Report On

Smart Hire: Revolutionize hiring using AI/ML

Submitted in partial fulfillment of the requirements of the Mini project in
Semester VI of Third Year Computer Engineering

by
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Department of Computer Engineering

(A.Y. 2023-24)

Vidyavardhini's College of Engineering & Technology

Department of Computer Engineering

CERTIFICATE

This is to certify that the Mini Project entitled **"Smart Hire"** is a bonafide work of **Kunal Chaudhari (11), Dhrub Das (13), Pratik Panigrahy (35), Irfan Patel (36)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **"Bachelor of Engineering"** in Semester VI of third Year **"Computer Engineering".**

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Mini Project Approval

This Mini Project entitled "Smart Hire**"** by **Kunal Chaudhari (11), Dhrub Das (13), Pratik Panigrahy (35), Irfan Patel (36),** is approved for the degree of **Bachelor of Engineering** in in Semester VI of Third Year **Computer Engineering.**

Examiners

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(Internal Examiner Name & Sign)

2……
(External Examiner name & Sign)

Date:

Place:

Contents

Abstract

Smart Hire is a transformative project revolutionizing recruitment processes through advanced technology integration, aimed at enhancing efficiency and candidate experience, thereby redefining talent acquisition in today's competitive landscape. Smart Hire offers a comprehensive suite of tools, including a Resume Analyzer, Resume Builder, and Interview Session module, all designed to streamline and optimize the recruitment journey. The Resume Analyzer employs cutting-edge machine learning algorithms to automate resume screening, significantly reducing the time and effort traditionally required for this task. Leveraging the power of AI, the Resume Builder assists candidates in crafting tailored resumes that effectively highlight their skills and experiences, increasing their chances of landing their dream job.

The Interview Session module facilitates structured virtual interviews, providing an intuitive platform for both recruiters and candidates. With AI-driven analytics, this module offers valuable insights for informed decision-making, ensuring that the best candidates are selected for the job. By integrating advanced technology into every stage of the recruitment process, Smart Hire sets a new standard for talent acquisition, fostering a more efficient, transparent, and engaging experience for both recruiters and candidates alike.

Acknowledgements

We would like to express our special thanks and gratitude to our Institute, **Vidyavardhini's College of Engineering and Technology**, our principal **Dr. H.V. Vankundre**, our Head of Department **Dr. Megha Trivedi** and our Project Guide **Mrs. Swati Varma** who gave us this valuable opportunity to develop this major project on the topic: Smart Hire: Revolutionize hiring using AI/ML. This project has greatly helped us in expanding our core of knowledge in Machine Learning. It has provided us a precious opportunity to take a hands-on experience and showcase our skills. We are also thankful to each of us because everyone of us aided to complete this project in a limited frame of time.

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Introduction

1.1 Introduction

In today's fast-paced and competitive job market, the recruitment process presents significant challenges for both employers and job seekers alike. Traditional methods of resume screening and interview evaluation often prove time-consuming and inefficient, leading to missed opportunities and mismatches between candidates and roles. Recognizing this need for innovation, Smart Hire emerges as a pioneering solution, harnessing the power of artificial intelligence to streamline and optimize every stage of the hiring journey. By combining cutting-edge technology with intuitive design, Smart Hire offers a comprehensive platform designed to revolutionize recruitment practices. Through the integration of advanced tools such as the Resume Analyzer, Resume Builder, and Interview Session module, organizations can effectively identify top talent while providing candidates with a seamless and personalized application experience.

In this project introduction, we delve into the key features and functionalities of Smart Hire, highlighting its potential to transform the way businesses approach talent acquisition. From automated resume screening to AI-driven interview analytics, Smart Hire represents a paradigm shift in recruitment, setting new standards for efficiency, effectiveness, and candidate engagement. Hiring the right candidate for a job position is a critical task for any organization. It often involves a significant investment of time and resources. Smart Hire is an AI/ML-based system designed to streamline and optimize the hiring process. It incorporates a range of features to facilitate the creation of resumes, analysis of resumes, provision of interview guidance, and automated interview scheduling and evaluation.

Smart Hire (HirEx) integrates several cutting-edge technologies, including AI and Machine Learning, to provide a one-stop solution for the hiring process. The system's primary objective is to simplify the recruitment process, making it more efficient, effective, and user-friendly. With features such as the Resume Builder, Resume Analyzer, Chatbot, and Interview Generator, Smart Hire significantly enhances the hiring process for both organizations and candidates.

1.2 Problem Statement & Objective

Current recruitment practices are plagued by inefficiencies and biases, hindering both employers and job seekers. Manual resume screening processes are time-consuming and prone to errors, resulting in missed opportunities and mismatches. Candidates struggle to create tailored resumes that effectively showcase their qualifications, while subjective interview evaluations lead to inconsistent decision-making. These challenges highlight the pressing need for a solution that leverages advanced technologies to streamline the recruitment process.

Without such a solution, employers face increased resource expenditure and candidate disengagement, while candidates encounter barriers to effectively presenting their skills and experiences. Smart Hire aims to address these issues by providing automated resume screening, personalized resume building tools, and standardized interview evaluations, ultimately optimizing talent acquisition processes for both employers and job seekers.

1.3 Scope

The Smart Hire project aims to develop and implement a comprehensive platform integrating AI-powered tools for resume analysis, resume building, and standardized interview sessions. The scope includes the development, integration, testing, and implementation of these components, along with user training and support.

Considerations for scalability and customization to meet diverse organizational needs are also included, with provisions for ongoing updates and enhancements. The project involves the following key aspects:

- Resume Analysis Tool Development: Developing a sophisticated AI-powered resume analysis tool to streamline the screening process, ensuring accurate evaluation and scoring of resumes.
- Resume Builder Implementation: Implementing an intuitive and user-friendly resume building tool that guides candidates in creating tailored resumes, enhancing their chances of securing interviews.
- Standardized Interview Session Module: Designing and implementing a standardized interview session module to ensure objective assessments of candidates' performance, facilitating informed decision-making by recruiters.
- Integration, Testing, and Implementation: Integrating all components into a unified platform, thoroughly testing for functionality and reliability, and ensuring seamless implementation.
- User Training and Support: Providing comprehensive user training and ongoing support to both organizations and candidates to ensure the effective utilization of the Smart Hire platform.

The project will also consider scalability and customization to meet diverse organizational needs. Provisions for ongoing updates and enhancements will be made to keep the system up-to-date with the evolving requirements of the recruitment process.

By addressing these aspects, Smart Hire aims to revolutionize the recruitment process, optimizing talent acquisition processes for both employers and job seekers.

