



CV Profiler

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Certificate

We accept the work contained in the report titled “CV Profiler”, written by Noman Mobeen and Warda Shahid as a confirmation to the required standard for the partial fulfillment of the degree of Bachelor of Science in Information Technology.

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Abstract

The aim of the project is to automate manually maintained human resource system for organizations. The automated system will seek to meet the needs of Human resource department as it will provide the facility to manager to extract resumes from LinkedIn and store them in repository further they can search through the resumes and find out the most suitable resumes of the candidate that will be suitable for the required job position. The automation of the system will improve the efficiency of the overall process which will make the services better and it will provide a comfort for the human resource management team a structure that provide a good management system in a paper less environment. On the other hand this system will provide interactivity between job seekers and HR management through Linked In. The main concern of this project is to save time, efforts and give comfort. The resultant product will introduce a resume recommender system.

Acknowledgments

Above all, we thank to Allah, the most Merciful and the most Beneficent, Who gave us the opportunity to achieve education of highest level. We would also like to thank our Supervisor Ms. Iqra Javed whose support, guidance and reassurance from the start till end, helped us to complete our project. It would have not been completed without her proper guidance and support. The support of our teachers also helped us along the way and lastly, we would like to thank Bahria University, Islamabad for allowing us to develop this application through their platform.

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“We think someone else, someone smarter than us, someone more capable, someone with more resources will solve that problem. But there isn’t anyone else.”

Regina Dugan

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CHAPTER 1

Introduction

1.1 Introduction

CV Profiler aims to automate the hiring process in Bahria University. Bahria University is using traditional method of recruiting employees. Employees have to submit their CV and application by hand, once the resumes are collected by the HR department. Related department goes through each CV and compare each of the attributes with job requirements. This whole process of recruiting tends to be tedious and inefficient. More chances of human error. Keeping all these before mentioned facts in mind we are developing a software application which will help HR department, collect CVs from online platforms, compare them with given requirements and find matches for the job. There will be two categories of jobs administration and faculty and requirements for both of the categories will be different and customizable. Our system will retrieve data from online platforms like LinkedIn using web scrapper in .word format. Then store it in a folder. When requirements for the job will be provided our system will extract, process and clean the data and display the list of most suited CVs for the job position. All the noisy data will be removed and key words will be searched to find best matches for job position. Manager can click on View profile button and will be directed to the profile of the candidate, he can send him a direct message for an interview call.

1.2 Problem description

Currently hiring process is done manually in Bahria University. Resumes are submitted by hands by the candidates and selection for interview has been a hectic and inefficient process. It takes a lot of time to compare analyses the resumes to call candidates for the interview. Excessive chances of human error. Some of the CVS could get skipped out of the bulk of the CVs.

1.3 Project scope

CV Profiler will retrieve data from online platforms like LinkedIn, store it in on database, and extract the data in .word format in according to the given requirements.

- For administrative positions.
 - a) Experience
 - b) Job title
 - c) Qualification

- For faculty positions.
 - a) Job title
 - b) Experience
 - c) Minimum number of publications
 - d) Qualification

1.4 Benefits

- System will make the hiring process efficient
- It will take less time in finding the best CVS.
- Very less chances of mistake
- Less hectic.

1.5 Block Diagram

Figure 1.1 shows the Block Diagram for the system.

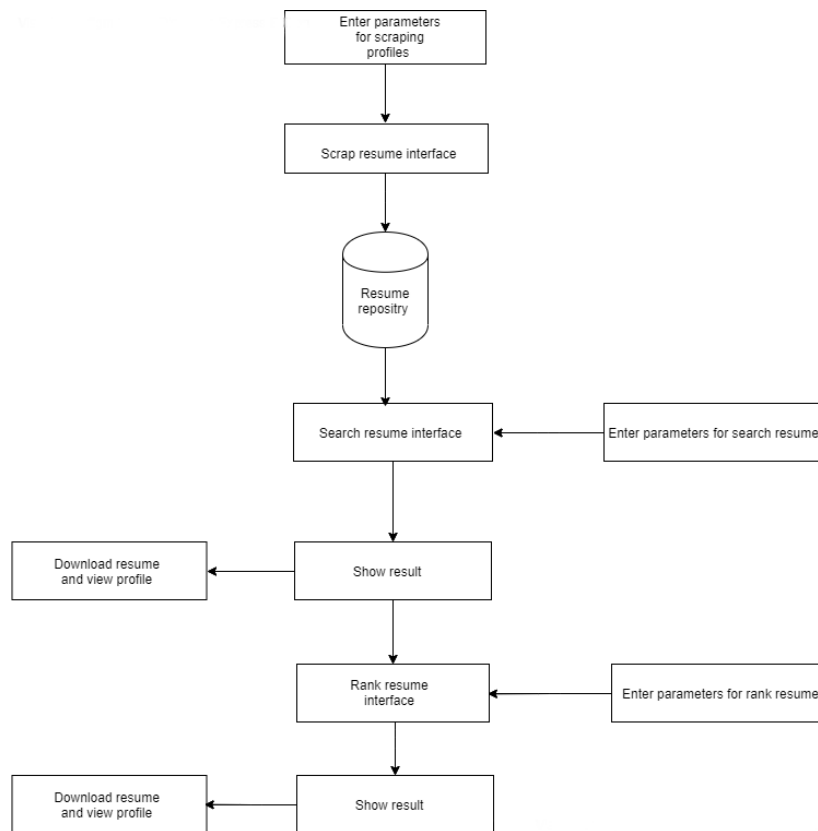


Figure 1.1: Block Diagram

CHAPTER 2

LITERATURE REVIEW

2.1 Existing applications

In this chapter, we will explain all the previous working related to our project. Many researchers have worked in this field so that will help us in understanding the working. This chapter evaluates different algorithms and implementing techniques which will help us in the project.

2.2 Machine Learning used for hiring

According to the research in [4] by the authors Sayed ZainulAbideen Mohd Sadiq, Juneja Afzal Ayub, Gunduka Rakesh Narsayya, Momin Adnan Ayyas and Prof. Khan Tabrez Mohd Tahir resumes could be ranked and parsed in any format using NLP and machine learning. Resumes can be stored and accessed in any desired format. The main reason of this research is to secure the confidential data of the users. For achieving the accuracy the astute framework is used which enables system to extracts the data of the candidates from their CV as well as from their social media accounts and keep the data updated and consistent. Two architecture models are used in this research one is outer system which is used to provide the CVs of the candidates that have been stored and before as well as they have worked before and they need to be positioned. In outer world model all the resumes are stored and provided to the companies, whether they are not the perfect match but it can be determined by using ranking algorithm through which cv are ranked using NLP techniques and Lexical, Syntactic and Semantic.

2.3 AHP based recruitment

In [5] authors Evanthia Faliagka, Konstantinos Ramantas, Athanasios Tsakalidis, ManolisViennas, EleannaKafeza and Giannis Tzimas stated and proposed an e-recruitment system. In this research paper the study shows that CV is in HR-XML format and AHP (analytic hierarchy process). In this system CVs are converted into web forms containing questions, experience abilities etc. it is converted in HR-XML and HR companies can exchange machine readable CVs with each other. There are three steps for online hiring process pre-selection of unqualified candidates, online background research and ranking of candidates. Using XQueries CVs are filtered and then CVs are classified which have gone through filtering process using IR techniques.

