AN AI-POWERED WEB APPLICATION FOR RESUME EXTRACTION AND JOB CLASSIFICATION

An Industry Oriented Mini Project Report submitted to
Jawaharlal Nehru Technological University
in partial fulfillment of the requirements for the award of Degree of

BACHELOR OF TECHNOLOGY
in
Computer Science and Engineering

Submitted by

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Under the Guidance of

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June,2025

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CERTIFICATE

This is to certify that Industry Oriented Mini Project entitled "**AN AI-POWERED WEB APPLICATION FOR RESUME EXTRACTION AND JOB CLASSIFICATION**" is being presented with report by **CH.Navya Sri** bearing Roll.No.**22WJ1A0551** in partial fulfillment for the award of Degree of Bachelor of Technology in **Computer Science & Engineering** to the Jawaharlal Nehru Technological University is a record of Bonafide work carried out them under my guidance and supervision.

The results embodied in this project report have not been submitted to any other University or Institute for the award of any Degree or Diploma.

.

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PROJECT COMPLETION CERTIFICATE

This is to certify that the following student of final year B.Tech, Department of Computer Science and Engineering - Guru Nanak Institutions Technical Campus (GNITC) has completed her training and project at GNITC successfully.

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The training was conducted on Python Technology for the completion of the project titled AN AI-POWERED WEB APPLICATION FOR RESUME EXTRACTION AND JOB CLASSIFICATION in June 2025. The project has been completed in all aspects.

RAM INNOVATIVE INFOTECH HYD ★

[illegible]
Signature

Declaration of Student

I ,CH. Navya Sri (22WJ1A0551), hereby declare that the major project titled “AN AI-POWERED WEB APPLICATION FOR RESUME EXTRACTION AND JOB CLASSIFICATION” has been carried out by us as part of the requirements for the award of the Degree of B. Tech in the Department of Computer Science and Engineering at Guru Nanak Institutions Technical Campus.

We confirm the following:

1. The project was undertaken by us under the supervision of our guide, Mr. Lalu Bonothu, from the selection of the topic to the completion of the final report.
2. We have ensured that the results presented in the report are accurate and based on our original work.
3. Each member of the team has contributed significantly and appropriately to the project work.
4. The project report has been prepared with diligence, ensuring clarity, accuracy, and adherence to academic standards.

We further declare that this report has not been submitted, in part or full, to any other institution or university for the award of any degree or diploma.

CH.Navya Sri Signature

22WJ1A0551

Date:

Place:

Declaration of Guide

I, Mr. Lalu Banothu, hereby declare that I have guided the Industry Oriented Mini Project titled "An AI-Powered Web Application for Resume Extraction and Job Classification" undertaken by CH. Navya Sri 22WJ1A0551. This project was carried out towards the fulfillment of the requirements for the award of the Degree of B. Tech in Department of Computer Science and Engineering at Guru Nanak Institutions Technical Campus.

As the guide, I confirm the following:

1. I have overseen the entire project process, from the selection of the project title to the submission of the final report.
2. I have reviewed and certified the accuracy and relevance of the results presented in the report.
3. The contributions of each student have been appropriately recognized and assessed.
4. The project report has been prepared under my supervision, ensuring adherence to high standards of quality, clarity, and structure.

I further certify that this project report has not been previously submitted in part or full for the award of any degree or diploma by any institution or university.

Name of Guide: Mr. Lalu Banothu Signature of the Guide

Date:

Place:

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to our internal guide, **Mr. Lalu Banothu, Associate Professor of Computer Science and Engineering**, for his/her valuable guidance, encouragement, and continuous support throughout the duration of this project.

We are very much grateful to our Project Coordinator, **Mr. Mohd Irfan, Assistant Professor of CSE, GNITC**, Hyderabad, who is not only shown utmost patience but was fertile in suggestions, vigilant in directions of error, and have been infinitely helpful.

We were also thankful to **Dr. Geeta Tripathi, Professor & HOD CSE, GNITC**, Hyderabad, for being so helpful with valuable insights and guidance during our project.

We wish to express our sincere thanks to **Dr. Rishi Sayal, Professor in CSE & Associate Director, GNITC** for providing us with the conductive environment for carrying through our academic schedules and project with ease.

On a more personal note, we thank our beloved parents and friends for their moral support during our project.

CH. Navya Sri 22WJ1A0551

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ABSTRACT

This project implements an AI-powered resume parser using deep learning techniques and a Flask web application. The system enables users to upload resumes in PDF format, automatically extracting key information such as name, email, phone number, job title, skills, and education details. The backend leverages a trained neural network model built with TensorFlow/Keras to analyze the text from resumes, classifying the job title and identifying key skills and educational qualifications based on predefined keywords and patterns.The core of the application involves text extraction from PDF files using the pdfplumber library, followed by text preprocessing to clean and tokenize the content. The system uses a deep learning model that was trained on labeled resume data to predict job titles and extract other relevant details. Once the information is parsed, it is displayed on the web interface for the user. Additionally, the extracted data can be downloaded in multiple formats, including CSV and JSON, for further analysis or storage.Through a user-friendly interface built with Flask, users can upload resumes, view parsed results, and download the parsed information in structured formats. The system also includes a search feature, allowing users to query the parsed resumes based on job titles, skills, or education. This project provides a robust solution for automating the extraction of valuable information from resumes, making it a useful tool for HR departments, recruitment agencies, and job seekers.

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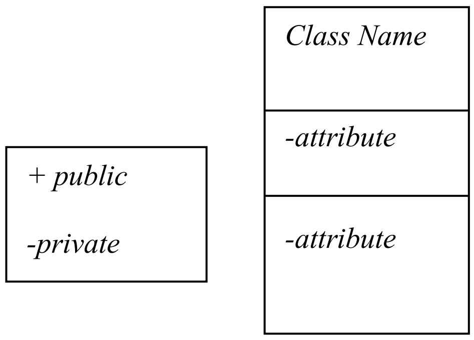
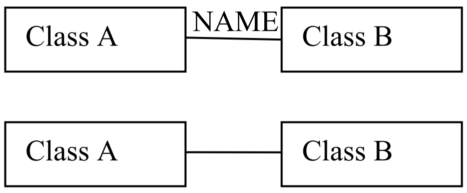
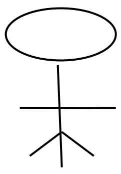
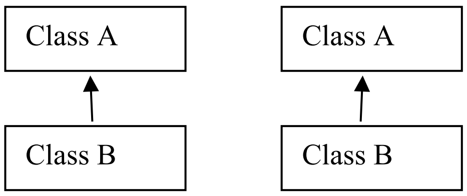
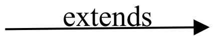
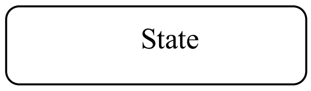
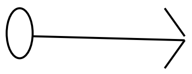
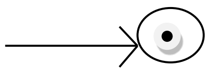
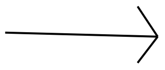
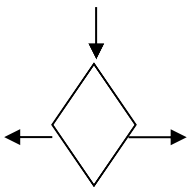
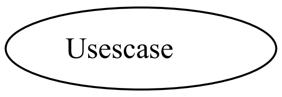
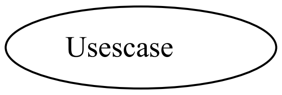
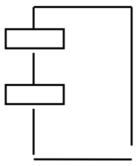
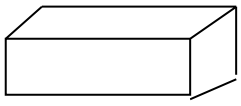
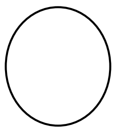
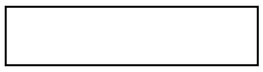
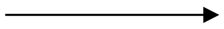
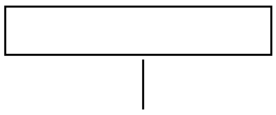
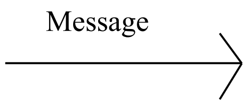
LIST OF ABBREVATION

S.NO	ABBREVATION	EXPANSION
1.	ML	Machine Learning
2.	SVM	Support Vector Machine
3.	COMPUTER VISION & IMAGE PROCESSING TECHNIQUES	Convolutional Neural Networks
4.	ANN	Artificial Neural Networks
5.	AI	Artificial Intelligence
6.	DNN	Deep Neural Networks

LIST OF SYMBOLS

S.NO	NOTATION NAME	NOTATION	DESCRIPTION
1.	Class	 Class Name -attribute -attribute + public -private	Represents a collection of similar entities grouped together.
2.	Association		Associations represents static relationships between classes. Roles represents the way the two classes see each other.
3.	Actor		It aggregates several classes into a single classes.
4.	Aggregation		Interaction between the system and external environment

5.	Relation (uses)	uses	Used for additional process communication.
6.	Relation (extends)		Extends relationship is used when one use case is similar to another use case but does a bit more.
7.	Communication		Communication between various use cases.
8.	State		State of the processs.
9.	Initial State		Initial state of the object
10.	Final state		F inal state of the object
11.	Control flow		Represents various control flow between the states.
12.	Decision box		Represents decision making process from a constraint
13.	Usecase		Interact ion between the system and external environment.

13.	Usecase		Interact ion between the system and external environment.
14.	Component		Represents physical modules which are a collection of components.
15.	Node		Represents physical modules which are a collection of components.
16.	Data Process/State		A circle in DFD represents a state or process which has been triggered due to some event or acion.
17.	External entity		Represents external entities such as keyboard,sensors,etc.
18.	Transition		Represents communication that occurs between processes.
19.	Object Lifeline		Represents the vertical dimensions that the object communications.
20.	Message		Represents the message exchanged.

CHAPTER 1
INTRODUCTION

1.1GENERAL

In today’s fast-paced job market, efficient and accurate resume screening is crucial for both recruiters and job seekers. Traditional resume parsing systems rely on keyword-based approaches, which often fail to capture the complexities of modern resumes with varied structures and formats. To address these limitations, this project introduces an AI-powered resume parser, leveraging deep learning and natural language processing (NLP) to extract and classify key details from resumes with high accuracy. The system enables users to upload resumes in PDF format, automatically extracting essential information such as name, email, phone number, job title, skills, and educational qualifications. Built using Flask, the web-based application offers a user-friendly interface where parsed results are displayed and can be downloaded in structured formats like CSV and JSON for further analysis. By integrating PDFPlumber for text extraction and a trained neural network for classification, the proposed system significantly enhances resume processing efficiency, making it a valuable tool for HR departments, recruitment agencies, and job seekers.

1.2 OBJECTIVE

The primary objective of this project is to develop an AI-powered web application that automates the process of resume parsing and job classification. The system aims to enhance the accuracy and efficiency of extracting key information such as name, contact details, job title, skills, and education from resumes submitted in PDF format. By leveraging Natural Language Processing (NLP), deep learning models, and PDFPlumber for text extraction, the project seeks to overcome the limitations of traditional keyword-based and rule-based resume parsers. The application provides a user-friendly interface where users can upload resumes, view structured parsed data, and download the extracted information in CSV or JSON formats for further analysis. This project is designed to benefit HR professionals, recruitment agencies, and job seekers by streamlining the resume screening process and improving candidate-job matching.