Literature Survey

2.1 Survey of Existing System/SRS

The current landscape of hiring systems reveals a considerable gap in providing a comprehensive and robust solution. Most of the existing systems focus on specific aspects of the hiring process, with only a few offering an integrated approach to the entire process. The survey conducted in this section highlights the limitations of the existing systems and the need for a more holistic solution.

Traditional resume builders provide users with a platform to input their personal and professional information, which is then formatted into a standard or customizable template [1]. However, these systems often lack sophistication and do not guide the user in creating a targeted resume. They also don't integrate features for analyzing the resume content to ensure it aligns with the job requirements. These traditional resume builders usually lack the ability to analyze and optimize the content of the resume for better job matching.

Applicant Tracking Systems (ATS) are prevalent in today's recruitment process. These systems are used by employers to manage job applications and screen resumes. While ATS efficiently organize and manage large volumes of resumes, they often lack in-depth resume analysis and guidance to the applicant [2]. Also, the output from ATS often does not provide substantial feedback to the applicant on how to improve their resume. ATS generally lack features to give the applicant insights into how their resume is being evaluated and what improvements could be made. There are some standalone tools available that claim to analyze resumes. However, these systems often lack the robustness and accuracy required for effective resume optimization. Many tools rely on simple keyword matching, which often leads to inaccurate analysis and recommendations [2]. The analysis provided by these tools is often superficial and doesn't offer detailed insights into how the resume can be improved.

Chatbots have gained popularity in various domains, including customer service and information retrieval. In the hiring process, chatbots have been employed to provide information about job openings, application status, and basic queries [4]. However, existing chatbots lack sophistication, providing only predefined responses and lacking the ability to give guidance tailored to the user's needs. The chatbots currently available are usually rule-based and lack the ability to provide personalized advice.

While some systems offer interview scheduling features, they are mostly confined to providing a platform for scheduling. There is a lack of systems that automate the interview process from scheduling to evaluation. Also, automated interview systems do not often provide detailed analysis and feedback to the candidates [4]. The interview scheduling systems available do not provide detailed insights into the performance of the candidate during the interview. Most importantly, there is a lack of systems that integrate all these essential components into a single, comprehensive solution. A system that combines resume building, resume analysis, interview guidance, and automated interview scheduling and evaluation into one platform is yet to be seen in the market. The current systems are disjointed and require the user to switch between different tools, leading to inefficiencies and a lack of coherence in the hiring process [1, 4].

2.2 Research gap

Despite the existing systems, there remains a significant research gap in the following areas:

1. Comprehensive Integration:

There is a need for a comprehensive and integrated solution that combines all aspects of the hiring process into a single platform. A system that seamlessly integrates resume building, resume analysis, interview guidance, and automated interview scheduling and evaluation is yet to be developed.

2. Sophisticated Resume Analysis:

The existing resume analysis tools lack sophistication and accuracy. There is a need for a more advanced resume analysis tool that utilizes AI and machine learning algorithms to provide accurate and insightful feedback to the candidates.

3. Advanced Chatbot Assistance:

Current chatbots for hiring lack sophistication and personalization. There is a need for a more intelligent chatbot that can provide personalized guidance to the user throughout the hiring process, including resume building, interview preparation, and job search assistance.

4. Automated Interview Process:

While some systems offer interview scheduling features, they are mostly confined to providing a platform for scheduling. There is a gap in systems that automate the interview process from scheduling to evaluation and provide detailed analysis and feedback to the candidates.

5. Need for Smart Hire (HirEx):

Given the limitations and gaps observed in existing systems, there is a clear need for a comprehensive and robust solution. Smart Hire (HirEx) aims to fill this void by providing a one-stop solution for the hiring process. By combining resume building, accurate resume analysis, intelligent chatbot assistance, and automated interview scheduling and evaluation, Smart Hire will revolutionize the hiring process, making it more efficient, effective, and user-friendly.

2.3 Mini Project Contribution

Tasks	Kunal	Dhrub	Pratik	Irfan
Planning	✓	✓	✓	✓
Research	✓	✓	✓	✓
Design		✓	✓	
Implementation	✓	✓	✓	✓
Final report	✓			✓

2.2 Gantt chart

Task name	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Planning						
Research						
Design						
Implementation						
Follow up						

Proposed System

3.1 Introduction

Smart Hire, also known as HirEx, is an AI/ML-based system designed to revolutionize the hiring process. The system is composed of four main features:

- Resume Builder
- Resume Analyzer
- Chatbot
- Interview Generator

3.2 Architecture/Framework/Block diagram

The architecture of Smart Hire comprises several components:

- Frontend: Developed using React
- Backend: Developed using Node.js
- Resume Analyzer: Developed using Python
- Streamlit: Used for building the resume analyzer model
- Database: MongoDB Atlas
- AWS Recognition Service: Used for video analysis during interviews

Architecture:

