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# Project Stage-I

## Report

## On

## “Expert Relevence in Interview Boards”

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[2024-25]



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## ***CERTIFICATE***

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## **ACKNOWLEDGEMENT**

We are grateful and sincerely appreciate the effort of our respected Project Guide **Dr. S. P. Patil** who acted as a fulcrum for us and supported us during the ups and downs of our project. We are profoundly indebted to her for innumerable acts of timely advice, encouragement and we sincerely express our gratitude to her.

We extend our sincere thanks to **Prof. Dr. U. M. Patil**, Head of Department, Computer Science and Engineering (Data Science), for providing us the right ambience for carrying out this work.

I would like to express my gratitude to the Director **Prof. Dr. J. B. Patil** for his visionary leadership and unwavering commitment to fostering a culture of research and innovation within our institution. His guidance and support have provided me with the motivation and encouragement to undertake this project and strive for excellence in all my academic pursuits.

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## **ABSTRACT**

*This project aims to improve the selection of experts in interview boards by assessing their relevance to both the subject of the interview and the candidate's area of expertise. The approach integrates advanced methodologies, including data-driven analysis and machine learning, to evaluate the alignment between interview board members' knowledge and the interview topics. Key factors such as academic background, research contributions, and professional experience are analyzed to ensure an optimal selection of experts. The backend is developed using Python to implement intelligent models that assess expert suitability. A structured database using MongoDB is employed to store and manage expert profiles, subject requirements, and candidate specializations efficiently. The system aims to enhance fairness, reduce biases, and ensure an insightful assessment process. By leveraging modern technologies, this framework enhances the credibility and effectiveness of interview evaluations.*

## CHAPTER - 1

### INTRODUCTION

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In today's knowledge-driven and innovation-centric industries, selecting the right experts for interview panels is essential—especially in technical and multidisciplinary domains like AI, aerospace, and research. Traditionally, interview boards are formed based on availability or reputation, rather than a precise match with the candidate's domain, leading to potential biases and suboptimal evaluations.

This project, **Expert Relevance in Interview Board**, addresses this challenge by developing a smart, data-driven system that automatically recommends the most relevant experts for interview panels. Using advanced **Natural Language Processing (NLP)** and **machine learning** models, the system matches candidate resumes with expert profiles based on domain relevance.

The web-based platform allows candidates and experts to register and submit their information. It uses **Python** for backend processing, **MongoDB** for managing semi-structured data, and a modern **React.js + Material UI** frontend for user interaction. This intelligent system enhances fairness, improves assessment accuracy, and lays the foundation for future features like semantic matching with large language models and external integrations.

## 1.1 Problem Statement

In technical and research-intensive domains, forming interview panels with domain-relevant experts is critical for fair and effective candidate evaluation. However, the current process of expert selection is largely manual, based on availability or reputation, without systematically assessing the relevance of an expert's domain expertise to the candidate's specialization.

This lack of structured matching often results in biased assessments, poor evaluation quality, and missed opportunities to accurately identify the most qualified candidates. There is a pressing need for an intelligent system that can automate the expert selection process by evaluating the alignment between expert profiles and candidate domains.

This project aims to develop a data-driven solution that uses Natural Language Processing (NLP) and machine learning techniques to compute a **relevancy score** for each expert with respect to a candidate's profile. The system will recommend the most suitable experts for interview panels, ensuring objective, domain-specific, and efficient evaluation processes.

## 1.2 Objectives

The primary objective of this project is to develop an intelligent, web-based system that automates the selection and recommendation of interview board members based on the semantic alignment between a candidate's domain expertise and the interviewer's area of specialization. This objective is achieved by integrating modern Natural Language Processing (NLP) techniques, machine learning algorithms, and scalable web technologies.

To create an intuitive, user-friendly platform for building AI chatbots. The work is driven by the growing need for transparency, fairness, and precision in forming interview panels for highly technical roles, especially in domains like defense research, academia, artificial intelligence, and engineering. The specific objectives of the system are outlined below:

- **Resume Parsing and Semantic Skill Extraction:**

- To develop a reliable resume parsing pipeline that can automatically extract structured information from unstructured resume formats (PDF/DOCX).
  - To extract key components from resumes, including technical skills, research interests, academic qualifications, certifications, and domain-specific keywords.
  - To represent candidate skill sets in a machine-interpretable format (e.g., 12 TF-IDF vectors, word embeddings, or contextual representations via BERT).

**• Expert Profile Management:**

- To enable subject matter experts to register and create detailed profiles that outline their areas of specialization, research work, academic credentials, and years of experience.
- To build a structured and searchable database of expert profiles that can be indexed and compared against candidate profiles.

