehensive research method for collecting information to describe, compare or explain knowledge, and behaviors [18]. Therefore, it was conducted to explore attitudes about significant benefits in IT companies and different ways of preparing for a job interview. This investigation aimed to rank 16 of the most popular benefits collected from online platforms for hiring in IT and to analyze preferred ways of learning in the IT community. This data was then included in Drool's knowledge base.

### A. Survey objectives

Survey objectives provide a framework for asking the right questions – these are specific and measurable steps to meet the survey goal [18]. In this paper, 2 objectives were defined.

*Objective 1*: Determine whether there is a significant difference in the importance of certain company benefits from a beginner's perspective compared to experienced IT employees.

*Objective 2*: Determine whether there is a significant difference in approach when preparing for an interview between IT beginners and experienced IT employees.

### B. Survey population

The survey's target population consists of two groups: IT employees (46.43%) and IT beginners (53.57%) – 196 respondents participated in the research. This sample structure was chosen in an attempt to conclude whether there is a difference in sentiment regarding benefits and interview preparation methods, between people who are just starting their careers, and those who already have experience in the IT industry. Considering that the number of respondents from both target groups is almost equal, the sample may be considered representative.

### C. Survey construction

To meet this study's research objectives, a free online survey tool was used for creating an anonymous questionnaire. The survey contains 28 questions - the respondents were asked to select an answer from a list of predefined choices. Ordinal scales were used to express a level of benefit's importance on a scale from 1 to 5. Dichotomous questions were used to ask respondents if they agree with stated assertions – two different benefits were chosen, and one was defined as more important than the other. This yes/no category of the question was chosen to avoid the scenario where examinees could mark all benefits with the same level of importance. The last question was related to interview preparation methods – examinees were allowed to choose multiple predefined options and optionally add a new one.

### D. Data analysis

The response rate was 79.67% - a significant number of respondents expressed positive attitudes and a desire to participate in the research. This can be possibly explained by the fact that the chosen topic is a relevant matter, both in the lives of people with work experience and in the lives of students and IT beginners. In general, people will be more motivated to provide complete and accurate responses if they can see that the results of the study are likely to be useful to them [18].

Statistical data processing was done in Microsoft Office Excel 2013 – the data was summarized in bar graphs and paired sample t-test was applied. The paired sample t-test, sometimes called the dependent sample t-test, is a statistical procedure used to determine whether the mean difference between two sets of observations is zero [19]. A paired t-test is used when we are interested in the difference between two variables for the same subject – in our case company benefits. The prerequisites for applying this statistical method were met: (1) samples are independent of each other, (2) the size of each sample is bigger than 30 – t-distribution is almost identical to the normal distribution [19].

### E. Results and Discussion

A survey is often described as a non-reliable methodology because respondents tend to be less than 100% honest. The reasons for this kind of behavior can vary – it might be that the examinees cannot find an adequate answer that reflects their beliefs, or they want to show themselves in a better light. In the paper, this problem is avoided by questioning topics that don't require self-evaluation and are relevant to the IT community.

Respondents consider almost all company benefits to be important. T-tests showed that there are statistically significant differences between the two samples for three benefits:

- Flexible working hours – 21.9% of IT employees are indifferent towards this benefit. Results showed that this is more valuable for IT beginners.
- Remote work – 47.2% of IT employees marked this benefit as very important and only 25.6% of IT beginners.
- Pleasant work environment – 91.2% of IT employees think that this is a very important benefit.

A rank list of the top five benefits (Table 1) represents how IT employees and IT beginners value company benefits (the full list is provided in [20]). Results gathered from dichotomous questions were also considered during the construction of this list.