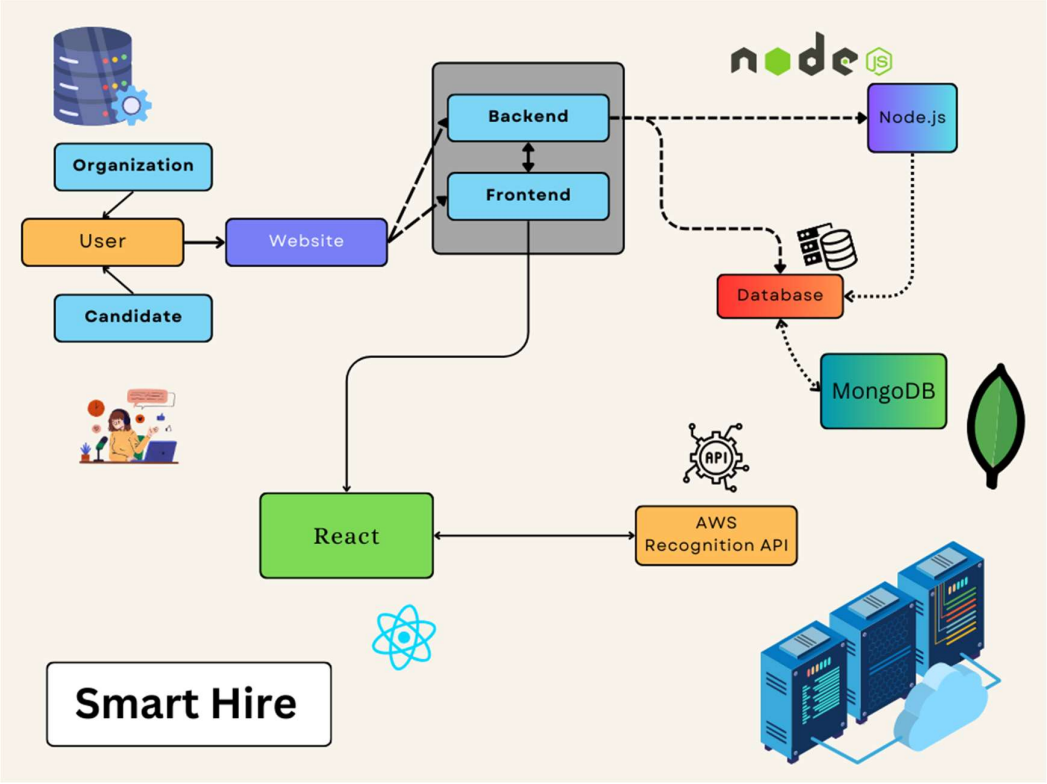

Fig 3.2: Architecture Diagram of HirEx

3.3 Process Design:

- Resume Builder:
  The resume builder follows a straightforward algorithm:
  Users input their personal and professional information into the system. Then, they select a preferred template. The system generates the resume based on the input provided. Finally, the user can download the resume in the desired format. This simple and intuitive process ensures that users can create a professional resume tailored to their needs quickly and efficiently.

- Resume Analyzer:
  The resume analyzer algorithm involves several steps:
  First, the system parses the text of the resume provided by the user. Next, it identifies keywords and skills relevant to the job market. Then, an ATS (Applicant Tracking System) score is assigned to the resume, giving the user an indication of its effectiveness. Finally, the system recommends improvements to the resume, ensuring that it stands out to potential employers. This algorithm ensures that users can optimize their resumes effectively, increasing their chances of success in the job market.

- Chatbot:
  The chatbot uses a rule-based algorithm to provide assistance to users:
  When a user asks a question, the system identifies the intent behind the query. Based on this intent, the chatbot provides an appropriate response, guiding the user through the hiring process. This rule-based approach ensures that users receive accurate and helpful information, improving their understanding of the hiring process and increasing their chances of success.

- Interview Generator:

1. Organization Page:

- Organizations register and fill in interview details, including the job position, requirements, and scheduling.
- They input questions and expected answers into the system.
- The system then schedules and conducts interviews automatically based on the provided information.

2. Candidate Page:

- Candidates register and attend scheduled interviews.
  During the interview, the system monitors the candidate's video, analyzing their emotions and confidence levels.
- The candidate's answers are then matched with the expected answers provided by the organization.
- After completing the interview, a comprehensive analysis report is generated and shown to the user.

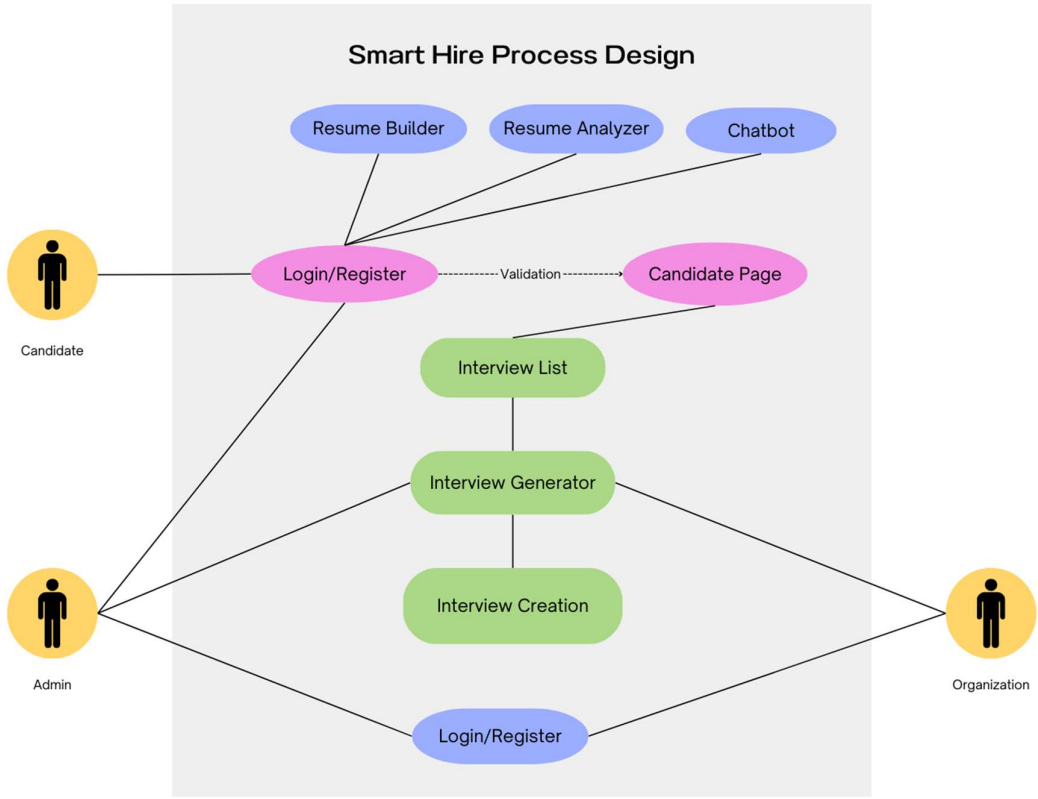

Fig 3.3: HireEx Process Design

This structured process ensures that both organizations and candidates can efficiently conduct and evaluate interviews, making the hiring process more streamlined and effective.

3.4 Details of Hardware & Software:

Here are some general hardware and software requirements that may be necessary:

Hardware Requirements:

- **Computer or Desktop.**
- **Internet Connection**: The Website requires an active internet connection.
- **Free Hard-disk space 200mb.**
- **Minimum Ram 2Gb.**
- **Processor i3.**

Software Requirements:

- **React:** React provides a robust and efficient framework for building user interfaces, ensuring a seamless and intuitive user experience.
- **Node.js:** Node.js offers a scalable and efficient platform for building server-side applications, enabling smooth communication between the frontend and the database.
- **Python:** Python is a versatile and powerful programming language, making it an ideal choice for implementing complex algorithms such as resume analysis.
- **Streamlit:** Streamlit is an open-source Python library that enables rapid development of custom web applications for machine learning and data science. It provides an interactive and user-friendly interface for the resume analyzer.
- **MongoDB Atlas:** MongoDB Atlas is a fully-managed cloud database service that provides high availability, scalability, and security. It ensures the seamless storage and retrieval of data, essential for the efficient functioning of the system.
- **AWS Recognition Service:** The AWS Recognition Service is utilized for video analysis during interviews. This service provides advanced capabilities for analyzing videos, including detecting emotions and confidence levels. It ensures accurate evaluation of the candidate's performance during the interview process.