**• Similarity Computation and Relevance Scoring :**

- To implement advanced similarity matching algorithms to measure the relevance between a candidate's profile and each expert's domain.
- To explore multiple matching techniques such as cosine similarity, word embedding similarity, and BERT-based semantic comparison.
- To compute and rank relevance scores that represent the strength of alignment between a candidate and each expert.

**• Recommendation System for Interview Panel Formation :**

- To develop a recommendation engine that automatically suggests the TopN most relevant experts for each interview.
- To ensure that suggested experts have strong semantic overlap with the candidate's domain, thus improving the assessment quality.
- To allow administrators or coordinators to view and review expert recommendations before finalizing the panel.

**• Web Platform with Secure User Interfaces:**

- To design a responsive and interactive web application using React.js and Material UI, with separate dashboards for candidates and experts.
- To ensure secure user authentication and role-based access control using

technologies like JSON Web Tokens (JWT) and bcrypt for password encryption.

- To allow candidates to upload resumes and manage their profile details, and allow experts to update their specialization areas and availability.

- **Scalable Backend and Database Design:**

- To build a robust backend using Node.js and Express.js to handle file uploads, authentication, ML model integration, and API management.
- To use MongoDB as the database to efficiently store semi-structured data including candidate information, expert metadata, and matching scores.

### 1.3 Applications

This Project can be applied across various domains such as:

#### 1. University & Academic Hiring Panels

- Automates expert selection for faculty interviews based on subject specialization (e.g., selecting an AI professor to interview an AI-focused candidate).

#### 2. Corporate Technical Recruitments

- Ensures interviewers are domain experts in the technology stack or field (e.g., DevOps, Data Science) the candidate is being hired for.

#### 3. Government and Public Sector Recruitment

- Used by recruitment boards to assign experts with relevant experience in administrative or technical domains (e.g., civil services, defense roles).

#### 4. R&D Organizations and Think Tanks

- Supports accurate expert-panel formation for selecting researchers or scholars in highly specialized areas like aerospace, quantum computing, etc.

#### 5. Project Evaluation Committees

- Useful in hackathons, startup incubators, or grant review panels to assign judges/mentors with relevant knowledge.

#### 6. Academic Thesis / PhD Defense Committees

- Helps assign relevant subject-matter experts as internal/external examiners based on the thesis topic.

#### 7. Freelance/Consultancy Matching Platforms

- Can be extended to match client requirements with domain-specific consultants or experts.

## CHAPTER-2

### LITERATURE SURVEY

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#### 2.1 Background

In today's era of rapid technological advancement and domain specialization, organizations across academia, industry, and research sectors are increasingly seeking ways to improve the fairness and effectiveness of recruitment and evaluation processes. One of the most critical aspects of these processes is the formation of interview boards that can accurately assess a candidate's qualifications, skills, and domain knowledge.

Traditionally, the selection of interview panel members is done manually, often relying on the availability or general reputation of experts rather than an objective assessment of their relevance to the candidate's domain. This can lead to panel compositions that are misaligned with the candidate's expertise, resulting in biased evaluations, missed insights, and an overall reduction in the effectiveness of the interview process.

This gap is especially problematic in technical and research-intensive fields such as artificial intelligence, data science, aerospace, and engineering, where understanding domain-specific knowledge is crucial for accurate candidate evaluation. A more intelligent and structured approach is needed to ensure that the selected experts align closely with the candidate's academic and professional background.

To address this challenge, the project proposes an automated expert recommendation system that evaluates the relevance of potential

interviewers using advanced Natural Language Processing (NLP) and

machine learning techniques. By analyzing both candidate and expert profiles, the system computes a relevancy score to identify the most suitable experts for each interview panel.

This data-driven approach not only improves fairness and accuracy in candidate evaluation but also reduces administrative burden, supports scalability, and fosters transparency in the interview process.

## **2.2 Existing Systems:**

**1. Resume Parsing Systems :** Several commercial platforms such as Hiretual, Sovren, and RChilli provide resume parsing solutions that extract structured data (skills, experience, education) from resumes. These platforms often use Natural Language Processing (NLP) pipelines to process unstructured text. While they are useful for automating resume screening, their focus is primarily on matching candidates to job descriptions rather than identifying suitable evaluators or experts.

**2. Expert Recommendation in Academia and Research :** Projects like Microsoft Academic, Google Scholar's "Related Authors" feature, and semantic platforms like AMiner attempt to suggest researchers or domain experts based on publication data and co-authorship networks. These systems use text mining and citation analysis to build expertise profiles. However, they are designed for academic discovery or networking rather than for recruitment or interview board formation.

