

Innovation Project Report

Divisions :

II- GLSID

VECTRA EXTENSION

Supported by .../05/2024

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Dedication

To Almighty God,

To our parents, our first mentors and infinite sources of inspiration,

To our dear brothers and sisters, partners in our joys and challenges,

To our entire family, for their unwavering support and constant encouragement,

To our respected professors, for their invaluable teaching and enlightened guidance,

To our devoted friends, our second family, for their faithful presence and unfailing support,

We humbly dedicate this project with profound gratitude and sincere respect.

Your love, esteem, and dedication have been the foundations of our success and the pillars of our motivation.

Please accept the expression of our highest regard and deepest respect.

Acknowledgements

We wish to express our deepest gratitude and sincere thanks to everyone who contributed to the success of our project.

First and foremost, we extend our heartfelt appreciation to our supervisors, Mr. DAAIF Abdelaziz and Mr. QBADOU Mohammed for their availability, guidance, and invaluable advice throughout the project. His kindness and expertise were crucial in helping us achieve our objectives.

We also wish to extend our warm thanks to the pedagogical team and staff of the School of Technical Education in Mohammedia for their practical support, encouragement, and guidance during the realization of our innovation project.

Finally, we express our profound gratitude to all the jury members for agreeing to evaluate our work. Their expertise and assessment helped us strengthen our project and present it comprehensively and relevantly.

We recognize that our success is the result of collective effort, and we sincerely thank every individual who contributed to our journey. Your encouragement, support, and expertise have been essential to our success.

Abstract

Embarking on our journey as software engineering students, we aimed to create an innovative project that not only showcases our academic prowess but also pushes the boundaries of what technology can achieve. With our project, Vectra, we sought to develop an extension that optimizes and enhances resumes based on job offers, leveraging machine learning techniques.

Our primary objective was to bridge the gap between theoretical knowledge and practical application by addressing real-world challenges in the job application process. Vectra represents our commitment to crafting innovative solutions that positively impact individuals seeking employment opportunities.

This report provides a comprehensive overview of Vectra, covering various aspects such as its background, functional and technical design, implementation, and evaluation. Through Vectra, we aim to revolutionize the resume-building process and empower users to tailor their resumes effectively to job requirements, ultimately enhancing their chances of securing their desired positions.

Keyword: Vectra, extension, optimization, resume enhancement, machine learning, innovation, job application, empowerment

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List of Abbreviations

- UI:** User Interface
- API:** Application Programming Interface
- **ML:** Machine Learning
- **CV:** Curriculum Vitae
- **JSON:** JavaScript Object Notation
- **PDF:** Portable Document Format
- **CRUD**:** Create, Read, Update, Delete
- **JPA:** Java Persistence API
- **MV:** Model-View-Controller
- **HTTP:** Hypertext Transfer Protocol
- **UR:** Uniform Resource Locator
- **JWT:** JSON Web Token
- **ORM:** Object-Relational Mapping
- **HTML:** Hypertext Markup Language
- **CSS:** Cascading Style Sheets
- **IDE:** Integrated Development Environment
- **OAuth:** Open Authorization
- **SSO:** Single Sign-On
- **AI:** Artificial Intelligence
- **NLP:** Natural Language Processing

General introduction

In the rapidly evolving landscape of job recruitment, the need for efficient and automated systems to match job applicants' resumes with relevant job postings has become increasingly critical.

This necessity forms the foundation of our innovative project, Vectra, a web-based application/extension designed to streamline and enhance the recruitment process. As students in the advanced stages of our computer science education, we are presented with the unique opportunity to apply our academic knowledge to real-world challenges through this project. The primary objective of Vectra is to utilize cutting-edge technology to create an effective solution for the recruitment industry, addressing the common issue of mismatched job applications and postings.

Vectra aims to revolutionize the recruitment process by providing an automated system that analyzes resumes and matches them with the most relevant job postings, thereby saving time for both employers and job seekers. By leveraging advanced algorithms and machine learning techniques, Vectra ensures precise and efficient matching, facilitating better job placements and enhancing overall recruitment efficiency.

This report presents a comprehensive overview of the Vectra project. Firstly, it provides a detailed introduction to the general context of the project, highlighting the specific problem we aim to solve and the proposed solution. This sets the stage for understanding the significance and impact of our innovation in the recruitment industry.

Secondly, we delve into the functional design of the Vectra application, describing the various features and functionalities of the application, and illustrating how they interact with different user roles through use case diagrams, activity diagrams, and mockups.

Thirdly, we focus on the technical architecture of Vectra, presenting the development tools, technologies, and services used in building the application, and discussing the benchmarks and performance evaluations conducted to ensure its efficiency and reliability.

Following this, we detail the implementation process of Vectra, covering the essential tools and methodologies that contributed to the project's realization, discussing the lessons learned, and evaluating the project's impact and results.

Lastly, the report offers a critical reflection on the project, assessing the feedback received from users, identifying areas for improvement, and proposing recommendations for enhancing and optimizing the solution.

This section also highlights the challenges encountered and the skills acquired by the development team, paving the way for future developments.

In conclusion, this report is supplemented by a bibliography and appendices, providing additional references and information to deepen the reader's understanding of various aspects of the project. It serves as a vital resource for anyone interested in our work, demonstrating our dedication, thorough analysis, and significant contribution to innovation in the recruitment sector.

Chapter I. Projet context

I.1 Introduction

In order to provide a thorough overview of our innovative project, this chapter, titled "Project Context," will start by defining the problem that Vectra aims to solve. Next, we will identify the specific target audience for the project and introduce our proposed solution. Finally, we will detail our methodology and planning process, covering everything from the initial development of project requirements to the completion of this report.

I.2 Description of the problematic

We have identified several compelling reasons for developing the Vectra project. Firstly, job seekers often face challenges in finding relevant job postings that align with their skills and experiences. The traditional method of job searching is time-consuming and inefficient, often requiring applicants to sift through numerous postings manually. Additionally, employers face difficulties in efficiently matching suitable candidates to job openings due to the high volume of applications. This mismatch leads to frustration for both job seekers and employers, resulting in missed opportunities and prolonged job vacancies.

Our objective is to address these issues by creating Vectra, a web-based application/extension designed to provide an efficient and automated system for matching job applicants' resumes/CVs with relevant job postings. Vectra aims to streamline the job search process, making it easier for applicants to find suitable positions and for employers to identify the best candidates. By leveraging advanced algorithms and AI technology, Vectra will enhance the job matching process, ultimately benefiting both job seekers and employers.

I.3 Target

The primary target audience for the Vectra application is job seekers. Vectra is designed to provide job seekers with an efficient and automated system to match their resumes and CVs with relevant job postings.

The application offers personalized job recommendations based on individual profiles and preferences, along with tools to optimize resumes and CVs for better compatibility with job descriptions.

Job seekers will benefit from alerts and notifications for new job postings that align with their qualifications and interests, as well as access to resources and tips for improving their job application materials and interview skills. By focusing on the needs of job seekers, Vectra aims to streamline the job search process and enhance the chances of finding suitable employment opportunities.

I.4 Solution

Our project, Vectra, aims to simplify and enhance the job search process for candidates. Vectra is a web platform that extracts information and skills from job seekers' CVs and matches these skills with job offers available on LinkedIn. Following this, Vectra suggests optimizations for the CV, indicating what adjustments are needed to better align the CV content with the job requirements.

By leveraging advanced technology, Vectra assists users in tailoring and improving their applications, thereby increasing their chances of securing interviews and job opportunities. This project seeks to make job searching more efficient and to better connect candidates' skills with employers' needs.

I.5 Methodology of work

Durant In the execution of the Vectra project, our team employed a structured approach centered around the use of **GitHub Enterprise** for version control and project management. We divided the project into distinct parts, assigning each part to a specific team member. Each member developed their assigned section within their dedicated GitHub branch, facilitating parallel development and minimizing integration conflicts.

Regular **meetings**, both on-site and remote, were held to discuss progress, address challenges, and coordinate the integration of various components. This approach ensured that all team members remained aligned with the project's goals and timeline, enabling efficient collaboration and effective problem-solving. By leveraging the collaborative tools provided by GitHub Enterprise, we maintained a high level of organization and transparency throughout the development process.

I.6 Planning

In the execution of the Vectra project, our team employed a structured approach centered around the use of GitHub Enterprise for version control and project management. We divided the project into distinct parts, assigning each part to a specific team member. Each member developed their assigned section within their dedicated GitHub branch, facilitating parallel development and minimizing integration conflicts.

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Project Phase	Duration(days)	Start and End Dates
Idea Selection	7	18/03/2024-25/03/2024
Choice of Technologies	7	25/03/2024-31/03/2024
Conception	7	31/03/2024-7/04/2024
Planning and task allocation	7	07/04/2024-14/04/2024
Implementation and development of the project	30	14/04/2024-14/05/2024
Testing and rectification	7	14/05/2024-21/05/2024
Drafting of documentation	5	21/05/2024-27/05/2024

Tableau 1-Planning

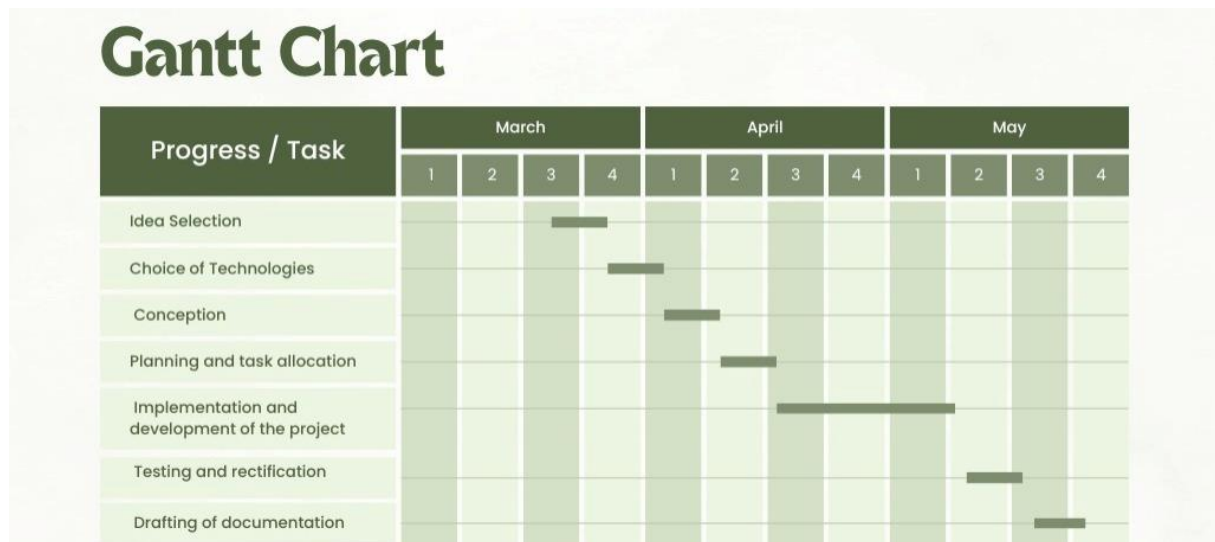


Figure 1-Diagramme de Gant

I.7 Conclusion

In this chapter, we conducted a comprehensive study of our project, situating it within its context. We introduced the proposed solution to address the identified problem and highlighted the methodology employed by our team, along with the timeline followed throughout the project's execution. To better model and design our solution, we conducted an in-depth functional study of the project, the details of which will be discussed in the following chapter.

Chapitre II. Functional design

II.1 Introduction

In this chapter, we focus on the preliminary analysis and design of our Vectra project using UML. We will begin by introducing this method, followed by a detailed discussion on the system's analysis and design phase. This will allow us to present use case diagrams, defining the various users and their interactions with our platform. Next, we will describe the activity diagrams in detail, illustrating the different workflows of our project.

Finally, the chapter concludes with the presentation of mockups, highlighting the different graphical interfaces and providing an overall vision of the final version of our project. It is essential to emphasize that the analysis phase is often overlooked in many projects, yet it is of crucial importance. Fully understanding the problem enables us to solve it more effectively.

By following a methodical and structured approach, we ensure that each design step is well-considered, allowing us to anticipate and address potential issues before they arise, thus ensuring the success of Vectra.

II.2 Methodology adopted

To represent the architecture of our Vectra system more precisely, we have chosen to use UML, the most widely adopted modeling language. UML employs an object-oriented approach and provides a universal descriptive language.

Through its numerous explicit diagrams, UML enables us to represent the architecture and functionality of complex computer systems, taking into account the relationships between the concepts used and their implementation.

UML is primarily an effective communication tool that facilitates the representation and understanding of object-oriented solutions. Its graphical notation allows for a visual expression of solutions, making comparison and evaluation easier. The formal notation of UML reduces ambiguities and misunderstandings. Additionally, UML is independent of programming languages, application domains, and processes, making it a universal language.

II.3 Use cas digram

To initiate our exploration of the functional design of the Vectra application, we'll commence by presenting the use case diagrams. These diagrams delineate the actions and potential interactions within the application, spotlighting the features accessible to users seeking job opportunities, regardless of their skills and experience. This analysis will aid in comprehending how users can engage with the application and pinpoint the primary features available to them.