3.5 Source Code

- Backend:

Add_New_Interview.js

```
const {
  Interview_Details_Model,
} = require("../../DatabaseSetup/Mongoose.InterviewDetails.Schema");
const Add_New_Interview = async (req, res, next) => {
  const {
    Res_Company_Name,
    Res_Description,
    Res_HR_Name,
    Res_Instruction,
    Res_Name_Technology,
    Res_Interview_ID,
    Res_Number_Of_Questions,
    Res_Time_Duration,
    Res_Time_Of_Interview,
    Res_Date_Of_Interview,
    Res_Question_Arrays,
    Res_Answer_Arrays,
    Res_Email_Arrays
  } = req.body;
  try {
    const Add_Interview_Result = await Interview_Details_Model.create({
      Company_Name: Res_Company_Name,
      Description: Res_Description,
      HR_Name: Res_HR_Name,
      Instruction: Res_Instruction,
      //Interview Details
      Name_Technology: Res_Name_Technology,
      Interview_ID: Res_Interview_ID,
      Number_Of_Questions: Res_Number_Of_Questions,
      Time_Duration: Res_Time_Duration,
      Time_Of_Interview: Res_Time_Of_Interview,
      Date_Of_Interview: Res_Date_Of_Interview,
      //Question bank details
      Question_Arrays: Res_Question_Arrays,
      Answer_Arrays: Res_Answer_Arrays,
      Email_Arrays:Res_Email_Arrays
    });

    if (Add_Interview_Result) {
      res.status(200).json({
        status: "Success",
        message: "Interview added successfully !",
        data1: Add_Interview_Result,
      });
    } else {
      res.status(500).json({
```

```
        status: "Error",
        message: "Unable to add interview !",
      });
    }
  } catch (Error) {
    console.log(Error);
  }
};

module.exports = { Add_New_Interview };
```

EmotionResult.js

```
const axios = require("axios");
const AWS = require("aws-sdk");
const fs = require("fs");
require('dotenv').config();

const accessKeyId = process.env.accessKeyId;
const secretAccessKey = process.env.secretAccessKey;
const region = process.env.region;
// Configure the AWS SDK
AWS.config.update({
  accessKeyId: accessKeyId,
  secretAccessKey: secretAccessKey,
  region: region,
});

// Create an instance of the Rekognition service
const rekognition = new AWS.Rekognition();

// Function to detect faces in an image
function Emotion_Detection_Function(req, res, next) {
  const imageUrl = req.body.imageUrl;
  // console.log(imageUrl)

  // Fetch the image using Axios
  axios
    .get(imageUrl, { responseType: "arraybuffer" })
    .then((response) => {
      // Save the image buffer to a local file
      fs.writeFileSync("temp_image.jpg", response.data);

      // Read the local image file
      const imageBytes = fs.readFileSync("temp_image.jpg");

      // Create parameters for the DetectFaces API
      const params = {
        Image: {
          Bytes: imageBytes,
```

```
        },
        "Attributes": [
          "ALL"
      ]
      };

      // Call the DetectFaces API
      rekognition.detectFaces(params, (err, data) => {
        // Cleanup: Delete the temporary image file
        fs.unlinkSync("temp_image.jpg");

        if (err) {
          res.status(500).json({ error: err.message });
        } else {
          res.json({ result: data.FaceDetails });
        }
      });
    })
    .catch((error) => {
      res.status(500).json({ error: error.message });
    });
}
module.exports = {
  Emotion_Detection_Function,
};
```

- Frontend:

App.js

```
import React, { useState, useEffect } from "react";
import { BrowserRouter } from "react-router-dom";
import Loader from "./Loader/Loader";
import WithoutLogin from "./Routing/WithoutLogin.jsx";
import WithLogin from "./Routing/WithLogin";
import InterviewShow from "./Student/InterviewShow.jsx";

function App() {
  const [isLogged, setIsLoggedIn] = useState(false);
  const [status, setStatus] = useState("");
  const [isLoading, setIsLoading] = useState(true);

  // Simulating a loading delay
  useEffect(() => {
    setTimeout(() => {
      setIsLoading(false);
    }, 1400); // Replace 2000 with the actual loading time for your
data or resources
  }, []);

  return (
```

```
    <>
      {isLoading ? (
        <Loader /> // Display the loader while loading
      ) : (
        <BrowserRouter>
          {isLogged ? (
            <WithLogin
              setStatus={setStatus}
              status={status}
              setIsLoggedIn={setIsLoggedIn}
            />
          ) : (
            <WithoutLogin
              setStatus={setStatus}
              status={status}
              setIsLoggedIn={setIsLoggedIn}
            />
          )}
        </BrowserRouter>
      )}
    </>
  );
}

export default App;
```

3.6 Experiment and Result

The experiment and results of the Smart Hire project include:

- Successful creation and analysis of resumes.
- Accurate chatbot responses.
- Efficient scheduling and evaluation of interviews.

