

Education & Career Guidance Portal

Final Report

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1. Summary/Overview

1.1 Background

With the advancement of technology, many recruitment platforms can be found on the internet to ease the workload of a job hunter. These platforms allow companies to post their job listing information and look out for suitable candidates. Job hunters can simply visit the recruitment platforms and enter keywords to search for a particular job they are interested in. Besides that, filters such as Sector, Specialization, and Minimum Salary also ease the searching process significantly.

1.2 Problem Statement

In the current state of education, many students are enrolling in their courses without knowing the possibility of the career paths when they completed their diploma. Besides that, there is also a situation whereby a student know which career path they will be taking but not sure which elective modules are relevant for them to reach their career.

Recruitment platforms available on the internet are only convenient if the person has some industry experience in that particular industry or for people who have a rough idea of what career they would like to pursue in the future. Students that enrolled their course without knowing what career paths are available for them may have a rough future ahead of them. When they realize that the careers offered to them based on their diploma are not what they are looking for, it will already be too late.

1.3 Purpose Statement

Our solution aims to be a web platform that helps provide guidance for students of ICT in planning for their future career path. The solution solves the issue of students not knowing what future careers are available for them. By knowing which courses our students are attending, the skill sets that they have and their personality, our ECG portal will be able to list down the jobs that are relevant to their details. There are also many different filters that let the student scope down the specific job that they might be interested in.

Letting the student know what jobs are available for them based on what they are or will be studying will let the student make wiser decisions to what elective modules to take in year 2 and 3.

Our portal also provides a list of courses from different universities to properly guide our students towards their further studies after polytechnic education. The list will show courses in universities that are relevant to the student's current course.

1.4 Stakeholders

The stakeholders of the project would be Students of ICT, Mentors, ECG Counsellors and Company employers looking for potential students to work in their company.

Student

The Students would be the primary stakeholders because the purpose of our portal is to lead them to a suitable career path. They are the main users of the portal and the portal is created to suit their needs.

Mentors & Counsellors

Mentors and ECG Counsellors are the secondary stakeholders because upon looking at what jobs their students are interested in, they may be able to give more appropriate feedback to the students.

Employers

Lastly, Company employers are our external stakeholders because their job postings on job portals on the internet would be appearing in our portal.

2. Analysis

2.1 Initial User Journey

In the beginning when we first started the project, our understanding towards how the user journey flow was very little. Our initial idea for ECG portal only consist of a few parts; Login, Job Preview, Course Planner, Personality Test, and also Web Crawling/Scripting.

Login

Upon login, students is required to select the course they are currently in. After the course has been selected, the ECG portal will populate a list of the related sector. Students will then need to select their desired working sector and lastly populate the relevant job.

Job Preview

When the relevant jobs are populated, students will then choose a job posting that they are interested in. Upon selecting the job listing, the ECG portal will display the job descriptions and relevant information such as skill sets needed.

Course Planner

After the skill sets needed are displayed on that particular job list, the ECG portal will save the information inside the database and display it on the Course Planner. Based on the skill sets retrieved from the database, students can follow the skill sets list to select electives modules relevant to a particular career path.

Personality Test

After filtering the desired sectors, another way of filtering is via the personality test. Students will be redirected to the 16personalities page to take the test. When the test is complete, students are required to select the personality type they are given via the test.

Web Crawling/Scraping

Web crawling is the most important component in this project. When the students filter based on skill sets, the ECG portal is required to scrap job from the different recruitment platforms to get the relevant job. If the students filter based on personality type, the ECG portal is also required to crawl job information to get the relevant job.

2.2 Survey

After designing the initial user journey in the first few weeks, we decided to create a survey to gather constructive feedback from the students of ICT. Topics such as Job Recommendation, Course Planner, Personality Test, and Further Studies has been highlighted in the survey as these are some of the key features we will be implemented in the project. *Following are some of the questions asked:*

The image displays three separate sections of a survey, each enclosed in a light brown border with dark brown header bars.

Section 2 of 13: Job Recommendation

The ECG Portal will have a list of working sectors that are related to the student's course of study. Based on the working sector selected, a list of jobs will be generated for the student to refer to and select as their desired job.

Do you think the above function is useful? *

Yes
 No

Section 5 of 13: Course Planner

After the student has chosen their desired job, the course planner will select the electives providing skill sets related to their desired job.

Do you think the above function is useful? *

Yes
 No

Section 8 of 13: Personality Test

Records the personality of the Student and recommend jobs based on their personality.

Do you think the above function is useful? *

Yes
 No

Section 11 of 13

X ::

Recommendation for Further Studies

Based on the job they selected, universities with courses related to their job will be recommended

Do you think the above function is useful? *

Yes

No

After gathering the feedbacks from 17 ICT student, we notice that majority of the responses for Job Recommendation involve around filtering. Suggestions such as sort by education qualification and personal interest were given. Besides that, feedbacks such as adding DISC into the personality test; Show in-depth information for a particular course; Retrieving the student's current cumulative grade and filter which course they are able to apply for, and also display the world ranking of universities. Hence, the responses gathered were very constructive as we get to understand what the student wishes to look out for and is more relevant than just going straight into the project development phase without any analysis. (Refer to **Appendix A** for the consolidated responses)

2.3 Actual User Journey

After gathering all the responses from 17 students in ICT, we decided to make some changes to our initial user journey. The actual user journey consists of Home, Personality Test, Bookmarks, Course Planner, and Further Studies.

Home

Upon login into their student account, the ECG portal will take the course id and redirect the page to their respective Home. Students can choose to filter based on course, skill sets, and their personality. After selecting the option, a list of checkbox will be populated for the student to check and they may proceed to Filter. Job listings will be populated and the student can choose to bookmark a particular job.