Once the user is logged in and their skills are extracted, the extension integrates with LinkedIn, allowing users o view job offers. The extension's icon will be displayed next to each job offer on LinkedIn. By clicking the icon, the user can match their skills with the requirements of the job offer. The extension will then use the AI model to analyze the user's skills and suggest potential CV optimizations

The use case diagram shows the following interactions :

- User: The primary actor, representing the individual using the Vectra Extension.
- Authentication: The initial step, where the user authenticates with one of the supported services (Gmail, LinkedIn, or GitHub) via the "Clurk" service.
- Upload CV: The user can upload their CV, allowing the extension to extract necessary information and skills.
- Fill Skills & Information Form: An alternative to uploading a CV, where the user can directly enter their skills and information.
- Optimize CV: This use case represents the core functionality of the extension. After matching their skills with a job offer, the user can utilize the AI model to receive recommendations for CV optimization.
- With Email, With Gmail, With LinkedIn, With GitHub: These use cases represent the various authentication methods supported by the extension.

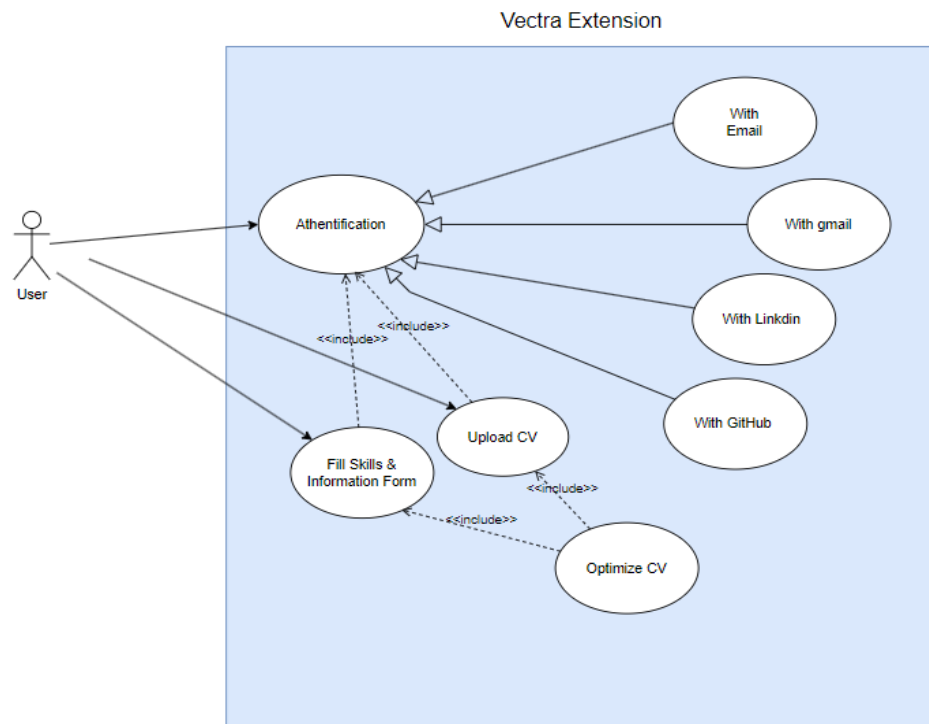


Figure 2-Use case Diagram

II.4 Sequence diagram

A sequence diagram is a type of interaction diagram in Unified Modeling Language (UML) used to visualize the interactions between objects or components within a system over time. It illustrates the flow of messages, or interactions, between various entities, typically focusing on the chronological order of these interactions.

At its core, a sequence diagram represents a scenario or a specific sequence of events in a system. It showcases the dynamic behavior of the system by detailing how objects or components collaborate to achieve a particular functionality or scenario. This makes sequence diagrams particularly useful for understanding the behavior of complex systems, designing system interactions, and communicating system requirements.

In a sequence diagram, objects or components are represented as vertical lines (also known as lifelines) arranged horizontally from top to bottom. These lifelines represent the entities involved in the interaction. Messages exchanged between these entities are depicted as horizontal arrows or lines between the lifelines, indicating the flow of communication.

Additionally, sequence diagrams may include various elements such as actors, objects, lifelines, messages, activation bars, and control flow constructs to provide a comprehensive view of system interactions.

After understanding the dynamic behavior of systems, sequence diagrams become indispensable tools for system designers, developers, and stakeholders. They offer a visual representation of how objects or components interact over time, aiding in system design, analysis, and communication throughout the software development lifecycle. Now, let's delve into the diagram of our project.

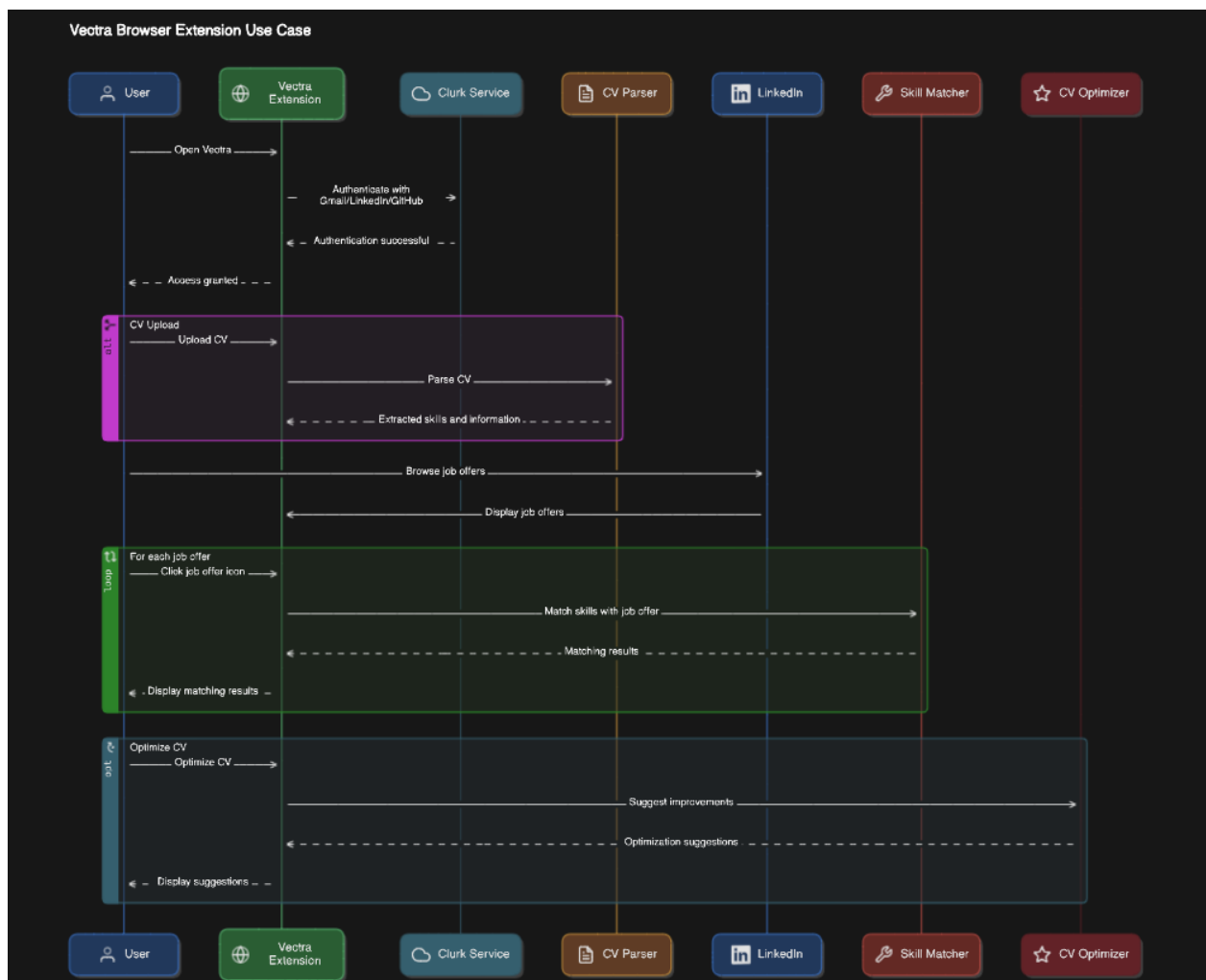
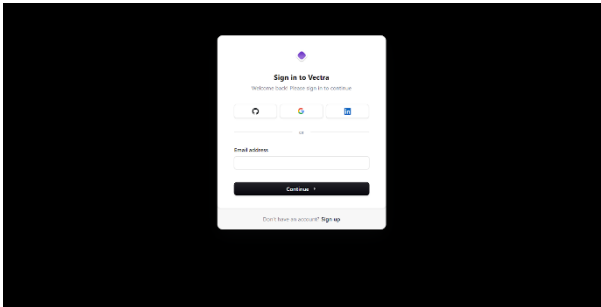
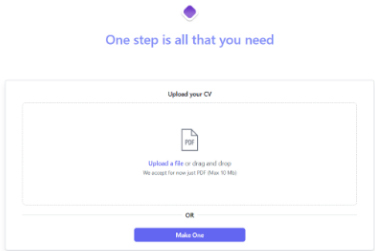


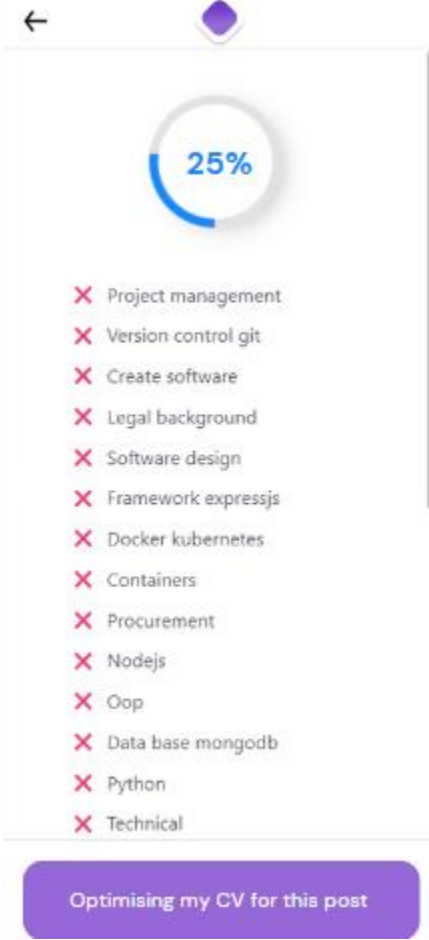
Figure 3-Sequence diagram

II.5 User Interface Mockups

This section delves into the visual embodiment of Vectra's functionality through user interface (UI) mockups. These mockups serve as blueprints for the system's visual design, showcasing how users will interact with the platform and experience its features. By visualizing the UI, we aim to:

Tableau 2-Mocket Interface

Mockup	Description
	In our homepage interface prototype prominently features a login field, encouraging users to authenticate through their Google, GitHub, or LinkedIn accounts. This design choice streamlines the authentication process, providing a smoother and more convenient user experience, while also leveraging the security measures provided by these platforms. This authentication process is facilitated by our integration with Clurk, which allows users to seamlessly authenticate through their preferred platform. Now, let's take a closer look at the prototype.
	Mockett show how cab user can Upload his CV in the extension with simple drag and drop

	User can Preview and show file he will upload to check if all is fine
	This Mockett describes the main features of our extension by measuring how much skills on LinkedIn or any job posting site and what he needs to enhance to suggest an optimization of his CV.

II.6 Conclusion

In conclusion, this chapter thoroughly explains the importance of a structured approach to system design using UML as a foundation for the Vectra project. The chapter effectively demonstrates the value of use case diagrams and sequence diagrams for visualizing the system's interactions and functionalities. By incorporating additional components such as activity diagrams, a data model, and a detailed explanation of UI mockups, the chapter could provide a more complete and insightful analysis of the project's functional design. Addressing limitations and outlining potential future work would further strengthen the chapter and demonstrate a comprehensive understanding of the project's current state and future possibilities.

Chapitre III. Technical design

III.1 Introduction

In this chapter, we focus on the technical design of our project "Vectra". We will begin by defining a technical architecture to structure and interconnect the various technological components that make up our system. Next, we will concentrate on the application architecture, which will describe the techniques used to create and design our platform. This chapter will conclude with the presentation of the different tools utilized during the realization of this project.

III.2 Technical Architecture

The technical architecture of the Vectra extension is designed to ensure a seamless integration of AI-driven functionalities with robust backend support and an intuitive frontend interface.