2.4 Online selection based on machine learning

In [6] authors Evanthia Faliagka, Kostas Ramantas, Athanasios Tsakalidis and Giannis Tzimas stated that according to the defined criteria data is collected from the linked accounts and from their social media account as well and their personality is checked using personality analysis. Then the top candidates are ranked according to the criteria and selected for the recruiting process using machine learning algorithms.

2.5 Proposed work

CV Profiler is proposed in order to make the hiring process more efficient and less erroneous. Our system will not only be providing greater help to the recruiters but also to the people seeking for a good job and they create their profiles on online platforms like LinkedIn. Our system will scrap CVs from LinkedIn. Our system will store the CV files in a folder. Then once the resumes are extracted from LinkedIn and stored on our system. System allows user to search CVs from two categories type faculty and type administration and find the best match for the required position. Once the required data will be extracted, a list will be displayed. Manager can download those CVs as well as open the CVs to preview. CVs will be ranked on the basis of qualification and experience. Once the data is shown to the user, then user can view and visit their profile and communicate with them.

Then the ranking will be performed on the basis of experience and qualification. User can view the LinkedIn profile of the candidate as well

Chapter 3

Requirements Specifications

3.1 Existing Systems

Recruiting employees is an important task to be done in any organization. It requires the whole processes which includes online ad for job on the portal then candidates apply by sending their resumes on the desired email or upload their resumes on the desired portal. Once all of the application for the job are collected then human resource department screens through all of the CVs manually and find out the most suitable resumes for the job. Human resource team then calls or sends emails to the selected candidates that they want to interview and after taking interview or test they employ the employee for the job position. This whole process is used by most companies. Also a lot of research has been done on this particular problem and multiple tools like Application tracking systems (ATS) are introduced and used by companies like coca cola nestle etc. Human resource managers search and extract the resumes that are stored in application tracking system by using specific keywords.

3.2 Proposed System

As this is the era of internet so the basic idea of developing this project is to completely automate the recruiting process especially for those people who have made accounts on linked and they expect to be called for their desired jobs but unfortunately they never get desired call. Through our application we will serve the purpose for both the recruiters and for the job seekers. System will scrap the CVs from LinkedIn. CV Profiler will retrieve resumes from LinkedIn like platforms and store it in a folder when the company will be in need to hire an employee they can simply enter their requirements and search for their desired candidates. Resume Sorter System will pick up those CVs which are more relevant to the requirements and show the results after that CVs will be ranked on the basis of experience and qualification. Manager can view the profiles of the candidates by clicking on view profile and further communicate with them.

3.3 Requirement Specification

It is essential to specify the requirements of project to make it successful. Requirement specification has two parts which are functional requirements and non-functional requirements. Functional requirements define the behavior of the system, what system is ought to perform,

what tasks are need to be done. Nonfunctional requirements cover the areas that are not covered by functional requirements, attributes associated with functional requirements.

3.4 Functional Requirements

These are the core functionalities of our application

- Login and sign up form for administration.
- Scraping CVs from LinkedIn
- Authenticate user will be able to extract CV by searching for administration and faculty job type
- All the CVs related to requirements shall be retrieved and displayed
- Download CVs
- Rank CVs
- View profile

3.5 Nonfunctional Requirements

- **Reliability**
Reliability is an essential requirement. CV Profiler must be reliable to so that we retrieve the data of candidates and provide it to the desired companies to find the best job for job seekers.
- **Availability**
Resume Sorter System must be available 24/7
- **Performance**
System must be efficient enough to process request in no time so that users don't find any difficulty in processing or performance.
- **Security**
It is a very important non-functional requirement which will depict that the data of the applicants must be kept safe and secure.
- **User Friendly Interface**
System must have simple representable UI and UX to allow the users to operate the software without any hindrance.

- **Recovery**

Resume Sorter System must have capability of recovery in sort of natural disaster or system break down the duplication and back up of data must be kept so that we don't lose any important data

3.6 Use Cases

These will show the interaction between the user and the system.

Main Use Case

Figure 3.1 shows the main use case for the system.

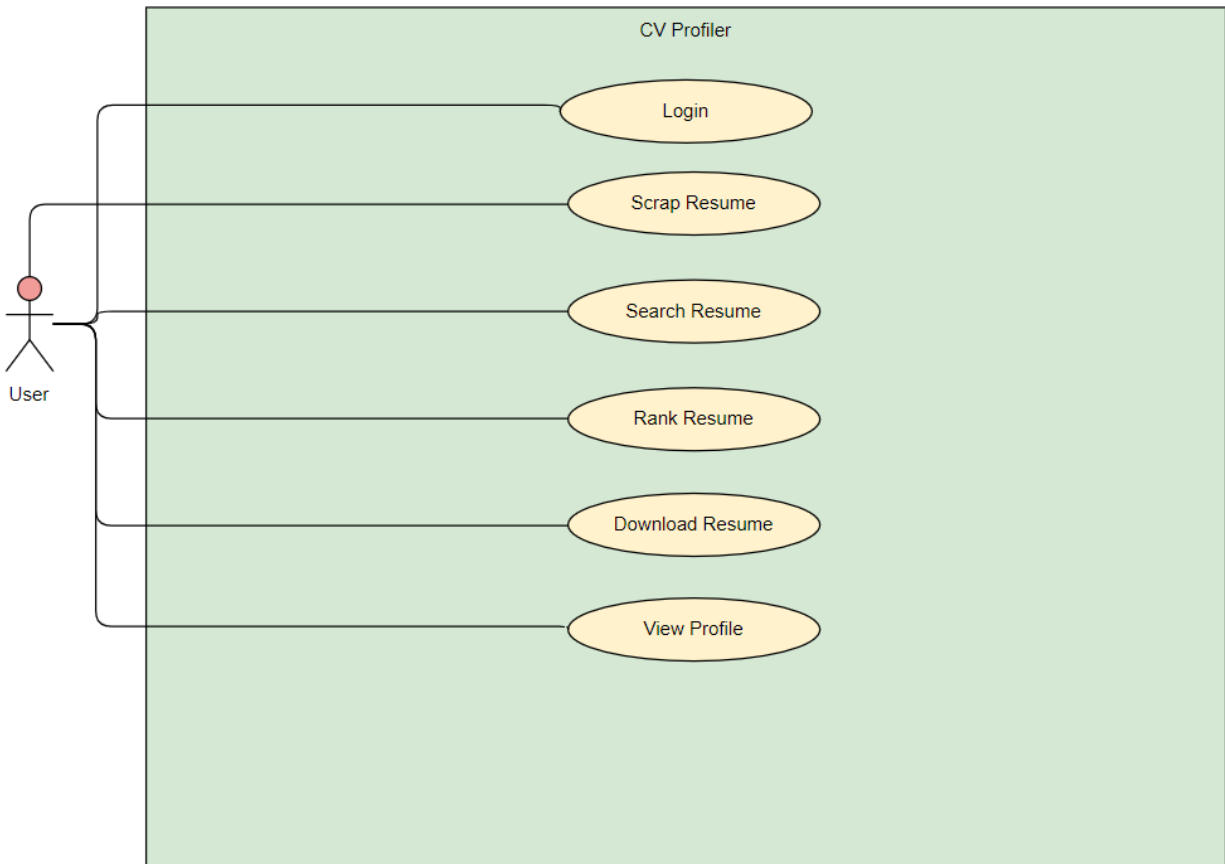


Figure 3.1: Main Use Case

Login Use Case

Figure 3.2 shows the Login Use Case for the system.

