Software Engineering Spring 2024 Project Proposal

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I. INTRODUCTION

Our mission is to revolutionize candidate evaluation by harnessing the power of social media data analysis, psychometric testing [1], and artificial intelligence (AI). Our innovative approach aims to provide comprehensive insights into candidates' personalities, behaviors, and suitability for organizational culture.

Our use case involves a holistic assessment process, combining the analysis of candidates' social media footprint with advanced psychometric testing and the generation of AI-driven personality dashboards. This multifaceted approach enables recruiters and hiring managers to gain deeper insights into candidates, facilitating more informed decision-making throughout the recruitment process [2], [3].

By leveraging cutting-edge technologies and diverse data sources, we seek to redefine the standards of candidate evaluation, ultimately enhancing the efficiency and effectiveness of talent acquisition efforts.

A. Stakeholders

- **Recruiters and hiring managers**: They rely on effective candidate evaluation methods to identify the best-fit candidates for job roles.
- **HR professionals**: They are responsible for designing and implementing recruitment processes that ensure the selection of high-quality talent.
- **Candidates**: These are directly impacted as they undergo evaluation and selection processes for employment opportunities.

B. Problems & Challenges

We target the shortcomings of traditional candidate assessment methods, primarily relying on interviews and resumes, which often lack depth in understanding candidates' potential and cultural fit. Our project proposes advanced evaluation techniques, combining social media analysis, psychometric tests, and AI-generated personality assessments to gain deeper insights into candidates' suitability.

Our aim is to address challenges such as identifying the most suitable candidates among numerous applicants and mitigating biases in traditional evaluation methods. Through our innovative approach, we aim to equip recruiters and hiring managers with data-driven insights to optimize talent acquisition processes.

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C. Significance of Problem

Addressing effective candidate evaluation is pivotal for the HR realm. Embracing advanced methodologies, like in our project, benefits recruiters and hiring managers significantly [4].

Sophisticated evaluation methods directly impact hiring decisions, ensuring candidates possess qualifications, desired traits, and cultural alignment. This improves team dynamics, productivity, and reduces turnover [2]. Candidates benefit from a fairer evaluation process, incorporating diverse data points beyond qualifications to assess their potential contributions equitably.

Solving effective candidate evaluation in the broader recruitment and HR domain leads to transformative advancements. It streamlines talent acquisition, enhances candidate selection accuracy, and fosters competitive and innovative workforces, driving industry growth.

II. KEY FUNCTIONALITIES

A. Core Features

The proposed web application system integrates various machine learning techniques and social media data analysis to provide comprehensive insights into candidates during recruitment.

- **Candidate Profile**: Candidate can create and edit their profile consisting of various details of the candidate such as social media profile URL, Personal Details, etc.
- **Sentiment Analysis**: Allows to predict the sentiment (negative, neutral, positive) of candidates' social media posts using BERT [5].
- **Red Flags Detection**: Recruiter can identify potential issues like sexism and hate speech in candidates' social media activity.
- **MBTI Classification**: Recruiter can see the candidates' MBTI personality types.
- **Big 5 Psychometric Test**: Candidate can fill a set of 50 questions of this test, and then the recruiter can see the personality traits (openness, conscientiousness, etc.).
- **Report Generation**: The recruiter can generate a human-readable report summarizing candidates' personalities, behaviors, and cultural fit using LLMs.
- **Skill Analysis**: This scans candidates' LinkedIn profiles to identify skills and suggest suitable job roles based on a mapping provided by LinkedIn.

B. Main User Actions/Features

- Candidate can create and edit their profile
- Candidate can give Big 5 Psychometric Test.
- Candidate can apply for a job.

- Recruiter can view sentiment analysis and red flags detection results.
- Recruiter can access MBTI classification and Big 5 psychometric test scores.
- Recruiter can generate comprehensive reports summarizing candidates' profiles.
- Recruiter can review skill analysis results for job role matching.
- Recruiter can accept or reject any candidate

There can be various other features of this system, which can be taken for future scope of improvement.