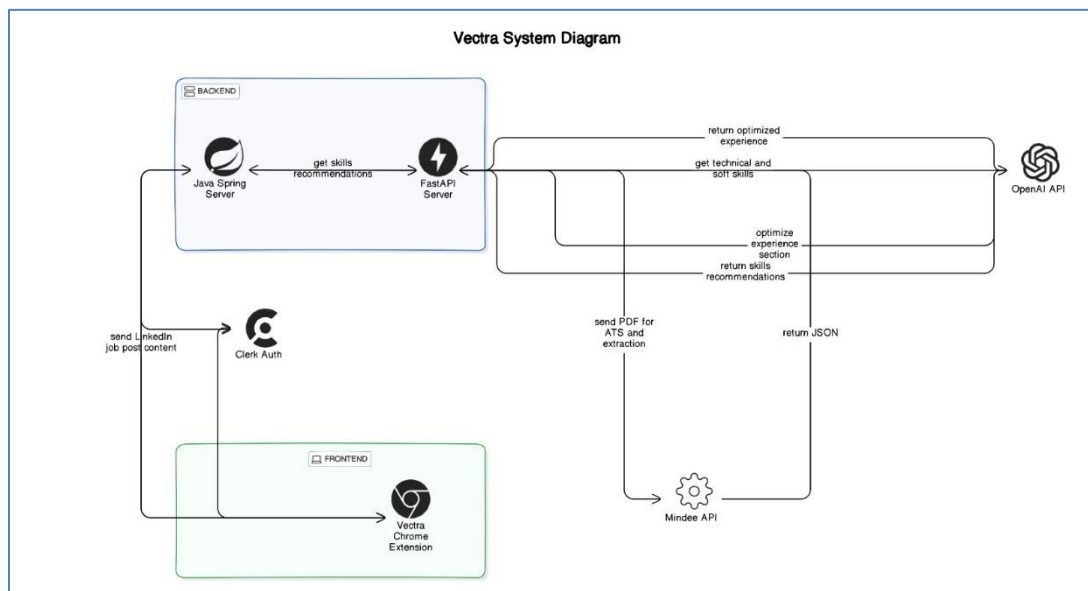


Figure 4-Technical Architecture

The frontend of Vectra, built as a Chrome extension using Plasmo, seamlessly integrates into the LinkedIn job browsing experience. When a user reviews a job post, the extension leverages Plasmo's capabilities to read the HTML text of the page. This extracted job post data is then automatically sent to the Java backend for processing.

By doing so, it ensures that the relevant job details are captured accurately and promptly, facilitating a smooth and efficient optimization process. This automation enables users to effortlessly tailor their resumes to specific job listings, enhancing their chances of success.

The backend of Vectra is a robust system leveraging Spring Web, Spring MVC, and Spring Boot Starter to ensure efficient and scalable operations. This backend serves as the core processing unit, handling incoming data from the frontend Chrome extension. Upon receiving the job post details, the Spring framework's web and MVC components manage the routing and processing of requests, ensuring a smooth flow of data.

The Spring Boot Starter provides a streamlined setup, reducing configuration overhead and allowing for rapid development and deployment. This backend not only communicates with the FastAPI server for AI-driven resume optimization but also manages user authentication and data persistence, ensuring a secure and efficient user experience.

The FastAPI server in Vectra is a crucial component dedicated to handling advanced AI functionalities. When the Java backend forwards a resume for optimization, the FastAPI server first communicates with the Mindee API to perform Optical Character Recognition (OCR), converting the resume into a structured JSON format.

This JSON data is then processed using OpenAI's GPT-4 to generate optimized sentences and provide auto skills suggestions tailored to the specific job post. The FastAPI framework ensures that these tasks are performed efficiently and effectively, delivering high-quality, AI-driven enhancements to the user's resume. This integration enables Vectra to offer personalized and intelligent resume optimization, significantly improving the chances of securing job interviews.

III.3 Development tools

To build and maintain the Vectra extension, we utilize a variety of development tools that enhance our productivity and ensure the quality of our application. Below are the key tools and their roles in our development process:

III.3.1 Plasmio

To build and maintain the Vectra extension, we utilize a variety of development tools that enhance our productivity and ensure the quality of our application. Below are the key tools and their roles in our development process:



Plasmio is the framework we use for developing the frontend of our browser extension. Designed specifically for extension development, Plasmio simplifies the process of building and deploying browser extensions.

It allows us to create dynamic, responsive user interfaces that integrate seamlessly with the browser, enhancing the user experience. Plasmio's built-in tools and optimizations make it easier to manage the complexities of extension development, ensuring our frontend is both functional and user-friendly.

III.3.2 FastAPI

FastAPI is our go-to framework for building backend services due to its high performance and ease of use. This modern web framework is built on Python 3.6+ and leverages standard Python type hints, making it both fast and intuitive.



FastAPI enables us to quickly develop robust APIs that facilitate smooth communication between the frontend and backend. Its automatic generation of interactive API documentation also aids in development and testing, ensuring our backend services are reliable and well-documented.

III.3.3 Clerk

Clerk is the service we use for authentication and user management, streamlining the process of integrating secure sign-in features into our application. With Clerk, users



can authenticate using their Google, GitHub, or LinkedIn accounts, ensuring a smooth and secure login experience. Clerk handles the complexities of user authentication, including session management and security protocols, allowing us to focus on building core application features without compromising on security.

III.3.4 UML

Unified Modeling Language (UML) is a standardized modeling language that enables developers to specify, visualize, construct, and document the artifacts of a software system. UML employs an object-oriented approach and provides a



universal descriptive language for representing the architecture and functionality of complex systems.

By using UML, we ensure that the design of our Vectra extension is clear, comprehensive, and easily understandable by all stakeholders, facilitating effective communication and documentation throughout the development lifecycle

enables us to quickly develop robust APIs that facilitate smooth communication between the frontend and backend. Its automatic generation of interactive API documentation also aids in development and testing, ensuring our backend services are reliable and well-documented.

III.3.5 Tailwind CSS

Tailwind CSS is a utility-first CSS framework that provides low-level utility classes to build custom designs without leaving the HTML. It enables developers to create highly customizable and responsive user interfaces by composing classes directly in the markup.



With Tailwind CSS, we can rapidly prototype and design consistent and visually appealing components, reducing the need for writing custom CSS. Its utility-first approach enhances our productivity and ensures that our extension's UI is both elegant and maintainable .

III.3.6 Post Man

Postman is a collaboration platform for API development, providing a comprehensive set of tools to simplify each step of building an API. With Postman, we can design, test, debug, and document APIs efficiently. Its user-friendly interface allows us to create and send HTTP requests, inspect responses, and automate testing with ease



Postman's capabilities streamline our API development process, ensuring that our APIs are reliable, well-documented, and maintain high performance and security standards.

III.3.7 Spring boot

Spring Boot is a powerful framework for building Java-based enterprise applications. It simplifies the development process by providing a suite of pre-configured tools and libraries, which reduce the need for boilerplate code and configuration.



Spring Boot is designed to enable the rapid creation of production-ready applications with minimal setup. It supports various extensions and third-party libraries, making it highly versatile for different use cases. Its robust ecosystem and support for embedded servers like Tomcat make Spring Boot an excellent choice for developing scalable and maintainable backend services.

III.3.8 Spring boot

Visual Studio Code (VS Code) is our preferred code editor due to its versatility and robust feature set. Developed by Microsoft, VS Code is an open-source editor that supports a wide range of programming languages and development workflows through an extensive library of extensions.



We utilize VS Code for writing, editing, and debugging our code, taking advantage of its integrated terminal, version control, and debugging tools. Its lightweight nature combined with powerful features makes it an ideal choice for efficient and productive coding sessions.

III.3.9 IntelliJ IDEA

IntelliJ IDEA is a powerful integrated development environment (IDE) primarily used for Java development, but also supporting a wide array of other programming languages through plugins. Developed by JetBrains, IntelliJ IDEA provides comprehensive tools for coding, debugging, and testing applications.



Its intelligent code completion, refactoring tools, and deep integration with build systems like Maven and Gradle make it a favorite among developers for enhancing productivity and code quality.

III.4 Conclusion

In this chapter, we have provided a detailed overview of the technical architecture of the Vectra extension, as well as the development tools and services used in its creation. We have justified our choice of technologies by explaining their utility in our project.

After examining both the functional and technical aspects, we now proceed to the final phase of the project cycle: implementation. This phase will be addressed in the next chapter.

Chapitre IV. Implementation

IV.1 Introduction

In the fourth chapter of our report, we will discuss the implementation of our innovation project, the Vectra extension. We will begin by presenting the essential tools that contributed to the realization of our project, followed by the deployment process to make our project accessible.

IV.2 Backend

IV.2.1 Introduction

The back-end implementation of the Vectra project is a critical component responsible for managing the server-side logic, data storage, and communication with the machine learning module. Utilizing Spring Boot as the primary framework, the back-end serves as the backbone of the application, handling user management, resume processing, and interaction with the Python server that performs machine learning tasks.

IV.2.2 Overview of the Back-End Implementation

The Vectra project's back-end is built using the Spring Boot framework, chosen for its robust ecosystem, ease of integration, and comprehensive suite of tools that streamline development. The back-end is designed to manage users and resumes, facilitating operations such as storing resumes in both JSON and PDF formats, and communicating with the Python server for various machine learning tasks like resume enhancement, job offer matching, and calculating matching scores.

The Spring Boot server plays a crucial role in receiving resumes from the front end, converting them to JSON via the Python server, and storing these formats efficiently. It also manages user data, ensuring secure authentication and authorization, and provides endpoints for various user-requested features. This architecture ensures a seamless flow of data and efficient processing of requests, enhancing the overall functionality of the Vectra project.

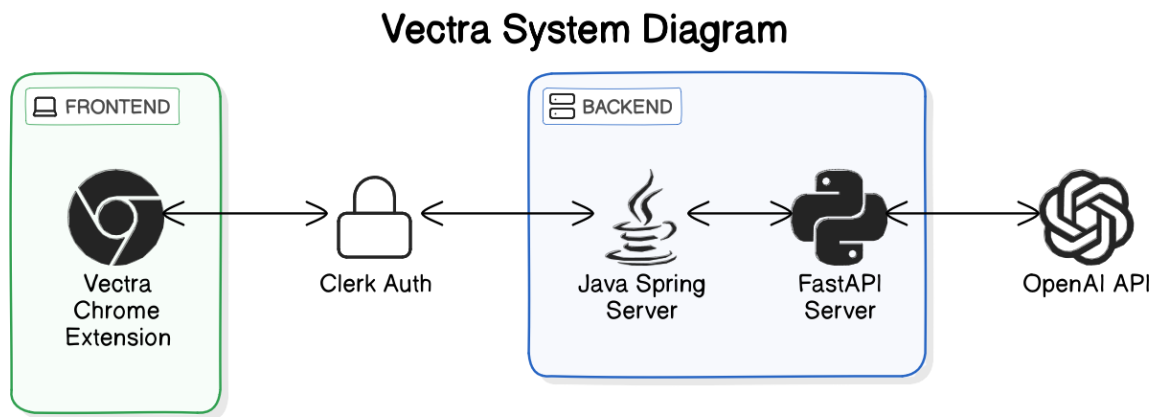
IV.2.3 Importance of the Spring Boot Framework

Spring Boot was selected for its powerful capabilities in simplifying the development of production-ready applications. Key benefits of using Spring Boot include:

- **Rapid Development:** Spring Boot's convention-over-configuration approach and embedded server setup allow for quick and efficient development cycles.
 - **Comprehensive Ecosystem:** Spring Boot integrates seamlessly with other Spring modules such as Spring Data for database operations, Spring Security for robust security measures, and Spring MVC for building RESTful APIs.
 - **Scalability and Flexibility:** The modular nature of Spring Boot makes it highly scalable and flexible, capable of handling various components of the Vectra project, from user management to complex data processing tasks.
 - **Community and Support:** Spring Boot boasts a large and active community, providing extensive documentation, tutorials, and third-party libraries that facilitate solving common challenges and implementing best practices.

IV.2.4 Architecture of the Back-End

The back-end architecture of the Vectra project revolves around the Spring Boot server, which serves as the primary interface for handling user requests, managing data, and communicating with the Python server responsible for machine learning tasks.



- **Spring Boot Server:**

- Acts as the main back-end server handling user authentication, resume processing, and interaction with the front end.
- Provides endpoints for user actions such as uploading resumes, requesting resume enhancements, and fetching job offer matches.
- Manages user and resume data, storing resumes in JSON and PDF formats.

- **Python Server:**

- Responsible for executing machine learning tasks such as linguistic resume enhancement and job offer matching.
- Communicates with the Spring Boot server through defined APIs, receiving resume data for processing and returning the results.

- **Data Flow:**

- Front end sends resume data to the Spring Boot server via RESTful APIs.
- Spring Boot server processes the data, stores resumes, and forwards them to the Python server for machine learning tasks.
- Python server performs the requested tasks and returns the results to the Spring Boot server.
- Spring Boot server communicates the results back to the front end for display to the user.

IV.3 Controllers and RESTful APIs

The controllers in the Vectra project's Spring Boot back-end serve as the bridge between the client-side requests and the server-side logic. They handle incoming HTTP requests from the front end and delegate the processing tasks to the appropriate services. Here's an overview of the controllers and the RESTful APIs they expose:

Resume Controller:

- Handles resume-related actions such as uploading, fetching, and processing resumes.
- Provides RESTful endpoints for resume management, including:
 - **/resume/upload**: Upload a new resume.
 - **/api/resume/{id}**: Retrieve a specific resume by its unique identifier.
 - **/resume/enhance**: Request linguistic enhancement of a resume.
 - **/resume/match**: Request the percentage and the matching of a resume with a job offer.