Bookmarks

After a particular job listing has been bookmark, it will be displayed in the Bookmarks page. The student can then remove the bookmark from the page if they are not interested in that particular job listing.

Personality Test

In order to filter by personality type, students are required to take a personality test using 16Personalities. After the test is completed, the 16Personalities will determine which personality type is cater to them. Once the student receives their MBTI results, they will need to update their personality.

Course Planner

Course Planner will display all the modules from semester 1 to 6. For semester that has elective and IS elective, choices given allocated for their particular course will be display in the format of a drop-down list.

Further Studies

The ECG Portal will then filter based on the student course id and populate the possible Bachelor course from the universities.

2.4 Comparison with Skillsfuture

Before the implementation phase start, we have decided to reference the Skillsfuture web platform to have a rough idea how the website will look. After looking at the website, we realize that color scheme is very important. Raising the question to our academic supervisor, he told us to use ICT related color. With the answer given, we proceed to draft out Home, Course Planner, Further Studies, and Personality pages. (*Refer to Appendix B for the paper prototype*)

3. Unique Value Proposition

3.1 Benefits of Solution

Clear Uncertainty

When students first enter polytechnic education, some of them may have already started to think about their future career path. However, there is a vast amount of jobs opportunities in the market and students have difficulties finding a suitable job for themselves. Students will also feel uncertain whether the career path they are striving for is relevant to what they are currently pursuing in.

With the ECG portal, we will clear the uncertainty of our students in ICT by analyzing what course a student is in, the skill sets they have and getting to know more about their personality. By doing so, we will be able to find out what kind of jobs are most suitable for the students. If they decide to choose a certain module with that

particular skill sets in their course, they will be able to find more job opportunities with that particular skills

In- Depth Filter

Filter Based On:

Interest:

Business & Data Analytics Cloud Computing
 Enterprise Solutioning Games Programming Mobile Business Applications
 Infocomm Sales & Marketing Solutions Architect List All

Filter Based On:

Programming Information Systems Operating Systems Web Application Development
 Object-Oriented Analysis & Design List All

Under the Job preview section, there are 3 primary filters namely; Course, Skill Sets, and Personality. Within the Course and Skill Sets filter, there is a set of secondary filters that allows the student to further scope down the jobs they wish to be displayed in the ECG portal. By choosing multiple filters, the students will have a broader range of job listing or target specific sectors in search of their desired job.

Course Planner

By displaying the course planner in the ECG portal, students can get an overview of the course and know what modules they are taking during the three years of polytechnic education.

Personality Test

Retrieving the MBTI results that students update, we are able to recommend job opportunities based on their personality. Besides looking at student's course and skill sets, it is also important to take their personality into account. By recommending jobs based on their personality type, we open up more opportunities for them even though the recommended job may not be related to their course. Therefore, they can still seek advice from their mentors/ECG counselors to guide them towards that career.

Further Studies

In addition to the wide variety of job recommendations, we also recommend our student's alternative paths to pursue their further studies. It is common for students

to be uncertain of what undergraduate courses to take in the university. Our recommendation will be based on student's current course so that they will be able to expand their knowledge in areas they are proficient in.

3.2 Unique Points

Approach

The approach of our ECG portal towards its target audience is distinctly different from traditional recruitment platforms. It is unique because the portal is able to identify jobs that are best suitable for the students. Even if the students do not know what jobs they are interested in or what skill sets they obtain, the ECG portal will find jobs that are most appropriate for that course. Comparatively, traditional recruitment platforms have a much wider range of job opportunities but require the end-users to have a good idea of what jobs they are looking for.

Course Specialization

Common Jobs in IT



There are 5 different home pages that cater to the 5 different course of ICT. Upon logging in with their user credentials, the student will be directed to the home page of their course. For each course, 4 most common jobs will be shown on the page. These common jobs act as a fast guide for students who have a wide range of skill sets and are unsure of which specific sector they would like to look into.

Algorithm (Web Scraping)

We used a web scraping algorithm that searches through the websites we have listed down. The algorithm will retrieve all job postings on Job Street and store it in our database. The keywords that we used are relevant to the course in ICT. By iterating through all the keywords stored in our database using the algorithm, we are able to retrieve all the possible jobs available for our students.

We also used the algorithm to search through various university according to the courses in ICT. Using the algorithm, we scrapped the information of courses that are relevant to our student's course of study. Since universities offer courses for undergraduates, graduates, and postgraduates, we wrote the algorithm in such a way that it only retrieves information for undergraduate courses as after obtaining a diploma, students will be looking for an undergraduate degree.

The algorithm also retrieves the links where the information came from so that the students will be able to click on the links on our portal to be directed to that particular page for more information. (*Refer to **Appendix C** for Activity Flow Diagram*)

Explanation:

Since we are scraping a large chunk of information from different websites, the process is rather time-consuming and can be difficult to maintain while running our server itself. Thus, the scraping process is to be executed separately from the portal to ensure that all job postings and further studies recommendations will be available for the students to view.