**3. Recruitment Matching Systems :** Modern recruitment platforms (LinkedIn Recruiter, SeekOut, Entelo) use machine learning algorithms to match candidates to job roles using profile keywords and inferred skills. Semantic matching has evolved through methods like Word2Vec, TF-IDF, and BERT-based models. Despite their success in candidate-to-job matching, they do not address the inverse problem: matching evaluators to candidates.

**4. Semantic Similarity Techniques :** Numerous research studies have

explored semantic similarity in text data using classical methods such as TF-IDF and cosine similarity, and more recent approaches like Word Embeddings (e.g., Word2Vec, GloVe) and deep learning models such as BERT and Sentence-BERT. These techniques have been applied in document classification, information retrieval, and recommendation systems, and are well-suited for identifying overlap between resume content and expert knowledge areas.

**5. Interview Management Platforms :** Some platforms like HackerRank, Codility, and Interview Mocha offer structured technical assessments and collaborative coding environments. However, they focus primarily on candidate evaluation through pre-set tests and do not contribute to expert evaluator selection based on candidate domains

## CHAPTER - 3

### METHODODOLOGY

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### **3.1 Hardware and Software Requirements**

**Table 3.1.1 Software Requirement**

Sr.No.	Name of Resource	Specifications
1.	Operating System	Windows 7
2.	Front-End	React.js , Material UI
3.	Back-End	Python , Machine Learning

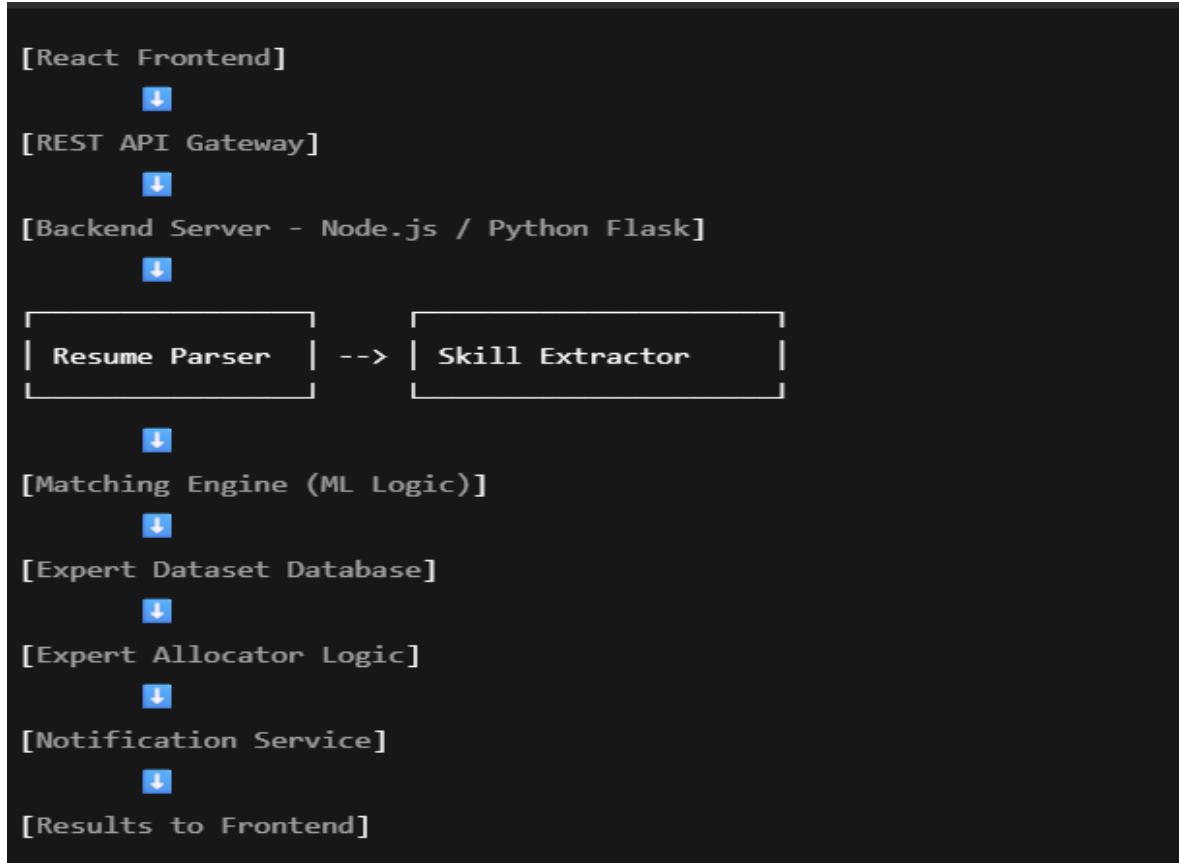
**Table 3.1.2 Hardware Requirement**

Sr.No.	Name of Resource	Specifications
1.	Computer system	dual core ~ 2.0 GHz
2.	Primary Memory	4GB
3.	Secondary Memory	128GB