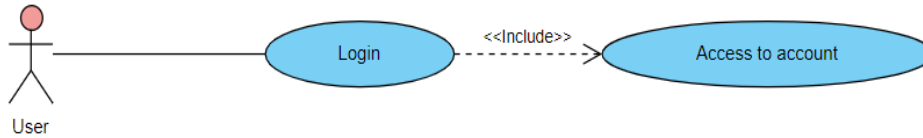


Figure 3.2: Login Use Case

Table 3.1 shows the Login Use Case for the system.

Table 3.1: Login Use Case

Login Use Case	
Use Case Id	1
Title	Login use case
Description	User can login by inserting details
Primary Actor	User
Pre-Condition	User must have valid username and password
Post-Condition	Login into system
Success Scenario	Successfully login into system and application is ready to scrap resume
Exception	Invalid username or password
Assumptions	User known how to start the application

Scrap Resume Use Case

Figure 3.3 shows the Scrap Resume Use Case for the system.



Figure 3.3: Scrap Resume Use Case

Table 3.2 shows the Scrap Resume Use Case for the system.

Table 3.2: Scrap Resume Use Case

Scrap Resume Use Case	
Use Case Id	2
Title	Scrap resume use case
Description	User can scrap resume by inserting job title and location
Primary Actor	User
Pre-Condition	Application is in running state and user must have job title and location information
Post-Condition	Scrap resume
Success Scenario	Application scrap resume
Exception	Internet disconnect
Assumptions	User known how to insert job title and location

Search Resume Use Case

Figure 3.4 shows the Search Resume Use Case for the system.



Figure 3.4: Search Resume Use Case

Table 3.3 shows the Search Resume Use Case for the system.

Table 3.3: Search Resume Use Case

Search Resume Use Case	
Use Case Id	3
Title	Search resume use case
Description	This use case is for extracting CVs from stored files.
Primary Actor	User
Pre-Condition	There must be scrapped CVs
Post-Condition	Display CVs
Success Scenario	Display searched CVs
Exception	No data found
Assumptions	User knows about the scrapped data.

Rank Resume Use Case

Figure 3.5 shows the Rank Resume Use Case for the system.



Figure 3.5: Rank Resume Use Case

Table 3.4 shows the Rank Resume Use Case for the system.

Table 3.4: Rank Resume Use Case

Use Case Id	4
Title	Rank resume use case
Description	We will rank resume
Primary Actor	User
Pre-Condition	Searched CVs
Post-Condition	Rank CVs
Success Scenario	CVs must be ranked
Exception	Application crashed
Assumptions	User knows about the scrapped and searched data.

Download Resume Use Case

Figure 3.6 shows the Download Resume Use Case for the system.



Figure 3.6: Download Resume Use Case

Table 3.5 shows the Download Resume Use Case for the system.

Table 3.5: Download Resume Use Case

Use Case Id	5
Title	Download searched CVs
Description	CVs can be downloaded clicking on download button
Primary Actor	User
Pre-Condition	CVs must be searched or ranked
Post-Condition	Download CVs
Success Scenario	CVs Downloaded successfully
Exception	Error
Assumptions	User download and view CVs

View Profile Use Case

Figure 3.7 shows the View Profile Use Case for the system.



Figure 3.7: View Profile Use Case

Table 3.6 shows the View Profile Use Case for the system.

Table 3.6: View Profile Use Case

View Profile Use Case	
Use Case Id	6
Title	View profile use case
Description	View Search CVs
Primary Actor	User
Pre-Condition	CVs must be searched
Post-Condition	View searched profiles
Success Scenario	view profile successfully
Exception	Internet disconnect
Assumptions	User can view profile and communicate with the candidate.

Chapter 4

System Design

In this chapter detailed design and architecture of our system will be defined by using diagrams. What tasks and roles are to be played by system and users? System is used in certain condition. How user will interact with system and how system is supposed to respond to the user and request made to system.

4.1 System Architecture

This is High level logical representation of system that explains modules and logical architecture of the system and their relevance with each other. This is a software application which will retrieve data from online platforms of users and store it in database then users/ HR managers will provide their requirements for job according to that CVs will be extracted and displayed. Then CVs will be ranked and classified. Users or HR managers have to signup first to avail the services of our application.

Our system has different modules that are mentioned below

- Signup
- Login
- Scrapping CVs from LinkedIn
- View /display CVs
- Rank CVs
- Send a direct message on LinkedIn to the selected candidates

4.2 Architecture Diagram

Figure 4.1 shows the Architecture Diagram for the system.

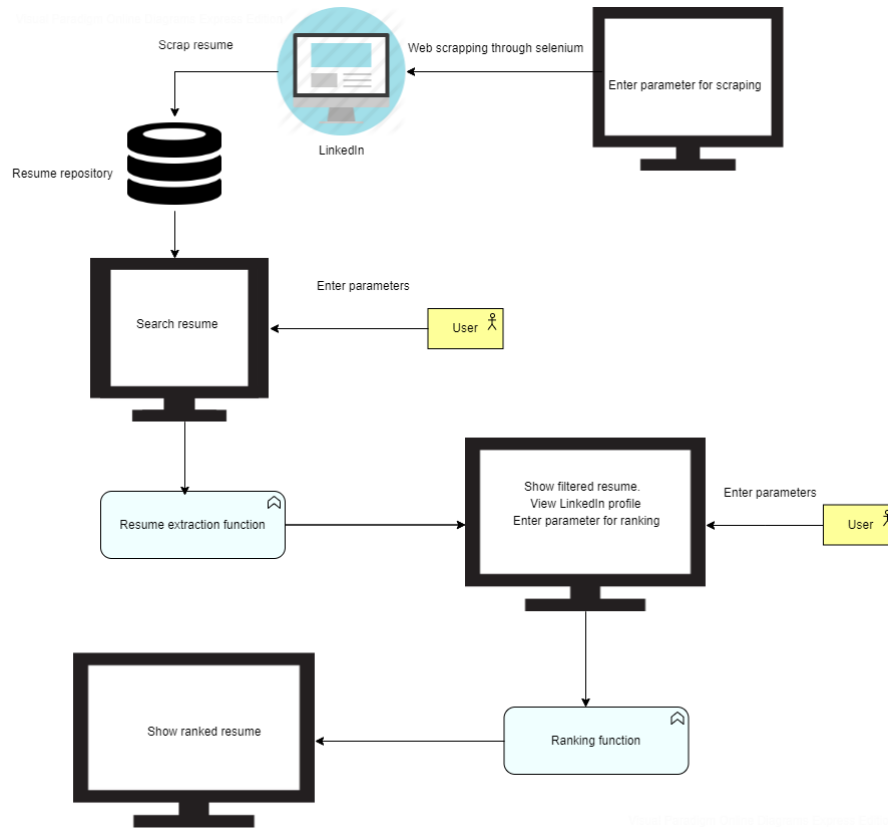


Figure 4.1: Architecture Diagram

4.3 Sequence Diagrams

4.3.1 Login Sequence Diagram

Figure 4.2 shows the Login sequence diagram of CV Profiler. We have one actor that is user and 3 events can take place. User enters the username and password and logs in to the system but if the details entered is wrong the system will give error message and user will not be able to log in to the system. If the user logs in successfully and gets verified from database then the information will be sent to dashboard.

