Department of Electrical and Computer Engineering
North South University

Senior Design Project

JobCore: AI Agent to Automate Your Job Hunt in Seconds

Md. Kamrul Islam **ID# 2211745642**

Farhan Ishraque **ID# 2212002042**

Atikul Islam Nahid **ID# 2211978042**

Iram Shehzad **ID# 2131614642**

Faculty Advisor:

Dr. Mohammad Shifat-E-Rabbi

Assistant Professor

ECE Department

Fall, 2025

LETTER OF TRANSMITTAL

December, 2025

To

Dr. Mohammad Abdul Matin
Chairman,
Department of Electrical and Computer Engineering
North South University, Dhaka

Subject: **Submission of Capstone Project Report on "JobCore: AI Agent to Automate Your Job Hunt in Seconds"**

Dear Sir,

With due respect, we would like to submit our **Capstone Project Report** on **"JobCore: AI Agent to Automate Your Job Hunt in Seconds"** as a part of our BSc program. This project aims to develop an intelligent job application assistant that integrates job search, resume optimization, and AI-driven mock interview simulations into a unified platform. The experience of completing this project has been extremely valuable, enabling us to apply our theoretical knowledge to real-world systems and modern AI technologies.

We will be highly obliged if you kindly receive this report and provide your valuable judgment. It would be our immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Sincerely Yours,

.....
Md. Kamrul Islam
ECE Department
North South University, Bangladesh

.....
Farhan Ishraque
ECE Department
North South University, Bangladesh

.....
Atikul Islam Nahid
ECE Department
North South University, Bangladesh

.....
Iram Shehzad
ECE Department
North South University, Bangladesh

APPROVAL

Md. Kamrul Islam (ID # 2211745642), Farhan Ishraque (ID # 2212002042), Atikul Islam Nahid (ID # 2211978042) and Iram Shehzad (ID # 2131614642) from Electrical and Computer Engineering Department of North South University, have worked on the Senior Design Project titled "JobCore: AI Agent to Automate Your Job Hunt in Seconds" under the supervision of Dr. Mohammad Shifat-E-Rabbi partial fulfillment of the requirement for the degree of Bachelors of Science in Engineering and has been accepted as satisfactory.

Supervisor's Signature

…….

Dr. Mohammad Shifat-E-Rabbi

Assistant Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

Chairman's Signature

…….

Dr. Mohammad Abdul Matin

Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

DECLARATION

This is to declare that this project is our original work. No part of this work has been submitted elsewhere, partially or fully, for the award of any other degree or diploma. All project-related information will remain confidential and shall not be disclosed without the formal consent of the project supervisor. Relevant previous works presented in this report have been properly acknowledged and cited. The plagiarism policy, as stated by the supervisor, remains in effect.

Students' names & Signatures

1. Md. Kamrul Islam

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2. Farhan Ishraque

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3. Atikul Islam Nahid

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4. Iram Shehzad

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Furthermore, the authors would like to thank the Department of Electrical and Computer Engineering, North South University, Bangladesh for facilitating the research. The authors would also like to thank their loved ones for their countless sacrifices and continual support.

ABSTRACT

JobCore: AI Agent to Automate Your Job Hunt in Seconds

JobCore is an AI-powered platform designed to simplify and enhance the job application process by integrating job search, resume optimization, ATS analysis, and AI-driven mock interview simulations within one ecosystem. The goal of the platform is to reduce job seekers' workload, increase application efficiency, and enhance interview readiness through the use of artificial intelligence.

The system incorporates some latest technologies like LangGraph, MCP Server, along with REST APIs, Natural Language Processing, to deliver personalized interview questions, evaluate user responses, and provide actionable feedback. The project follows a structured software engineering methodology, including requirements analysis, system design, frontend and backend development, database integration, and API communication.

Results indicate that JobCore delivers an effective AI-assisted job preparation experience, demonstrating potential for practical deployment in modern recruitment ecosystems.

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1.1 Background and Motivation

Job seekers today face significant challenges: finding suitable job postings, optimizing resumes for Applicant Tracking Systems (ATS), and preparing for increasingly technical interviews. Research shows that more than half of applicants struggle with creating ATS-friendly resumes, while many lack structured tools for preparing for interviews.