1.3 Existing System:

The existing systems for resume parsing often rely on traditional keyword-based approaches or rule-based algorithms to extract and classify information from resumes. These systems generally focus on identifying specific keywords or patterns within resumes to determine job titles, skills, contact information, and educational background. However, such systems can struggle with handling complex and unstructured data, especially when dealing with varied resume formats or layouts. The reliance on predefined rules or keyword lists also limits their flexibility, as they cannot easily adapt to new, unseen resumes or handle the nuances of natural language.Many existing resume parsers use simple methods for text extraction, such as Optical Character Recognition (OCR) or text scraping, to capture content from PDF or Word documents. These approaches can often result in poor text extraction quality, particularly when the formatting is inconsistent or the document includes images, tables, or complex structures.

1.3.1 Disadvantages:

- Accuracy of Text Extraction (OCR Limitations)
- ML Limitations
- Complexity in Handling Unstructured Data

1.3.2LITERATURE SURVEY:

Title: Deep Learning-Based Resume Parsing and Classification

Author: Patel et al.

Year:2021

Description:

Patel and his team investigated the effectiveness of deep learning models in resume parsing, comparing Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks. Their findings indicated that LSTMs outperform CNNs in identifying unstructured resume information, particularly in classifying skills, job titles, and experience levels. They also emphasized the importance of labeled datasets for training deep models, noting that data preprocessing significantly impacts model accuracy.

Title: AI-Powered NLP Techniques for Resume Information Extraction

Author: Gupta & Sharma

Year: 2022.

Description:

This study explored the use of Natural Language Processing (NLP) techniques such as Named Entity Recognition (NER) and Part-of-Speech (POS) tagging to extract structured data from resumes. Gupta and Sharma implemented spaCy and BERT-based models, finding that BERT achieved an accuracy of 92%, outperforming traditional NLP methods. They concluded that pretrained transformer models are highly effective for resume parsing but require significant computational resources for deployment.

Title: Enhancing Resume Screening with Machine Learning and OCR

Author: Rajan et al.

Year: 2023.

Description:

Rajan and his team developed a resume parsing system using Optical Character Recognition (OCR) and machine learning to extract information from scanned PDFs. They integrated Tesseract OCR with a Random Forest classifier to identify candidate names, skills, and education with 85% accuracy. Their research highlighted OCR's limitations in handling low-quality or misaligned resumes, suggesting that hybrid models combining deep learning with OCR yield better results.

Title: Intelligent Resume Matching Using BERT and Transformer Models

Author: Das et al.

Year: 2022.

Description:

Das and colleagues proposed an AI-powered resume matching system leveraging BERT and Transformer-based embeddings to classify job roles based on resumes. They trained their model on a dataset of 100,000 resumes, achieving a precision of 89% in matching candidates to job descriptions. Their research demonstrated that context-aware embeddings improve resume classification, making AI-based approaches more suitable than traditional TF-IDF and keyword-based methods.

Title: A Hybrid Approach for Automated Resume Parsing Using NLP and ML

Author: Mehta & Verma

Year: 2024.

Description:

This study introduced a hybrid AI model combining machine learning classifiers and NLP-based entity recognition for resume parsing. Mehta and Verma tested Support Vector Machines (SVM) and Random Forest for categorizing resumes, achieving 90% accuracy in extracting skills, experience, and job roles. They noted that NLP-based preprocessing, including tokenization and lemmatization, significantly improves feature extraction, making hybrid models more effective than standalone ML classifiers.

1.4 Proposed System

The proposed system is an AI-powered resume parser built using deep learning techniques and a Flask web application framework. It aims to automate the extraction of critical information from resumes submitted in PDF format, including details such as the applicant's name, email, phone number, job title, skills, and educational background. The system employs advanced natural language processing (NLP) and machine learning algorithms to analyze the content of resumes and classify job titles, as well as to detect and extract relevant skills and education information.

The user-friendly web interface, developed using Flask, allows users to upload resumes, and the backend processes them in real-time using a pre-trained deep learning model. Once the resume is processed, users can view parsed results directly on the webpage. Additionally, the system provides options to download the parsed information in CSV and JSON formats for further use or data analysis.

1.4.1 ADVANTAGES

- Enhanced Text Extraction
- Layout Preservation with PDFPlumber
- Improved Text Understanding

CHAPTER 2

PROJECT DESCRIPTION

2.1 METHODOLOGIES

2.1.1 MODULES NAME:

1. Resume Upload & Text Extraction
2. NLP-Based Text Processing
3. Job Title & Skill Classification
4. Web Display

2.2.2 MODULES EXPLANATION

Resume Upload & Text Extraction

Users upload a resume via Flask web UI.PDFPlumber extracts text while preserving layout.

NLP-Based Text Processing
Tokenization, stopword removal, lemmatization improve text quality.Named Entity Recognition (NER) extracts key details.

Job Title & Skill Classification
Machine learning model (LSTM/BERT) predicts job titles.Keyword-matching techniques extract relevant skills.

Web Display

Extracted resume details are displayed directly on the Flask web app.Users can search and filter results.

Resume Data Download (CSV/JSON)
Since no database is used, data is available for direct download in CSV/JSON format.

CHAPTER 3

REQUIREMENTS ENGINEERING

3.1 GENERAL

We can see from the results that on each database, the error rates are very low due to the discriminatory power of features and the regression capabilities of classifiers. Comparing the highest accuracies (corresponding to the lowest error rates) to those of previous works, our results are very competitive.

3.2 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be a complete and consistent specification of the whole system. They are used by software engineers as the starting point for the system design. It should what the system do and not how it should be implemented.

• PROCESSOR	:	DUAL CORE 2 DUOS.
• RAM	:	4GB DD RAM
• HARD DISK	:	250 GB

3.3 SOFTWARE REQUIREMENTS

The software requirements document is the specification of the system. It should include both a definition and a specification of requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the teams and tracking the team's progress throughout the development activity.

• Operating System	:	Windows 7/8/10
• Platform	:	Spyder3
• Programming Language	:	Python
• Front End	:	Spyder3

3.4 FUNCTIONAL REQUIREMENTS

A functional requirement defines a function of a software-system or its component. A function is described as a set of inputs, the behavior, Firstly, the system is the first that achieves the standard notion of semantic security for data confidentiality in attribute-based deduplication systems by resorting to the hybrid cloud architecture.

3.5 NON-FUNCTIONAL REQUIREMENTS

EFFICIENCY

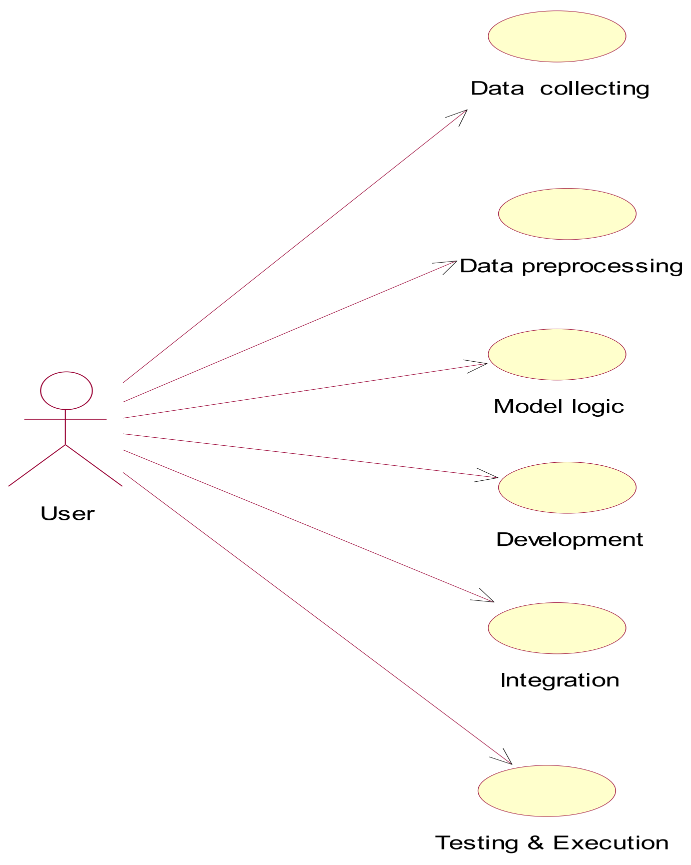
Our multi-modal event tracking and evolution framework is suitable for multimedia documents from various social media platforms, which can not only effectively capture their multi-modal topics, but also obtain the evolutionary trends of social events and generate effective event summary details over time.

CHAPTER 4
DESIGN ENGINEERING

4.1 GENERAL

Design Engineering deals with the various UML [Unified Modelling language] diagrams for the implementation of project. Design is a meaningful engineering representation of a thing that is to be built. Software design is a process through which the requirements are translated into representation of the software. Design is the place where quality is rendered in software engineering.

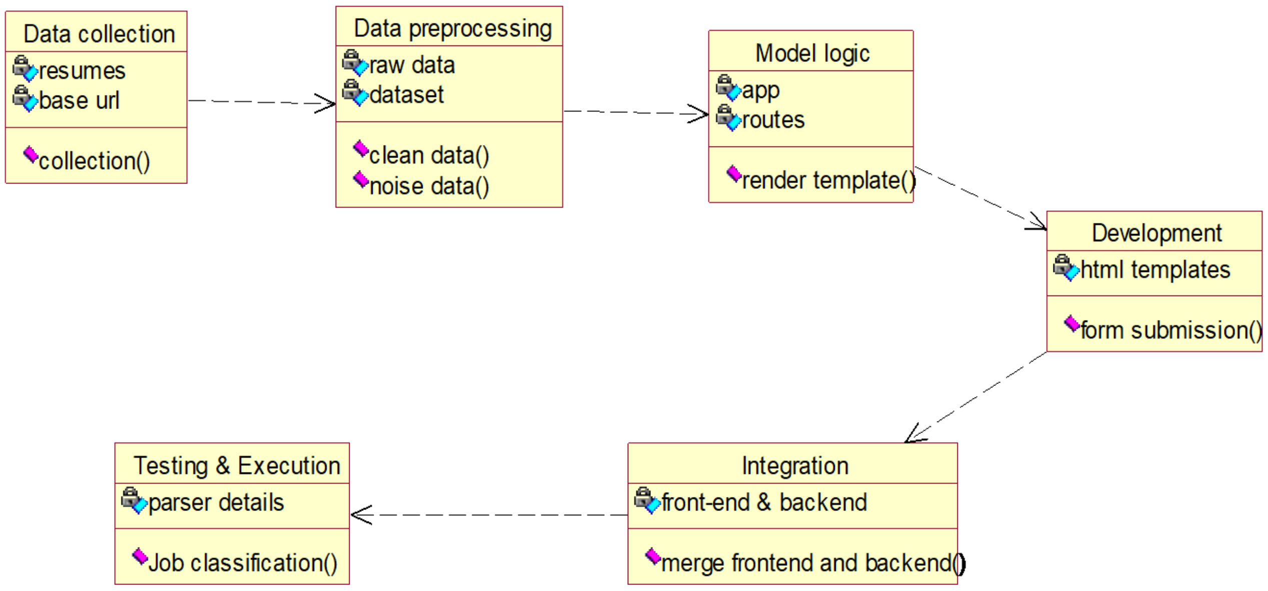
4.1.2 USE CASE DIAGRAM



EXPLANATION:

The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted. The above diagram consists of user as actor. Each will play a certain role to achieve the concept.