1. In order to start the process, the administrator in charge must first execute the scraping tool.
2. The tool would retrieve all keywords stored in our database and store them in an array. The retrieval is done using an SQL statement that selects the different job categories and possible job sectors from our database.

```
# Retrieve Keywords from Database
def retrieve_keywords():
    select_keywords_sql = "SELECT job_category FROM `ecg_jobcategory`"
    select_mbti_sql = "SELECT mbti_code, possible_job_sector FROM `ecg_mbti`"

    conn = MySQLdb.connect(host='localhost', user='root', password='', db='ecgdb')
    db = conn.cursor()

    conn.set_character_set('utf8')
    db.execute('SET NAMES utf8;')
    db.execute('SET CHARACTER SET utf8;')
    db.execute('SET character_set_connection=utf8;')

    status = ""
    try:
        # Retrieve Job Keywords
        db.execute(select_keywords_sql)
        rows = db.fetchall()
        for each_row in rows:
            keywords_search.append(each_row[0])
    except:
        status = "Error: unable to connect to database"
```

3. The next process would be the algorithm that searches through websites with the keywords that we have entered.

```
# js_scrape_keyword: Job Keyword Scraping from JobStreet
def js_scrape_keyword():
    mbti = ""
    data = []
    for keyword in keywords_search:
        keyword = keyword.strip()
        keyword_space_replace = keyword.replace(' ', '%20')
        keyword_no_space = keyword.replace(' ', '')
        url = "https://www.jobstreet.com.sg/en/job-search/job-vacancy.php?ojs=10&key=" + keyword_space_replace
        html_contents = requests.get(url).text
        soup = bs.BeautifulSoup(html_contents, 'html5lib')

        containers = soup.find_all('div', {'class': 'panel-body'})
```

For Job Street, while searching for jobs using their search box, their URL would replace the spaces between words entered in the search box with special characters. In order to ensure compatibility between our keywords and Job Street's search function, we replaced the spaces in our keywords for our algorithm to have a valid URL that matches the ones in Job Street.

Following that, we would retrieve the contents of the page by using the request. Get text function.

For the main gist of our algorithm, we used BeautifulSoup which is a library available in python. BeautifulSoup helps pull data out from the HTML contents we retrieved from the URL. The “html5lib” is a pure python parser that parses the HTML contents of the text that we retrieved into its different HTML.

The containers will store all the HTML code that was found within the panel body of Job Street's website. The panel body contains the information that we require such as Job Title, Company and a Link to view the full job posting.

4. Proceeding on we would be retrieved all the attributes contained inside our container.

```
containers = soup.find_all('div', {'class': 'panel-body'})  
  
counter = 0  
for con in containers:  
    if counter != 3:  
        job_position = con.find('a', {'class': 'position-title-link'})  
  
        if job_position is not None:  
            if (job_position.get('href') != 'https://www.jobstreet.com.sg/en/job/1'):  
                counter += 1  
                counter_string = str(counter).rjust(3, '0')  
                job_id = "JS" + "-" + keyword_no_space.upper() + counter_string  
  
                job_link = job_position.get('href')  
  
                job_company = con.find('a', {'class': 'company-name'})
```

We've set a counter to limit the job postings we will be scraping to 3. As mentioned early, the scraping process is very time consuming and if a limit wasn't set, the scraping of all the job contained within Job Street website would take many hours.

From within the container, we are able to find all the attributes of the job posting related to our keywords. By using the HTML references in the website itself, such as the class names and href tags, we are able to retrieve all information that we need.

```
# Retrieve Job Descriptions  
job_html_contents = requests.get(job_link).text  
job_soup = bs.BeautifulSoup(job_html_contents, 'html5lib')  
job_desc = job_soup.find('div', {'class': 'unselectable wrap-text'})  
if job_desc is not None:  
    job_desc = job_desc.text  
else:  
    job_desc = "Job has already been unlisted"  
  
job_date = str(datetime.date.today())  
  
values = [job_id, job_link, job_position.text, job_company, job_category, job_desc.strip(),  
data.append(values)
```

Specifically for retrieving the job description, since the panel body of the URL, we are currently scraping in only contains a portion of the job description. We had to scrap the contents from within the URL of the job posting itself. From there we are able to retrieve the full description of the job post. If the description cannot be found, it means that the job has already been unlisted and we will add a description to inform the user.

Finally, for each object in our container, after retrieving the necessary information, we will append our database with the values. The algorithm repeats itself 3 times for each keyword, retrieving a total of 3 jobs, and iterates again until all keywords have been scrapped.

Technique

Filter Based On: Course Skill Sets Personality

Interest:

Business & Data Analytics Cloud Computing
 Enterprise Solutioning Games Programming Mobile Business Applications
 Infocomm Sales & Marketing Solutions Architect List All

Filter

We used checkboxes on our home page to help filter down the jobs to be displayed on the portal. Instead of just showing jobs based on their course, we allowed our students to have an interest section that lets them choose specific areas of interest from within their course. This technique in a way helps the student to both narrow down and broaden the list of jobs displayed on the portal.

Deliverables

Even though the portal is solely targeting at the School of ICT for now, we feel that it can be a unique portal where all students of Ngee Ann Poly can use to guide them on their career path. The portal can be expanded to cater to all the other courses of our school, similarly like NPai and Mel.

4. Solution Description

4.1 Important Characteristics

Versatility

The ECG Portal that we have developed is very versatile and has much potential for growth. Currently, the portal is only targeted at the school of ICT and our 5 courses. The scraping tool is also only scraping job postings from Job Street as of now. As for further studies, the universities that we scrapped are NUS, NTU, SIM, and DigiPen.

There's high versatility because our portal can be expanded to serve all the different courses in Ngee Ann Poly to cater to all our students. The scrapping functionality can also be further developed to allow a wider range of websites. This

way, the solution would be more effective in helping our students find their most suitable or desired job.

Security

During our development phase, we did not focus heavily on security because we felt that the functionality of our portal is of higher importance. Without the initial functions of our portal, we will not be able to identify the flaws in our portal and whether there are any vulnerabilities for hacking attacks. However, a simple validation was done to ensure that only students that have their details in our database would be able to login to the portal.