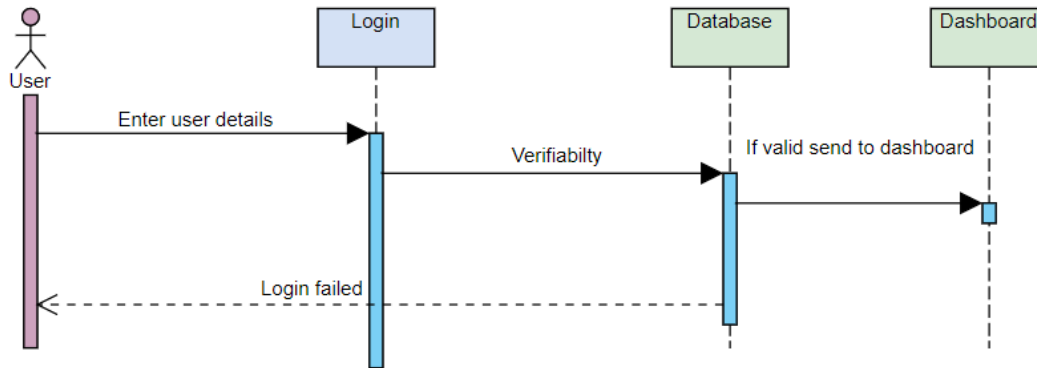


Figure 4.2: Login Sequence Diagram

4.3.2 Scrap Resume Sequence Diagram

In figure 4.3 user wants to scrap the CVs and scenario is that user has to enter the parameters required to scrap the CVs.

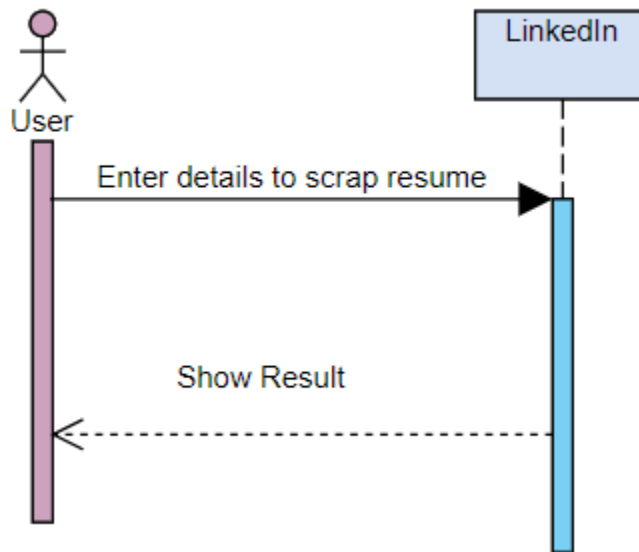


Figure 4.3: Scrape Resume Sequence Diagram

4.3.3 Search Resume Sequence Diagram

In figure 4.4 users has to enter parameters to be able to search resumes from the repository. After adding the parameters system searches the resumes from resume repository.

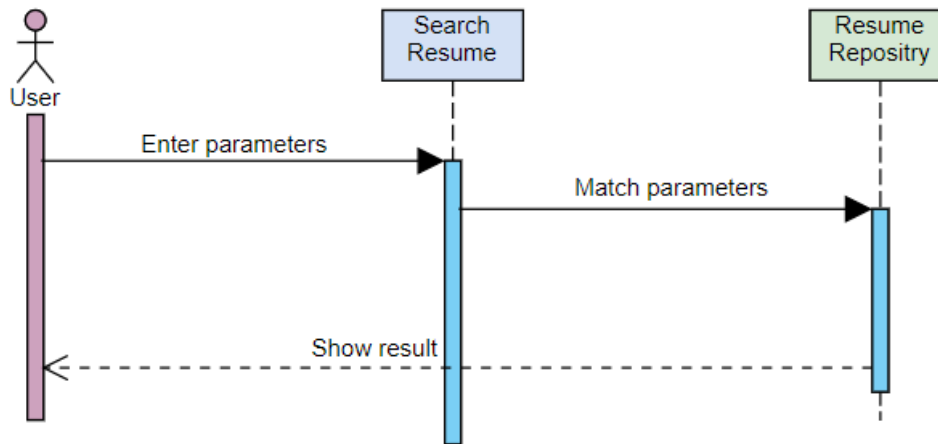


Figure 4.4: Search Resume Sequence Diagram

4.3.4 Rank Resume Sequence Diagram

In figure 4.5 user can rank the CVs, for that user has to enter the required parameters and accordingly the system will match the parameters and search through resumes and show the final result.

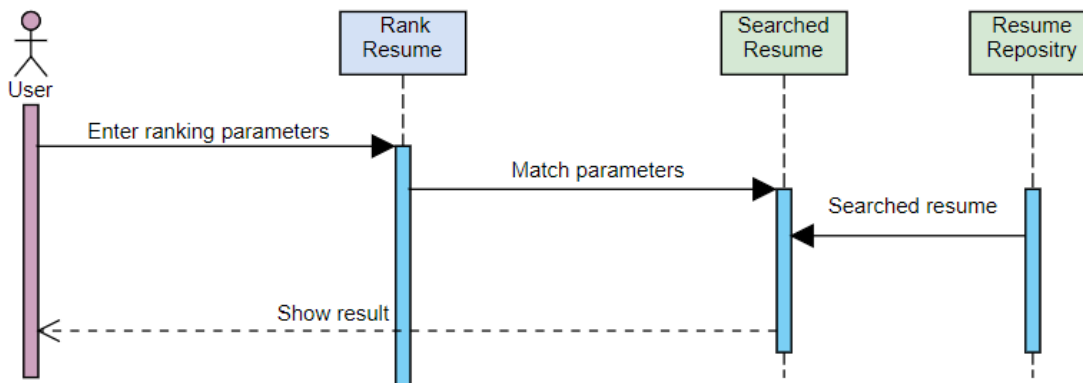


Figure 4.5: Rank Resume Sequence Diagram

4.3.5 Download Resume Sequence Diagram

In figure 4.6 users can rank the CVs, for that user wants to download the CVs. User has to click on the download button and system will download and save CVs.