### 3.2 System Design:

The system will follow a modular design that supports cloud deployment. Here's an overview of the architecture:

#### 3.2.1 Expert Relevance in Interview Boards Architecture:



3.2.1 flowchart of project

### 3.3 Algorithm:

**Cosine Similarity-Based Expert Matching Algorithm :** This algorithm determines the relevance between a candidate's domain and multiple expert profiles by calculating the cosine similarity between their respective vector representations. By leveraging NLP techniques and embeddings generated from resumes or profile descriptions, the system identifies and ranks experts based on how closely their expertise aligns with the candidate's domain.

#### Steps :

- **Step 1:** Extract domain-relevant text from candidate resumes and expert profiles using NLP (skills, research areas, project titles, keywords).
- **Step 2:** Convert the extracted text into vector embeddings using a pre-trained language model (e.g., TF-IDF, Word2Vec, or Sentence-BERT).
- **Step 3:** Calculate the cosine similarity between the candidate's vector and each expert's vector to measure domain alignment.
- **Step 4:** Rank experts based on their similarity scores.
- **Step 5:** Recommend the top-N experts with the highest scores for interview panel selection.

## CHAPTER-4

### IMPLEMENTATION DETAILS

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#### 4.1 Frontend Development:

The frontend of our project, "Expert Relevance in Interview Board," plays a crucial role in creating a seamless and user-friendly experience for both candidates and domain experts. It serves as the primary interface through which users interact with the system. Designed using React.js, a modern JavaScript library for building dynamic user interfaces, the frontend is structured to be clean, responsive, and intuitive, ensuring ease of navigation and functionality across various devices.

#### Objectives of the Frontend Module:

- Provide a structured and simple user interface for candidate registration.
- Enable smooth and secure upload of resumes.
- Establish routing for smooth transitions between multiple frontend components.
- Facilitate future integration with expert and admin modules.

## **Key Functional Components :**

### **◆ 1. Candidate Registration Interface :**

The registration module is the first point of interaction for a user (candidate). It includes:

- Input fields for essential details like name, email, and qualifications.
- A clean form design that is easy to use and mobile-friendly.
- Basic input validation to ensure data completeness and correctness before submission.
- This module captures and stores candidate details in preparation for resumeupload and expert matching.

### **◆ 2. Resume Upload Module :**

A vital part of the frontend is the resume upload functionality. It enables candidates to:

- Upload their resumes in accepted formats such as .pdf or .docx.
- Receive feedback on the upload status (e.g., success or failure).
- Initiate backend processing by sending the resume file to the backend server.
- This module acts as the bridge between user input and the NLP-based backend feature extraction pipeline.

### **◆ 4. Responsive Design with Material UI :**

To ensure the application looks and functions well across devices (desktops, tablets, and mobiles), we used Material UI, a popular UI library for React. This framework offers:

- Pre-designed and customizable components such as buttons, text fields, cards, and toolbars.

- Responsive layout structures using the Grid and Box systems.
- A consistent and modern visual design that aligns with user expectations.
- Material UI helped accelerate the development process while maintaining a professional appearance.

## 4.2 Resume Processing and Skills Extraction :

One of the most crucial features of the Expert Relevance in Interview Board system is its ability to intelligently extract meaningful data from unstructured candidate resumes. This functionality not only reduces manual effort but also ensures accurate and efficient matching of candidate profiles with subject matter experts.

### Objective :

- Candidate's core skills and technical capabilities.
- Relevant keywords, tools, and technologies.
- High-level domain categorization based on skill clusters.
- This extracted data forms the foundation for calculating the relevance between candidates and experts.

#### 4.2.1 Process Workflow :

The resume processing and skill extraction workflow involves the following key steps:

##### Step 1: Resume Upload

- Candidates upload their resumes through the frontend interface.

- Supported formats include .pdf and .docx.
- The uploaded file is forwarded to the backend for processing.