Examples of resume experience enhancement :

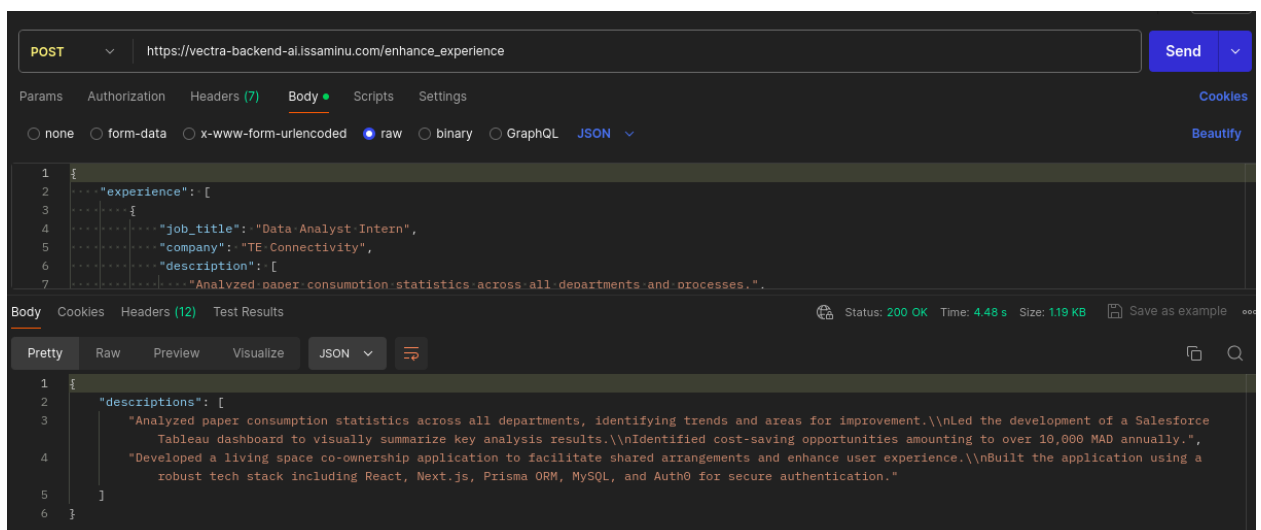


Figure 5-bakcend-exemple

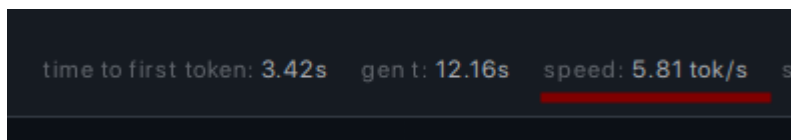
These controllers follow RESTful principles, providing a clear and consistent API interface for communication between the front end and the back end. They encapsulate the business logic and interact with the appropriate services to fulfill the client's requests

efficiently

IV.4 Machine-Learning

Lors For the Machine Learning part, we opted to utilize an existing LLM solution and not train (or finetune a existing) model due to the following reasons:

- Training LLMs requires specialized hardware (GPUs/NPUs) which aren't available on our machines.
- If we were to consider the speed that's available from a CPU only approach, it would take months of training to get a decent result (for reference, just inference produces about 5 tokens/second on an 11th Gen Intel i5-1135G7 CPU using Llama 3 8B Instruct on LMStudio.



- If we were to rent a machine on the cloud that has a decent GPU, the cost would be very significant. For example, renting a VM on Puzl.cloud with an Nvidia A100 GPU costs about ~12,458 MAD/month.
- Current open models are not nearly as powerful as their closed source counterparts. For example, the current state-of-the-art open model that's currently available, and is small enough to run locally on our machines, Llama 3 8B Instruct, is currently placed 19th in the LMSYS Chatbot Arena Leaderboard. While a closed weights model like GPT-4o is currently placed #1 on the leaderboard

LMSYS Chatbot Arena Leaderboard
[Vote](#) | [Blog](#) | [GitHub](#) | [Paper](#) | [Dataset](#) | [Twitter](#) | [Discord](#)
 LMSYS Chatbot Arena is a crowdsourced open platform for LLM evals. We've collected over 1,000,000 human pairwise comparisons to rank LLMs with the [Bradley-Terry model](#) and display the model ratings in Elo-scale. You can find more details in our [paper](#).

Arena Full Leaderboard
 Total #models: 99. Total #votes: 1,170,955. Last updated: 2024-05-20.
 NEW! View leaderboard for different categories (e.g., coding, long user query)! This is still in preview and subject to change.
 Code to recreate leaderboard tables and plots in this [notebook](#). You can contribute your vote 🗳️ at [chat.lmsys.org](#)!

***Rank (UB)**: model's ranking (upper-bound), defined by one + the number of models that are statistically better than the target model. Model A is statistically better than model B when A's lower-bound score is greater than B's upper-bound score (in 95% confidence interval). See Figure 3 below for visualization of the confidence intervals of model scores.

Rank (UB)	Model	Arena Elo	95% CI	Votes	Organization	License	Knowledge Cutoff
1	GPT-4o-2024-05-13	1287	+5/-3	20156	OpenAI	Proprietary	2023/10
2	GPT-4-Turbo-2024-04-09	1252	+3/-3	62203	OpenAI	Proprietary	2023/12
2	GPT-4-1106-preview	1250	+3/-3	82286	OpenAI	Proprietary	2023/4
2	Gemini 1.5 Pro API-0409-Preview	1248	+3/-3	62929	Google	Proprietary	2023/11
3	Claude 3 Opus	1246	+2/-2	121218	Anthropic	Proprietary	2023/8

Figure 6-machine learning

A So what did we use instead? At first we opted with Fine-Tuning an existing model, OpenAI currently only allows fine-tuning on the GPT-3.5-turbo, so that's what we went with.

IV.4.1 Fine tuning model

Fine-tuning is the process of taking a pre-trained LLM, such as GPT-3, and further training it on a specific task or domain-specific dataset. The pre-trained LLM serves as a strong foundation, having learned general language patterns and knowledge from a vast amount of text data during its initial pre-training phase.

During fine-tuning, the LLM's weights are adjusted and fine-tuned using a smaller, targeted dataset relevant to the desired task or domain. This allows the LLM to adapt and specialize its knowledge, enabling better performance on the specific task or domain compared to using the general pre-trained model alone. For our application, we needed to optimize the sentences of our user's resumes, as well as tailor them to job requirements for job offers on LinkedIn.

In terms of the dataset, we found difficulty in finding datasets that have data in the format that we needed (input: sentences that are unoptimized, output: optimized versions of those same sentences), so we opted to creating our very own dataset! We discovered a technique that allowed us to utilize GPT-4 to create the very dataset that we needed.

```

uploaded = files.upload()

[ ]

# After uploading, the file will be in the current directory
file_name = 'finetuning_examples.json'

# Read the contents of the file
with open(file_name, 'r') as file:
    file_contents = file.read()

# Print the contents of the file
print(file_contents)

```

No files selected. Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

Saving finetuning_examples.json to finetuning_examples.json

```

{
  "resume": "John Doe is an experienced software developer with a strong background in Python and Java. He has worked on various projects involving web development and data processing. John is proficient in using frameworks",
  "job_title": "Senior Software Engineer",
  "job_description": "We are seeking a Senior Software Engineer with expertise in Python, Java, and Ruby on Rails. The ideal candidate should have experience with both front-end and back-end development, including frameworks",
  "technical_skills": ["Ruby on Rails", "React", "MySQL", "AWS"],
  "soft_skills": ["communication"]
},
{
  "resume": "Jane Smith has over five years of experience in digital marketing, specializing in content creation and social media strategy. She has successfully increased brand visibility and engagement through targeted campaigns",
  "job_title": "Digital Marketing Manager",
  "job_description": "The Digital Marketing Manager should be proficient in advanced digital marketing techniques, including SEO, SEM, and PPC campaigns. The candidate must have experience with marketing automation tools such as",
  "technical_skills": ["SEO", "SEM", "PPC", "HubSpot", "Salesforce"],
  "soft_skills": ["leadership", "strategic planning"]
},
{
  "resume": "Michael Brown is an accomplished project manager with over eight years of experience in managing large-scale construction projects. He is proficient in Microsoft Project and AutoCAD, and has a strong track record of",
  "job_title": "Construction Project Director",
  "job_description": "The Construction Project Director will oversee multiple construction projects, ensuring they meet all safety and quality standards. The ideal candidate should have experience with BIM software and Lean",
  "technical_skills": {
    "BIM software": "Revit",
    "Lean construction principles": "5S",
    "construction law": "contract management",
    "risk management": "safety protocols"
  },
  "soft_skills": ["negotiation", "interpersonal skills"]
},
{
  "resume": "John Doe is a recent graduate with a Bachelors degree in Computer Science. During his time at university, he completed projects in Java and Python, focusing on data structures and algorithms. He also completed a",
  "job_title": "Software Engineer",
  "job_description": "We are looking for a Software Engineer to join our team. The ideal candidate will have experience with C++, Python, and Java. They should be familiar with agile development methodologies and have a strong",
  "technical_skills": ["C++", "agile development methodologies", "React"]
}

```

Figure 7-Fine-Tuning Model

```

952     "problem-solving skills.",
953     "job_title": "Data Scientist",
954     "job_description": "Looking for a Data Scientist to join our team. The role involves using machine learning algorithms and
data mining techniques to analyze big data and provide insights. The ideal candidate will have experience with machine
learning frameworks (e.g., TensorFlow, PyTorch), big data technologies (e.g., Hadoop, Spark), and cloud services (e.g.,
AWS, Azure). Must have strong statistical analysis skills, the ability to communicate complex data in a simple way, and
experience in data-driven decision making.",
955     "technical_skills": [
956         "machine learning frameworks (e.g., TensorFlow, PyTorch)",
957         "big data technologies (e.g., Hadoop, Spark)",
958         "cloud services (e.g., AWS, Azure)"
959     ],
960     "soft_skills": [
961         "strong statistical analysis skills",
962         "ability to communicate complex data in a simple way",
963         "experience in data-driven decision making"
964     ]
965 },
966 {
967     "resume": "Human Resources Specialist with 7 years of experience in recruitment, employee relations, and performance
management. Proficient in HRIS systems and familiar with labor laws. Strong interpersonal and communication skills.",
968     "job_title": "Director of Human Resources",
969     "job_description": "Seeking a Director of Human Resources to oversee all aspects of human resources practices and
processes. The role involves developing HR strategies, managing talent acquisition, ensuring compliance with labor laws,
and implementing employee development programs. Must have experience with organizational development, compensation and
benefits planning, and diversity and inclusion initiatives. Requires exceptional leadership qualities, strategic thinking,
and the ability to handle sensitive information discreetly.",
970     "technical_skills": [
971         "organizational development",
972         "compensation and benefits planning",
973         "diversity and inclusion initiatives"
974     ],
975     "soft_skills": [
976         "exceptional leadership qualities",
977         "strategic thinking",
978         "ability to handle sensitive information discreetly"
979     ]
980 }

```

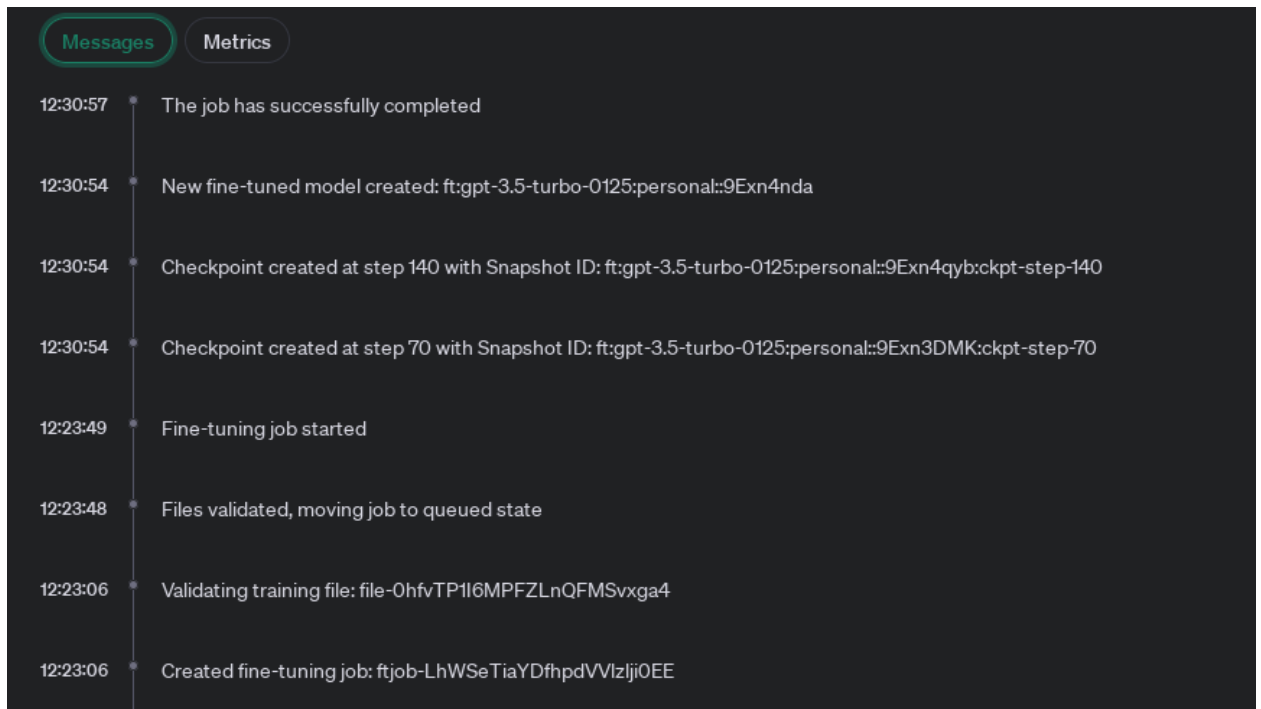
La After generating the dataset, we utilized the Fine-Tuning feature in the OpenAI dashboard.