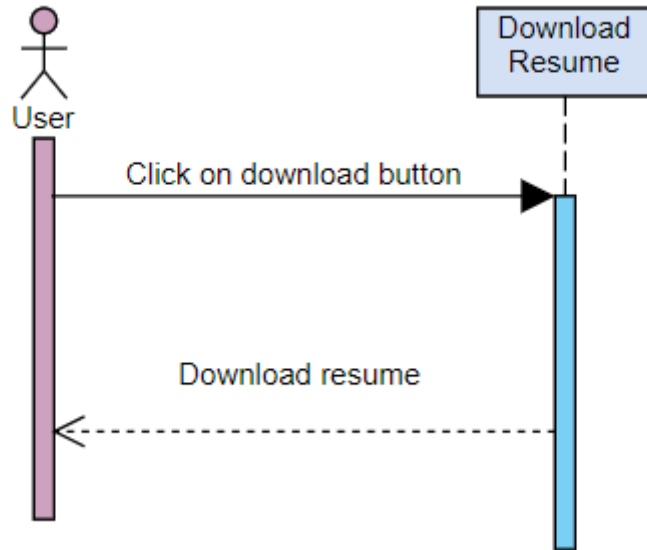


Figure 4.6: Download Resume Sequence Diagram

4.3.6 View profile Sequence Diagram

In figure 4.7 users can view the LinkedIn profile of the candidate. User will click on view profile button and log in to LinkedIn. Profile of the candidate will be viewed.

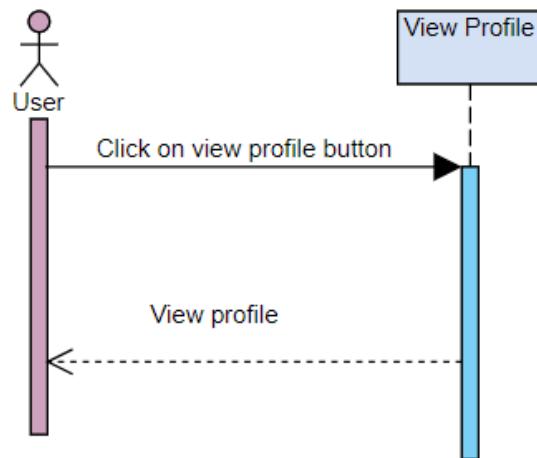


Figure 4.7: View Profile Sequence Diagram

Chapter 5

System Implementation

In this chapter we will describe the architecture of our system i.e. modules, functionality of the components and their communication between each other and how they are integrated in our application.

5.1 System Architecture

We will introduce the CV profiler system and how the system was implemented logically, physically and systematically. This is logical representation of top-level application that describes that which components are being used and how they are working and Integrated in our system. It also gives information about the environment in which system is being developed.

5.2 Tools and Technology

There are many techniques which are being used in CV profiler system.

Database

Excel database file make it easy to enter, store and find specific information.

Python

We are using python language for implementation of our project. We required scrapping CVs from LinkedIn so there were libraries that support scrapping better than other languages.

PyCharm

It is integrated development environment used in computer programing for the python language.

Selenium driver

We have used selenium driver to help scrap CVs from LinkedIn. Selenium driver python is web automation framework which could be used for automatic testing and to perform tasks through web. Through python APIS we can connect to the browser through selenium driver.

PyQt

It is a graphical user interface widgets toolkit.

HTML/CSS

Hypertext markup language is a standard language to create different web applications. It includes cascading style sheets along with JavaScript.

5.3 Methodology

This Application is composed of multiple features so we have used incremental model. The reason to choose this model is because at each increment a new feature was to be developed and changes were made according to the user suggestions.

Phase 1: In our first increment we developed the login/Signup page.

Phase 2: then login page will be opened by entering credentials HR manager will further go to the main page.

Phase 3: in this phase manager will add location and job title and the system will scrap CVs from LinkedIn and CVs will be stored in a folder.

Phase 4: In this phase interface/portal will be developed, where manager can add the requirements related to the job faculty type or administration type and search the CVs.

Phase 5: In this phase we have developed the system that it will display the CVs and allow to download and view candidate LinkedIn profile.

Phase 6: In this phase system will rank the CVs and display the CVs.

Phase 7: In this phase we will develop a view profile system through which manager will view the LinkedIn profile of any candidate.

Phase 8: In the last phase all the components of the system are going to be integrated. And the system will be ready for testing in this phase.

5.3 Flowchart

Figure 5.1 displays the flow chart for the system.

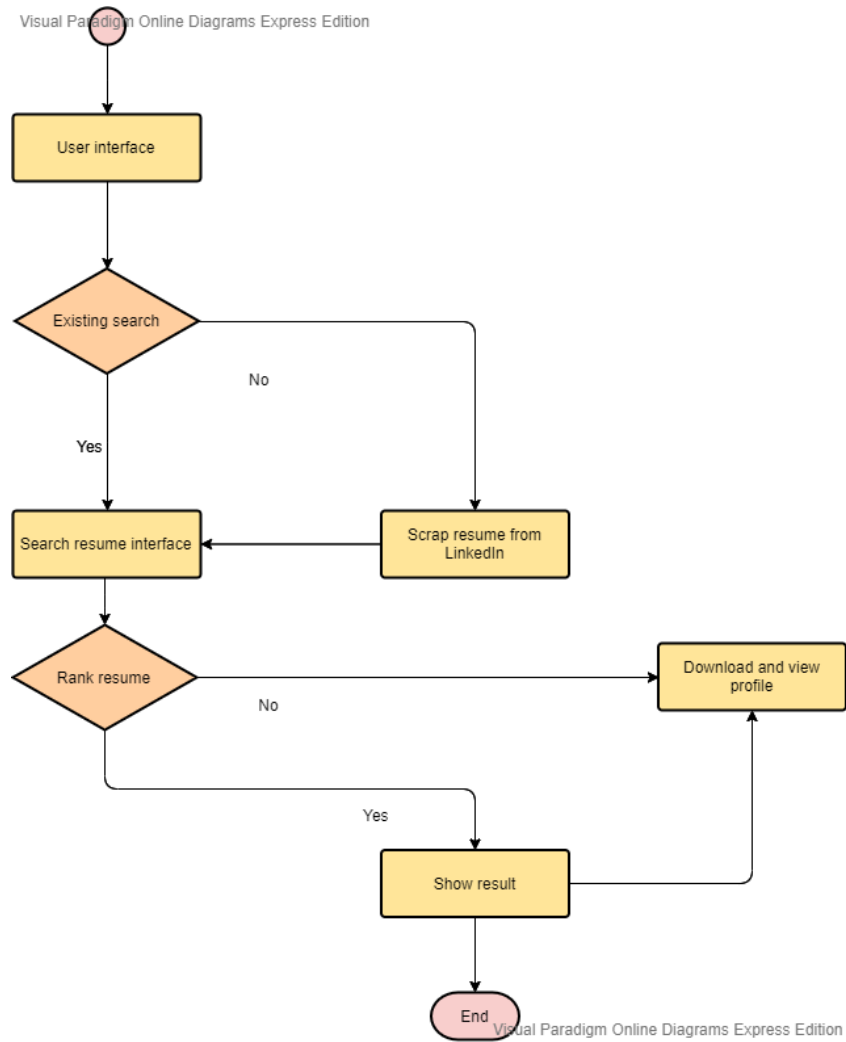


Figure 5.1: Flowchart

Chapter 6

System testing and evaluation

In this chapter evaluation and testing is performed to ensure that the CV Profiler is developed correctly to perform tasks it was supposed to perform. Testing and evaluation is very vital part after development to identify the system errors and bugs those which can occur in certain circumstances. Testing is done using multiple techniques and tools. Our system basically is supposed to scrap CVs from LinkedIn, allow HR manager to view and download the CVs, rank them and select the matched CVs according to the job requirement. So we will test our system that it scraps CVs according to the title and location.