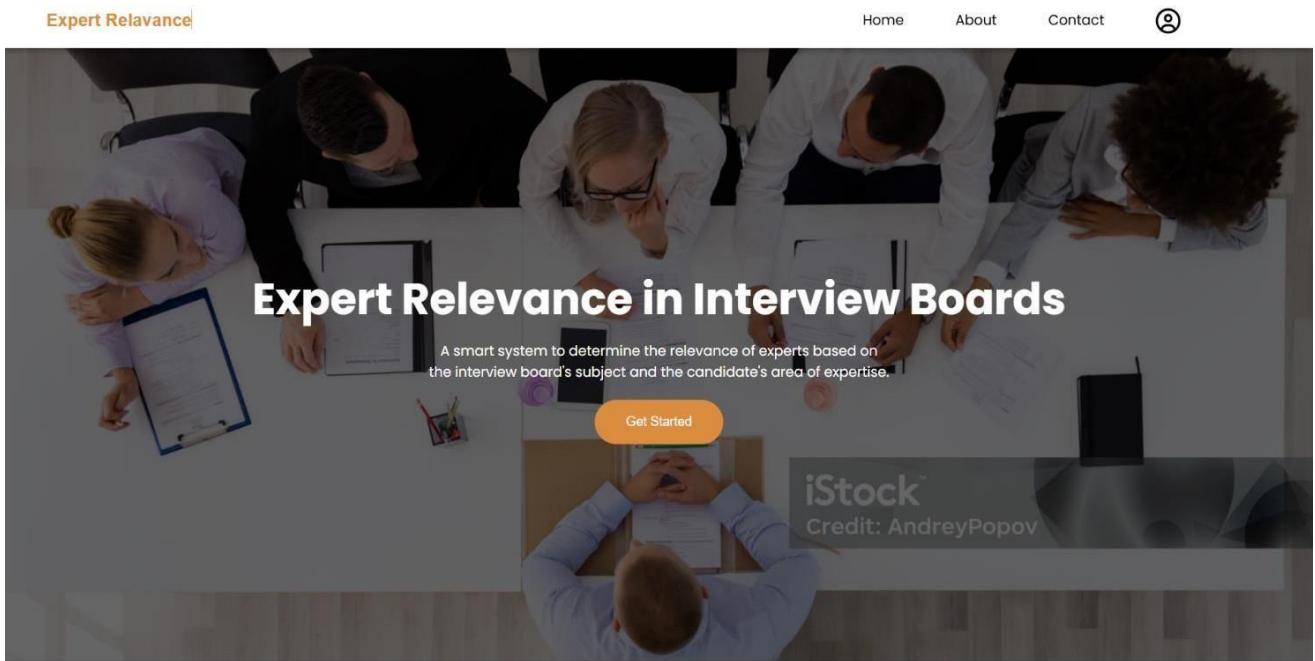
## **Step 2: Text Extraction**

- The system uses Python libraries such as PyPDF2 and python-docx to read and extract raw text from resumes.
- Preprocessing is applied to clean the text by removing stopwords, unnecessary punctuation, and formatting inconsistencies.

## **Step 3: Natural Language Processing (NLP)**

- Tokenization, lemmatization, and Named Entity Recognition (NER) are performed using NLP libraries like spaCy or NLTK.
- Keywords, technical terms, and skill phrases are identified from the text.

## 4.3 Snapshot of Implementation :



### 4.3.1 Home Page

### 4.3.2 Register as candidate

## Register

Select your role and fill the form to register.

[CANDIDATE](#) [EXPERT](#)

Full Name \*

Email \*

Password \*

Mobile Number \*

[REGISTER](#)

### 4.3.3 Register as Expert

The screenshot shows a terminal window with the following output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS + v ... ^ X
Database Connected Successfully!
Server Started
No resume uploaded
Skills: [
  'python',
  'html',
  'javascript',
  'css',
  'java',
  'machine learning',
  'web development',
  'data science'
]
esbuild
node
```

### 4.3.4 Keyword Extraction

## **CHAPTER-5**

### **CONCLUSION**

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The “Expert Relevance in Interview Board” project addresses a critical gap in the interview process—ensuring that subject experts on evaluation panels are genuinely aligned with the candidates’ domains of expertise. By leveraging Natural Language Processing (NLP), machine learning, and cosine similarity-based matching, the system intelligently recommends the most relevant experts for interview panels.

This approach not only improves the fairness, objectivity, and quality of evaluations but also reduces the manual effort and bias traditionally involved in expert selection. With a scalable and user-friendly web-based platform, the system can be applied across academic institutions, research organizations, and corporate hiring processes.

In essence, the project offers a reliable, data-driven solution to enhance candidate assessments and foster a more efficient and merit-based recruitment ecosystem.

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- Natural Language Processing : [https://scikit-learn.org/stable/modules/generated/sklearn.feature\\_extraction.text.TfidfVectorizer.html](https://scikit-learn.org/stable/modules/generated/sklearn.feature_extraction.text.TfidfVectorizer.html)