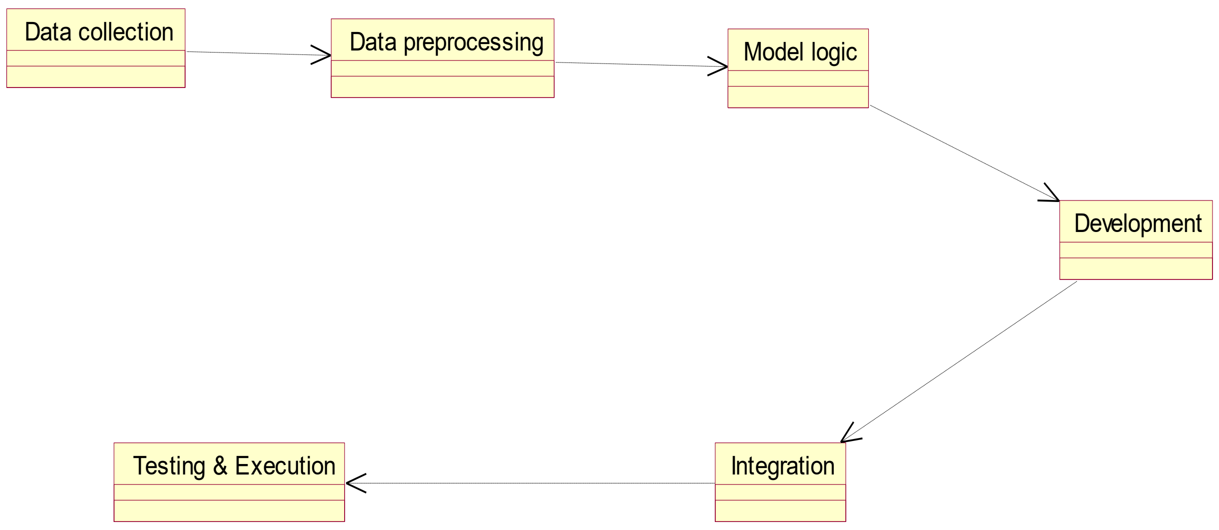
4.1.3 CLASS DIAGRAM



EXPLANATION

In this class diagram represents how the classes with attributes and methods are linked together to perform the verification with security. From the above diagram shown the various classes involved in our project.

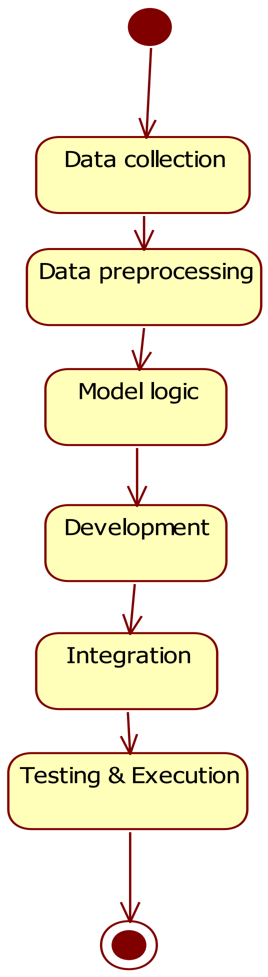
4.1.4 OBJECT DIAGRAM



EXPLANATION:

In the above digram tells about the flow of objects between the classes. It is a diagram that shows a complete or partial view of the structure of a modeled system. In this object diagram represents how the classes with attributes and methods are linked together to perform the verification with security.

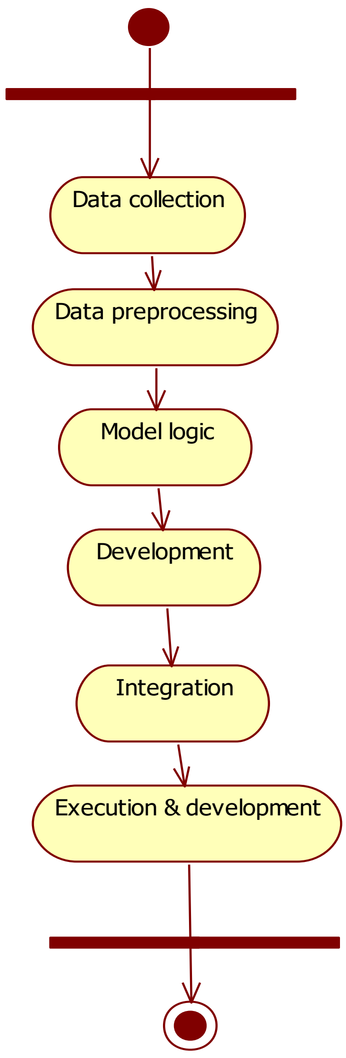
4.1.5 STATE DIAGRAM



EXPLANATION:

State diagram are a loosely defined diagram to show workflows of stepwise activities and actions, with support for choice, iteration and concurrency. State diagrams require that the system described is composed of a finite number of states; sometimes, this is indeed the case, while at other times this is a reasonable abstraction. Many forms of state diagrams exist, which differ slightly and have different semantics.

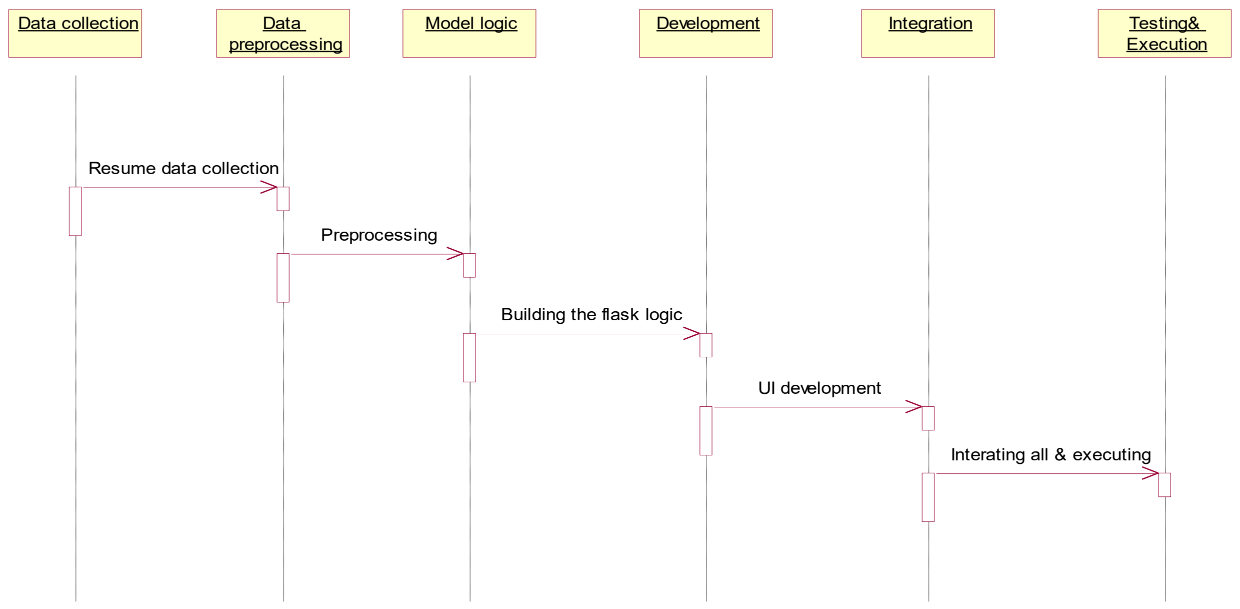
4.1.6 ACTIVITY DIAGRAM



EXPLANATION:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.