This is a fine-tuned version of GPT-3.5-Turbo, made specifically for adding missing skills into resumes.

4, 12:23 PM

MODEL
ft:gpt-3.5-turbo-0125:personal::9Exn4nda ✓ Succeeded

🔍 Job ID	ftjob-LhWSeTiaYDfhpVlzlji0EE
📦 Base model	gpt-3.5-turbo-0125
📦 Output model	ft:gpt-3.5-turbo-0125:personal::9Exn4nda
🕒 Created at	Apr 17, 2024, 12:23 PM
⚙️ Trained tokens	70,929
🔄 Epochs	3
⚖️ Batch size	1
📶 LR multiplier	2
🔑 Seed	379396212



This fine-tuned model is great. It generates very good results even though it's just based on GPT-3.5-Turbo.





GPT-4o is the latest model released by OpenAI, happening just 2 weeks ago. It is the world's first natively multimodal flagship model. It can receive multiple input sources across audio, video, and text. For our use case, these are the reasons that compelled us to make the switch:

- It's 2X faster at inference than GPT-4, while being half the cost per token.
- Flagship level intelligence across a wide range of benchmarks

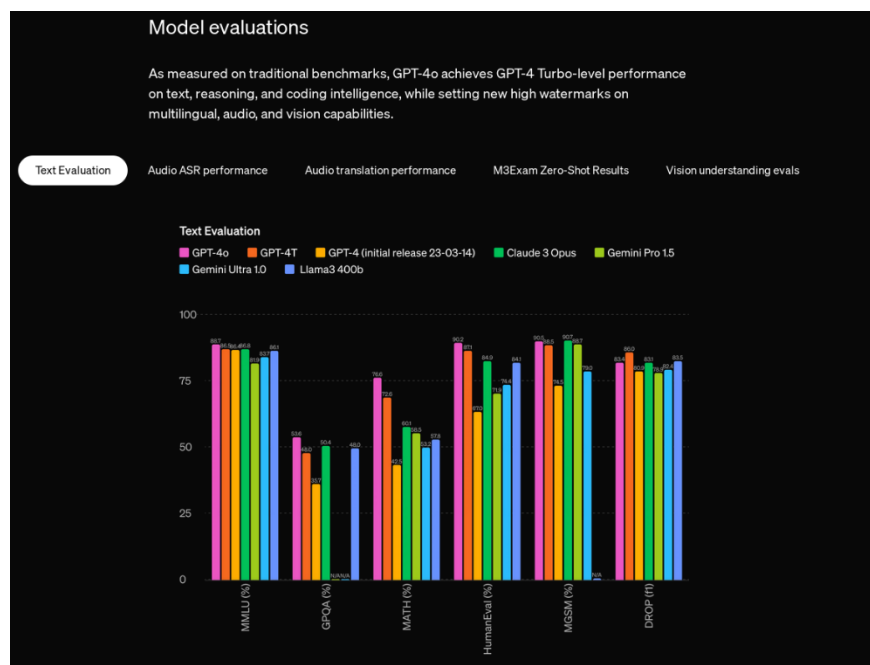


Figure 8-Gpt4O

- La Better performance across multiple languages, with a much smaller tokenizer.

Language tokenization	
These 20 languages were chosen as representative of the new tokenizer's compression across different language families	
Gujarati 4.4x fewer tokens (from 145 to 33)	હોલો, માત્ર નામ જીપીટી-4૦ છે. હું એક નવા પ્રકારનું ભાષા મોડલ છું. તમને મળીને સારું લાગ્યું!
Telugu 3.5x fewer tokens (from 159 to 45)	నమస్కారము, నా పేరు జీపీటి-4౦. నేను ఒక్క కొత్త రకమైన బాషా మోడల్ ని. మిమ్ముల్ని కలిసినందుకు సంతోషం!
Tamil 3.3x fewer tokens (from 116 to 35)	வணக்கம், என் பெயர் ஜிபிடி-4௦. நான் ஒரு புதிய வகை மொழி மாடல். உங்களை சந்தித்ததில் மகிழ்ச்சி!
Marathi 2.9x fewer tokens (from 96 to 33)	नमस्कार, माझे नाव जीपीटी-4० आहे। मी एक नवीन प्रकारची भाषा मॉडेल आहे। तुम्हाला भेटून आनंद झाला!
Hindi 2.9x fewer tokens (from 90 to 31)	नमस्ते, मेरा नाम जीपीटी-4० है। मैं एक नए प्रकार का भाषा मॉडल हूँ। आपसे मिलकर अच्छा लगा!
Urdu 2.5x fewer tokens (from 82 to 33)	ہیلو، میرا نام جی پی ٹی-40 ہے۔ میں ایک نئے قسم کا زبان ماڈل ہوں، آپ سے مل کر اچھا لگا!
Arabic 2.0x fewer tokens (from 53 to 26)	مرحبًا، اسمي جي بي تي-40. أنا نوع جديد من نموذج اللغة، سررت بلغاتك!
Persian 1.9x fewer tokens (from 61 to 32)	سلام، اسم من جی پی ٹی-۴۰ است. من یک نوع

In our testing, we found that it was often produced results that were better with just utilizing a detailed system prompt with a GPT-4o model than a Fine-tune of GPT-3.5-Turbo.

Speaking of our system prompts, here's the general overview of how we went into making the system prompt of the Skills Suggestions functionality:

IV.4.2 System prompt

The system prompt aims to rewrite the experiences section to make it more impactful, clear, and aligned with professional standards. The goal is to highlight the candidate's achievements, skills, and responsibilities effectively, making the CV more appealing to potential employers.

The system prompt of Skills Suggestions is divided into several sections:

IV.4.2.1 Objectif

-This subsection concisely states the overall goal of the task, which is to rewrite the experiences section of a CV to make it more impactful, clear, and aligned with professional standards.

- It highlights the importance of enhancing the content to effectively showcase the candidate's achievements, skills, and responsibilities, ultimately making the CV more appealing to potential employers.

IV.4.2.2 Instruction

The instructions emphasize understanding the context by retaining core details like job titles, company names, and employment dates, while tailoring the content to relevant job roles and highlighting applicable skills and achievements. Enhancing clarity and impact involves using action verbs, quantifying achievements when possible, and spotlighting key responsibilities and notable accomplishments.

IV.4.2.3 Input Format

- This subsection clearly defines the expected input format, which is a JSON structure containing an array of job experiences.

- Each job experience includes the job title, company name, and an array of strings representing bullet points describing the user's responsibilities in that role.

IV.4.2.4 Output Format

- This subsection specifies the desired output format, which is a JSON structure with an array of strings.

-Each string in the array represents multiple sentences separated by '\\n', where each sentence is an improved version of the original bullet point from the input.

IV.4.2.5 Exemple

- This subsection provides a concrete example to illustrate the expected input and output formats. It shows a sample input JSON with two job experiences and the corresponding desired output JSON with rewritten descriptions, following the specified formats

The instructions, input/output formats, and example work together to provide a comprehensive guide for enhancing the experience section of a CV, ensuring a clear understanding of the task and the expected outcome.

Overall, the system prompt demonstrates a significant amount of work and attention to detail in creating a comprehensive guide for enhancing the experience section of a CV. It covers input/output formats, provides examples, offers detailed instructions and considerations, and sets clear constraints to ensure the task is performed effectively. By utilizing an extremely specific and detailed system prompt we can ensure that our model's prediction is as high quality as is possible.

IV.4.3 Application Interface

IV.4.3.1 Authentification interface

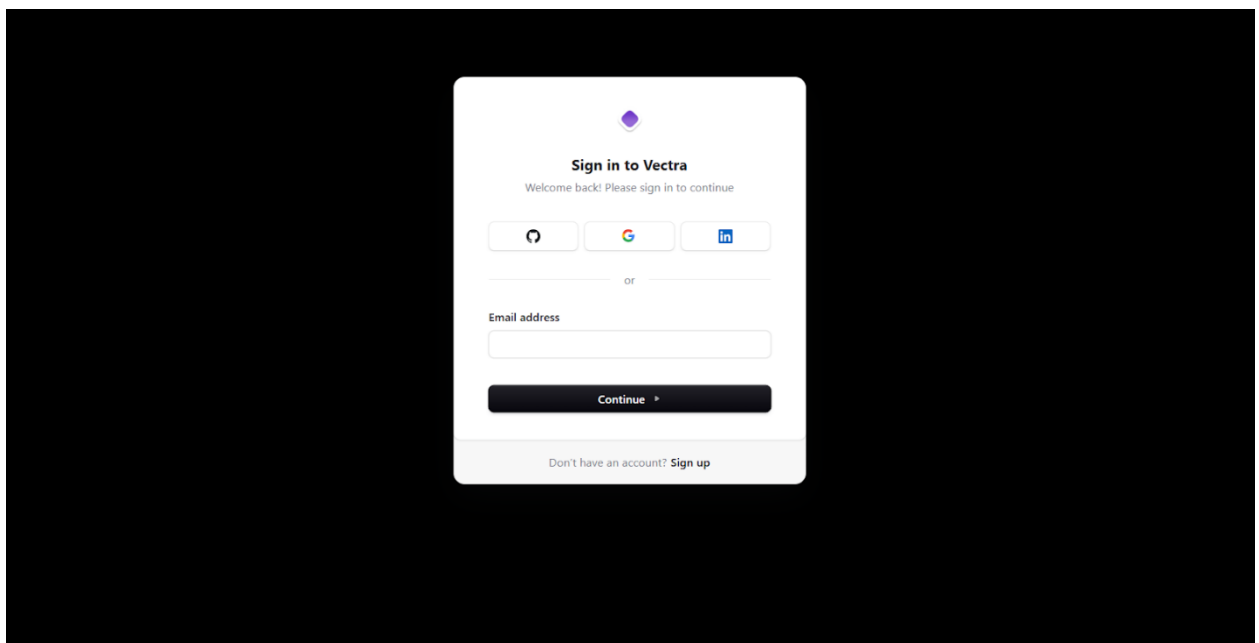
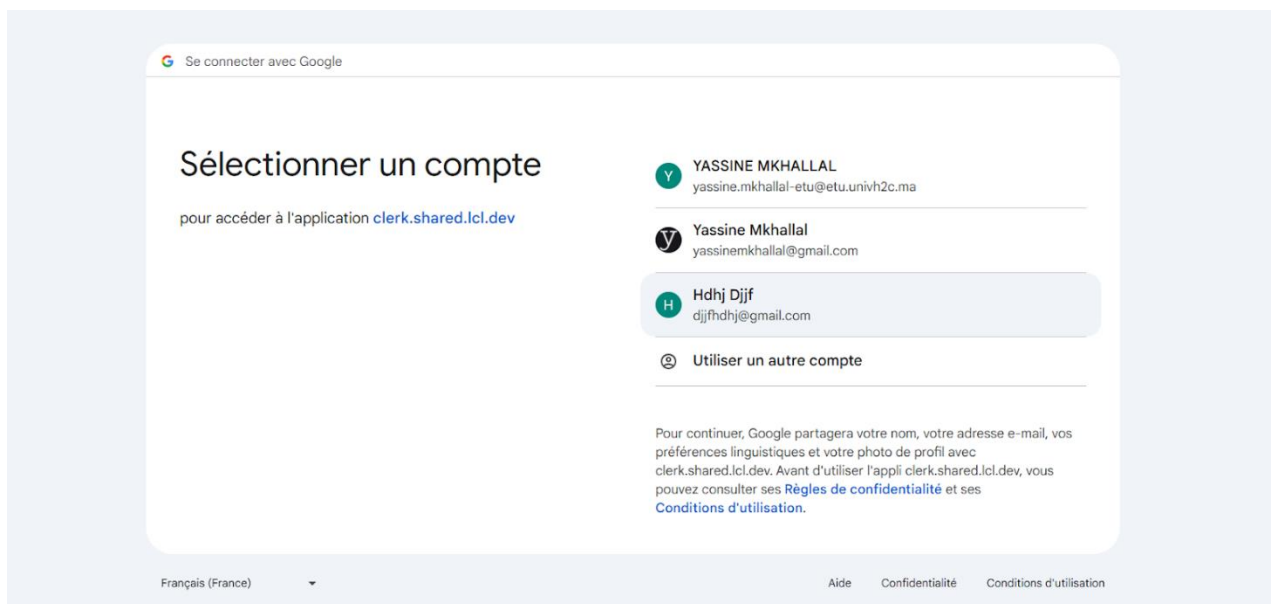


Figure 9-Authentification -Interface

The following page represents the authentication interface of our application. Authentication is made simple and secure by offering multiple sign-in options, including GitHub, Google, and LinkedIn accounts, as well as email-based login. By using Clerk as our authentication provider, we ensure that users can easily access our platform using their existing credentials from these popular services. This approach provides a smooth and convenient authentication experience for our users while leveraging the robust security measures offered by these external authentication systems.