There is a significant difference in approach when preparing for an interview between IT beginners and experienced IT employees. It is noticed that respondents without work experience tend to follow concise and well-organized YouTube crash courses or FAQ lists (68.3%), while IT employees often use professional literature (51.7%). A complete table for ranging interview preparation methods is provided in [20].

| | Important | Not important |
|---|---|---|
| Professional growth | 97.0% | 3.0% |
| Pleasant work environment | 96.4% | 3.6% |
| A balance between business and private life | 95.9% | 4.1% |
| Modern technologies | 92.3% | 7.7% |
| Competitive salary | 88.3% | 11.7% |

*Table 1 Rank list of the top five benefits*

## VI. System design

IT Career Adviser is designed as a web application that allows each user to get a personalized list of job positions and job offers based on their competencies (class diagram is provided in [21]). As previously stated in chapter IV, the online platforms have proven to be very popular and intuitive to end users – web applications are flexible enough to reliably develop but also to scale up when required. In addition, web platforms provide a very accessible experience, while keeping the option of developing special client side apps for further growth.

The information gathered as a part of the survey in chapter V represents domain knowledge that is transformed into rules – some of the most significant ones will be explained in the following chapter. The rules are kept in one place – business logic is separated from the rest of the system, which results in easier reusability. In the context of this system, it would be easy to extend the knowledge base with an updated set of benefits or interview preparation methods. The Drools platform makes it possible to change/redeploy rules without stopping the whole application which means easier adaptation to new conditions. The job positions and offers were scraped from Serbian job advertising platforms.

## VII. Description of solution

The system described in this paper is designed as a rule-based system, where the knowledge base contains a set of rules that are divided according to the functionality they support. As mentioned earlier, the system's primary purpose is to recommend a list of suitable job offers based on job seekers' competencies. Registered users are required to specify their work experience in a resume that consists of five sections (programming languages, specific libraries and frameworks, theoretical concepts, foreign languages, and soft skills). The more information is provided, the better the suggested career path will fit the individual.

Therefore, the main functionalities of the system are:

- Professional orientation
- Job offer recommendation
- Interview materials recommendation

### A. *Professional orientation*

Every job position is described with a title and a list of required/optional skills. Before requesting a personalized set of job offers, a user needs to evaluate which job profiles suit them best. In this phase, the system conducts professional orientation by comparing competencies defined in their resume with requirements for specific job positions. This step provides the user with a list of job positions, a recommended seniority level, and a summary of the most important skills. This list is sorted by how well the job seeker fulfills the requirements.

Job position recommendation is divided into four phases. In the first phase, a comparison between the user's knowledge of programming languages and job position requirements is conducted. The system checks if the user knows at least one of the programming languages specified for each job position. If so, these job positions are used as the input for the next step.

Two mutually exclusive rules can be triggered in the second phase. The first one is activated if the user knows a required programming language for the specific job position – in that case points proportional to the importance of that language are assigned to the job position suggestion. The other one is activated if the user is missing a required programming language in their resume – consequently, that job position is removed from the list and won't be processed in the next stage.

In the third phase, proficiency in relevant libraries and frameworks, as well as the knowledge level of relevant theoretical concepts, is checked. The points for the job position suggestion are incremented for each match.

The last phase determines which seniority level is suitable for the job position suggestion, based on the user's previous working experience with similar job positions and technical requirements (Listing 1). Seniority levels for a certain position are usually determined on a per-company basis. Since the system was designed to provide general recommendations, guidelines from [22] were used.

```
rule "JobPositionSuggestion - phase 4 - Medior"
   agenda-group "jps-p4"
   lock-on-active
   when
      $jpr: JobPositionRating(rating != 0,
           seniority == SeniorityLevel.NONE,
           $jobPosition: jobPosition)
       and
      $jps: JobPositionSuggestion(
         $positionRatings: positionRatings,
         $user: jobSeeker, $positionRatings.size() != 0,
         $positionRatings contains $jpr, finished == false)
      and
      accumulate(WorkingExperience($months: months,
          $seniority:  seniority, position.title ==
          $jobPosition.title) from
          $user.getWorkingExperience();
          $effectiveMonths: sum((int) ($seniority.getValue() * $months));
          $effectiveMonths >= 24, $effectiveMonths < 60)
   then
      SeniorityLevel $newLevel = SeniorityLevel.MEDIOR;
      int $seniorityPoints = (int) ($effectiveMonths *
         monthsExperienceCoefficient);
      int $newRating = $jpr.getRating() + $seniorityPoints; modify
      ($jpr) {
         setSeniority($newLevel),
         setRating($newRating)
      }
end
```

*Listing 1 Rule example for defining a seniority level*

### B. *Job offer recommendation*

After professional orientation, users can request job offer recommendations. Each job offer will reference some of the job positions defined in the previous phase. Users will get information if the offer is a perfect match, or if additional improvement is needed. If a company is highly recommended in reviews, its job offers will get a specific flag to indicate good working conditions.