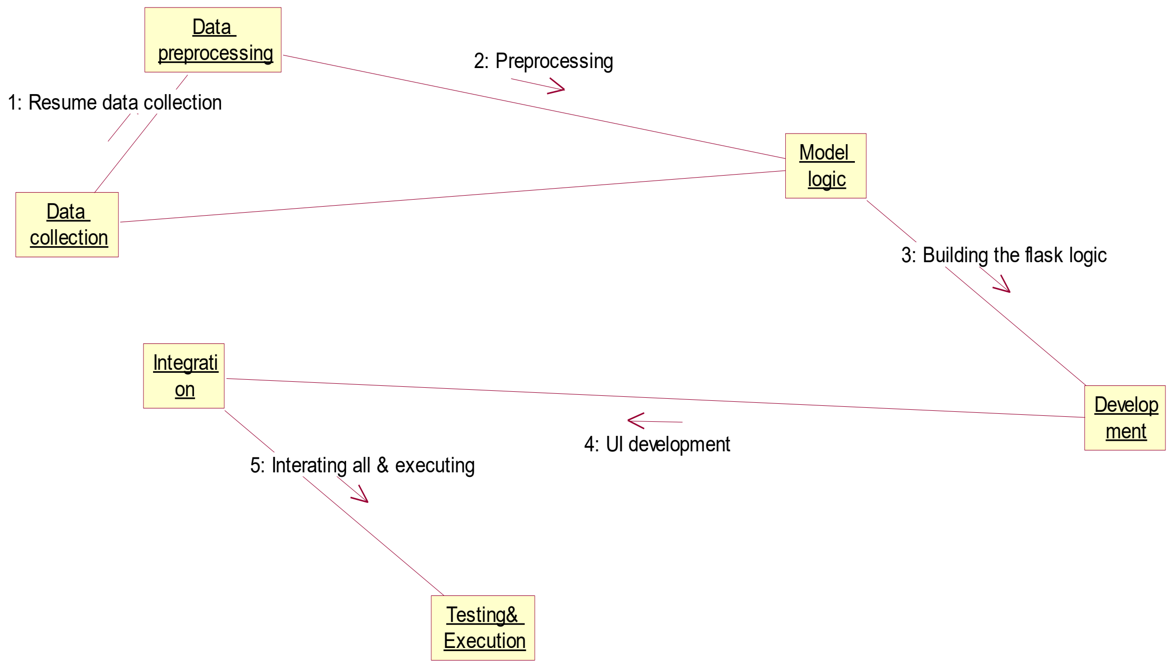
4.1.7 SEQUENCE DIAGRAM



EXPLANATION:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

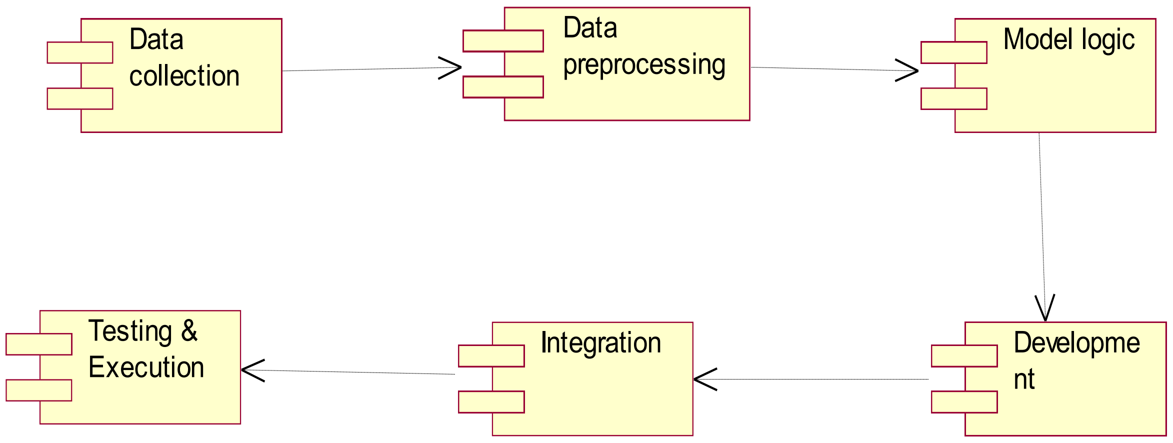
4.1.8 COLLABORATION DIAGRAM



EXPLANATION:

A collaboration diagram, also called a communication diagram or interaction diagram, is an illustration of the relationships and interactions among software objects in the Unified Modeling Language (UML). The concept is more than a decade old although it has been refined as modeling paradigms have evolved.

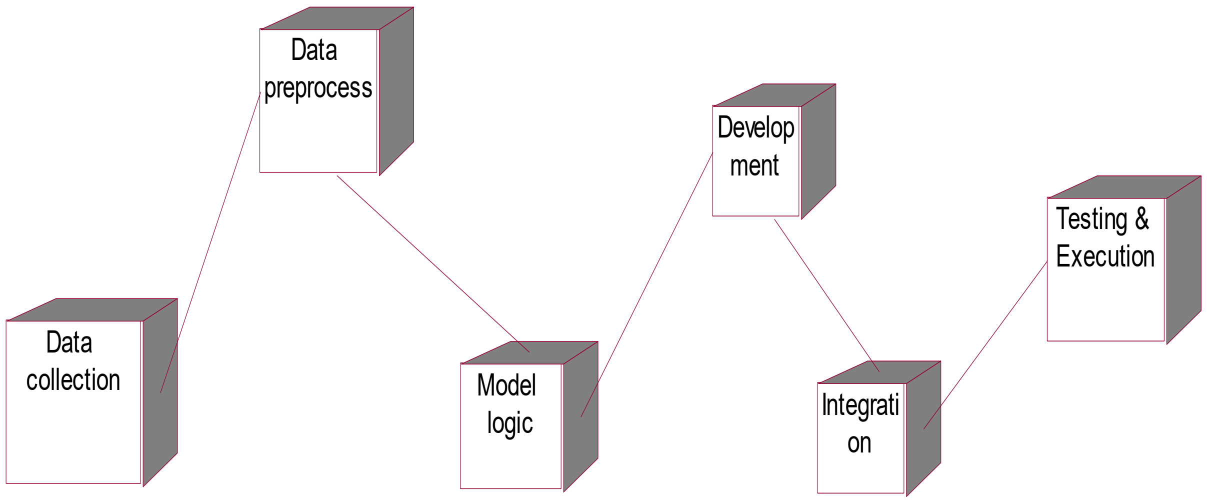
4.1.9 COMPONENT DIAGRAM



EXPLANATION

In the Unified Modeling Language, a component diagram depicts how components are wired together to form larger components and or software systems. They are used to illustrate the structure of arbitrarily complex systems. User gives main query and it converted into sub queries and sends through data dissemination to data aggregators. Results are to be showed to user by data aggregators. All boxes are components and arrow indicates dependencies.

4.1.10 DEPLOYMENT DIAGRAM

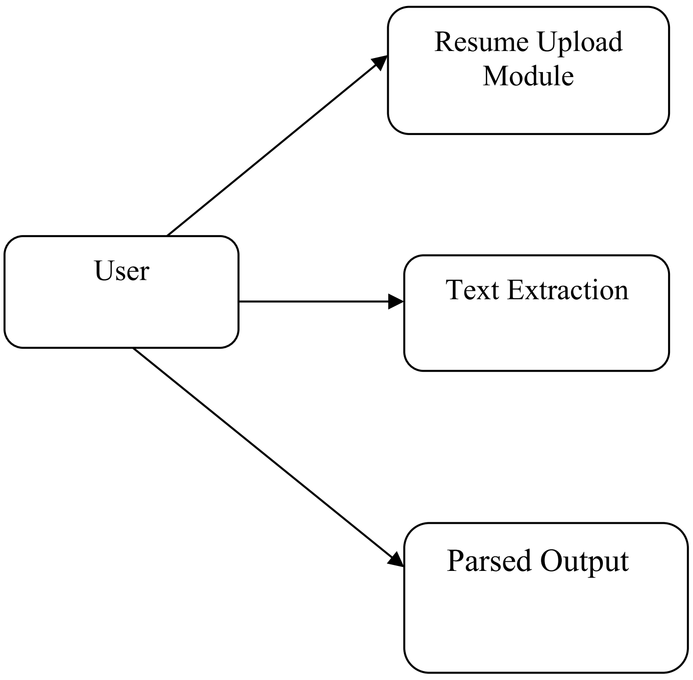


EXPLANATION:

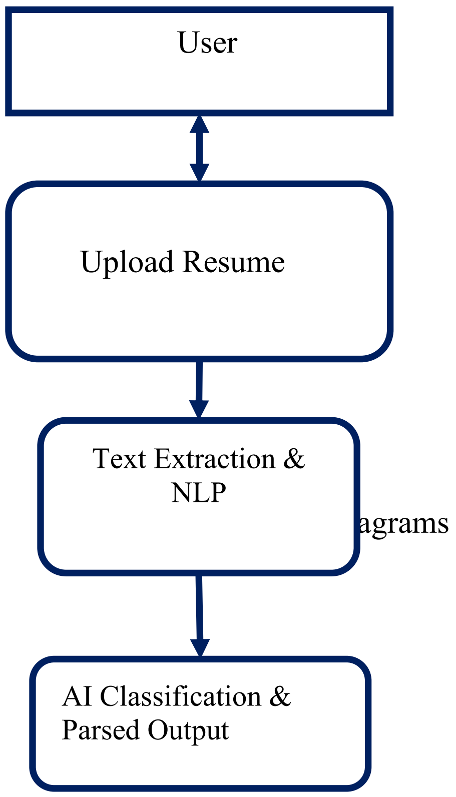
Deployment Diagram is a type of diagram that specifies the physical hardware on which the software system will execute. It also determines how the software is deployed on the underlying hardware. It maps software pieces of a system to the device that are going to execute it.

4.1.11 Data Flow Diagram

Level 0and Level 01



Level 1



EXPLANATION:

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. Often they are a preliminary step used to create an overview of the system which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).

A DFD shows what kinds of data will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It does not show information about the timing of processes, or information about whether processes will operate in sequence or in parallel.

4.2 DATABASE DESIGN
System Architecture

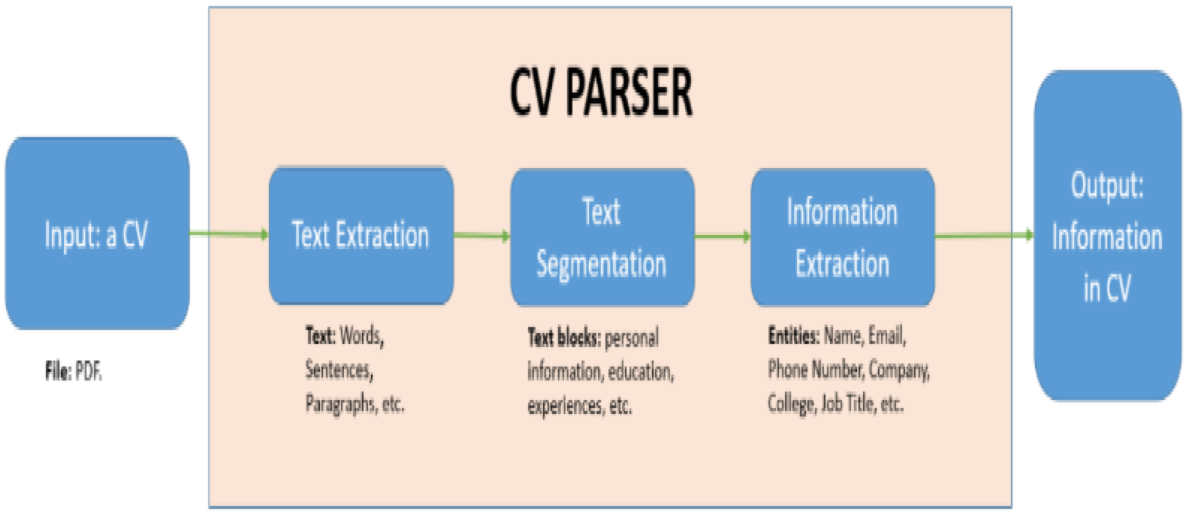

CV PARSER
Input: a CV
File: PDF.
Text Extraction
Text: Words, Sentences, Paragraphs, etc.
Text Segmentation
Text blocks: personal information, education, experiences, etc.
Information Extraction
Entities: Name, Email, Phone Number, Company, College, Job Title, etc.
Output: Information in CV

Fig 4.12: System Architecture

CHAPTER 5
DEVELOPMENT TOOLS

5.1 PYTHON

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

5.2 HISTORY OF PYTHON

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python is now maintained by a core development team at the institute, although Guido van Rossum still holds a vital role in directing its progress.