Motivated by these issues, JobCore aims to develop an AI-powered assistant that streamlines the entire job application workflow, enabling candidates to become more confident and better prepared.

1.2 Purpose and Goal of the Project

The primary objectives of JobCore are:

- Automate job discovery through intelligent search
- Provide AI-powered resume evaluation and ATS scoring
- Generate role-based mock interview questions
- Evaluate user answers with natural language processing
- Centralize job preparation tools into a single platform

1.3 Organization of the Report

Chapter 2 reviews existing research and tools.

Chapter 3 describes the system design and methodology.

Chapter 4 presents results and analysis.

Chapter 5 explains societal and environmental impacts.

Chapter 6 includes planning and budget.

Chapter 7 outlines Complex Engineering Problems and Activities.

Chapter 8 concludes the project.

Chapter 2 Research Literature Review

2.1 Existing Research and Limitations

Existing tools, such as VMock, Rezi, and LinkedIn ATS Scanner, offer resume scoring or job matching individually. However, they lack integration, personalization, and AI-driven interview evaluation. Research on LLM-powered interviewing demonstrates potential, but real-world tools often fail to integrate job search, resume optimization, and interview preparation into a seamless workflow.

Limitations in current research & tools:

- Tools focus on individual parts (e.g., resume or interview), not the full workflow.
- Lack of personalized evaluation tailored to role and experience level.
- Limited accessibility due to paid subscriptions.
- Less emphasis on real-time feedback.

These gaps justify the need for JobCore.

Chapter 3 Methodology

3.1 System Design

JobCore follows a modular architecture:

- Frontend: ReactJS, Tailwind, and JavaScript.
- Backend: NodeJS, Express, Python, and Flask.
- AI Module: OpenAI (GPT-3.5 Turbo), Llama-3.3-70B-Instruct-fast
- Database: MongoDB, Firebase.
- API Communication: REST API

3.2 Tools & Technologies

TABLE I. A SAMPLE SOFTWARE/HARDWARE TOOLS TABLE

Tool	**Functions**	**Other similar Tools (if any)**	**Why selected this tool**
React	UI development	Angular, Vue	Fast, flexible
NodeJS, Python	Backend	Spring	Lightweight & scalable
MongoDB	Database	MySQL	High Performance
Firebase	Authentication	Superbase	Secure and scalable
OpenAI Model	AI tasks	Gemini	Strong NLP accuracy
Llama Model	AI tasks	Gemini	Strong NLP accuracy
LangGraph	Handle complex, stateful, multi-agent AI workflows	AutoGen, CrewAI	Well documented
PDF handling	To extract text from PDF	PyPdf2	To return errors if the text cannot be extracted

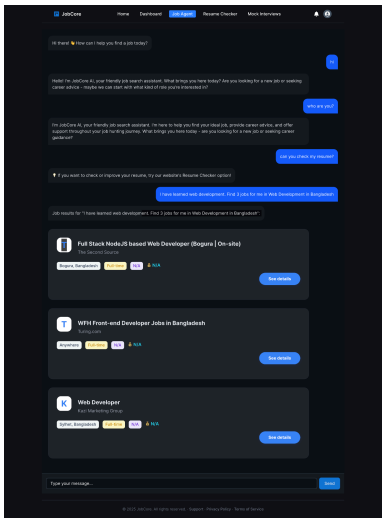
3.3 Implementation

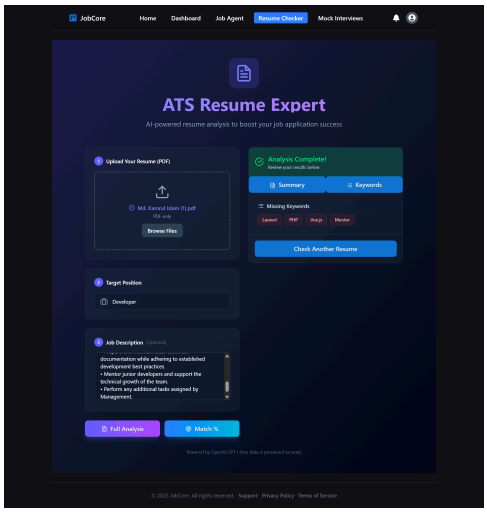
- Designed backend routes for question generation, answer evaluation, and resume scoring
- Developed React components for mock interview, dashboard, and job agent
- Integrated AI responses via REST APIs
- Connected PostgreSQL for persistent storage
- Performed unit testing (Postman) and integration testing
- Flask backend that accepts a PDF resume and job info.
- Designed a resume checker backend that runs an LLM-based ATS-style analysis and returns JSON results.
- Load environment variables from .env.local (expected OPENAI_API_KEY).
- Resume checker frontend with React and JavaScript.