Every job offer in the system contains a list of employers' requirements. Required and optional skills are defined, as well as the level of importance for each of them. Rules conduct the comparison between users' skills defined in their resumes and job offer requirements. A ranking list of relevant job offers is created by assigning points to each of them. The calculation consists of subtracting numerical representation of importance levels for user's knowledge and expected knowledge – the result is then multiplied by the coefficient that defines how significant is the skill for a particular offer. An example of the rule that activates for a programming language, that is deemed mandatory in job requirements, and that exists in users' resumes is shown in Listing 2.

```
rule "JobOfferSuggestion - phase 2 - mandatory programming languages  (exist)"
    agenda-group "jos-p2"
    lock-on-active
    when
        $jobOfferRating: JobOfferRating(
        rating == 0, $progImportances: jobOffer.getCvElementImportances())
        and
        $jobOfferSuggestion: JobOfferSuggestion(
         $user: jobSeeker, offerRatings contains $jobOfferRating)
        and
        $userProgrammingLang: List() from accumulate(
             CVElementProficiency(
                 $progLang: cvElement.getName(),
                 cvElement.getType() == CVElementType.PROGRAMMING_LANGUAGE)
                 from $user.getProficiencies(),
                 collectList($progLang))
        and
        $importance: CVElementImportance(optional == false,
             $userProgrammingLang contains
             cvElementProficiency.getCvElment().getName())
             from $progImportances
        and
        $userProficiency: CVElementProficiency(cvElement.getName() ==
        $importance.getCvElementProficiency().getCvElement().getName())
        from $user.getProficiencies()
    then
        SkillProficiency $proficiency =
        $importance.getCvElementProficiency().getProficiency());
        int $difference =
        $userProficiency.getProficiency().skillDifference($proficiency);
        int $points = $importance.getImportanceLevel() * $difference;
        modify($jobOfferRating) {
            setRating($points),
        }
end
```

*Listing 2 Rule example for mandatory programming languages*

The ranking list of job offers is affected by the benefits listed in the job description – the significance of every benefit is derived from previously mentioned survey results. This rule is designed in the form of a template (Listing 3) – for each benefit, a separate rule is generated automatically. With this approach we achieve flexibility – a list of benefits can be easily extended.

```
template "Job offer - benefits"
rule "Benefits for job offers @{row.rowNumber}"
agenda-group "jos-p9"
lock-on-active
when
    JobOfferSuggestion(
          jobOfferRatings: offerRatings,
          finished == false
    ) and
    jor: JobOfferRating(
          offerBenefits: jobOffer.getCompany().getBenefits()
    )
    from jobOfferRatings and
    accumulate(Benefit(benefitName: name) from offerBenefits;
               benefitNames: collectList(benefitName);
               benefitNames contains "@{name}")
then
    int points = @{levelImportance} * 2;
    int newRating = jor.getRating() + points;
    modify(jor) {
        setRating(newRating),
    }
end
end template
```

*Listing 3 Template rule for job offer benefits*

Every job offer from the recommendation list is assigned with the specific flag – *improvement needed*, *low competition*, *hot company* or *best match*. For each flag there is one rule triggered – the conflict scenario is fixed with the usage of saliance mechanism. The purpose of these statuses is to give some additional information that will help job seekers to choose the job offer that suits them best.