5.3 IMPORTANCE OF PYTHON

- **Python is Interpreted** − Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive** − You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented** − Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language** − Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

5.4 FEATURES OF PYTHON

- **Easy-to-learn** − Python has few keywords, simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- **Easy-to-read** − Python code is more clearly defined and visible to the eyes.
- **Easy-to-maintain** − Python's source code is fairly easy-to-maintain.
- **A broad standard library** − Python's bulk of the library is very portable and cross-platform compatible on UNIX, Windows, and Macintosh.
- **Interactive Mode** − Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.
- **Portable** − Python can run on a wide variety of hardware platforms and has the same interface on all platforms.
- **Extendable** − You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.
- **Databases** − Python provides interfaces to all major commercial databases.
- **GUI Programming** − Python supports GUI applications that can be created and ported to many system calls, libraries and windows systems, such as Windows MFC, Macintosh, and the X Window system of Unix.
- **Scalable** − Python provides a better structure and support for large programs than shell scripting.

Apart from the above-mentioned features, Python has a big list of good features, few are listed below −

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.
- It provides very high-level dynamic data types and supports dynamic type checking.
- IT supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

5.5 LIBRARIES USED IN PYTHON

- numpy - mainly useful for its N-dimensional array objects.
- pandas - Python data analysis library, including structures such as dataframes.
- matplotlib - 2D plotting library producing publication quality figures.
- scikit-learn - the machine learning algorithms used for data analysis and data mining tasks.

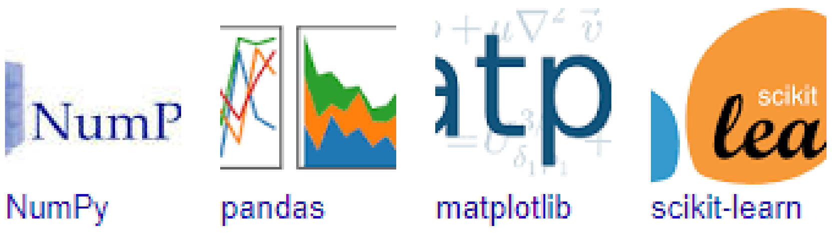


Figure : NumPy, Pandas, Matplotlib, Scikit-learn

CHAPTER 6

IMPLEMENTATION

6.1 GENERAL

6.2 IMPLEMENTATION

```
from flask import Flask, request, render_template, send_file, session
import os
import pdfplumber
import re
import phonenumbers
import csv
import json

app = Flask(__name__)
app.secret_key = os.getenv('FLASK_SECRET_KEY', 'your_secret_key')

# Load intents from JSON
with open('intents.json') as json_file:
    intents_data = json.load(json_file)

# Create mapping from patterns to job labels
keyword_to_label = {}
for intent in intents_data['intents']:
    for pattern in intent['patterns']:
        keyword_to_label[pattern.lower()] = intent['tag']
```

```
# Skills list
skills_keywords = [
    "Python", "Machine Learning", "Data Analysis", "Project Management",
    "Java", "C++", "JavaScript", "SQL", "HTML", "CSS", "React",
    "Node.js", "Django", "Flask", "Excel", "PowerPoint", "Communication",
    "Teamwork", "Leadership", "Problem-Solving", "Agile", "Scrum"
]


def clean_text(text):
    return text.strip()


def extract_text_from_pdf(pdf_path):
    text = ""
    with pdfplumber.open(pdf_path) as pdf:
        for page in pdf.pages:
            page_text = page.extract_text()
            if page_text:
                text += page_text + "\n"
    return text


@app.route('/')
def index():
    return render_template('index.html')
```

```
@app.route('/upload', methods=['POST'])
def upload():
    if 'resume' not in request.files:
        return render_template('index.html', error="No file part.")

    file = request.files['resume']

    if file.filename == '':
        return render_template('index.html', error="No selected file.")

    if file and file.filename.endswith('.pdf'):
        upload_folder = 'uploads/'
        os.makedirs(upload_folder, exist_ok=True)
        file_path = os.path.join(upload_folder, file.filename)
        file.save(file_path)

        text = extract_text_from_pdf(file_path)
        cleaned_text = clean_text(text)

        if not cleaned_text:
            return render_template('index.html', error="Failed to extract text from the uploaded PDF.")

        print(f"Extracted Text: {cleaned_text[:500]}...")

        # Extract details
        education = extract_education(cleaned_text)
        skills = extract_skills(cleaned_text)
        key_info = extract_key_information(cleaned_text)
        job_title = key_info['job_title']
        job_class = classify_job(skills, job_title, intents_data)

        results = [{
            'filename': file.filename,
            'name': key_info['name'],
            'email': key_info['email'],
            'phone': key_info['phone'],
            'job_title': job_title,
            'skills': skills,
            'education': education,
            'job_class': job_class
        }]

        session['results'] = results

        return render_template('index.html', results=results)
    else:
        return render_template('index.html', error="Invalid file format. Please upload a PDF file.")

def extract_job_title(text):
    text_lower = text.lower()
    for keyword, title in keyword_to_label.items():
        if keyword in text_lower:
            return title
    return "Job title not found."


def extract_key_information(text):
    email_pattern = r'[a-zA-Z0-9_.+-]+@[a-zA-Z0-9-]+\.[a-zA-Z0-9-.]+'
    phone_pattern = r'(\+?\d{1,3}[-. ]?)?\(?\d{3}\)?[-. ]?\d{3}[-. ]?\d{4}'
    phone_matches = re.findall(phone_pattern, text)

    email = re.findall(email_pattern, text)
    name = text.split('\n')[0] if text else 'N/A'
    job_title = extract_job_title(text)

    normalized_phone = 'N/A'
    if phone_matches:
        for match in phone_matches:
            try:
                phone_number = phonenumbers.parse(match, "US")
                if phonenumbers.is_valid_number(phone_number):
                    normalized_phone = phonenumbers.format_number(phone_number,
phonenumbers.PhoneNumberFormat.E164)
                    break
            except phonenumbers.NumberParseException:
                continue
    return {
        'name': name,
        'email': email[0] if email else 'N/A',
        'phone': normalized_phone,
        'job_title': job_title
    }

def extract_skills(text):
    extracted_skills = [skill for skill in skills_keywords if skill.lower() in text.lower()]
    return ", ".join(extracted_skills) if extracted_skills else "No skills found."

def extract_education(text):
    education_keywords = ["Bachelor", "Master", "PhD", "B.Sc", "M.Sc", "University", "College"]
    extracted_education = [edu for edu in education_keywords if edu.lower() in text.lower()]
    return ", ".join(extracted_education) if extracted_education else "No education information found."

def classify_job(parsed_skills, job_title, intents_data):
    parsed_skills = [skill.lower() for skill in parsed_skills.split(", ")]
    job_title = job_title.lower()

    matched_intent = None
    highest_score = 0

    for intent in intents_data['intents']:
        patterns = [p.lower() for p in intent['patterns']]
        match_score = 0

        for pattern in patterns:
            for item in parsed_skills + [job_title]:
                if pattern in item:
                    match_score += 1

        if match_score > highest_score:
            highest_score = match_score
            matched_intent = intent

    return matched_intent['responses'][0] if matched_intent else "Unknown Job Role"

@app.route('/download/csv', methods=['GET'])
def download_csv():
    results = session.get('results', [])
    output_file = 'parsed_resumes.csv'

    with open(output_file, mode='w', newline='') as file:
        writer = csv.writer(file)
        writer.writerow(['Filename', 'Name', 'Email', 'Phone', 'Job Title', 'Skills', 'Education', 'Job Classification'])
        for result in results:
            writer.writerow([
                result['filename'], result['name'], result['email'], result['phone'],
                result['job_title'], result['skills'], result['education'], result['job_class']
        ])

    return send_file(output_file, as_attachment=True)

@app.route('/download/json', methods=['GET'])
def download_json():
    results = session.get('results', [])
    output_file = 'parsed_resumes.json'

    with open(output_file, 'w') as file:
        json.dump(results, file, indent=4)

    return send_file(output_file, as_attachment=True)

if __name__ == '__main__':
    app.run(debug=True)
```