6.1 Graphical user interface testing:

Graphical user interface testing is an effective process to evaluate the flexibility and interactivity of the user interface. CV Profiler system is particularly developed for HR department so the interface has to be simple and interactive.

6.2 Usability testing

Usability testing is performed to make sure that application is easy to use and user friendly. There should be no training required to learn how to use it. It should not be complex for managers to use.

6.3 Load testing

Load testing is performed to ensure that application searches profiles or CVs of people on the basis of location and job title. System should not get hanged or slow down while scraping profiles and CVs.

6.3 Functional testing

We will use this functional testing to test the performance of the functions that our system is supposed to perform.

6.4 Unit testing

Every part of the system must be tested individually so that it works properly and does not create any issues.

6.5 Test cases

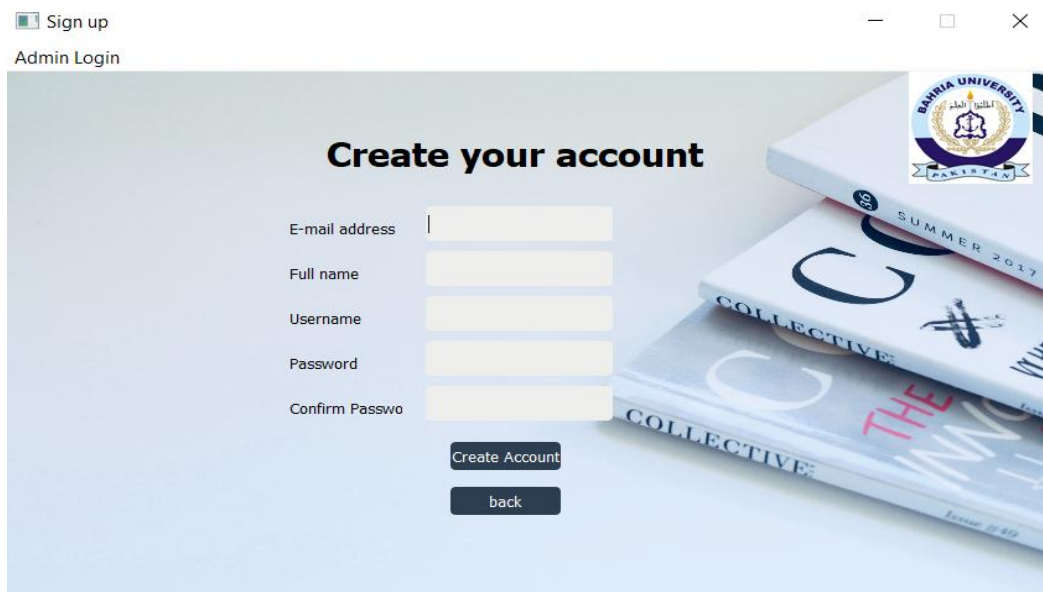
Test case for Signup screen:

Table 6.1 displays the Test Case for Signup Screen.

Table 6.1: Test Case for Signup Screen

Test case Id	01
Function to be tested	Checking Sign up screen
Initial state	Sign up form is open
Input	Adding user details
Expected output	Signed up successfully
Status	Success

Output



The screenshot shows a web browser window with the title 'Sign up' and 'Admin Login'. The main content is a 'Create your account' form. The form includes five input fields: 'E-mail address', 'Full name', 'Username', 'Password', and 'Confirm Passwo'. Below the fields are two buttons: 'Create Account' and 'back'. The background of the form is light blue and features a stack of books on the right side. The top book is 'BANKIA UNIVERSITY' with a logo and 'PAKISTAN' below it. The middle book is 'SUMMER 2017' and the bottom book is 'COLLECTIVE THE'. The browser window has standard window controls (minimize, maximize, close) in the top right corner.

Test case for login screen:

Table 6.2 displays the Test Case for Login Screen

Table 6.2: Test Case for Login Screen

Test case Id	02
Function to be tested	Log-in credentials
Initial state	Login page is open
Input	Providing correct username and password
Expected output	Successfully login
Status	Success

Output



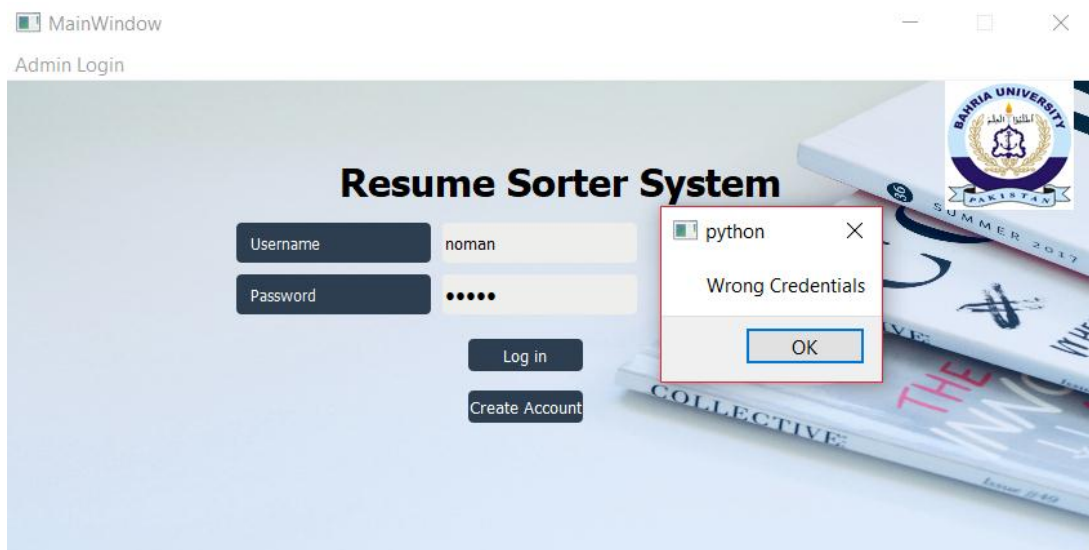
Test case for login screen (wrong username and password)

Table 6.3 displays the Test Case for Login Screen (Wrong username or password).