As of now, although our portal does not have any security functions, there isn't much valuable information that can be obtained by hacking into the portal as well. Since the portal is used as a guide to recommend jobs to students, the personal information that we store would only be the student's name and password. Therefore, it would be much of a threat unless we are attacked heavily on our database structure.

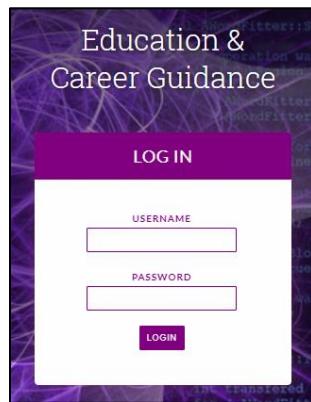
Effective Navigation



We used global navigation for our portal. Our portal is fairly simple because we only have 5 main tabs and an account drop-down list. The tabs are of our functions inclusive of, the home page, personality page, bookmarks page, course planner page and further studies page. Global navigation is effective because our portal does not have any multi-leveled pages that require breadcrumb navigation. When the user clicks on any of the 5 tabs at the navigation bar, he/she would be immediately directed to that page without having to navigate elsewhere.

Global Navigation is also persistent and prevalent across the portal, the navigation bar will remain the same, and it can be seen in all the pages of our portal.

Color Scheme



We went with purple as the primary color for our portal because it represents the school of ICT. Purple is also a rather luxurious color and makes the portal look professional. Instead of dull colors or overly bright colors like yellow, we are able to portray professionalism and students using the portal will be captivated and feel more interested in exploring the functions of the portal. White was used as our secondary color to give the portal a simple look. If too many colors were used, it may be too distracting to the user's eyes or may cause discomfort for their eyes. By using purple and white, our portal looks professional yet simple at the same time. Attributes that show up on our portal will also be easily seen on a whitish background instead of a brightly colored background.

4.2 Key Features

These are the key features incorporated into our portal. Each of the functions plays a role in helping us achieve our goal in guiding the students towards a good career.

Job Recommendation

Filter Based On: Course Skill Sets Personality

Interest:

Business & Data Analytics Cloud Computing
 Enterprise Solutioning Games Programming Mobile Business Applications
 Infocomm Sales & Marketing Solutions Architect List All

MAGES Institute of Excellence Pte. Ltd.
Lecturer - Game Programming

[View Job Listing](#) [Bookmark This](#)

LECTURER – GAME PROGRAMMING – SINGAPORE CAMPUS

Can you inspire the next generation of Videogame Developers?

This is an exciting and rare opportunity to join our thriving Games Development department. We are a forward-thinking, well-resourced and highly productive creative industries school and our goal is to give our learners a competitive edge in an ever-changing world by focusing on new and emerging technologies. We have a brilliant curriculum, focused o...
[Show More](#)

By using keywords for each of the 5 courses of ICT that we found in Ngee Ann Poly's course brochure we are able to recommend jobs that are relevant to the student's course of study. The scrapping function we implemented uses those keywords and searches through Job Street' website. Job Street will list out job postings that are relevant to the keywords we have and our scraping tool will retrieve the details of the job postings and store it in our database. Upon logging in to our portal, the student will be able to select multiple filters and jobs will be listed down based on the filters they selected.

Personality Test

Click on 'Do Test' if you do not have your MBTI results on hand. Once done, select your test result to proceed.

ENFJ	ENFP	ENTJ	ENTP	ESFJ	ESFP	ESTJ	ESTP
INFJ	INFP	INTJ	INTP	ISFJ	ISFP	ISTJ	ISTP

The personality test feature allows the student to select their personality after completing a test from an external link provided in our portal. The result that they selected on our portal will be saved into the database matching their user id. Different personalities have different jobs that are recommended for them and by retrieving their personality result, we are able to provide the students a wider range of job choices.

Explanation:

In order to display the 16 personalities button in the personality page, we would first need to create a database table called, MBTI. In this table, we will be appending in 16 personality types with its description and possible job sector.

1. To get started, we have to create a method called "mbtilist" in the views.py.

```

def mbtilist(request):
    response = {}
    mlist = []
    mbti = Mbti.objects.all()
    if len(mbti) is not 0:
        for m in mbti:
            cc = m.mbticode
            mlist.append(cc)
    response['results'] = mlist
    return JsonResponse(json.dumps(response), content_type="application/json")

```

- Next, code a div container in the personality.html to place the list of personality buttons.

```
<div id="mbti" class="mbtil1"></div>
```