INTENTS :

```
{
  "intents": [
    {
      "tag": "Software Developer",
      "patterns": ["Java", "C++", "Backend", "Spring", "REST", "SQL", "API"],
      "responses": ["This candidate fits best in a Software Developer role."]
    },
    {
```

```
    "tag": "Data Scientist",
    "patterns": ["Python", "Machine Learning", "Data Analysis", "AI", "Deep Learning", "TensorFlow", "Pandas", "NumPy", "SQL"],
    "responses": ["This candidate fits best in a Data Scientist role."]
  },
  {
    "tag": "Web Developer",
    "patterns": ["HTML", "CSS", "JavaScript", "React", "Vue.js", "Angular", "Node.js", "Frontend"],
    "responses": ["This candidate fits best in a Web Developer role."]
  },
  {
    "tag": "Project Manager",
    "patterns": ["Leadership", "Agile", "Scrum", "Management", "Team Collaboration", "Stakeholder Management"],
    "responses": ["This candidate fits best in a Project Manager role."]
  },
  {
    "tag": "Mobile Developer",
    "patterns": ["Java", "Kotlin", "Swift", "iOS", "Android", "React Native"],
    "responses": ["This candidate fits best in a Mobile Developer role."]
  },
  {
    "tag": "Data Engineer",
    "patterns": ["SQL", "ETL", "Big Data", "Hadoop", "Spark", "Apache Kafka", "Data Warehousing"],
    "responses": ["This candidate fits best in a Data Engineer role."]
  },
  {
    "tag": "DevOps Engineer",
    "patterns": ["Docker", "Kubernetes", "AWS", "CI/CD", "Terraform", "Jenkins", "Linux"],
    "responses": ["This candidate fits best in a DevOps Engineer role."]
  },
  {
    "tag": "Quality Assurance",
    "patterns": ["Manual Testing", "Automation Testing", "Selenium", "Test Plans", "Bug Tracking", "Unit
Testing"],
    "responses": ["This candidate fits best in a Quality Assurance role."]
  },
  {
    "tag": "Business Analyst",
      "patterns": ["Business Analysis", "Data Analytics", "SQL", "Requirements Gathering", "Data
Visualization", "Stakeholder Communication"],
    "responses": ["This candidate fits best in a Business Analyst role."]
  },
  {
    "tag": "Cloud Architect",
     "patterns": ["AWS", "Azure", "Google Cloud", "Cloud Computing", "Microservices", "Docker",
"Kubernetes"],
    "responses": ["This candidate fits best in a Cloud Architect role."]
  },
  {
    "tag": "UI/UX Designer",
     "patterns": ["Figma", "Sketch", "Adobe XD", "Wireframing", "User Research", "Prototyping", "UI
Design", "Usability Testing"],
    "responses": ["This candidate fits best in a UI/UX Designer role."]
  },
  {
    "tag": "System Administrator",
    "patterns": ["Linux", "Windows Server", "Networking", "System Monitoring", "Virtualization", "Backup and Recovery", "Shell Scripting"],
    "responses": ["This candidate fits best in a System Administrator role."]
  },
  {
    "tag": "Network Engineer",
    "patterns": ["Cisco", "Networking", "IP Routing", "VPN", "Firewall", "Network Security", "Wi-Fi"],
    "responses": ["This candidate fits best in a Network Engineer role."]
  },
  {
    "tag": "Game Developer",
    "patterns": ["C#", "Unity", "Unreal Engine", "Game Design", "Game Development", "3D Modeling", "Animation"],
    "responses": ["This candidate fits best in a Game Developer role."]
  },
  {
    "tag": "Marketing Manager",
    "patterns": ["Digital Marketing", "SEO", "Content Strategy", "Social Media", "Email Marketing", "Google Ads", "Analytics"],
    "responses": ["This candidate fits best in a Marketing Manager role."]
  },
  {
    "tag": "Sales Executive",
    "patterns": ["Sales", "Lead Generation", "Customer Relationship Management", "Sales Strategy", "Cold Calling", "Negotiation", "Product Knowledge"],

    "responses": ["This candidate fits best in a Sales Executive role."]

  },

  {

    "tag": "Graphic Designer",

    "patterns": ["Adobe Photoshop", "Adobe Illustrator", "Design", "Creative Suite", "Branding", "Typography", "Print Design"],

    "responses": ["This candidate fits best in a Graphic Designer role."]

  },

  {

    "tag": "Financial Analyst",

    "patterns": ["Financial Modeling", "Forecasting", "Budgeting", "Excel", "Data Analysis", "Accounting", "Investment Analysis"],

    "responses": ["This candidate fits best in a Financial Analyst role."]

  },

  {

    "tag": "HR Manager",

    "patterns": ["Recruitment", "Employee Relations", "HR Policies", "Training and Development", "Performance Management", "Payroll", "Talent Acquisition"],

    "responses": ["This candidate fits best in a HR Manager role."]

  },

  {

    "tag": "Research Scientist",

    "patterns": ["Research", "Data Collection", "Lab Experiments", "Analysis", "Scientific Writing", "Peer Review", "Data Analysis"],

    "responses": ["This candidate fits best in a Research Scientist role."]

  },
  {
    "tag": "Content Writer",
    "patterns": ["Writing", "Content Strategy", "SEO", "Blogging", "Copywriting", "Research", "Editing"],
    "responses": ["This candidate fits best in a Content Writer role."]
  },
  {
    "tag": "Operations Manager",
    "patterns": ["Operations Management", "Process Optimization", "Supply Chain", "Logistics", "Vendor Management", "Cost Reduction", "Inventory Management"],
    "responses": ["This candidate fits best in an Operations Manager role."]
  },
  {
    "tag": "Cybersecurity Analyst",
    "patterns": ["Network Security", "Penetration Testing", "Ethical Hacking", "Firewall", "Malware Analysis", "Incident Response", "Risk Assessment"],
    "responses": ["This candidate fits best in a Cybersecurity Analyst role."]
  },
  {
    "tag": "Software Tester",
    "patterns": ["Manual Testing", "Automation Testing", "Test Plans", "Selenium", "Bug Tracking", "Unit Testing", "Jira"],
    "responses": ["This candidate fits best in a Software Tester role."]
  },
  {
    "tag": "Database Administrator",
    "patterns": ["SQL", "MySQL", "PostgreSQL", "Oracle", "Database Management", "Data Backup", "Data Recovery"],
    "responses": ["This candidate fits best in a Database Administrator role."]

  },

  {

    "tag": "Artificial Intelligence Engineer",

    "patterns": ["Machine Learning", "AI", "Deep Learning", "Python", "TensorFlow", "Keras", "Neural Networks"],

    "responses": ["This candidate fits best in an Artificial Intelligence Engineer role."]

  },

  {

    "tag": "Embedded Systems Engineer",

    "patterns": ["Embedded C", "Embedded Systems", "Microcontrollers", "Hardware Design", "IoT", "RTOS", "PCB Design"],

    "responses": ["This candidate fits best in an Embedded Systems Engineer role."]

  },

  {

    "tag": "Full Stack Developer",

    "patterns": ["HTML", "CSS", "JavaScript", "Node.js", "React", "MongoDB", "Express", "Backend"],

    "responses": ["This candidate fits best in a Full Stack Developer role."]

  },

  {

    "tag": "Product Manager",

    "patterns": ["Product Development", "Market Research", "Roadmap", "Product Launch", "Stakeholder Management", "Agile", "Cross-functional Teams"],

    "responses": ["This candidate fits best in a Product Manager role."]

  },

  {

    "tag": "Legal Advisor",
    "patterns": ["Legal Research", "Contract Law", "Corporate Law", "Litigation", "Intellectual Property",
"Compliance", "Negotiation"],

    "responses": ["This candidate fits best in a Legal Advisor role."]

  },

  {

    "tag": "Healthcare Analyst",

    "patterns": ["Healthcare", "Data Analysis", "Patient Care", "Medical Billing", "Data Visualization",
"Health IT", "EHR"],

    "responses": ["This candidate fits best in a Healthcare Analyst role."]

  },

  {

    "tag": "Civil Engineer",

    "patterns": ["Structural Engineering", "AutoCAD", "Construction", "Project Management", "Building
Codes", "Surveying", "Materials Engineering"],

    "responses": ["This candidate fits best in a Civil Engineer role."]

  },

  {

    "tag": "Product Designer",

    "patterns": ["UX Design", "Wireframing", "Prototyping", "Sketch", "Figma", "Adobe XD", "3D
Modeling"],

    "responses": ["This candidate fits best in a Product Designer role."]

  },

  {

    "tag": "Research Analyst",

    "patterns": ["Market Research", "Data Analysis", "Survey Design", "Statistical Analysis", "Data
Visualization", "Report Writing"],

    "responses": ["This candidate fits best in a Research Analyst role."]

  },
  {
    "tag": "Architect",
      "patterns": ["AutoCAD", "Architecture", "Building Design", "3D Modeling", "Structural Design",
"Construction Management", "Urban Planning"],
    "responses": ["This candidate fits best in an Architect role."]
  }
]
}
```

Train.py :

```
# === Import Libraries ===
import numpy as np
import pandas as pd
import re
import nltk
import pdfplumber
import os
from docx import Document
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Embedding, Conv1D, MaxPooling1D, LSTM, Dense, Bidirectional
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from sklearn.model_selection import train_test_split
from collections import Counter
from nltk.corpus import stopwords
from nltk.stem import PorterStemmer
```

```
nltk.download('stopwords')


# === Step 1: Extract Text ===

def extract_text_from_pdf(pdf_path):

    text = ""

    with pdfplumber.open(pdf_path) as pdf:

        for page in pdf.pages:

            page_text = page.extract_text()

            if page_text:

                text += page_text + "\n"

    return text


def extract_text_from_docx(docx_path):

    text = ""

    doc = Document(docx_path)

    for para in doc.paragraphs:

        text += para.text + "\n"

    return text


# === Step 2: Load and Clean Resumes ===

resume_folder = r'H:\AI-Resume-Parser-main\Resumes'

resume_texts = []


for filename in os.listdir(resume_folder):

    file_path = os.path.join(resume_folder, filename)
    if filename.endswith('.pdf'):
        text = extract_text_from_pdf(file_path)
    elif filename.endswith('.docx'):
        text = extract_text_from_docx(file_path)
    else:
        continue
    resume_texts.append({'filename': filename, 'text': text})

df = pd.DataFrame(resume_texts)

# === Step 3: Text Preprocessing ===
def clean_text(text):
    text = re.sub(r'[^a-zA-Z\s]', '', text)
    text = text.lower().strip()
    return text

stop_words = set(stopwords.words('english'))
ps = PorterStemmer()

def preprocess(text):
    cleaned = clean_text(text)
    tokens = [word for word in cleaned.split() if word not in stop_words]
    stemmed = [ps.stem(word) for word in tokens]
    return ' '.join(stemmed)
```

```
df['cleaned_text'] = df['text'].apply(preprocess)


# === Step 4: Assign Labels ===
keyword_to_label = {
    'manager': 'Manager',
    'sales manager': 'Sales Manager',
    'project manager': 'Project Manager',
    'analyst': 'Analyst',
    'software engineer': 'Software Engineer',
}


def assign_label(cleaned_text):
    for keyword, label in keyword_to_label.items():
        if keyword in cleaned_text:
            return label
    return 'Other'


df['label'] = df['cleaned_text'].apply(assign_label)


# === Step 5: Prepare Data for Training ===
X = df['cleaned_text']
y = df['label']


X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
tokenizer = Tokenizer(num_words=5000)
tokenizer.fit_on_texts(X_train)

X_train_seq = tokenizer.texts_to_sequences(X_train)
X_test_seq = tokenizer.texts_to_sequences(X_test)

# Use fixed max_len = 1149 for consistency
max_len = max(len(x) for x in X_train_seq)
if max_len < 1149:
    max_len = 1149

X_train_pad = pad_sequences(X_train_seq, maxlen=max_len)
X_test_pad = pad_sequences(X_test_seq, maxlen=max_len)

# Convert labels to one-hot encoding
y_train_encoded = pd.get_dummies(y_train).values
y_test_encoded = pd.get_dummies(y_test).values
# === Step 6: Build and Train Model ===
model = Sequential()
model.add(Embedding(input_dim=5000, output_dim=128, input_length=max_len))
model.add(Conv1D(filters=128, kernel_size=5, activation='relu'))
model.add(MaxPooling1D(pool_size=2))
model.add(Bidirectional(LSTM(100)))
model.add(Dense(units=y_train_encoded.shape[1], activation='softmax'))
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])


history = model.fit(X_train_pad, y_train_encoded, epochs=10, batch_size=32, validation_split=0.2)


# === Save Model ===

model.save('resume_parser_model2.h5')
```

