EELU
GRADUATION PROJECT2024

Job Recommendation Web application.

JOBSHOP

presentation content:

1-INTRODUCTION.
2-STAKEHOLDERS.
3-PROBLEM DEFINITION & BACKGROUND
4-SCOPE.
5-COMPETITORS.
6-USER REQUIREMENTS.
7-DIAGRAMS.
8-IMPLEMENTATION.

1-Introduction

At the forefront of this technological revolution stands the job recommendation system – a sophisticated platform empowered by artificial intelligence (AI) and machine learning algorithms. By leveraging the vast troves of data available in the job market, including user profiles, job listings, and historical interactions, the job recommendation system employs advanced analytics to generate tailored job recommendations that match the skills, experience, and preferences of individual users.

2-Stakeholders:

1)JOB SEEKERS

*ROLE:INDIVIDUALS ACTIVELY SEEKING EMPLOYMENT OR STUDENTS THAT WANT TRAINING...

*INTERESTS:EFFICIENT JOB MATCHING, PERSONALIZED RECOMMENDATIONS.

2)EMPLOYERS/RECRUITERS

*ROLE:ENTITIES RESPONSIBLE FOR HIRING EMPLOYEES.

*INTERESTS:ACCESS TO A POOL OF QUALIFIED CANDIDATES, EFFICIENT RECRUITMENT PROCESSE
EFFECTIVE FILTERING MECHANISMS

3)COMPANY ADMINISTRATORS

*ROLE:INDIVIDUALS RESPONSIBLE FOR COMPANY PAGE MAINTENANCE, UPDATES, AND MONITORING.

*INTERESTS:•CONTROLLING OF COMPANY PROFILE PAGE.

4)DEVELOPERS AND IT TEAM

*INDIVIDUALS RESPONSIBLE FOR THE DEVELOPMENT AND MAINTENANCE OF SYSTEM.

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3-problem definition & Background:

1) Challenges and Pain Points:

-The traditional job search process is often overloaded and inefficient for both job seekers. Job seekers find it hard to find relevant job opportunities in a sea of listings, while employers face challenges in attracting qualified candidates.

1.Information Overload

2.Lack of Personalization:

3.**Inefficient Matching Process:**

4-Scope:

1) Objectives:

1-Efficient Job Matching.
2-Enhanced User Experience.
3.Personalization.

2)Inclusions:

1-User Registration and Authentication.
2-Profile Management.
3-Job Recommendation Engine.
4-Application and Recruitment Workflow.
5-User Feedback Mechanism.

3)Exclusions:

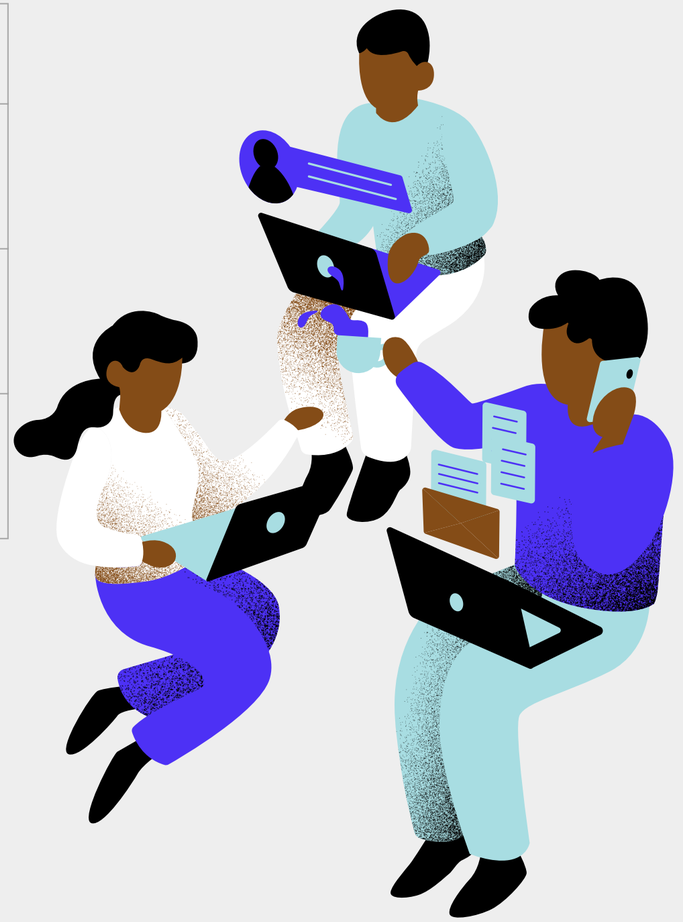
1-Job Placement Services.
2-Semantic analysis.
3-Background Checks .

5-Competitors:

Disadvantages of competitors	Our solutions
-Indeed.com : Do not provide specific information about companies.	-Each company has company profile that contains its all posted jobs and all fields that company support.
-Bayt.com : Does not explain job requirements.	-The response of each recommendation request contains explained job requirements.
-Monster.co.uk: Jobs are not updated on an ongoing basis	-Each company employer can update jobs required in any post.
-Linked in :users being presented with generic job recommendations that may not align with their specific skills, experience, and career goals.	-The system will tailor recommendations based on user preferences, skills.