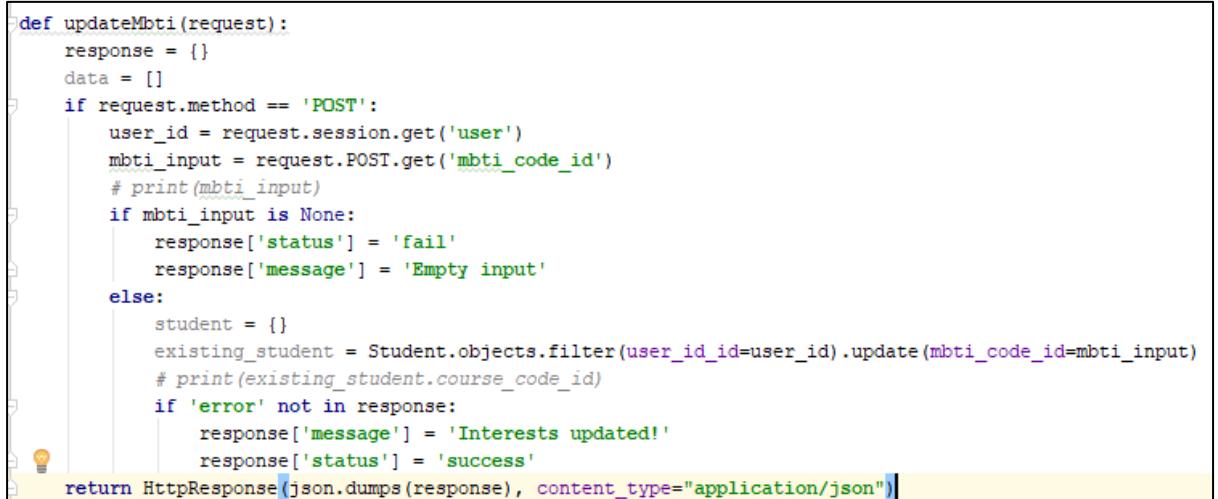
- After that code a script to get the “mbtilist” method after the HTML tag.



```
<script>
$(function () {
    $.ajax({
        type: 'GET',
        url: '/mbtilist/',
        dataType: 'json',
        success: function (data) {
            var fields = data.results.sort();
            if (fields.length != 0) {
                var htmlToAppend = '<center>';
                for (var i = 0; i < fields.length; i++) {
                    if (i % 8 == 0) {
                        htmlToAppend += '<br/>';
                    }
                    htmlToAppend += '<a class="btn btn-sq btn-success" id="'+fields[i] +'" value="'+fields[i] +'" onClick="mod_click(this.id)">' + fields[i] + '</a>';
                }
                htmlToAppend += '</center>';
                $('#mbti').append(htmlToAppend);
            } else {
                document.getElementById("mbti").style.display = 'none';
            }
        }
    });
});
```

Changing of personality type may occur after a student retakes the personality test. Therefore, the update function is implemented.

- First create a method called “updateMBTI” in the views.py



```
def updateMbtI(request):
    response = {}
    data = []
    if request.method == 'POST':
        user_id = request.session.get('user')
        mbti_input = request.POST.get('mbti_code_id')
        # print(mbti_input)
        if mbti_input is None:
            response['status'] = 'fail'
            response['message'] = 'Empty input'
        else:
            student = {}
            existing_student = Student.objects.filter(user_id=user_id).update(mbti_code_id=mbti_input)
            # print(existing_student.course_code_id)
            if 'error' not in response:
                response['message'] = 'Interests updated!'
                response['status'] = 'success'
    return JsonResponse(json.dumps(response), content_type="application/json")
```

- Next, code a div container in the personality.html to place the message.

```
<div id="message" class="mbtil1"></div>
```

- After that code a script to get the “updateMBTI” method after the HTML tag.

```

function mod_click(clicked_id) {
    $.ajax({
        type:"POST",
        url:"/updateMbtI/",
        data: {
            'mbti_code_id': clicked_id // from form
        },
        success: function(data){
            if(data.status == 'success'){
                $('#message').html('<span class="glyphicon glyphicon-ok" aria-hidden="true"></span> Results saved. You are ' + clicked_id + ' . ')
            }else{
                $('#message').html('Error! '+ data.message);
            }
        }
    });
}

```

Bookmarks

The Supreme HR Advisory Pte. Ltd.
Software QA Engineer [Operating system // 5 Working days]

[View Job Listing](#)

Work Life Balance
Career Progression Opportunities

Attractive Salary Package Interested applicants can send your resume to and allow our Consultants to match you with our Clients. No Charges will be incurred by Candidates for any service rendered. ROLE:- Manage creation and execution of test suite/cases based on product requirements- Document defects using a defect tracking system- Evaluate product for errors and stability and feedback to the development- S...

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Bookmarked

The bookmark feature allows the student to bookmark any job listed in our portal. Once bookmarked, the information of that job will be stored matching the student's user id. Even if the admin runs the scraping tool to re-populate all the jobs, the bookmarked job would still be contained in our database.

My Bookmarks

This page shows the jobs that you have bookmarked down

Job Title	Company	Location	Action
The Supreme HR Advisory Pte. Ltd. Software QA Engineer [Operating system // 5 Working days]	The Supreme HR Advisory Pte. Ltd.	Singapore	Remove Bookmark

The Supreme HR Advisory Pte. Ltd.
Software QA Engineer [Operating system // 5 Working days]

[View Job Listing](#)

Work Life Balance
Career Progression Opportunities

Attractive Salary Package Interested applicants can send your resume to and allow our Consultants to match you with our Clients
No Charges will be incurred by Candidates for any service rendered
ROLE:- Manage creation and execution of test suite/cases based on product requirements- Document defects using a defect tracking system- Evaluate product for errors and stability and feedback to th...

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When the student clicks on the bookmark tab, all the jobs that he/she has bookmarked will be shown. If the student loses interest in that job, he/she can also choose to remove the bookmark.

Course Planner

View prescribed modules of your course. Select a specialization & plan your specialization electives.		
📎 Year 1	🕒 Year 2	⚙️ Year 3
Semester 1	Semester 3	Semester 5
Computing Mathematics Fundamentals for IT Professionals I Programming I Enterprise Information Systems Operating Systems Fundamentals Sports & Wellness Innovation Toolkit	Fundamentals for IT Professional II Web Application Development Information Security Object-Oriented Analysis & Design Elective Modules Elective Modules Career & Professional Preparation Interdisciplinary Studies Elective	Internship Final Year Project
Semester 2	Semester 4	Semester 6
Databases Front End Development Networking Fundamentals Portfolio I Programming II Communication & Contemporary Issues	Full-Stack Development Fundamentals for IT Professionals III User Experience Portfolio II Elective Modules Elective Modules Interdisciplinary Studies Elective	Elective Modules Elective Modules Elective Modules Elective Modules Elective Modules Capstone Project Interdisciplinary Studies Elective World Issues: A Singapore Perspective

When the student navigates to the Course planner tab, the ECG portal will display the modules taken for each semester. For semester that requires choosing elective and IS elective module will be prompt via email notification by the ICT office.