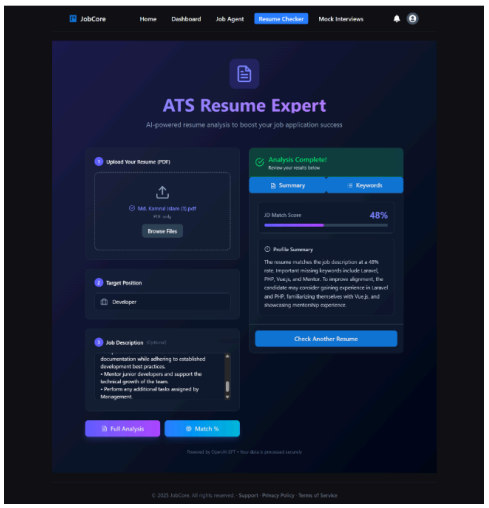
Chapter 4 Investigation/Experiment, Result, Analysis and Discussion

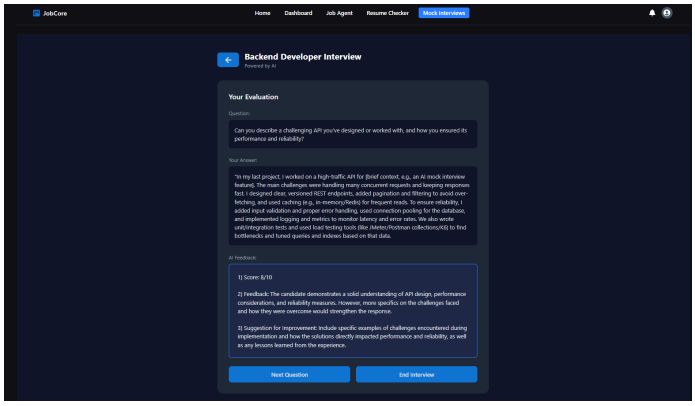
Key results:

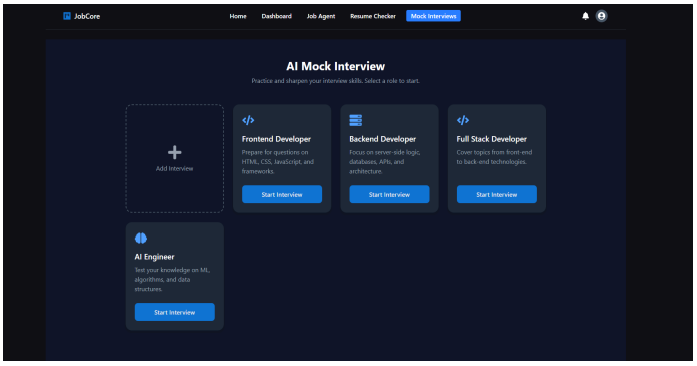
- AI successfully generates customized interview questions for roles (Frontend, Backend, ML Engineer, etc.)
- Evaluation endpoint returns feedback on clarity, correctness, and completeness
- Resume module produces ATS-focused improvement suggestions
- User testing showed increased confidence in interview preparation











Chapter 5 Impacts of the Project

5.1 Impact of this project on societal, health, safety, legal and cultural issues

- Assists unemployed individuals with improving job readiness
- Reduces anxiety related to interviews and career uncertainty
- Ensures fairness through standardized AI feedback
- Encourages digital skill development across cultures

5.2 Impact of this project on environment and sustainability

- Minimizes paper usage (digital resumes, digital training)
- Reduces the need for physical training centers
- Promotes long-term sustainability through cloud-based systems