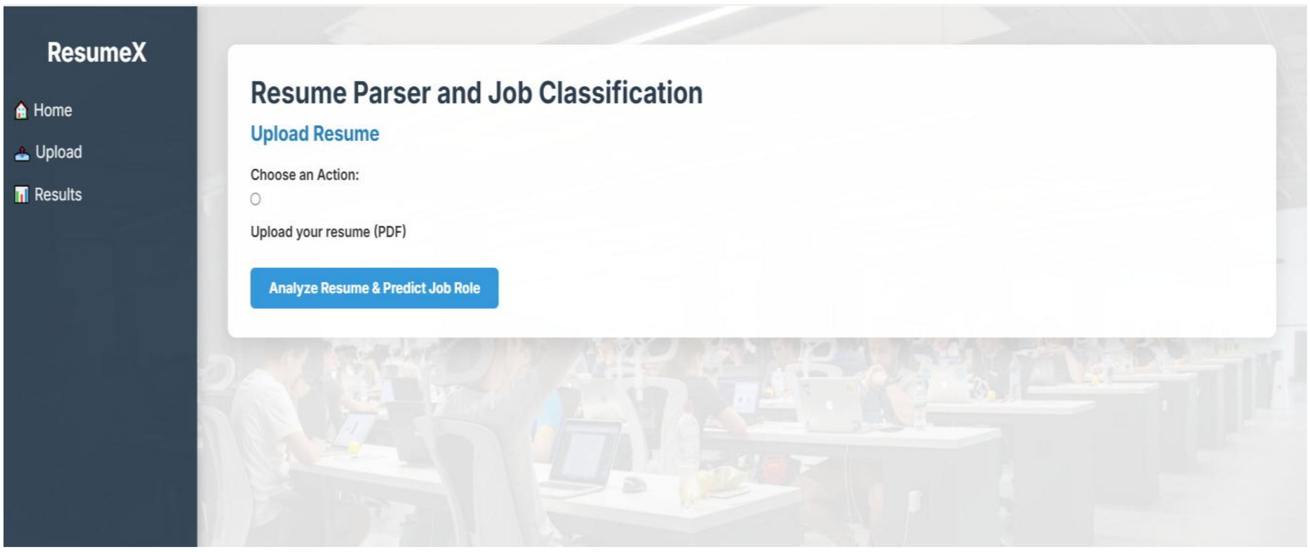
CHAPTER 7

SNAPSHOTS

7.1 GENERAL:

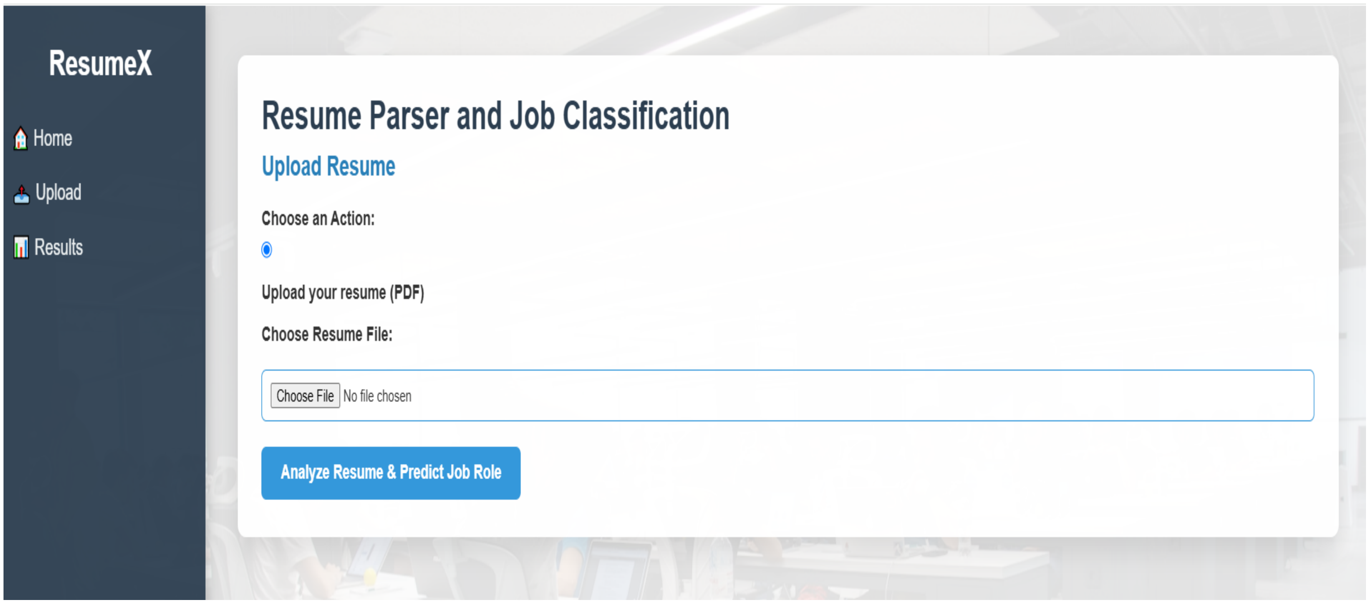
This project is implements like application using python and the Server process is maintained using the SOCKET & SERVERSOCKET and the Design part is played by Cascading Style Sheet.

7.2 VARIOUS SNAPSHOTS



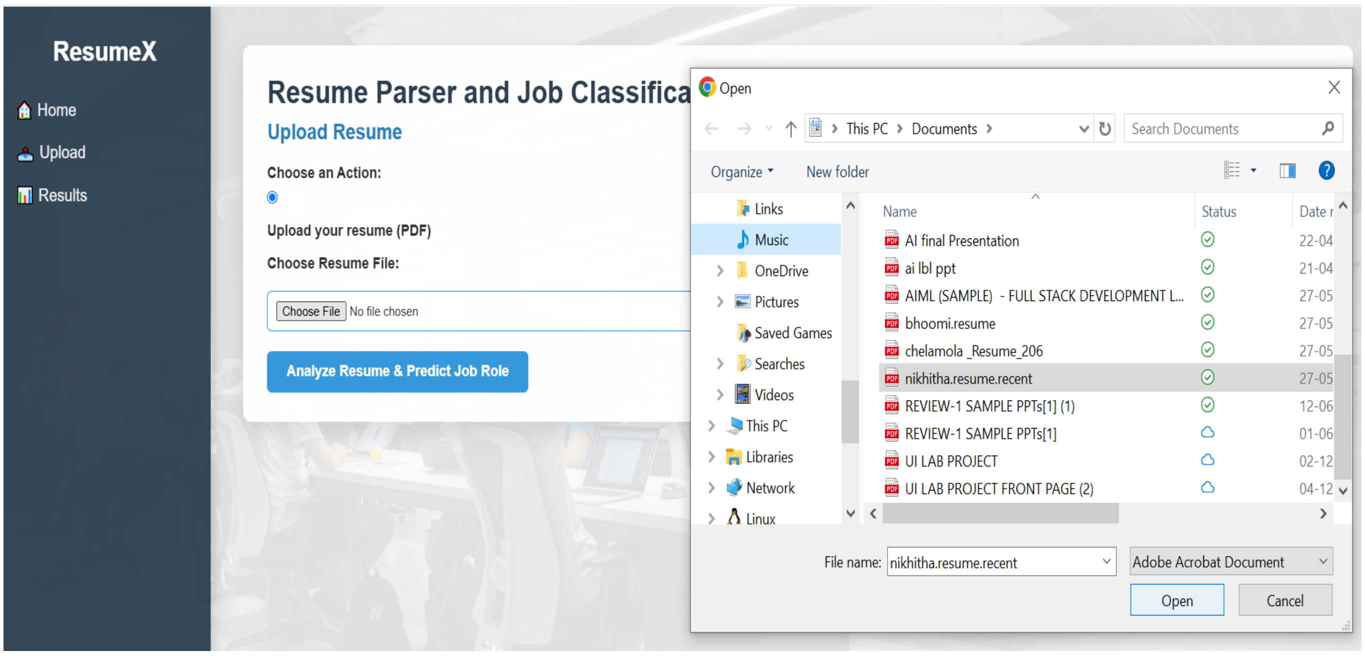
Resume Parser and Job Classification
Upload Resume
Choose an Action:
Upload your resume (PDF)

Home Page

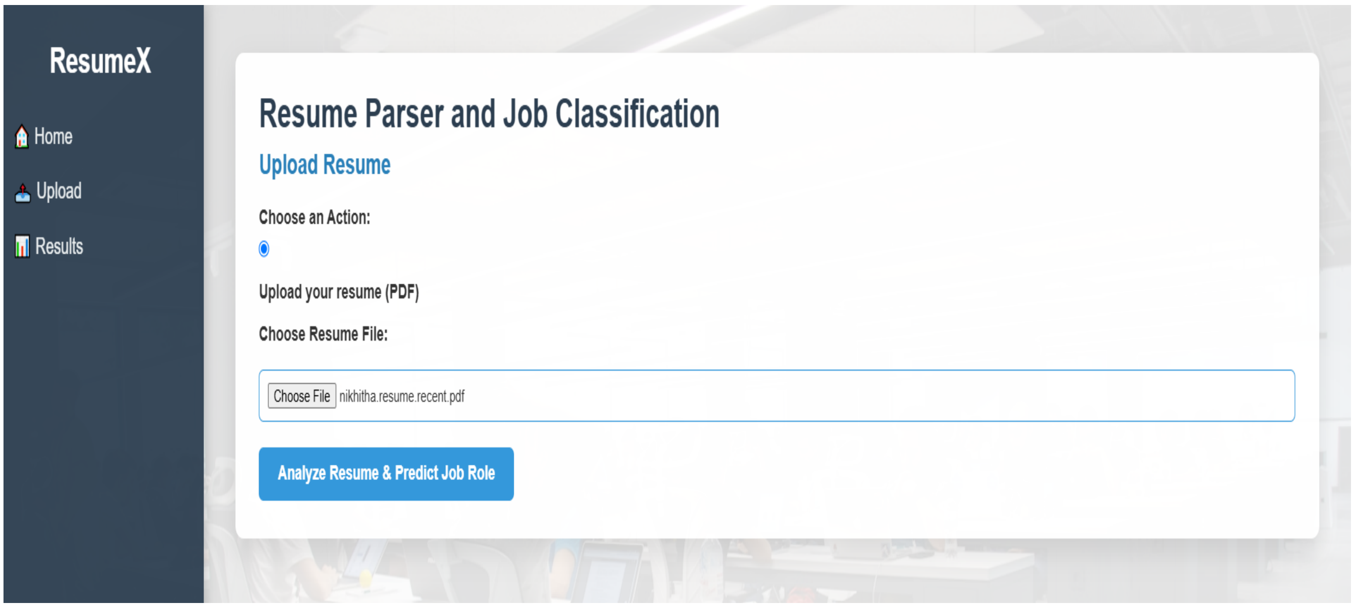


Resume Parser and Job Classification
Upload Resume
Choose an Action:
Upload your resume (PDF)
Choose Resume File:
No file chosen