Further Studies Recommendation

Further Studies

These are the university courses relevant to your studies

NUS
Bachelor of Computing in Computer Science (with Honours*)
[View Program Listing](#)

Life as a Computer Science student
Developing cutting edge web applications
Studying the latest developments in AI and machine learning
Working with industry leaders in software, social media and gaming
These are just a few of the opportunities you'll have as a Computer Science student at NUS
With deep connections at leading companies, NUS offers a truly immersive Computer Science education
We pride ourselves on providing the strongest techni...
[Show More](#)

Similarly to our Job Recommendation feature, the further studies page uses our scraping tool to scrap for university courses relevant to our students' course. Within our 5 courses, IT, FI and ISF have more Information Technology aspects. Whereas A3DA and IMGD have artistic aspects. We separated the further studies recommendations into 2 groups. The Information Technology based courses and the art based courses. IT, FI and ISF students would be shown the Information Technology based courses while A3DA and IMGD students would be shown the art based courses.

4.3 Design Considerations

4.3.1 Database

Poor Naming Convention

Naming a table is the most important line of documentation for any applications and it is also good to be consistent throughout the database design. Names we choose are not just to enable its end-users to identify the purpose of the object, but to allow future stakeholders to quickly understand how a component part of the database was intended to be used and what data it stores.

Poor Design Database

A poorly designed database will generate errors that may lead to bad decision making being made, which may have serious consequences for the organization. On the other hand, a well-designed database provides the correct information for the decision making process to succeed. (*Refer to Appendix D & E for Data Dictionary & Class Diagram*)

4.3.2 User Interface

Virtual Space

The best interfaces are simple, seamless and invisible to the user, our portal provides a very user-friendly virtual space because it isn't congested with information from the get-go. The different pages are not congested by words and make it easy on the eyes of the user.

Layout Rules

Designed for scanning, when users visit a website they prefer to scan through content instead of reading them. Instead of dumping a whole chunk of information for the 4 common jobs, we listed down the related skill sets so that

if the user reads the skill sets and gets interested, he/she will be able to click view more and be redirected to the job posting itself.

Layout Elements

Listing - the elements are displayed out in a listing layout. Since the elements contain similar content, it would make it easier for the user to relate to the different elements if they are listed side by side. Because everything looks more connected and nothing seems out of place, it improves the user experience of users. Listing is also meant for simplicity and coherence and it's perfect for the use of our portal because they aren't any subpages and there aren't many elements on each page.

Efficiency

Efficiency is important because it allows the user to complete their task in the quickest way possible. If users have to go through a long list of steps before they can accomplish their task, it will be easy for them to get frustrated.

The interface of our portal is efficient because all the steps to complete a certain task have been minimized. For students to view recommended jobs, they simply have to select the main filter and check the checkboxes for any secondary filters. In the case of the personality filter, when the personality button is clicked, the jobs would already be shown on the portal. The process would only take a maximum of 3 steps including clicking on the filter button after checking their secondary filter.

With this upfront interface, the students will not have to take any unnecessary steps to search for a job. Thus, making the interface efficient.

Consistent Layout

Throughout all the different pages of our portal, the layout is kept the same. The navigation bar can be seen throughout all the pages the layout is consistent with each page would have a container to display the elements relevant to that particular page. The personality page, bookmarks page, and further studies page have the most similar layout because all 3 pages only have the header field and the container to store the elements. As for the home page, it has additional common jobs element but nevertheless, the look of it is still similar to

that of the other pages. The course planner displays multiple elements in its container as it has to display modules from all the 3 years of study.

The color scheme used is kept the same throughout all the pages and all of the pages use a standard template. By keeping the layout consistent, it enables the students to remember how to use the interface easily.

Alignment

The view more button of the 4 common jobs displayed and centrally aligned at the bottom of the container to allow students to easily scan through the related skill sets. While scanning through they might get interested and with the button aligned centrally at the bottom of the container, it is able to catch their attention after they finish scanning. Additionally, the bookmark button is aligned to the top right-hand corner of the container storing the job information. This is to make sure that the student does not get distracted by any buttons. If the student is really interested in that job, he will notice the button as it is isolated away from the content.

Proximity

Functions that are related are all located on one page to reduce confusion for the students. By grouping similar functions together, it is easier on the eye of the students. This improves the user's experience because the student will not have to frantically look around the page just because one function is seen as different from the others.

Colors

Purple; Purple is the School of ICT's color, it is a representation of our school, thus our portal's primary color is purple. Students will be able to easily identify the portal as a product of ICT. Purple is also very soothing to the eyes, because of the luxurious feeling it gives of, the portal doesn't look too overwhelming nor too boring.

White; White is also widely used in the site as it brings a sort of cleanliness and purity to the portal. This helps support the other colors where it draws attention to the more stimulating purple and other elements in the portal.

Grey; Grey provides an impression of neutrality, its roles is to contrast with the white background to draw attention from the students to the contents inside the containers.

Blue; The buttons and hyperlinks are blue as blue gives off a friendly and inviting emotional impact. The welcoming color attracts users the click on the links to gather more information.