IV.4.3.2 Uplaod CV interface

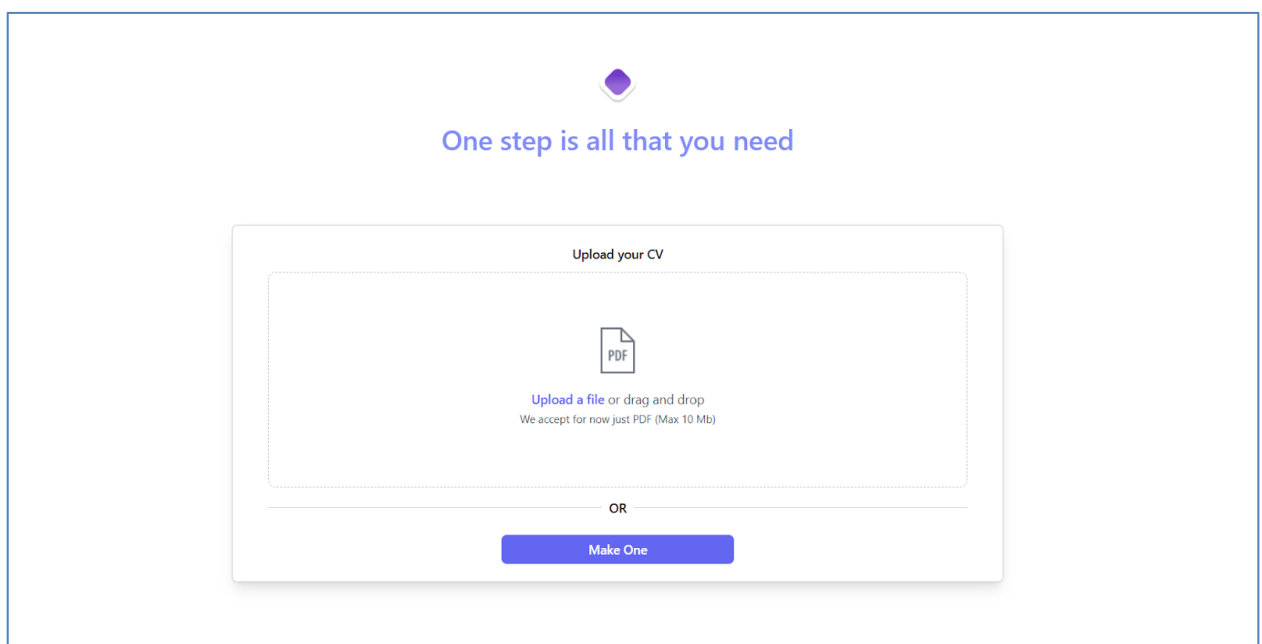
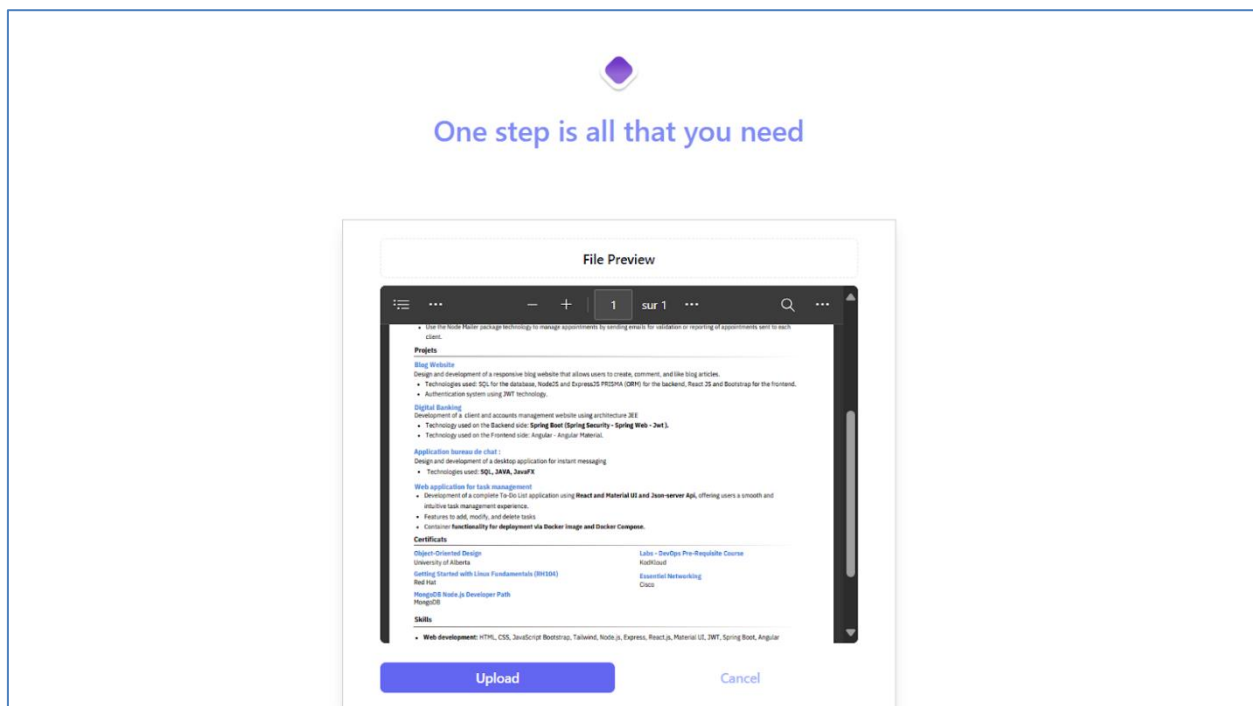
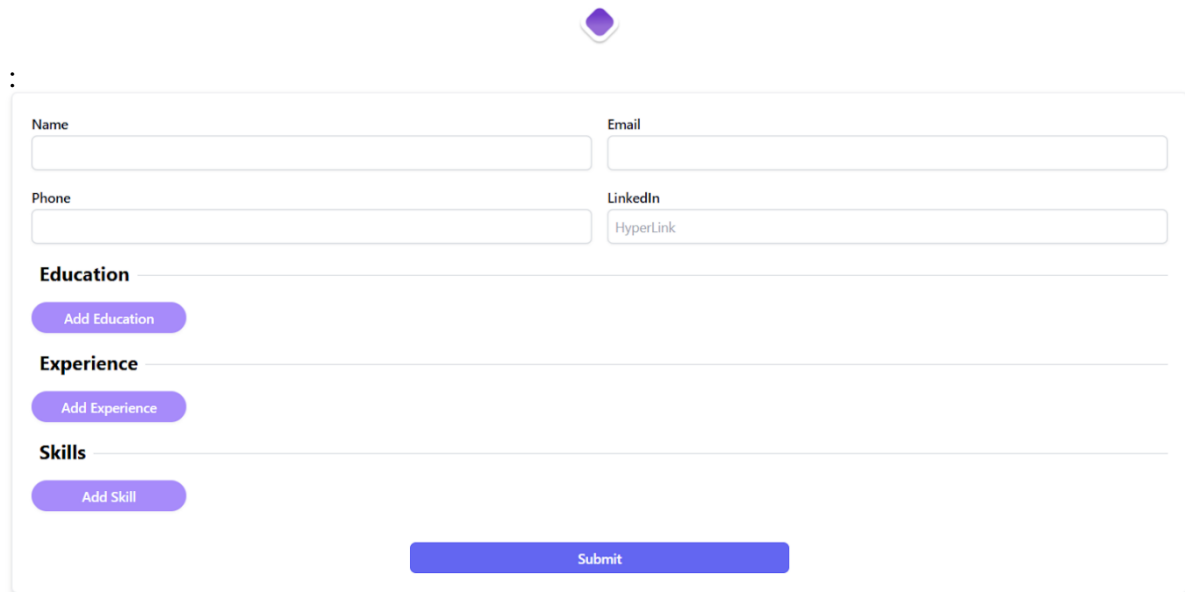


Figure 10-Upload CV Interface

Vectra supports two methods for clients to upload their CVs after authentication. The first method allows users to directly upload their CV via the intuitive interface, where they can drag and drop the file or select it from their device. Once uploaded, the server immediately processes the CV, extracting relevant information such as skills, experience, and education. This ensures that the data is ready for instant matching with job postings.



In the second option, users have the opportunity to manually input their CV information directly into the platform. The interface allows users to enter personal details such as name, email, phone number, and LinkedIn profile. Additionally, users can add sections for education, experience, and skills by clicking the corresponding "Add Education," "Add Experience," and "Add Skill" buttons. This approach does not generate a CV document but rather collects and organizes the information into a structured format within the Vectra system. This data is then used to match the user's profile with relevant job postings, ensuring that the job search process is tailored to their qualifications and experiences. This method provides flexibility for users who may not have an existing CV or prefer to enter their information in a guided manner.



The form is titled with a purple diamond icon. It contains the following fields and sections:

- Name**: Text input field.
- Email**: Text input field.
- Phone**: Text input field.
- LinkedIn**: Text input field with a "HyperLink" label.
- Education**: Section header with an "Add Education" button.
- Experience**: Section header with an "Add Experience" button.
- Skills**: Section header with an "Add Skill" button.
- Submit**: A large blue button at the bottom.

IV.4.3.3 Extension Interface

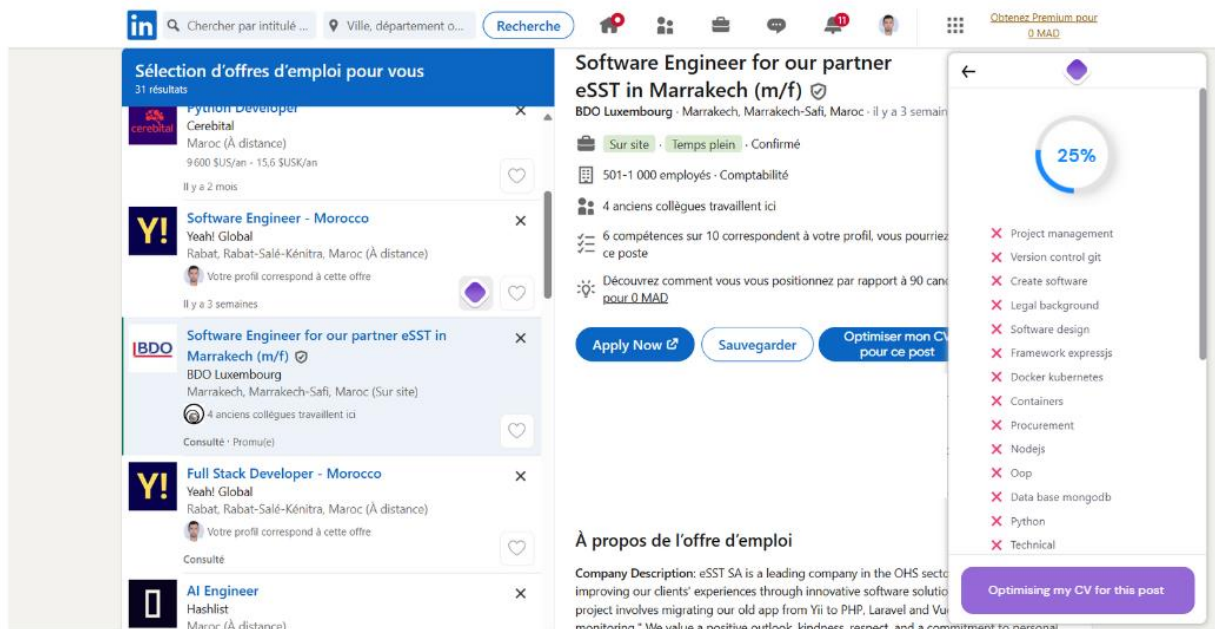


Figure 11-Interface-Extension

Vectra currently supports job offers exclusively from LinkedIn. Once a user uploads their CV, Vectra meticulously extracts the relevant information and skills. As the user navigates through LinkedIn job postings, the Vectra extension becomes visible, displaying a match percentage directly on the job listing. This immediate feedback informs

the user of how closely their CV aligns with the specific job requirements.