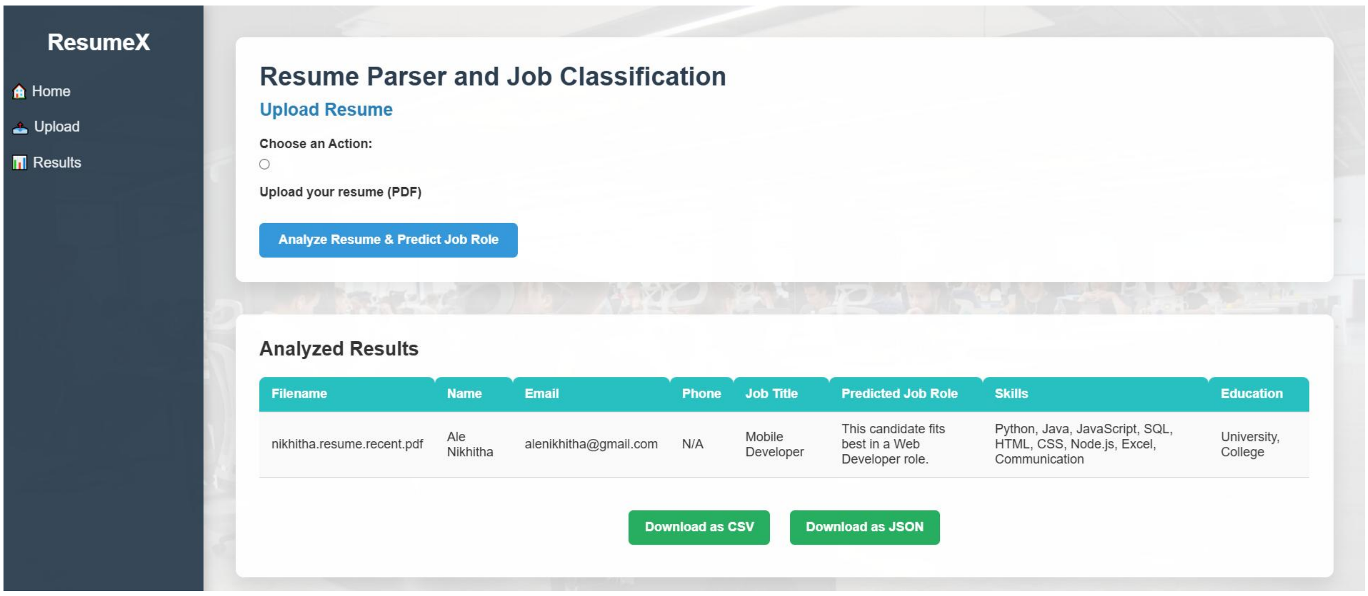
Choose an Action



Choose Resume File


ResumeX
Home
Upload
Results
Resume Parser and Job Classification
Upload Resume
Choose an Action:
Upload your resume (PDF)
Choose Resume File:
Choose File nikhitha.resume.recent.pdf
Analyze Resume & Predict Job Role

Analyze Resume



Resume Parser and Job Classification

Upload Resume

Choose an Action:

Upload your resume (PDF)

Analyzed Results

Filename	Name	Email	Phone	Job Title	Predicted Job Role	Skills	Education
nikhitha.resume.recent.pdf	Ale Nikhitha	alenikhitha@gmail.com	N/A	Mobile Developer	This candidate fits best in a Web Developer role.	Python, Java, JavaScript, SQL, HTML, CSS, Node.js, Excel, Communication	University, College

Analyzed Result

CHAPTER 8
SOFTWARE TESTING

8.1 GENERAL

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

8.2 DEVELOPING METHODOLOGIES

The test process is initiated by developing a comprehensive plan to test the general functionality and special features on a variety of platform combinations. Strict quality control procedures are used. The process verifies that the application meets the requirements specified in the system requirements document and is bug free. The following are the considerations used to develop the framework from developing the testing methodologies.

8.3Types of Tests

8.3.1 Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program input produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

8.3.2 Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input	: identified classes of valid input must be accepted.
Invalid Input	: identified classes of invalid input must be rejected.
Functions	: identified functions must be exercised.
Output	: identified classes of application outputs must be exercised.
Systems/Procedures	: interfacing systems or procedures must be invoked.

8.3.3 System Test

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

8.3.4 Performance Test

The Performance test ensures that the output be produced within the time limits,and the time taken by the system for compiling, giving response to the users and request being send to the system for to retrieve the results.

8.3.5 Integration Testing

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

8.3.6 Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

Acceptance testing for Data Synchronization:

- The Acknowledgements will be received by the Sender Node after the Packets are received by the Destination Node
- The Route add operation is done only when there is a Route request in need
- The Status of Nodes information is done automatically in the Cache Updation process

8.3.7 Build the test plan

Any project can be divided into units that can be further performed for detailed processing. Then a testing strategy for each of this unit is carried out. Unit testing helps to identity the possible bugs in the individual component, so the component that has bugs can be identified and can be rectified from errors.

CHAPTER 9
APPLICATIONS AND FUTURE ENHANCEMENT

9.1 GENERAL

9.2 APPLICATIONS

1. **Automated Resume Screening :** AI extracts key information (skills, experience, education) from resumes and filters candidates based on job requirements, saving HR teams time.
2. **Job Matching and Recommendation** :AI compares extracted resume data with job descriptions to match candidates to the most relevant roles, improving placement accuracy.
3. **Duplicate Resume Detection :**AI systems detect and remove duplicate or nearly identical resumes from large datasets, streamlining candidate management.
4. **Smart Candidate Ranking :**Using natural language processing and machine learning, resumes are ranked according to relevance to the job, enabling better hiring decisions.
5. **Bias-Free Screening :**AI can be trained to ignore demographic information like gender, age, or ethnicity, helping reduce unconscious bias in hiring.

9.3 FUTURE ENHANCEMENTS :

The Smart Resume Parser can be further enhanced by integrating advanced AI techniques and additional functionalities to improve accuracy, efficiency, and user experience. One key enhancement is the integration of Large Language Models (LLMs), such as GPT-based models, to improve context-aware information extraction from resumes. This will help in understanding complex job descriptions, identifying soft skills, and ranking candidates based on job requirements.Another future upgrade is the implementation of multi-format support, allowing the system to process not just PDF resumes, but also Word documents (DOCX), images (using OCR), and structured resume data from LinkedIn profiles. Additionally, multi-language support can be incorporated to parse resumes written in different languages, making the system more globally accessible.

To enhance recruitment efficiency, an AI-powered recommendation system can be developed, which automatically matches candidates with job postings based on skills, experience, and job preferences. This will help recruiters filter the best candidates instantly. Moreover, integrating real-time resume validation can detect missing or incorrect information, ensuring better quality data.In the future, the system can be converted into a full-fledged SaaS (Software-as-a-Service) application, where recruiters and companies can upload bulk resumes, track applicants, and generate analytics reports on candidate trends. Cloud integration with platforms like AWS or Google Cloud can improve scalability and allow storage and retrieval of parsed resumes.By incorporating these future enhancements, the Smart Resume Parser can become a powerful AI-driven recruitment assistant, helping HR professionals and job seekers streamline the hiring process with greater accuracy and automation.

CHAPTER 10
CONCLUSION & REFERENCE

10.1 CONCLUSION

The Smart Resume Parser successfully automates the process of resume extraction and job classification using deep learning and NLP techniques. By leveraging PDFPlumber for text extraction and a trained neural network for job classification, the system efficiently extracts key candidate information such as name, email, phone number, job title, skills, and education details. The Flask-based web interface ensures a user-friendly experience, allowing users to upload resumes, view parsed results, and download structured data in CSV or JSON formats.

Unlike traditional keyword-based resume parsers, this AI-powered system offers better accuracy and adaptability in handling unstructured and varied resume formats. Additionally, it eliminates the manual effort involved in resume screening, making it a valuable tool for HR professionals, recruitment agencies, and job seekers.With future enhancements such as multi-format resume support, AI-driven job recommendations, and cloud integration, the project has significant potential to evolve into a full-scale recruitment automation tool. This smart, efficient, and scalable solution contributes to faster and more precise candidate evaluation, ultimately enhancing the hiring process.

10.2 REFERENCES

[1] João Vítor Andrioli de Souza, Lucas Emanuel Silva E Oliveira, Yohan Bonescki Gumiel,Deborah Ribeiro Carvalho, and Claudia Maria Cabral Moro (2023). *AI-powered Resume-Job Matching using Siamese Neural Networks for Candidate Evaluation.*

[2] Smith et al. (2021). *Machine Learning for Resume Parsing and Job Recommendation Systems.*

[3] Patel et al. (2022). *Deep Learning-Based Resume Parsing Using LSTM and CNN Models.*

[4] Gupta & Sharma (2023). *AI-Powered NLP Techniques for Resume Information Extraction Using BERT.*

[5] Rajan et al. (2023). *Enhancing Resume Screening with Machine Learning and OCR Techniques.*

[6] Das et al. (2022). *Intelligent Resume Matching Using Transformer-Based Models.*

[7] Mehta & Verma (2024). *A Hybrid AI Approach for Automated Resume Parsing and Classification.*

[8] Gerard Deepak, Varun Teja, A. Santhanavijayan (2020). *Firefly Algorithm for Resume Parsing and Matching Based on NLP.*

[9] Sinha A. K., Amir Khusru Akhtar M., Kumar A. (2021). *Systematic Review on Resume Screening Using NLP and Machine Learning.*

[10] Jacob Devlin, Ming-Wei Chang, Kenton Lee, Kristina Toutanova (2018). *BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding.*

[11] Nils Reimers, Iryna Gurevych (2019). *Sentence-BERT: Sentence Embeddings Using Siamese BERT-Networks.*

[12] Ashish Vaswani, Noam Shazeer, Niki Parmar, Jakob Uszkoreit, Llion Jones, Aidan N Gomez, Łukasz Kaiser, Illia Polosukhin (2017). *Attention Is All You Need – Foundation of Transformer Models for NLP.*

[13] Padmaja D. L., Vishnuvardhan C., Rajeev G., Kumar K. N. S. (2023). *Automated Resume Screening Using NLP and Deep Learning.*

[14] Harsha T. M., Moukthika G. S., Sai D. S., Pravallika M. N. R., Anamalamudi S., Enduri M. (2022). *Resume Parsing and Job Classification Using NLP and ML.*

[15] Kumar et al. (2021). *AI-Driven Resume Extraction Using Named Entity Recognition and BERT Models.*

[16] Tiwari et al. (2023). *Improving Resume Screening with AI-Based Job Matching and Recommendation Algorithms.*

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[17] Chen & Wang (2020). *Deep Learning for Automated Resume Evaluation and Candidate Shortlisting.*

[18] Lee & Park (2021). *Big Data Analytics in Resume Screening: A Machine Learning Approach.*

[19] Ravi et al. (2022). *AI-Powered Recruitment: Enhancing Resume Screening with NLP and Machine Learning.*

[20] Singh et al. (2023). *Resume Ranking and Skill Extraction Using AI-Based Text Classification.*

[21] Liu & Zhang (2024). *A Transformer-Based Resume Parsing Framework for Efficient Candidate Evaluation.*

[22] Kumar & Prakash (2023). *Automated Resume Screening Using GPT-3 and Natural Language Processing Techniques.*

[23] Choudhary et al. (2022). *A Hybrid Approach to Resume Classification Using ML and Rule-Based Systems.*

[24] Mishra et al. (2021). *AI-Based Candidate Screening: A Study on Resume Parsing and Selection Models.*

[25] Bose et al. (2023). *Enhancing Recruitment with AI-Powered Resume Screening and Job Matching.*