6-User Requiremnets :

user	Functions
Job Seekers	-Login , Profiles , Job search , Request Recommend , Security , Application Submission ,Application management .
Employers	-Login , Profiles , Job Posting , Candidate matching, submitted application manage ,Security.
Company Administrator	-Employer Management, content management , Field Management, Job posting.



7-Diagrams (Sequence Diagrams**)**

1-REGISTERATION
2-LONG
3-JOB SEARCH
4-MAKE A POST
5-APPLICATION SUBMISSION
6-APPLICATION MANAGEMENT
7-CREATE EMPLOYER
8-FIELDS MANAEGEMENT
9-FEEDBACK
10-REQUEST RECOMMENDATION

8-Implementation

8.1-Technologies used :

-PROGRAMMING LANGUAGES USED:

-JAVA FOR BACK-END:

-PYTHON FOR AI AND MACHIN LEARNING

-JAVASCRIPT FOR FRONT-END

--DATABASE USED:MYSQL

8.2-Hardware and Software Requirements :

- **THE BACKEND (DATABASE SERVER):** THE DATABASE SERVER IS PREFERABLY A COMPUTER WITH THE PROCESSOR SPEED OF 2.0 GHZ (RECOMMENDED), 8GB OR HIGHER RAM, 70 GB OR HIGHER STORAGE SPACE DEPENDING ON THE COMPANY'S DATA STORAGE REQUIREMENTS.
- **THE APPLICATION SERVER (WEB SERVER) :** IT IS OBSERVED THAT THE PERFORMANCE OF THE WEB SERVER IS ONE OF THE MOST VITAL FACTORS PERTAINING TO THE SPEED OF THE SYSTEM. THEREFORE, A PROCESSOR (3.0 GHZ), 8GB OR HIGHER RAM, 30 GB OR MORE FREE HARD DISK CAPACITY.
- **CLIENT:** ALL THAT IS NEEDED BY THE CLIENT SIDE IS A COMPUTER THAT CAN RUN ANY STANDARD JAVASCRIPT ENABLED WEB BROWSER (PREFERABLY GOOGLE® CHROME) AND ACCESS TO INFORMATION SUPERHIGHWAY AT A MINIMUM RATE OF 1MBPS. NEVERTHELESS, THE MORE THE PERFORMANCES OF THE COMPUTER AND THE NETWORK BANDWIDTH, THE FASTER THE SYSTEM PROCESSES AS IT WOULD BE.

8.3-Back-end jobseeker functionality :