Upon clicking the Vectra extension, users are presented with a detailed analysis of their CVs compatibility with the job posting. This analysis includes a breakdown of the match percentage and highlights specific skills, experiences, or qualifications that may be lacking. This feature not only helps users pinpoint deficiencies in their CVs but also offers actionable suggestions for improvements. By providing such tailored feedback, Vectra enhances the user's ability to fine-tune their CV, thereby increasing the likelihood of securing relevant job opportunities.

Moreover, the extension's user-friendly interface ensures that the information is conveyed clearly and concisely. Users receive a comprehensive overview of what aspects of their CV need enhancement, be it additional skills, more experience, or specific qualifications. This targeted approach makes the job search process more efficient, allowing users to focus their efforts on the most relevant job opportunities and adjust their CVs accordingly for better alignment with job market demands.

IV.5 Deployment

For deployment, we first tried using Railway, which is a hosting service that provides managed infrastructure to make deploying projects a breeze, all you have to do it connect it with a Github repo and you're good to go.

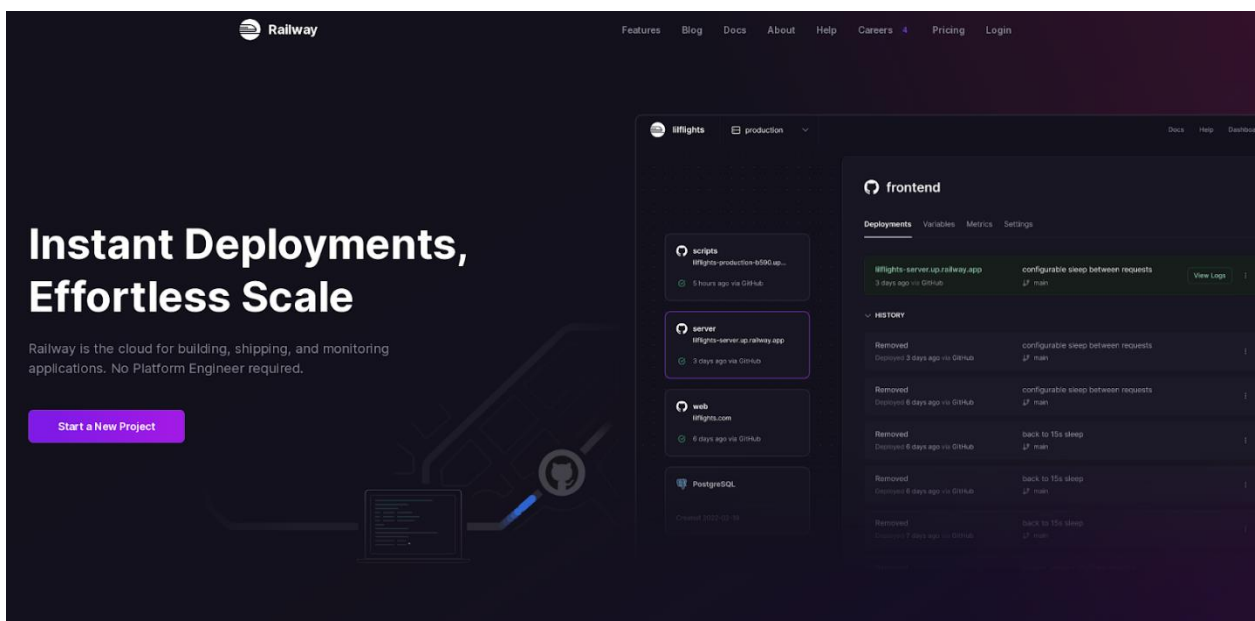
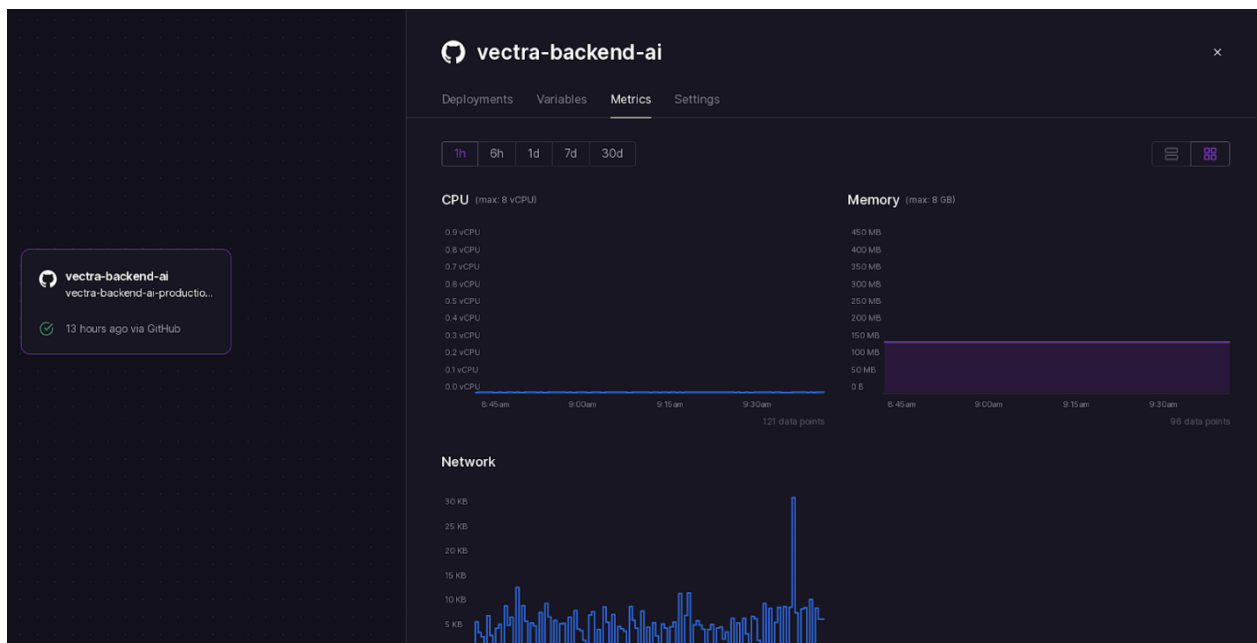
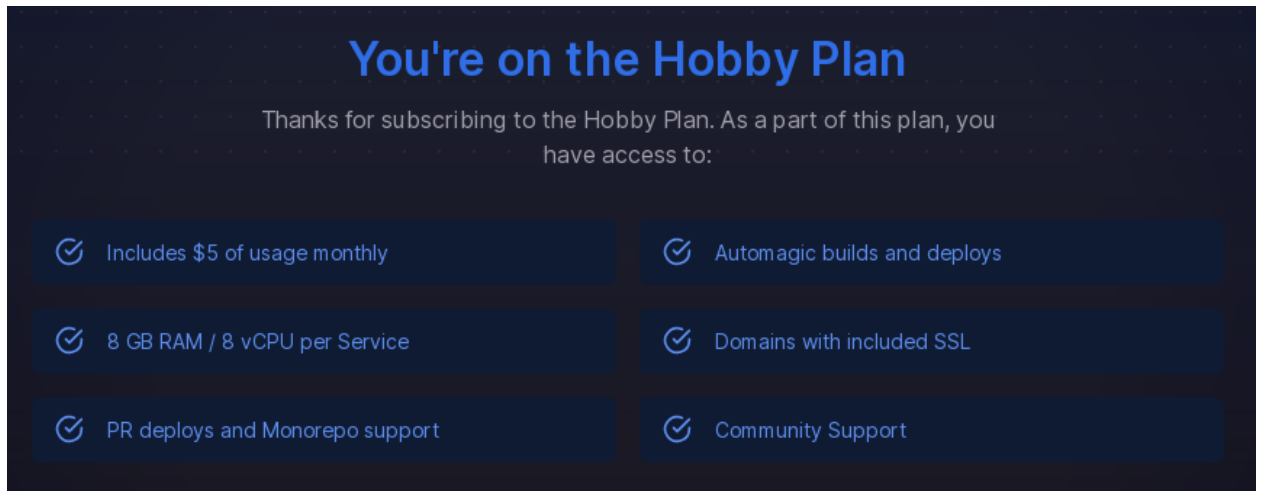


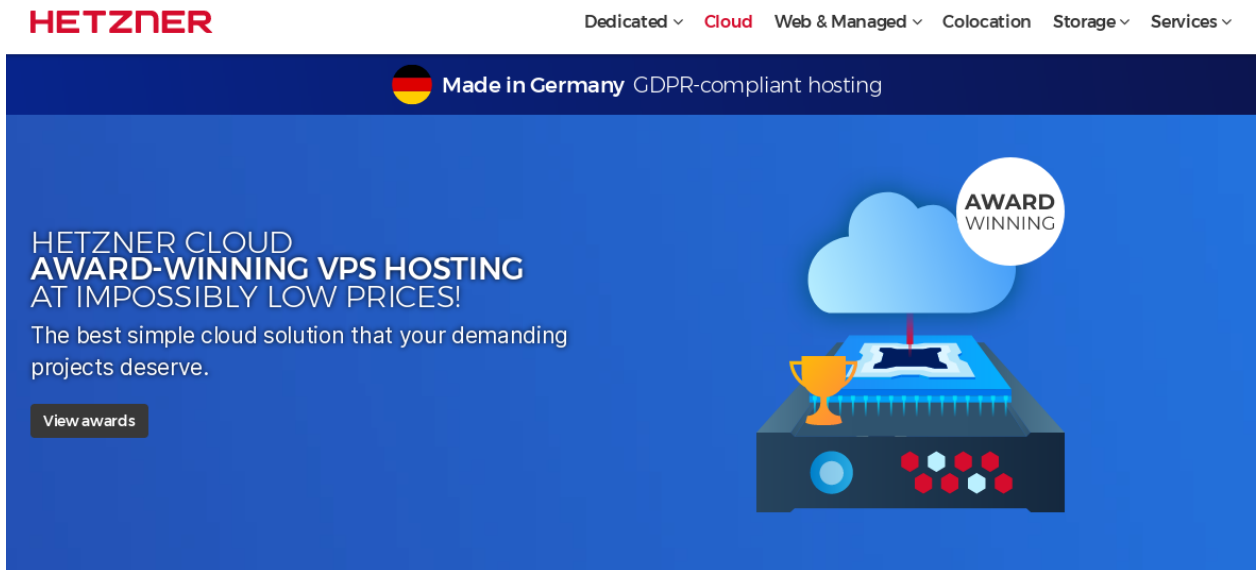
Figure 12-Deployment



But when we tried deploying our FastAPI server there, we found an issue related to domain assignment and host mapping for our server, so we had to pivot.

Hetzner: an incredible VPS solution

We landed on Hetzner, another cloud provider that specializes in providing virtual machines at exceptionally cheap prices.



We ended up provisioning a VPS that has the following specs:

```

root@my-hetzner-vps ~ (0.198s)
fastfetch

      .',;:::,,',
      .',;cccccccccc;,,
      .;cccccccccccccccccccc;.
      .:cccccccccccccccccccccc:.
      .;cccccccccccc;.dddl.;ccccccc;.
      .:cccccccccccccc;OWMK00XMWd;ccccccc;.
      .:cccccccccccccc;KMMc;cc;xMMc;ccccccc:.
      ,cccccccccccccc;MMM.;cc;WW;cccccccc,
      :cccccccccccccc;MMM.;cccccccccccccccc:
      :ccccccc;ox000o;MMM000k.;cccccccccccc:
      ccccc;0MMKxdd.;MMKddc.;cccccccccccc;
      ccccc;XM0';cccc;MMM.;cccccccccccccccc'
      ccccc;MMo;cccc;MMW.;cccccccccccccccc;
      ccccc;0MMc.ccc.xMMd;cccccccccccccccc;
      ccccc;dNMWXXWMM0.;cccccccccccccccc;,
      cccccccc;.odl.;ccccccccccccccc;,.
      cccccccccccccccccccccccccccccccc:'.
      :ccccccccccccccccccccccccccc;,,.
      ':ccccccccccccccccccc;,,.

root@my-hetzner-vps
-----
OS: Fedora Linux 40 aarch64
Host: vServer (20171111)
Kernel: 6.8.10-300.fc40.aarch64
Uptime: 12 hours, 58 mins
Packages: 722 (rpm)
Shell: bash 5.2.26
Display (QEMU Monitor): 1024x768 @ 75Hz
Terminal: /dev/pts/0
CPU: Neoverse-N1 + NotSpecified (2)
GPU: RedHat Virtio 1.0 GPU
Memory: 884.00 MiB / 3.71 GiB (23%)
Swap: Disabled
Disk (/): 7.03 GiB / 37.41 GiB (19%) - ext4
Local IP (eth0): 157.90.245.6/32 *
Locale: en_US.UTF-8

```

Figure 13-Amper Ultra VM

We got an Ampere Altra CPU with 2 vCPUs and 4GB of RAM, as well as 40GB of disk space.