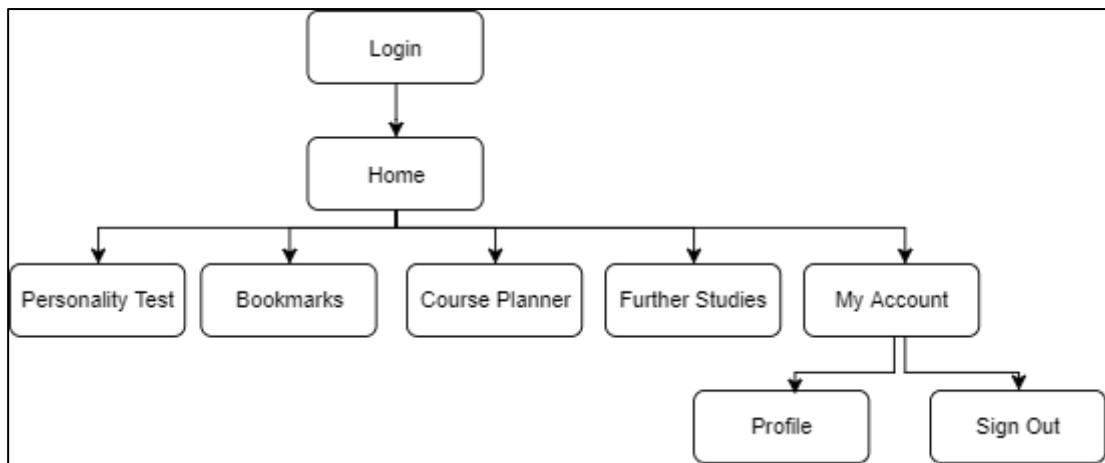
Monochromatic; The color mixing technique we used was monochromatic, different shades of purple were used together with white and grey. It makes our portal very visually pleasing and focuses on the main color which is purple. It is a very minimalist design because our portal does not have very complicated features. As we are only concentrating on a handful of elements, the monochromatic technique suggests a theme of elegance and creates an easy, less-distracting interface.

Typography

Oversized lettering; In our header, we paired up images with oversized lettering, By pairing images with oversized lettering, we are able to emphasize the important functions within the page without letting loose of the visual aesthetic and mental model help that the image provides. The font we choose was also not very complex which eases the readability of the content so that all of our guests will be able to view the content clearly. (*Refer to Appendix F for UIs*)

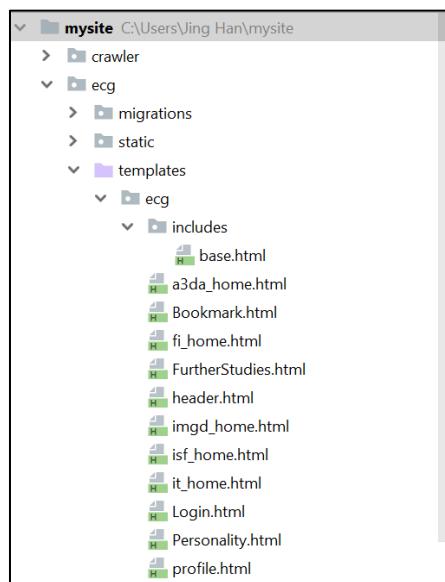
4.3.3 Sitemap of ECG portal

The below diagram shows the structure of which our ECG portal is created upon. From our login screen upon successful login, the user will be authenticated and redirected to the homepage. Using the navigation bar on the home page, the student can be redirected to the 4 different pages and sign out from the portal. The program implements the style of each page as well as the scraping feature.



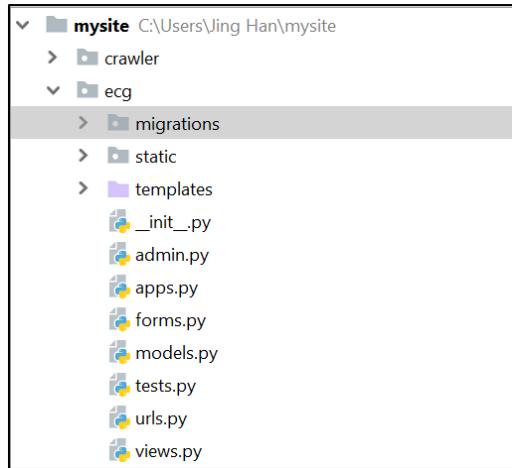
Template

Within the template folder, it consists of all the different HTML files for each of our functioning pages. There are 5 different home pages as mentioned earlier to cater to the 5 different courses of our school. There is a base.html file that creates the style of the navigation bar which is used throughout all the other HTML files.



URLs, Models & Views

One directory above the templates folder contains all the python files that provide interaction between our different web pages.



Views.py;

The views python file contain view functions that are relevant to our portals interactivity. A view function is a python function that takes a Web request and returns a web response. The response can be HTML contents of a page, redirecting the user to another page or a 404 error. The view function contains the logic needed to return that response. In the above view function, index, it receives the request when the user login has been successfully authenticated. It will then check for the course id of the student by retrieving the course_code_id of the user from the student object. Depending on the course code, the request will be rendered with the appropriate HTML page, and the student will be redirected to that page.

```

32 def index(request):
33     if check_session(request) is not None:
34         if request.session.get('role') is 3:
35             return render(request, './admin/index.html')
36         student = Student.objects.get(user_id_id=request.session.get('user'))
37         if student.course_code_id == "N54":
38             return render(request, 'ecg/it_home.html')
39         elif student.course_code_id == "N94":
40             return render(request, 'ecg/isf_home.html')
41         elif student.course_code_id == "N81":
42             return render(request, 'ecg/fi_home.html')
43         elif student.course_code_id == "N92":
44             return render(request, 'ecg/a3da_home.html')
45         elif student.course_code_id == "N55":
46             return render(request, 'ecg/imgd_home.html')
47
48     return render(request, 'ecg/Login.html')

```

URLs;

The URLs python file manages the URLs that links the html pages to the view functions.

```

1 import ...
3
4 urlpatterns = [
5     url(r'^$', views.index, name='index'),
6     url(r'^login/$', views.loginPage, name='loginPage'),
7     url(r'^logout/$', views.logout, name='logout'),
8     url(r'^authenticate/$', views.authenticate, name='authenticate'),

```

JavaScript - Login Function;

The below image shows a JavaScript function written in at the login html page of our portal. The function executes when the user clicks the login button, the URL variable within the function redirects the code to the view function. Without the code existing in the URL file, the program will not be able to handle the interaction between the JavaScript function and the view function.

