University of Novi Sad
Faculty of Technical Sciences

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

NATAŠA IVANOVIĆ
ANĐELA TRAJKOVIĆ
SINIŠA NIKOLIĆ

Content

A BRIEF REVIEW OF THE LITERATURE AND OUR ARGUMENTS ON WHY THIS TOPIC IS SO IMPORTANT

MOTIVATION

A DESCRIPTION OF THE ACTIONS WE TOOK TO INVESTIGATE THE PROBLEM

METHODOLOGY

AN OVERVIEW OF TECHNOLOGIES AND TECHNIQUES APPLIED IN DEVELOPMENT

SYSTEM DESIGN

A DESCRIPTION OF THE MAIN FUNCTIONALITIES OF THE SYSTEM

SYSTEM IMPLEMENTATION

FINAL IMPRESSIONS AND IMPROVEMENT POINTS FOR THE FUTURE

CONCLUSION

Motivation

- Choosing a career is one of the most important milestones in an individual's life – improper career selection may cause poor job performance, social disregard, and declining mental health[1]
- Consistent demand for quality software is becoming commonplace in almost every industry, which, in turn, makes software engineers an essential part of the modern workforce
- The increased workload due to the COVID-19 pandemic, combined with the option of working remotely, resulted in the IT sector having further growth, while also proving to be one of the most resilient industries[2]
- Navigating the ever-expanding field of career opportunities can be difficult, exact job requirements and benefits can be unclear, and preparing for the interview without professional guidance can be challenging

1. Alkhelil, A. H. (2016). The relationship between personality traits and career choice: A case study of secondary school students. International Journal of Academic Research in Progressive Education and Development
2. GERHARDT, Uta. Talcott Parsons: an intellectual biography. Cambridge University Press, 2002.

Methodology

- Review of the related work, concerning systems designed to solve problems by mimicking expert behavior, in the context of professional orientation and the 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 IT field, by administering a survey – this included: setting a survey’s objectives, choosing 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