We deployed our FasAPI application on the VM, then used Nginx as a reverse proxy to our web server.


```

root@my-hetzner-vps ~
systemctl status nginx

● nginx.service - The nginx HTTP and reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset: disabled)
   Drop-In: /usr/lib/systemd/system/service.d
            └─10-timeout-abort.conf
            /etc/systemd/system/nginx.service.d
            └─php-fpm.conf
   Active: active (running) since Sun 2024-05-26 19:54:21 UTC; 13h ago
     Process: 968 ExecStartPre=/usr/bin/rm -f /run/nginx.pid (code=exited, status=0/SUCCESS)
     Process: 972 ExecStartPre=/usr/sbin/nginx -t (code=exited, status=0/SUCCESS)
     Process: 975 ExecStart=/usr/sbin/nginx (code=exited, status=0/SUCCESS)
    Main PID: 977 (nginx)
      Tasks: 2 (limit: 4413)
     Memory: 866.9M (peak: 867.5M)

```

```

root@my-hetzner-vps:~ (0.128s)
systemctl status fastapi

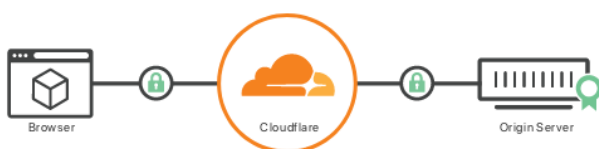
● fastapi.service - FastAPI Application
   Loaded: loaded (/etc/systemd/system/fastapi.service; enabled; preset: disabled)
   Drop-In: /usr/lib/systemd/system/service.d
            └─10-timeout-abort.conf
   Active: active (running) since Sun 2024-05-26 20:00:42 UTC; 12h ago
    Main PID: 2547 (fastapi)
      Tasks: 6 (limit: 4413)
     Memory: 67.1M (peak: 68.1M)

```

For our domains, we utilized Cloudflare as it provides simple utilities for handling DNS, subdomains, and end-to-end encryption (which our application supports!).

✓ Your SSL/TLS encryption mode is Full (strict)

This setting was last changed 7 months ago



- ☐ Off (not secure) ⓘ
No encryption applied
- ☐ Flexible
Encrypts traffic between the browser and Cloudflare
- ☐ Full
Encrypts end-to-end, using a self signed certificate on the server
- ☒ **Full (strict)**
Encrypts end-to-end, but requires a trusted CA or Cloudflare Origin CA certificate on the server

Learn more about [End-to-end encryption with Cloudflare](#).

Chapitre V. Reflection

V.1 Introduction

The concluding chapter of this report reflects on the Vectra project in many respects, an exercise that has really stretched our technical capabilities and our imagination. This reflection not only identifies some major lessons learned in the development of the project but also talks about the challenges and triumphs we went through. It will address a number of key points that played leading roles in giving Vectra a final shape and offer a critical point of view related to the journey of the project from conception to completion.

V.2 Impact

The Vectra project has had a significant impact by streamlining and enhancing the resume-building process for job seekers. By providing intuitive and interactive features for resume optimization based on job offers, Vectra has brought substantial benefits and opportunities for professional development.

One of the most important impacts of our project is the empowerment of job seekers. Vectra facilitates the creation of tailored resumes that match specific job requirements, thereby increasing the chances of securing employment. By leveraging machine learning, Vectra offers personalized suggestions for improving resume content, identifying missing skills, and recommending resources to acquire these skills. This has enabled users to present themselves more effectively to potential employers.

For users, Vectra has created a dynamic and supportive environment. The extension encourages proactive engagement with job listings, allowing users to continuously update and refine their resumes based on real-time job market demands. This not only boosts their confidence but also enhances their employability by ensuring their resumes are aligned with industry standards and expectations. The interactive interface and real-time feedback have made the resume-building process more engaging and efficient, helping users to feel more connected to their career development journey.

On an administrative level, Vectra has the potential to streamline HR processes for companies as well. By enabling job seekers to better tailor their resumes, employers receive more relevant applications, which can reduce the time and effort required for screening candidates. This can lead to more efficient hiring processes and better job matching, ultimately benefiting both employers and job seekers.

Overall, Vectra has fostered a sense of empowerment and motivation among its users. By providing a tool that enhances their ability to compete in the job market, Vectra has helped users to develop their professional skills and take control of their career paths. The positive feedback from early users and industry professionals highlights the significant value that Vectra adds to the job application process, positioning it as a transformative tool in the realm of career development.

V.3 Perspectives

The Vectra project has truly opened up exciting new perspectives for the future of career development and job application processes. With our innovative extension, we have laid the groundwork for a dynamic, interactive, and user-focused platform that enhances resume optimization. However, our work doesn't stop here. In reality, this is just the beginning of an adventure filled with possibilities and discoveries.

Un Personalized Learning and Skill Development

- **Enhanced Recommendation System:** We plan to expand Vectra's capabilities by integrating a more sophisticated recommendation system that not only suggests skills and keywords but also offers personalized learning paths. Users will receive tailored course recommendations from platforms like Coursera or Udemy, helping them acquire the skills needed to match job requirements.

Interactive Features and Gamification

- **Gamification and Rewards:** Introducing a system of badges and points to reward users for their engagement with the platform. For example, users could earn badges for completing resume updates, integrating suggested skills, or applying to a certain number of jobs. This would encourage continuous improvement and make the job application process more engaging.

Community and Networking

- **Community Interaction:** Implementing a "User of the Month" feature to recognize and

celebrate the most proactive users. Criteria could include the number of applications submitted, the number of skills updated, and the feedback received from job interviews. This would foster a sense of community and healthy competition among users.

Advanced Technologies

- **Virtual Reality for Interviews:** Exploring the use of virtual reality (VR) to simulate job interviews and networking events. This feature would allow users to practice their interview skills in a realistic, immersive environment, helping them prepare more effectively for real-life scenarios.

Enhanced Support and Assistance

- **AI-Powered Chatbot:** Developing an AI-powered chatbot to provide instant assistance to users. This chatbot could answer questions about resume optimization, suggest resources, and guide users through the platform, reducing the workload on our support team and offering quick, efficient help.

Collaboration with Educational Institutions

- **Integration with Academic Institutions:** Allowing educators to create specialized groups or clubs related to their fields of expertise. This would encourage deeper exploration of specific subjects and foster active learning. Educators, with their extensive knowledge, can share their passion and insights, creating an environment conducive to intellectual growth and knowledge deepening.

By implementing these forward-looking features, Vectra aims to become a comprehensive tool that not only assists in resume optimization but also supports continuous learning and career development. We envision Vectra evolving into a platform that not only prepares users for the job market but also empowers them to achieve long-term professional growth and success.

V.4 Recommendations

To ensure the continued success and improvement of the Vectra extension, several recommendations should be considered:

4.1 Regular User Feedback Collection

First, it is essential to establish a mechanism for regularly collecting feedback from users. This could include surveys, feedback sessions, or informal discussions aimed at gathering user comments. This feedback is invaluable for identifying the strengths of Vectra and areas needing improvement. By adjusting and optimizing the extension based on real user needs, we can ensure a satisfactory user experience.

4.2 Training and Awareness Plan

Second, a comprehensive training and awareness plan should be implemented to maximize adoption and usage of the extension. This plan should be targeted at job seekers, career counselors, and HR professionals. Initial training sessions, online resources, user guides, and clear, accessible communication materials will help familiarize users with Vectra's features and benefits. Adequate training promotes optimal use of the extension and allows users to fully leverage its capabilities.

4.3 Continuous Maintenance and Support

Third, ensuring the sustainability and continuous maintenance of Vectra is crucial. A dedicated technical maintenance team should be established to address technical issues, update the extension based on emerging needs, and ensure data security. Continuous technical support will provide a smooth and uninterrupted user experience, strengthening user confidence in the extension.

4.4 Active Engagement and Incentives

Next, it is recommended to actively encourage the engagement of users in improving their resumes and learning new skills. Recognizing user achievements, offering incentives for active participation, and providing both educational and technical support are key actions to foster engagement. Users who are actively involved in their career development journey inspire others and contribute to the dynamic nature of the Vectra community.

4.5 Monitoring and Evaluation Mechanisms

Finally, it is important to establish monitoring and evaluation mechanisms to measure the impact of the Vectra extension. Collecting data on user engagement, job

application success rates, user satisfaction, and other relevant metrics will help evaluate the extension's effectiveness. These measures will also identify areas for further improvement, ensuring the continuous evolution and adaptation of Vectra to meet user needs.

By integrating these recommendations, we can solidify the success and growth of the Vectra project as a catalyst for change, a driver of innovation, and an enabler of professional development. This will provide an inspiring user experience and help job seekers realize their full potential.

V.5 Difficultés rencontrées

Implementing the Vectra project posed several significant challenges. A huge difficulty was integrating Vectra with job platforms like LinkedIn and Indeed, which had varying APIs and web structures. This presented complexity in developing a modular API integration framework to handle varied data formats, ensuring seamless data retrieval and processing. Additionally, ensuring the security and privacy of user data, especially sensitive resume information, was paramount. We addressed this through the implementation of robust encryption protocols for both data storage and transmission, and adherence to stringent data privacy practices, including anonymizing user data where possible and obtaining explicit user consent for data usage.

Another problem was that of developing an **accurate and reliable machine learning model** capable of analyzing resumes and job descriptions across a number of industries. This requires both large and diverse datasets for training and continuous model validation by real-world data. We also integrated feedback from users to refine the model to improve in accuracy and relevance.

Designing an intuitive and user-friendly interface also posed a problem: it was crucial for Vectra to be adopted and used regularly. Extensive user research and usability testing informed the design process to give it a clean and simple interface that makes complex tasks easy. Other features like the capability for drag-and-drop resume uploading, real-time suggestions, and interactive dashboards were implemented for improving the user experience.

These challenges could not deter us from developing a strong and reliable extension by employing customized solutions and strategies. These tests were not only for technical expertise but also learned the importance of ensuring the product would meet users' needs and provide tremendous value in the resume-building process.

V.6 Skills Acquired

Throughout the Vectra project, we have acquired a range of skills, both personal and professional, contributing to our individual development and expertise as software engineers.

On a personal level, our ability to work effectively in a team has been significantly enhanced. Collaborating with other team members on Vectra, we learned to actively listen, share our ideas, consider others' perspectives, and work collectively towards a common goal. This experience strengthened our sense of cooperation, communication, and teamwork—essential skills in the professional world.

Professionally, we have honed our project management skills by following the necessary steps and processes required for a successful project. We gained a deep understanding of planning, organizing, resource management, and progress tracking. Additionally, we improved our time management and problem-solving abilities by overcoming the various challenges encountered during the project.

Moreover, we developed new technical skills specific to our field of software engineering. Working on Vectra allowed us to explore and implement relevant technologies and tools. These technical skills are valuable and will be beneficial in our professional journey as software engineers.

Overall, our participation in the Vectra project has enabled us to acquire personal skills such as collaboration, communication, and teamwork, as well as professional skills in project management and information technology. These enhanced skills will contribute to our personal and professional growth, preparing us to tackle new challenges and succeed in our careers as software engineers.

V.7 Conclusion

This chapter has provided a comprehensive reflection on the Vectra project by examining its impacts and the skills acquired during its implementation. We have seen that the project has met its objectives by optimizing and enhancing resumes according to job offers, offering significant benefits to users.

The engagement of users has been increased, communication between job seekers and potential employers has been improved, and the process of creating and updating resumes has been streamlined.

In terms of skills, we have acquired personal attributes such as collaboration, communication, and teamwork, which will be invaluable in our professional journey. Additionally, we have developed professional skills in project management and information technology, specific to our field of software engineering.

Our work on Vectra not only showcased our ability to create innovative solutions but also reinforced our commitment to continuous learning and professional development, setting a solid foundation for our future endeavors in the tech industry.

General Conclusion

Vectra is a proof of our dedication and commitment as software engineering students. By using the latest machine learning technologies, we have designed and developed an extension that optimizes and enhances resumes based on job offers, hence meeting a big need in the job market.

This project has given us priceless experience in project management, team collaboration, and problem-solving. We have successfully solved the problems that the design and development of Vectra posed by applying the skills and knowledge acquired throughout our academic life. Vectra is not only a software extension but a manifestation of our creativity, perseverance, and determination to contribute something positive in the professional world.

By streamlining the customization process of resumes, our platform enables better job matching, hence improving the experience of job seekers and employers.

We feel proud of the results achieved and the improvements done through this project. We are very sure that Vectra will become a valuable tool for both job seekers and employers, which offers a dynamic and efficient solution for the resume optimization process.

However, we must never forget that the major drawback of our project is the absence of the study of further integration possibilities with other job application platforms to enhance the interoperability and extend the scope of reach for our extension.

Moreover, ensuring the security and confidentiality of users' data is a vital issue that should be taken care of and upgraded with changes in the days to come.

Additional features, such as advanced analytics for resume performance, AI-driven career advice, and enhanced customization options to better cater to the unique needs of the user, may be considered.

Passing through this project has been a great experience that has contributed much towards the development of a person and further engineers. We would like to thank our institution and each one who supported us in this regard. We hope that Vectra will continue to improve and act as a spur for innovations, efficiency, and enhancement of improvement in the job application process.

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