C. User Interaction

1) Candidate: • Login/Signup • Create/Edit Profile • Give Psychometric Test
2) Recruiter: • Login • See all Candidates • See a particular candidate profile • Check further report of a candidate • Accept/Reject a Candidate

D. Technical Highlights

We will be using the pre-trained models available online for the above-mentioned tasks. We aim to use a React.js-based framework for the frontend part of the application due to its wide availability and ease of maintenance in the long term, and we aim to use a Python-based backend framework (FastAPI for now), which ensures rapid development and seamless integration.
We aim to use MongoDB as our database as it offers flexible schema design and horizontal scalability, which is ideal for handling diverse data types and scaling with growing demands. Moreover, its speed is noteworthy, facilitated by its document-oriented data model.

E. Design Patterns

- **Builder Pattern**: An application review form requires various types of data classes to be entered (composition), making it complex which can be handled with this pattern.
- **Strategy Pattern**: Various kinds of models can inherit from the same ModelInterface and implement different strategies for inference.
- **Chain of Responsibility**: When a form is submitted, inference is performed on it in an order (Skill-based analysis, MBTI Classification, etc.), which can be cleanly done with this pattern.
- **Observer Pattern**: The recruiter has the ability to notify applicants about the release of their reviews, which can be done using observer pattern.
- **Factory Pattern**: Creating various subclasses of models and users can be done using factory pattern.

III. Expected Timeline

We expect to use the Agile Methodology [6] for the development of the project. The project is expected to go through the below five phases in approximately 3 sprints, each of 1 week:

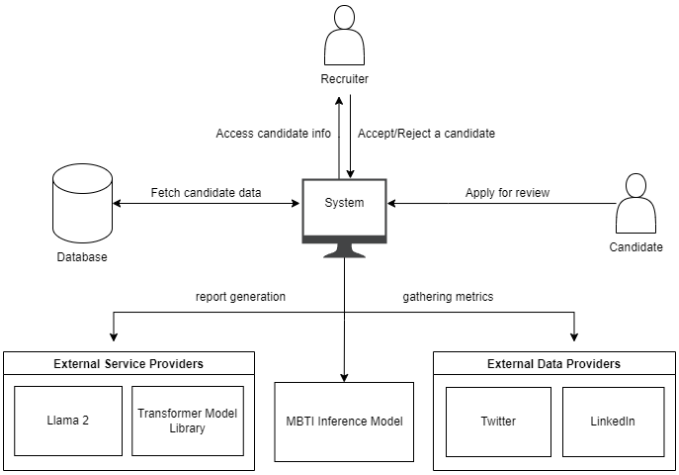

Fig. 1: Architecture Diagram

- **Discussion:** Align the team on project goals, requirements, scope, and constraints. Identify potential risks and dependencies that may impact the project's success.
- **Analysis:** Break each feature down into smaller, actionable tasks. Conduct a brief feasibility study to assess technical challenges and identify potential roadblocks. Define acceptance criteria for each feature to ensure clarity on completion.
- **Strategy:** Plan the sprint backlog by organizing the identified tasks into manageable chunks of work. Assign tasks to team members based on their expertise and availability.
- **Execution:** Start the sprint by addressing high-priority tasks first. Use daily stand-up meetings to stay aligned and discuss progress. Embrace Agile practices for quality maintenance and collaboration. Regularly demo completed work for feedback.
- **Testing and Refinement:** Allocate time for continuous testing throughout the sprint. Conduct unit testing for components to catch bugs early. Integrate testing into development to ensure features meet acceptance criteria and user expectations.

IV. Domain

This project comes under the domain of *Talent Acquisition & Human Resources (HR)*, where it can revolutionize recruitment. Further, it can be put in the specific categories of Artificial Intelligence and Applications using various principles of Software Engineering.

By leveraging advanced machine learning and social media data analysis, we'll provide comprehensive insights into candidates' suitability, boosting hiring quality and reducing turnover. Our solution empowers recruiters to make data-driven decisions, fostering diverse, innovative teams and enhancing organizational success.

Note: The features, design patterns, and choices are subject to change based on code implementation and project proposal reviews.

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