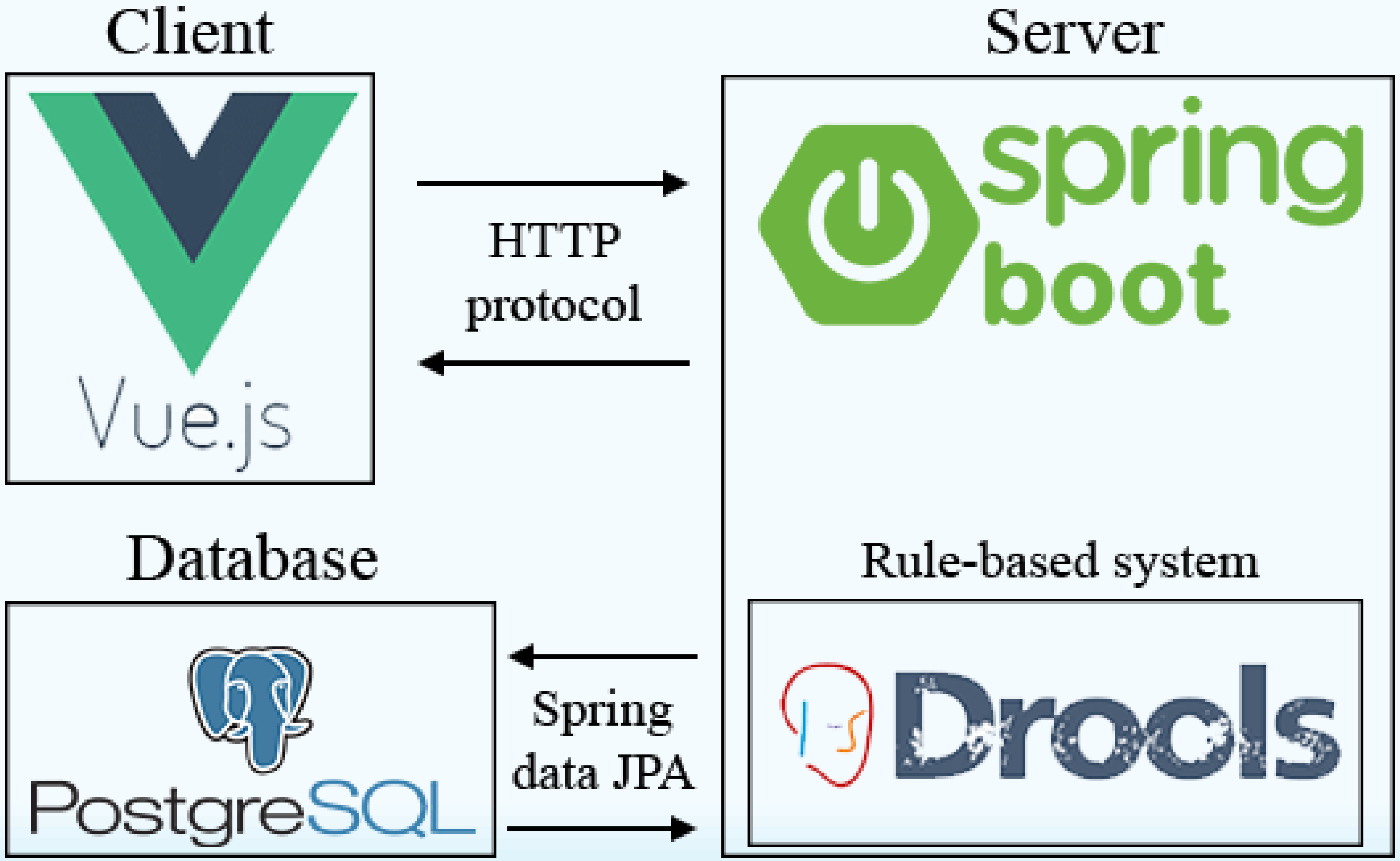
Benefits sorted by importance

	Important	*Not important*
Professional growth	**97.0%**	**3.0%**
Pleasant work environment	**96.4%**	**3.6%**
Balance between business and private life	**95.9%**	**4.1%**
Modern technologies	92.3%	7.7%
Competitive salary	88.3%	11.7%
Flexible working hours	81.6%	18.4%
Current projects	79.1%	20.9%
Remote work	73.5%	26.5%
Paid internship	58.2%	41.8%
Brand and product purpose	49.0%	51.0%
Home office budget	44.9%	55.1%
Parking space	41.3%	58.7%
Business English lessons	35.7%	64.3%
Opportunity to work abroad	30.6%	69.4%
Free food	22.9%	77.1%
Fitness coupons	22.4%	77.6%

Interview preparation methods

	Employees	*Students*
Udemy courses	48.3%	39.4%
YouTube tutorials	55.2%	68.3%
Demo applications	55.2%	44.2%
Written tutorials	55.2%	40.4%
Books	51.7%	26.9%
Other	3.3%	5%
Udemy courses	48.3%	39.4%

System design



System implementation

- The main functionalities of the system are:
  - Professional orientation
  - Job offer recommendation
  - Interview preparation guidance

Professional orientation

Creating all possible job position suggestions based on the user’s known programming languages

```
rule "JobPositionSuggestion - phase 1"
    agenda-group "jps-p1"
    lock-on-active
    when
        $jps: JobPositionSuggestion($user: jobSeeker,
                                    $posRatings: positionRatings,
                                    finished == false) and
        forall(JobPositionRating(rating == 0) from $posRatings) and
        $u_progLanguages: List()
            from accumulate (CVElementProficiency
                   ($cvElement: cvElement,
                   cvElement.getType() == CVElementType.PROGRAMMING_LANGUAGE)
                   from $user.proficiencies, collectList($cvElement)) and
        $position: JobPosition
                    ($p_progLanguages: cvElements,
                    !Collections.disjoint($u_progLanguages, $p_progLanguages))
        and
        $progLang: CVElement(type == CVElementType.PROGRAMMING_LANGUAGE)
                   from $p_progLanguages
    then
        JobPositionRating $jpr = new JobPositionRating();
        $jpr.setRating(0);
        $jpr.setTitle($position.getTitle());
        $jpr.setSubtitle($progLang.getName());
        $jpr.setDescription("");
        $jpr.setJobPosition($position);
        $jpr.setSeniority(SeniorityLevel.NONE);
        modify($jps) {
            getPositionRatings().add($jpr)
        }
        insert($jpr);
end
```

Job offer recommendation

Creating all possible job offer suggestions based on the job positions from the previous phase and user's known programming languages

```
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
```