Chapter 6 Project Budget

Category	Cost (BDT)
API Usage	630
Development Tools	Free
Total	~630

Chapter 7 Complex Engineering Problems and Activities

7.1 Complex Engineering Problems (CEP)

TABLE II. A SAMPLE COMPLEX ENGINEERING PROBLEM ATTRIBUTES TABLE

Attributes		**Addressing the complex engineering problems (P) in the project**
P1	Depth of knowledge required (K3-K8)	The project requires knowledge of Software Engineering and Web Development (K3), Machine Learning and Natural Language Processing (K4), System Design and Algorithm Optimization (K5), use of programming and AI development tools such as Python, Flask, React, and Gemini API (K6), deployment environment and user-data handling considerations (K7), and research on state-of-the-art AI interview and resume-analysis technologies (K8)
P2	Design and Integration Complexity	There are conflicting requirements such as: high accuracy vs. fast response time, detailed resume feedback vs. user privacy, realistic mock interview scoring vs. fairness and bias reduction, and comprehensive features vs. limited system resources and cost. Balancing performance and usability is critical.
P3	Multi-disciplinary Engineering Knowledge	There is no single fixed method to build the system. Decisions require deep analysis such as: selecting suitable AI models, choosing best resume–job matching technique, designing scoring logic for mock interviews, and evaluating multiple UI/UX approaches. Careful comparisons were needed to finalize the best architectural choices.
P4	Problem-Solving / Analytical Skills	The team needed familiarity with authentication systems, user data security, ATS (Applicant Tracking System) rules, web hosting environments, API limitations, and ethical challenges in automated hiring. Problems like data formats, privacy compliance, and response correctness required expert understanding.
P5	Societal & Practical Impact	There are no fixed universal standards for AI-driven job recommendation, resume scoring, or automated interview evaluation. However, the project must align with general software engineering quality standards, ethical AI guidelines, and data protection policies to avoid unfair or biased decisions.

P6	Extent of stakeholder involvement	Multiple stakeholders are involved such as: job seekers (main users), recruiters and HR professionals (beneficiaries), cloud platform providers, and academic supervisors. Their feedback affects usability, performance requirements, and future expansion of the product
P7	Interdependence	The system consists of many interconnected sub-modules including: User interface, Backend server, Resume analyzing AI, Job recommendation engine, Mock interview module, database (if added), and external job-platform APIs. Proper functionality depends on smooth communication between all components.

7.2 Complex Engineering Activities (CEA)

TABLE III. A SAMPLE COMPLEX ENGINEERING PROBLEM ACTIVITIES TABLE

Attributes		**Addressing the complex engineering activities (A) in the project**
A1	Range of resources	Our project requires different types of resources, including the technical skills of the team, cloud-based tools for hosting and running AI models, web and backend frameworks, and publicly available job-market data. We also needed computing power for testing and improving the system's features.
A2	Level of interactions	Successful development of this system relies on strong interaction among team members, continuous guidance from the supervisor, and an understanding of real user needs. The platform also interacts with several external services through APIs, meaning smooth communication between the frontend, backend, and AI modules is essential.
A3	Innovation	The system introduces an innovative approach by combining resume checking, mock interviews, and job matching in one AI-based platform. Instead of users switching between multiple tools, our solution simplifies the process and supports job seekers with personalized feedback and automated assistance.

A4	Consequences to society / Environment	This project has potential benefits for society, especially for fresh graduates and job seekers who struggle with job applications. It can help users improve their resumes, build interview confidence, and reduce stress. At the same time, the project considers ethical issues such as data privacy, responsible use of AI, and fairness in evaluation. It also relates to **UN SDG #08: Decent Work and Economic Growth** and **SDG #09: Industry, Innovation & Infrastructure**.I
A5	Familiarity	Requires familiarity with AI/NLP, Python backend, React/Flask frameworks, API integration, authentication systems, and cloud deployment. Team members must also understand modern HR technologies, ATS (Applicant Tracking Systems), and job-market evaluation techniques.

Chapter 8 Conclusions

8.1 Summary

JobCore has been developed as an AI-powered job preparation platform offering resume evaluation, job discovery, and interview training. The system demonstrates strong potential for real-world deployment

8.2 Limitations

- Dependent on external AI API availability
- Limited accuracy for highly niche technical roles
- Requires constant dataset updates

8.3 Future Improvement

- Integrate custom-trained AI models
- Add job auto-apply automation
- Expand support for global job markets
- Introduce voice-based interview simulations

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