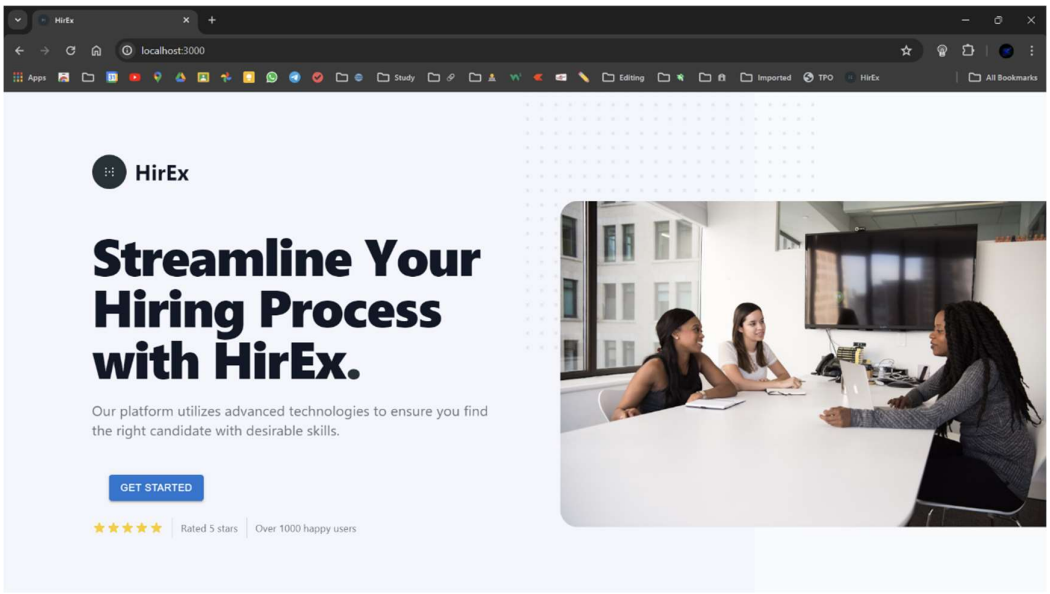

Fig 3.6.1: Smart Hire Home Page

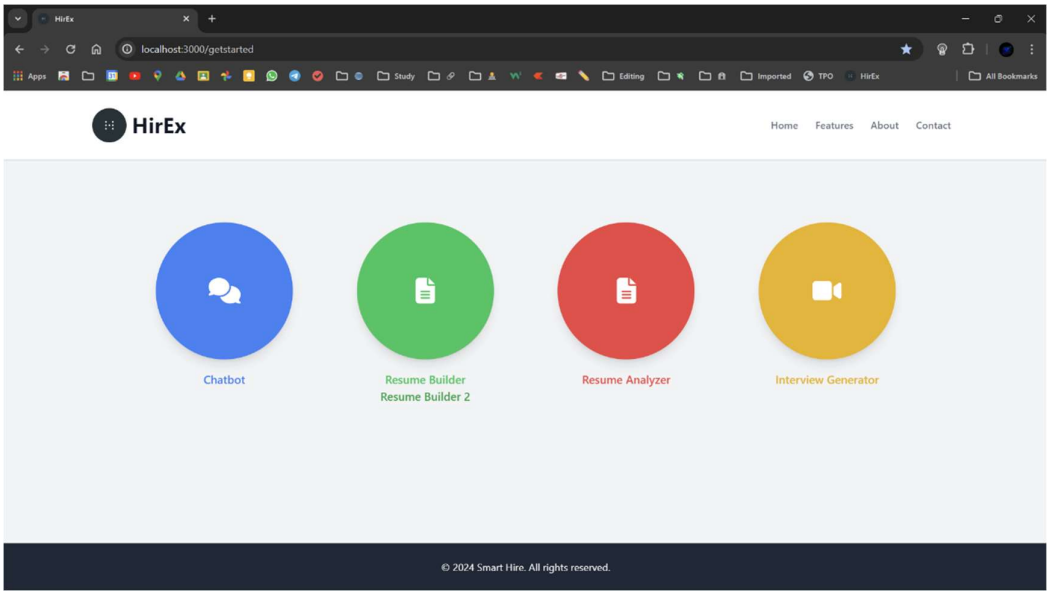

Fig 3.6.2: Features

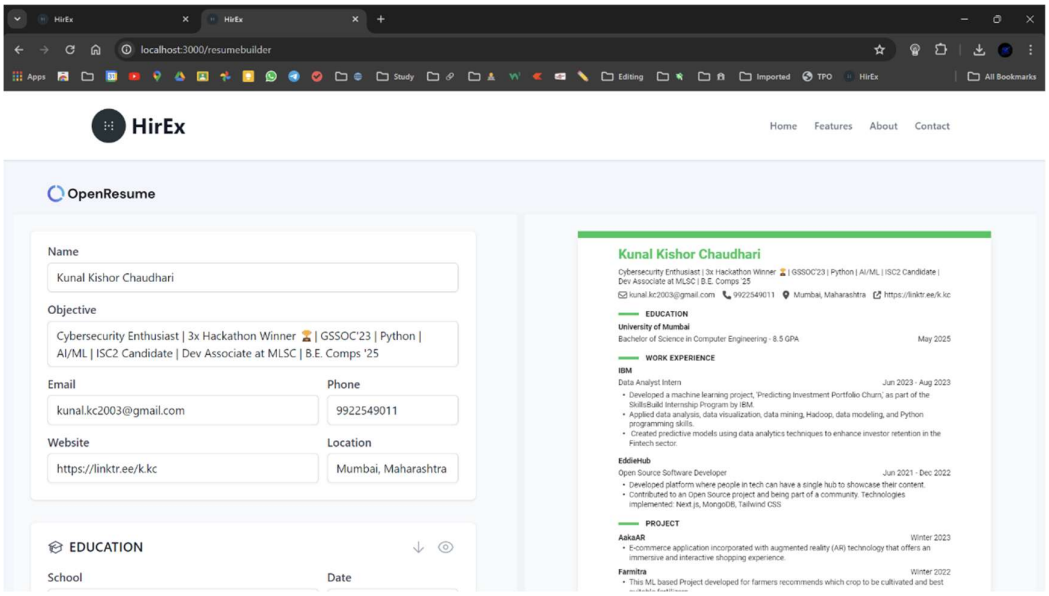

Fig 3.6.3: Resume Builder

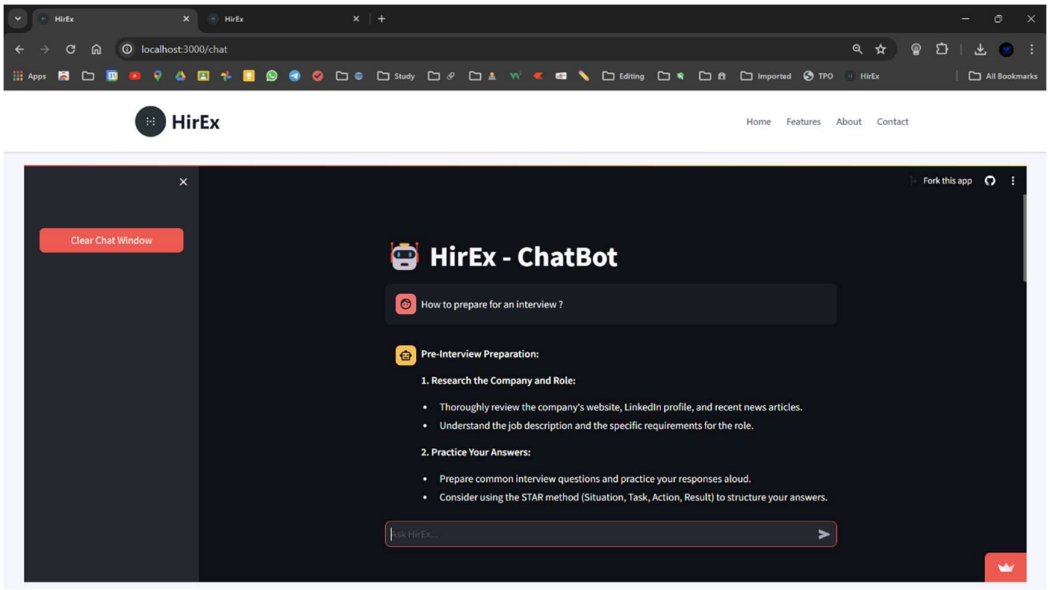

Fig 3.6.4: HirEx-Chatbot

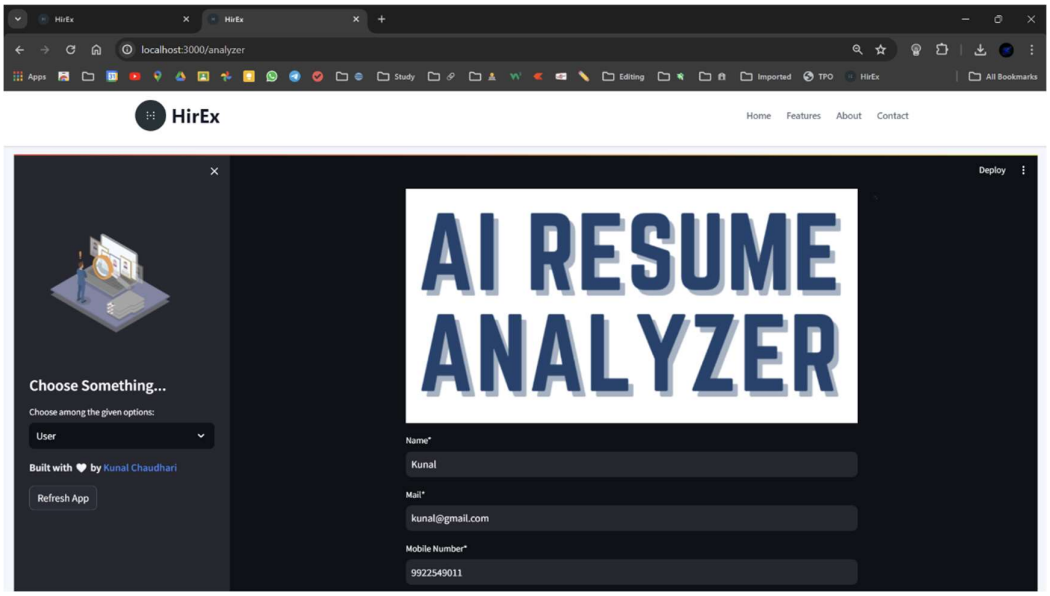

Fig 3.6.5: Resume Analyzer

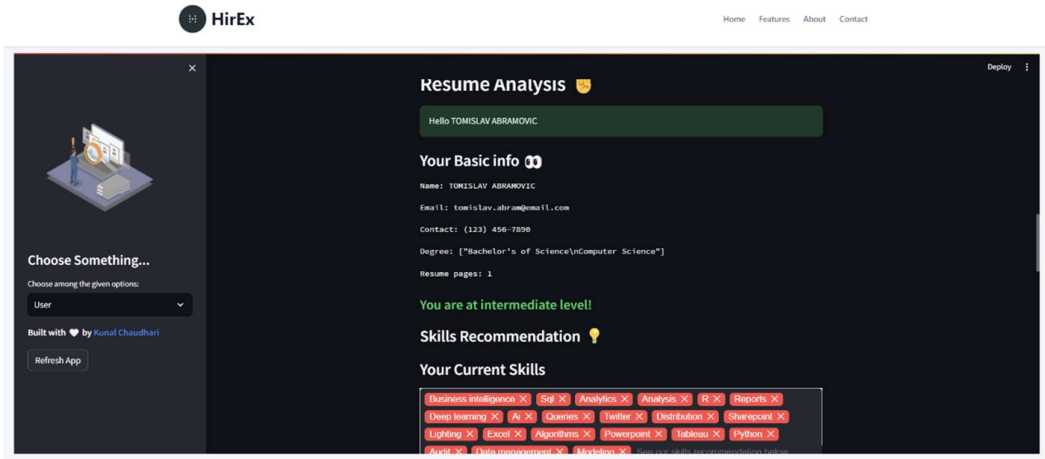

Fig 2.6.6: Analysis of Resume

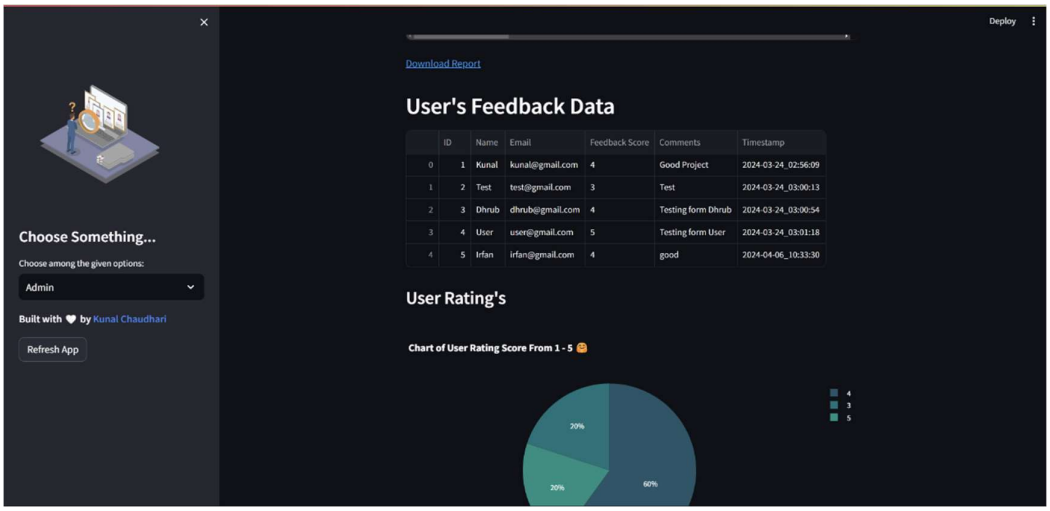

Fig 2.6.7: Feedback

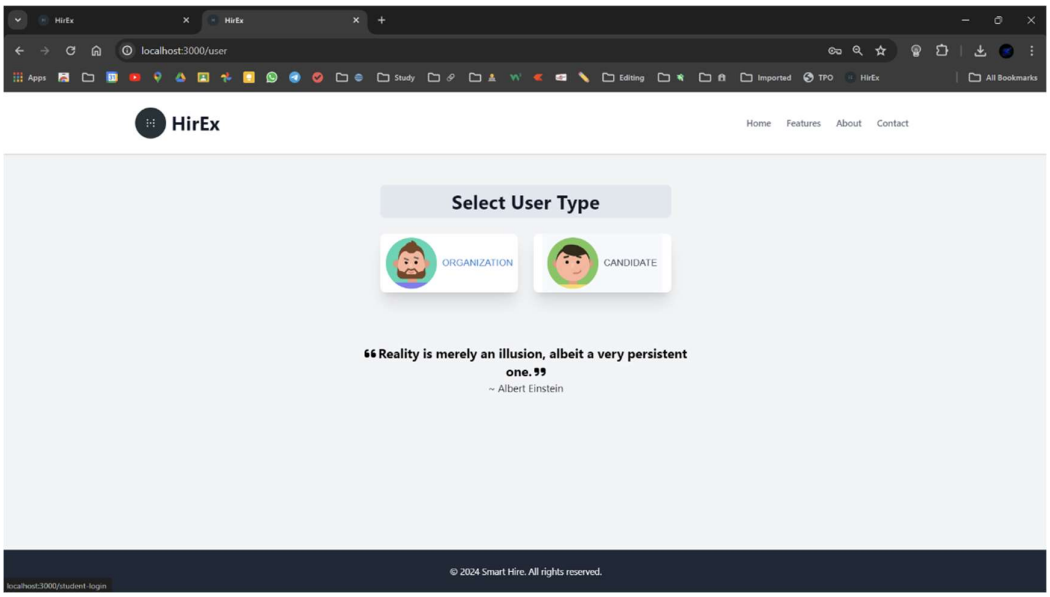

Fig 3.6.8: Interview Generator

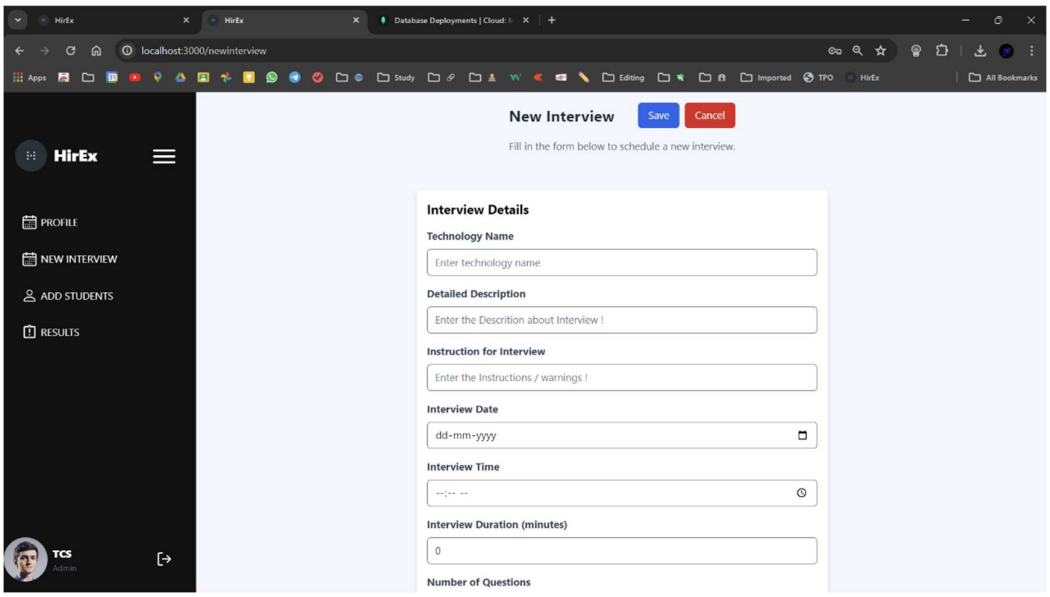

Fig 3.6.9: Organization Interview Generation

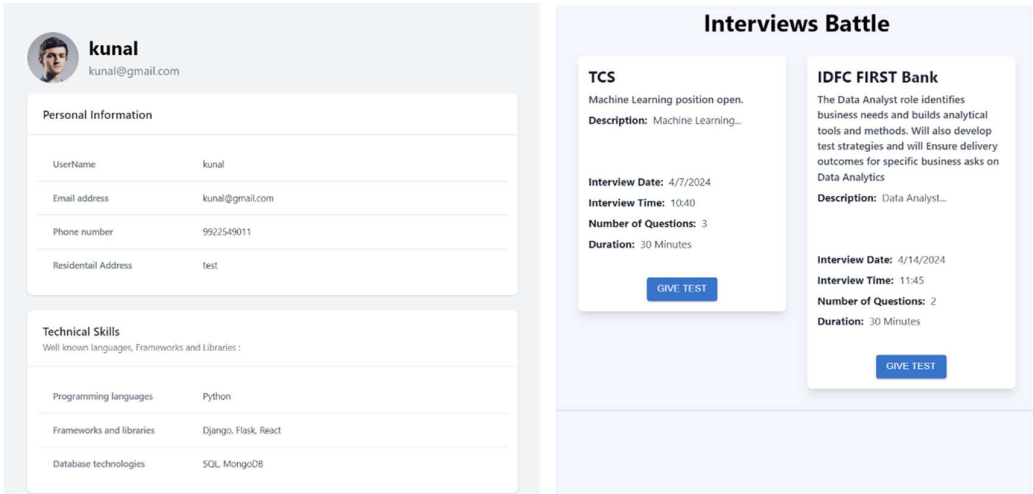

Fig 3.6.10: Candidate Profile

Fig 3.6.11: Interview List

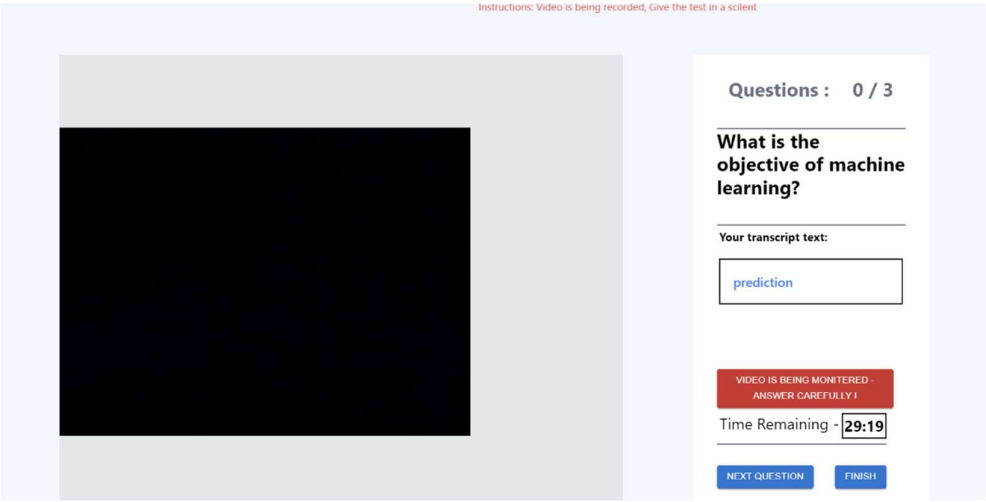

Fig 3.6.12: Interview Process

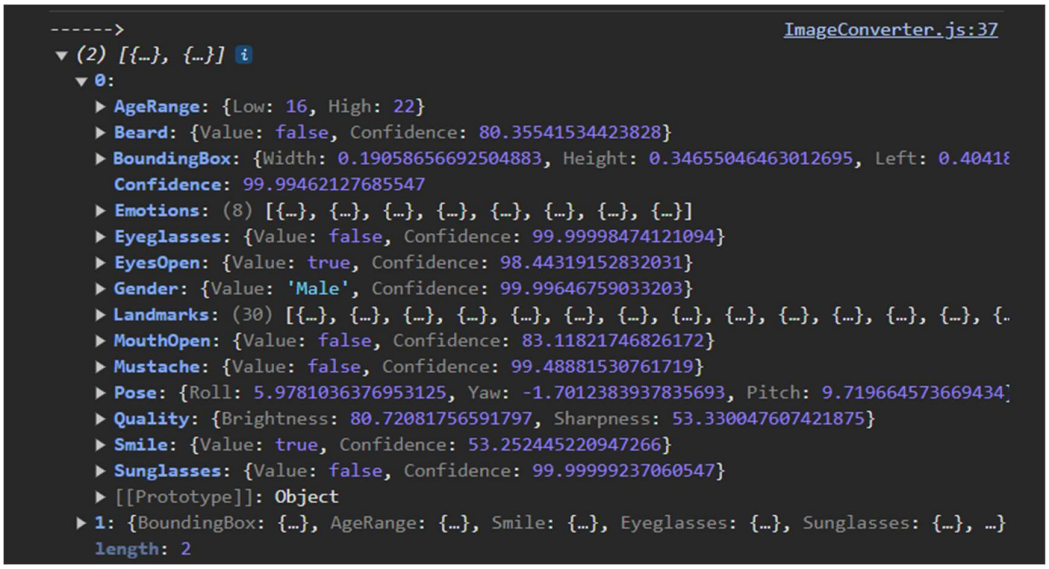

Fig 3.6.13: Emotion Detection

Fig 3.6.14: Result

Fig 3.6.15: Overall Percentage

3.7 Conclusion

3.7.1 Required problem encountered

The Smart Hire project represents a significant advancement in the field of recruitment by leveraging advanced technologies to streamline and optimize talent acquisition processes. Through the development and implementation of AI-powered tools such as the Resume Analyzer, Resume Builder, and Interview Session module, the project aims to address key challenges faced by both employers and job seekers in traditional recruitment practices. By automating resume screening, facilitating tailored resume creation, and standardizing interview processes, Smart Hire enhances efficiency, reduces biases, and improves the overall candidate experience. The platform offers a user-friendly interface, robust