Table 6.3: Test Case for Login Screen (Wrong username or password)

Test case Id	03
Function to be tested	Log-in credentials
Initial state	Log in page is open
Input	Providing Incorrect username and password
Expected output	Displays Error
Status	Success

Output



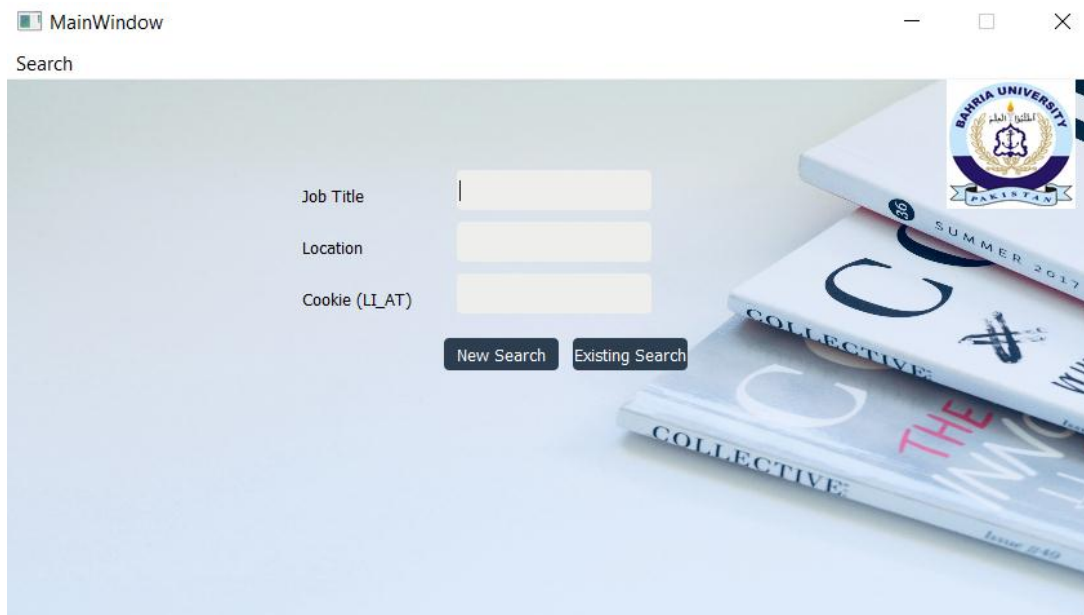
Scrapping CV:

Table 6.4 displays the Test Case for Scrapping CVs.

Table 6.4: Test Case for Scrapping CVs

Test case Id	04
Function to be tested	Getting CVs from LinkedIn
Initial state	Admin should be logged into the system
Input	Enter location and job title
Expected output	Getting data from LinkedIn profiles
Status	Success

Output



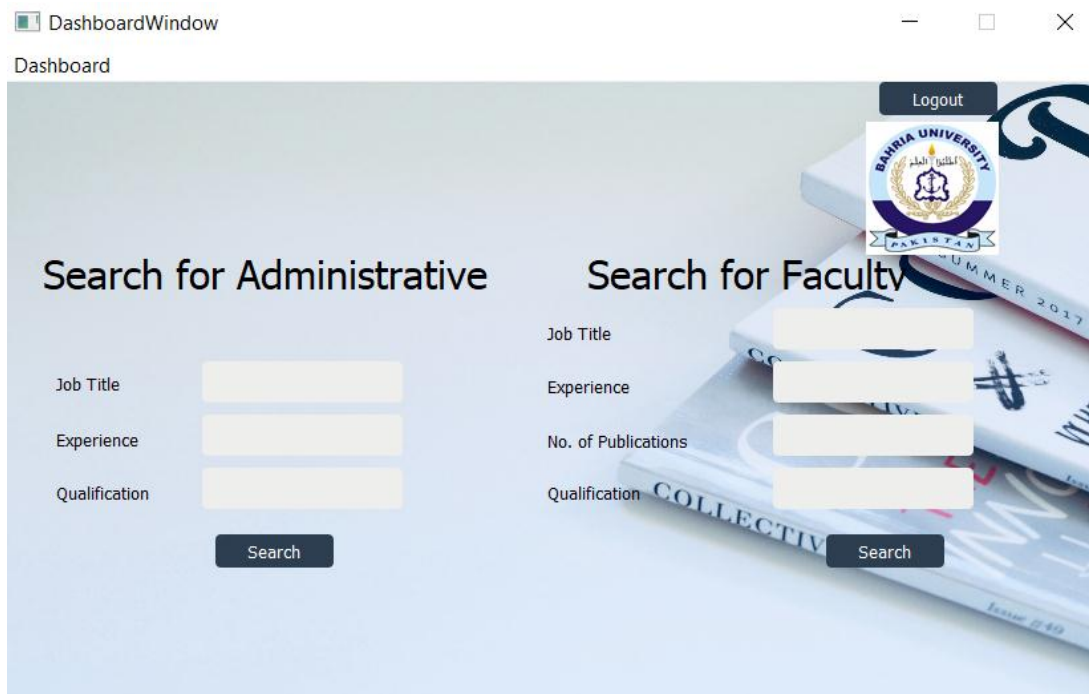
Searching CVs

Table 6.5 displays the Test Case for Searching CVs.

Table 6.5: Test Case for Searching CVs

Test case Id	05
Function to be tested	CVs are being extracted
Initial state	Scrapped CVs
Input	Insertion of fields faculty type and administration type
Expected output	Search successful
Status	Successful


Output



The screenshot shows a web application window titled "DashboardWindow" with a "Dashboard" header. The main content area is split into two search sections. On the left, "Search for Administrative" includes input fields for "Job Title", "Experience", and "Qualification", with a "Search" button below. On the right, "Search for Faculty" includes input fields for "Job Title", "Experience", "No. of Publications", and "Qualification", with a "Search" button below. A "Logout" button is located in the top right corner. The background features a stack of books, including one titled "COLLECTIVE" and another "SUMMER 2017". A circular logo for "BAHRIA UNIVERSITY" is overlaid on the right side.

MainWindow Results

Logout



Resume for Faculty Position

	Name	
1	TAIBA Creations.docx	Download
2	Iqra Noor.docx	Download
3	Rida Hashmi.docx	Download
4	Zohaib Liaqat.docx	Download


Qualification

Experience

<Back Search

MainWindow Results

Logout



Resume for Administrative Position

	Name	
1	Azka Shahid.docx	Download
2	TAIBA Creations.docx	Download
3	Nafees Anwar.docx	Download
4	Amir Mughal.docx	Download