Job offer recommendation

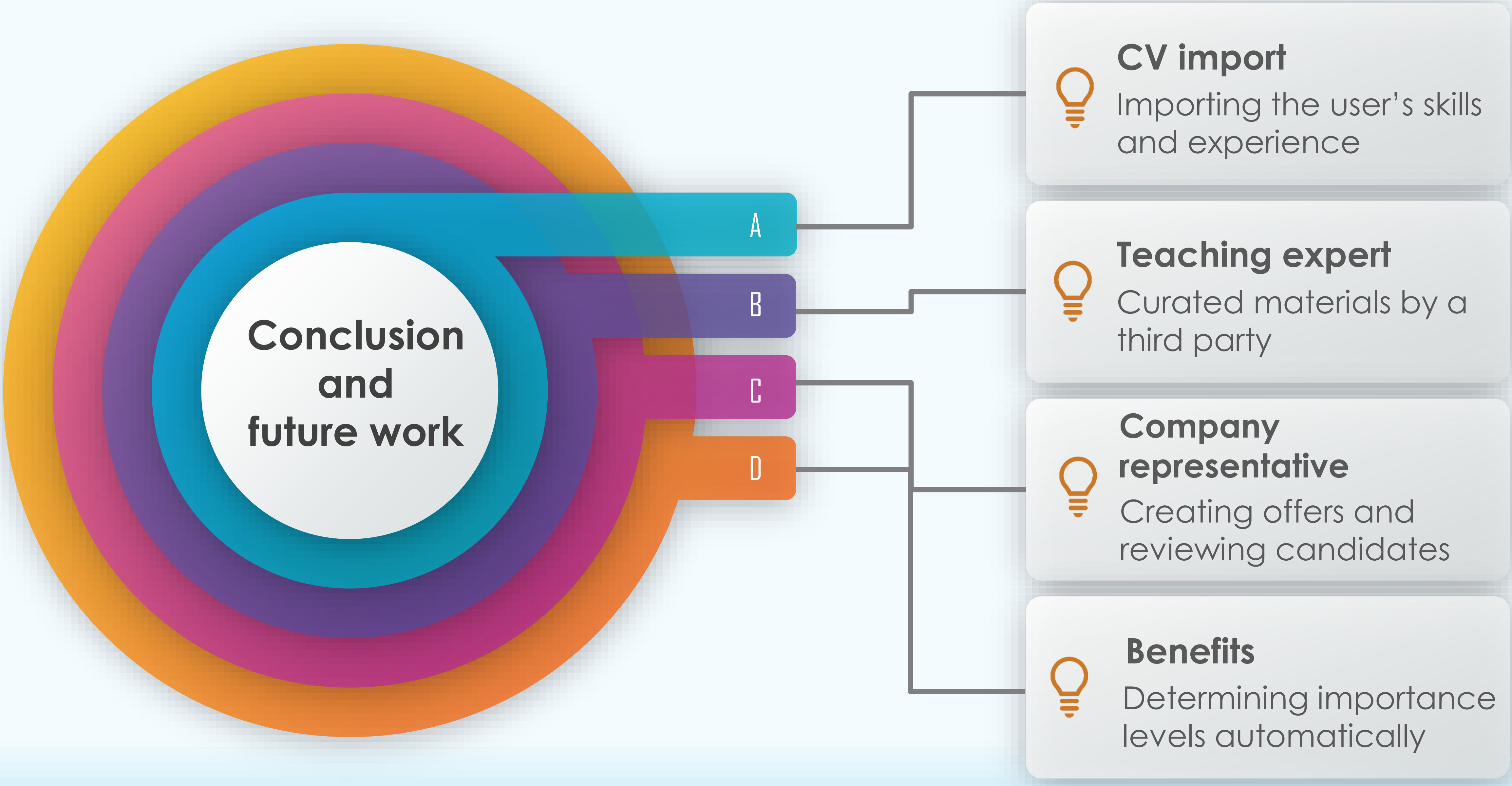
The ranking list of job offers is affected by the benefits listed in the job description – the significance of every benefit is derived from survey results

```
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
```

Interview preparation guidance

Getting adequate educational materials based on user’s competencies and job requirements

```
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
```



Conclusion and future work

A

CV import

Importing the user's skills and experience

B

Teaching expert

Curated materials by a third party

C

Company representative

Creating offers and reviewing candidates

D

Benefits

Determining importance levels automatically

Thank you for your attention!

Questions?