functionality, and scalability to meet diverse organizational needs, ultimately redefining how businesses identify and onboard top talent in today's competitive job market. Despite the project's significant contributions to recruitment innovation, several challenges and considerations must be addressed:

1. Data Privacy and Security: Ensuring compliance with data protection regulations and implementing robust security measures to safeguard sensitive candidate information is paramount.

2. Algorithm Bias: Mitigating biases inherent in AI algorithms used for resume screening and candidate evaluation to ensure fair and equitable treatment of all applicants.

3. User Adoption and Training: Providing comprehensive training and support to recruiters and candidates to maximize platform utilization and effectiveness.

4. Integration with Existing Systems: Seamlessly integrating the Smart Hire platform with existing HR systems and processes to minimize disruption and facilitate smooth adoption.

5. Continuous Improvement: Continuously gathering feedback from users and stakeholders to identify areas for improvement and enhancements, ensuring the platform remains relevant and effective in meeting evolving recruitment needs.

3.7.2 Summary of project work

The Smart Hire project developed an innovative platform with AI-powered tools for resume analysis, resume building, and standardized interviews. Key components included the Resume Analyzer, Resume Builder, and Interview Session Module. Rigorous testing, user training, and ongoing support ensured seamless integration and usability. Challenges such as data privacy and algorithm bias were addressed. The platform aimed to optimize recruitment processes, enhance efficiency, and improve candidate experience. Continuous feedback mechanisms were implemented for ongoing improvement and relevance.