Qualification

Experience

<Back Search

Ranking CVs

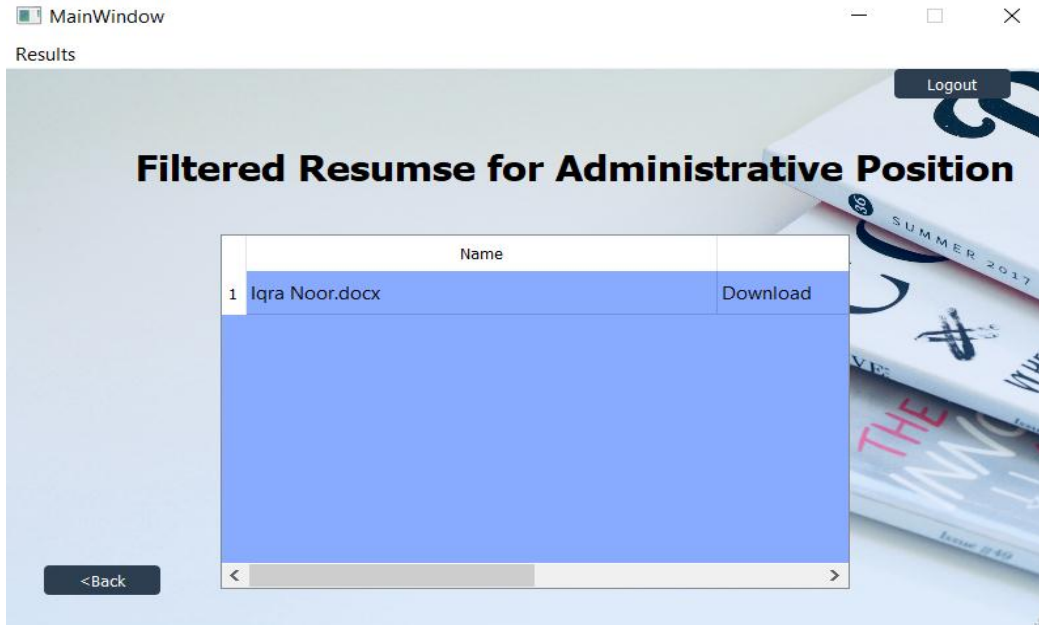
Table 6.6 displays the Test Case for Ranking CVs

Table 6.6: Test Case for Ranking CVs

Test case Id	06
Function to be tested	Ranking CVs
Initial state	Scrapped/extracted CVs
Input	Insertion of Experience and Qualification
Expected output	Displaying CVs
Status	Success

Output





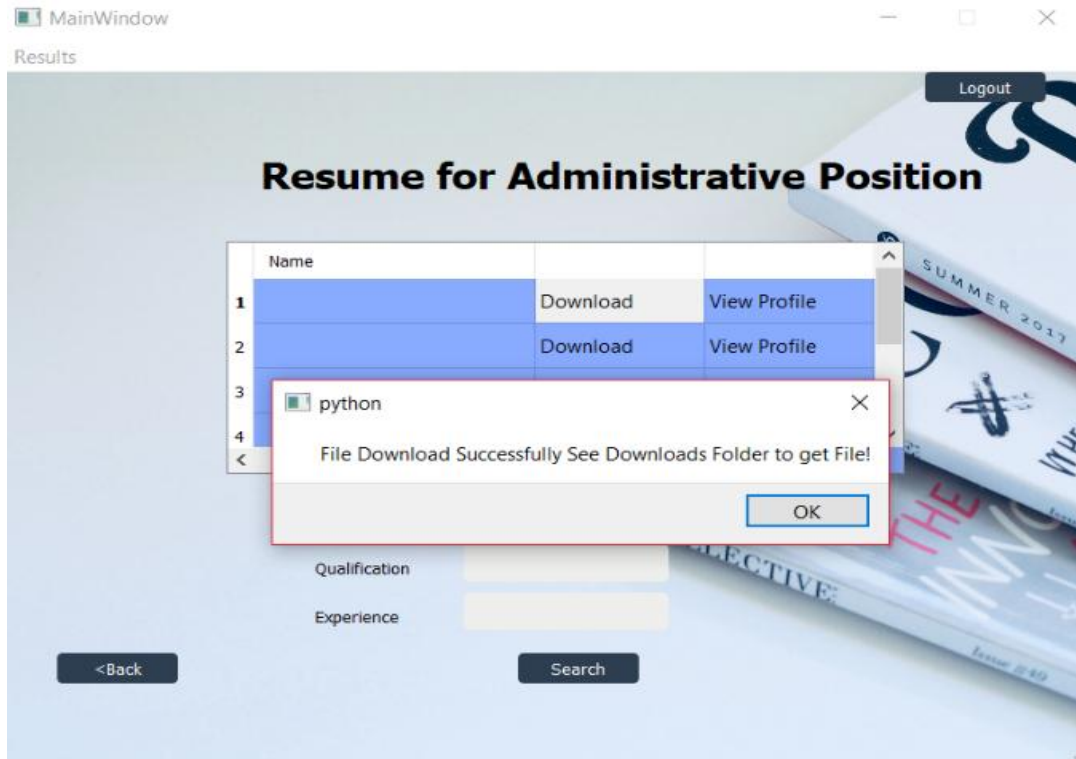
Downloading CVs

Table 6.7 displays the Test Case for Downloading CVs.

Table 6.7: Test Case for Downloading CVs

Test case Id	06
Function to be tested	Downloading CVs
Initial state	Searched CVs
Input	Displayed CVs
Expected output	Downloading CVs
Status	Success

Output



View LinkedIn profile of the candidates

Table 6.8 displays the Test Case for View LinkedIn Profiles.

Table 6.8: Test Case for View LinkedIn Profiles


Test case Id	07
Function to be tested	Viewing the LinkedIn profile of the desired candidates.
Initial state	After ranking, if manager wants to view and communicate with candidates.
Input	Click on view profile option
Expected output	Profile opened
Status	Success

Output

MainWindow

Results

Logout




Resume for Faculty Position

Name		
1	Download	View Profile
2	Download	View Profile
3	Download	View Profile
4	Download	View Profile

Qualification

Experience

<Back Search



Chapter 7

Conclusion

The project “CV Profiler” is basically developed to help Bahria University finding talented and deserving candidates through their LinkedIn profiles. Our system is particularly for HR department which will help them in the recruiting process. Manually collecting CVs is hectic and inefficient method. Through this application manager will insert the Job title and location and the system will scrap LinkedIn profiles of candidates and extract their CVs in .Word format. And save those files in a folder in C drive. Further HR manager can apply filters on the saved files and get the desired results. Rank those CVs on the basis of candidates Experience. Hr. manager can also view the LinkedIn profile of the candidate and can call for an interview or communicate. All functions were implemented in the application smoothly.

7.1 Major Accomplishment

During the development process of this process we faced a lot of challenges and difficulties. Language we had to use in order to develop the project was completely new to us. We learned the languages, tools and technologies. We got stuck and searched for the solution the problems that we faced. It was a major accomplishment for us to complete this project due to our endless efforts and spirit of not giving up even when certain things became difficult for us to carry along and perform few tasks.

7.2 Future enhancement

Scope of our project is limited at initial level for now. We were advised to keep the scope less to make it efficient due to the lack of resources and time. In future we can add more features and expand the scope of our project. Now the data is being extracted from LinkedIn but for future enhancements we can scrap data from multiple websites like LinkedIn rozee.pk. we will also add the feature of uploading manual CVs and connect the system with university’s email so that the candidates who email CVs. Data will be identified and extracted from it and will be stored in repository.

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