*Improvement needed* implies that the job seeker is on the right track for the job, but there are still some knowledge gaps that should be filled before applying. This rule (Listing 4) has the largest *salience* value, meaning it will be checked first, as the first step in the classification phase is checking the basic requirements. The *low competition* status is assigned when the job offer is adequate and also has less than the average number of followers. Offers that belong to a well reviewed company are assigned the *hot company* status. The remaining offers are classified as *best match*.

```
salience 50
rule "JobOfferSuggestion - phase 7
   agenda-group "jos-p7"
   lock-on-active
   when
      $jobOfferRating: JobOfferRating(
      category == JobOfferCategory.NONE,
       rating <= 0)
   then
      modify($jobOfferRating)
          setCategory(JobOfferCategory.IMPROVEMENT_NEEDED)
      }
end
```

*Listing 4 Rule for applying improvement needed status*

Users can follow job offers that seem most lucrative for them. They will be added to the job offer leaderboard – this is where all job seekers interested in this offer are ranked by their competencies. This can help users to see if they are behind other candidates interested in a job.

### C. *Interview materials recommendation*

Every suggested job offer can be evaluated by analyzing the user's knowledge. Job seekers can get an analysis of the job's requirements against their competencies, which gives them an indication if their knowledge of a specific skill is lacking. If their competencies are behind the requirements, they can request educational materials for interview preparation.

The interview material recommendation is built with the Drools query system (Listing 5). The query filters all interview materials based on the user's input and the results are learning materials that can take a user from their current level to the job offer's expected level of knowledge. With each material a user marks as done, their CV is updated, as well as their job offer recommendations and leaderboard positions.

```
query getInterviewSuggestionForCVElement(
          SkillProficiency iUserProficiency,
          SkillProficiency iJobProficiency,
          String iSubject,
          CVElementType iCv,
          InterviewSuggestion $is)
 $is := InterviewSuggestion(
 cvElementProficiency.getCvElement().getType() == iCv,
 subject == iSubject,
 cvElementProficiency.getProficiency.getValue() > iUserProficiency.getValue(),
 cvElementProficiency.getProficiency.getValue() <= iJobProficiency.getValue())
end
```

*Listing 5 Query for selecting relevant interview materials*

The system rewards the user for continuously improving their skills. Every day a user improves a new skill, the system keeps track, and after five days they get a special *continuous learning* badge which is displayed on the leaderboard (Listing 6). If the user stops the learning spree, they lose the badge and must start the streak again.

```
rule "StudiedTodayEvent added - 5 days in a row"
agenda-group "studied-today"
when
      $event: StudiedTodayEvent($jobSeekerId: jobSeekerId) and
      Number(intValue >= 5) from accumulate (
      StudiedTodayEvent(jobSeekerId == $jobSeekerId)
      over window:time( 24h ),
      count(1))
and
      $user: JobSeeker(id == $jobSeekerId, continuousLearning == false)
then
      modify($user) {
            setContinuousLearning(true)
      }
end
```

*Listing 6 CEP for detecting continuous learning*

A full video demonstration can be found at [20].

## VIII. Conclusion

The system proposed in this paper aims to aid IT beginners as well as experienced people in finding the right career path. A survey was conducted on the difference in sentiment towards different job benefits as well as interview preparation methods, from the perspective of IT beginners vs experienced employees.

We often have some idea of what we are seeking and the way we build the survey instrument can inadvertently reveal our biases. The downside of this survey are Yes/No questions - they suffer from acquiescence bias. A future improvement would be to allow the system to use user-defined benefit rankings in the rule engine, which would result in vastly different results for different people.

System evalution could be performed by creating individual accounts for group of people with similar skillsets. After the recommendation process, individuals would be asked to rate every proposed job offer. Results from these types of tests could be used to fine tune the weights for specific parts of the recommendation algorithm.

Another issue with this type of system arises in the discrepancies between the rule engine database and the backend database. This increases the maintence costs of the system.

Potential improvements for the system include new administrative roles, such as a *Teaching expert*, who could create and maintain educational materials. Another possible role would be a *Company representative*, who would be tasked with creating and updating job offers for their company, while monitoring the leaderboards for recruitment candidates. The system could also be improved by automatically gathering data from a user-provided CV and filling in the user's profile on the website.

The classroom could be improved with an advanced mentorship program, which could provide learning paths and personalized guidance for users. The findings from the survey in regards to the learning methods should be incorporated into this future version of the classroom.

More research and innovation are needed to develop and maintain this type of application while still supporting all of the intereseted parties in the recruitment process. However, the implemented system provides a good starting point for further research in this domain.

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