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Annexure

4.1 Proof of Concept

- Introduction:

  The proof of concept for the Smart Hire project aims to validate the feasibility and functionality of the system. In this section, we present the implementation details and outcomes of the proof of concept, providing insights into the system's capabilities and performance.

- Implementation:

  The proof of concept for Smart Hire focuses on the following core features:

  - Resume Builder: Implementing a user-friendly interface for creating and customizing resumes tailored to the user's needs.
  - Resume Analyzer: Developing an AI-powered resume analysis tool capable of accurately evaluating resumes, providing recommendations, and generating an ATS (Applicant Tracking System) score.
  - Chatbot: Designing and implementing an intelligent chatbot capable of providing personalized assistance to users regarding resume building, interview preparation, and job search.
  - Automated Interview Process: Developing a system that automates the interview process, from scheduling to evaluation, providing detailed analysis and feedback to the candidates.

- Outcome

The proof of concept demonstrated the following outcomes:

- Resume Builder: The resume builder feature provides a user-friendly interface that allows users to input their personal and professional information, which is then formatted into a customizable template. Users can tailor their resumes according to their preferences and requirements, ensuring a more effective presentation of their skills and experiences.

- Resume Analyzer: The AI-powered resume analysis tool accurately evaluates resumes, providing recommendations on skill addition and generating an ATS score. The analysis is based on deep learning algorithms, which ensure a high level of accuracy and efficiency. Additionally, the system suggests YouTube videos to help users optimize their resumes further.
- Chatbot: The intelligent chatbot provides personalized assistance to users throughout the hiring process. It offers guidance on resume building, interview preparation, and job search, enhancing the user experience and improving the chances of securing interviews.
- Automated Interview Process: The system automates the interview process from scheduling to evaluation. Organizations can register and schedule interviews, and candidates can participate in scheduled interviews. During the interview, the system monitors the candidate's video, analyzes their emotion and confidence levels, and matches their answers with the organization's provided answers. After completing the interview, a comprehensive analysis report is generated and presented to the user.

➢ Conclusion

The proof of concept demonstrates the feasibility and functionality of the Smart Hire system. It successfully integrates resume building, resume analysis, chatbot assistance, and automated interview scheduling and evaluation into a single platform. The outcomes of the proof of concept validate the potential of Smart Hire to revolutionize the hiring process, making it more efficient, effective, and user-friendly.

Smart Hire: Revolutionize hiring using AI/ML

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