- **MAIN PACKAGES:**
  - DTO, CONTROLLER, SERVICE, REPOSITORY
  - **FEATURES:** PROFILE, QUALIFICATION, REQUESTS, SKILL
- **CONTROLLER PACKAGE:**
  - GITHUB LINK (INCLUDE REST CONTROLLER ENDPOINTS)
  - **FUNCTIONS:**
    - **JOBSEEKERRESTCONTROLLER.JAVA:**
      - SAVE SKILLS AND QUALIFICATIONS (POST)
      - UPDATE PROFILE (PUT)
      - APPLY FOR JOB (POST)
      - FIND ALL APPLICATIONS (GET)
- **SERVICE PACKAGE:**
  - **SERVICES:**
    - JOBSEEKERSERVICEINTERFACE.JAVA
    - JOBSEEKERSERVICE.JAVA (INCLUDES FIRST MATCH ALGORITHM)
    - JOBSEEKERREPOSITORY.JAVA (JPA REPOSITORY)
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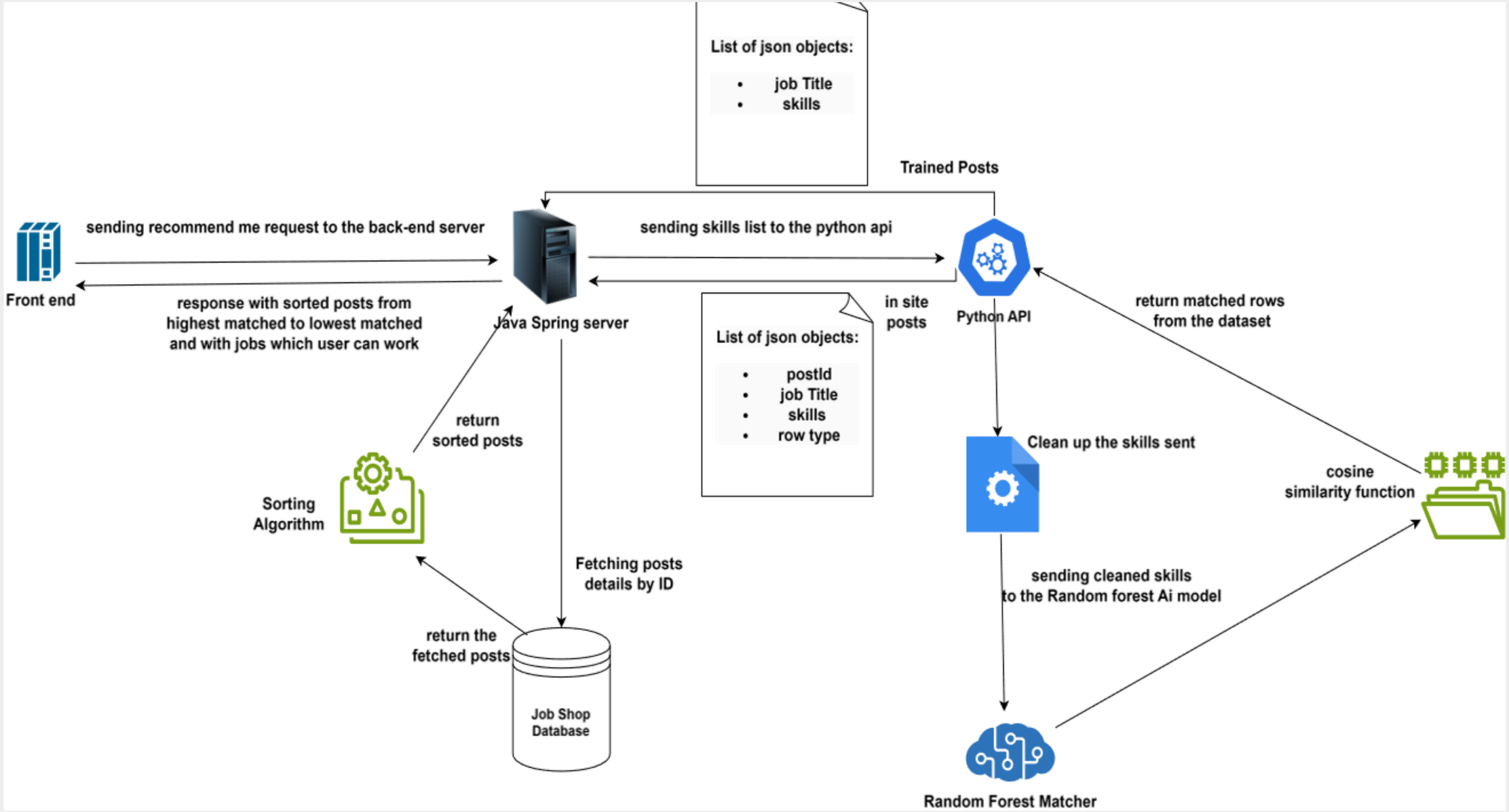
8.4-Back-end jobSeeker job matching Algorithm :

- **Algorithm Overview:**
  - **Function:**
    - getPostsWithSkillsOnPublic(Long jobSeekerId)
- **Main Steps:**
  a. **Fetching Job Seekers and Their Skills:**
     - Find job seeker entity by ID.
     - Retrieve skills and qualifications using service.
  b. **Processing Posts:**
     - Fetch posts matching job seeker's skills.
     - Filter posts based on job seeker's criteria.
  c. **Calculating Scores and Filtering:**
     - Calculate score for each post based on skill match.
     - Categorize posts as matched or unmatched.
  d. **Sorting Posts:**
     - Sort posts based on match quality.
     - Prioritize posts with more matches and fewer remaining skills.
     - Use a comparator for sorting logic.
  e. **Handling Duplicates:**
     - Remove duplicate posts to avoid redundancy.
  f. **Returning Results:**
     - Return a list of unique posts with scores and match statuses.
     - Include percentage of match in the results.

8.5-Job Seeker Skill Matching with Machine Learning:

- **Main Steps:**
  a. **Data Preparation:**
     i. **Cleanup Function:**
        - Tokenizes sentences, removes punctuation, converts to lowercase, and rejoins cleaned sentences.
        - Essential for text data preparation before machine learning.
  b. **Model Training:**
     - Training and Saving the Model:
     - Reads data from a CSV file.
     - Encodes job titles into numerical labels.
     - Transforms skills into TF-IDF features.
     - Splits data into training and testing sets.
     - Trains a Random Forest classifier.
     - Evaluates the model and prints a classification report. (With accuracy 95%).
     - Saves the model, vectorizer, and label encoder to disk.
  c. **Model Deployment:**
     - Saving and loading the trained model for future use.
  d. **Skill Matching:**
     - Uses cosine similarity to find relevant jobs based on user-provided skills.
  e. **API Integration:**
     - Exposes the functionality via Flask API endpoints.

8.6 -> The integeration between back-end and ai model:



9.Testing

Unit test

Testing each function with test cases

Integration test

Run the designed test cases on the integrated components.
Record the results, including any failures or defects found

Systems test

Test the complete and integrated software system to ensure it meets the specified requirements.

Acceptance Test

Validate the software against business requirements and ensure it is ready for production

Thank you!

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