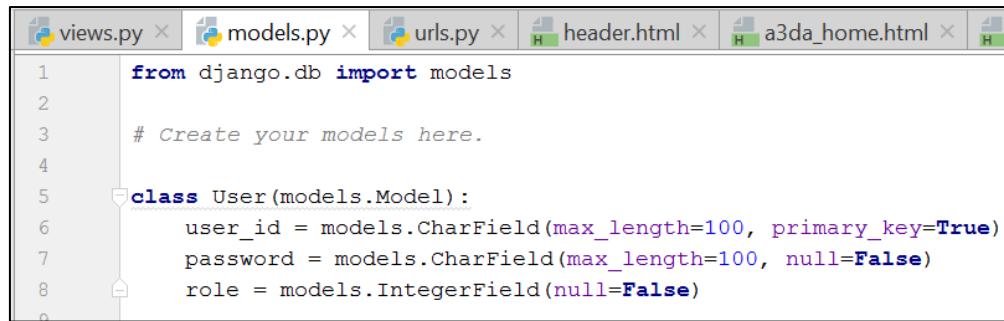
```

<script src="{% static '/ecg/js/ajaxpost.js' %}"></script>
<script>
  $("#loginBtn").click(function (event) {
    event.preventDefault();
    var dataString = '&username=' + $("#username_input").val() + '&password=' + $("#password_input").val();
    $('#cover').fadeOut(1000);
    $.ajax({
      type: 'POST',
      url: '/authenticate/',
      dataType: 'json',
      data: dataString,
      success: function(data) {
        $('#overlay').remove();
        if (data.status == 'success') {
          location.reload();
          //alert('Login Success!')
        } else {
          //alert(data.message);
          document.getElementById("alert-box").style.display = 'block';
          $('#alert-box').html(data.message);
        }
      },
      error: function(xhr) {
        alert(xhr);
      }
    });
    return false;
  });
</script>

```

Models;

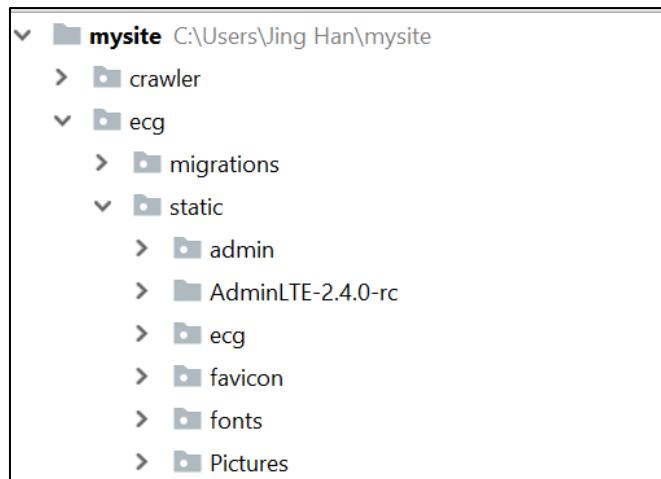
A model is the single, definitive source of information about our data. It contains the essential fields and behaviors of the data you're storing. Generally, each model maps to a single database table. Without the models file, we would not be able to access the values in our database table from our view functions. The models file creates objects for each class so that we can access them easily from within our code.



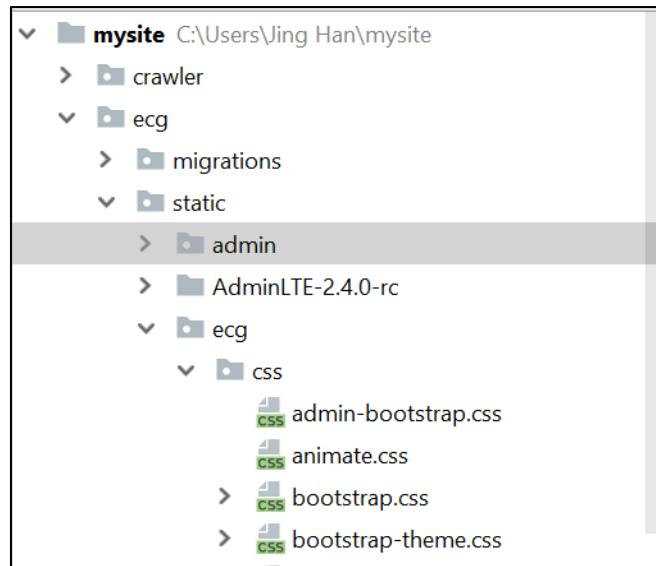
```
views.py x models.py x urls.py x header.html x a3da_home.html x
1 from django.db import models
2
3 # Create your models here.
4
5 class User(models.Model):
6     user_id = models.CharField(max_length=100, primary_key=True)
7     password = models.CharField(max_length=100, null=False)
8     role = models.IntegerField(null=False)
9
```

Static Files:

The static folder contains all files that are needed for the html pages to display the elements in our portal. This includes the fonts used and pictures that are used in our portal. Since the pictures used will not change very often, they are stored in the static folder.

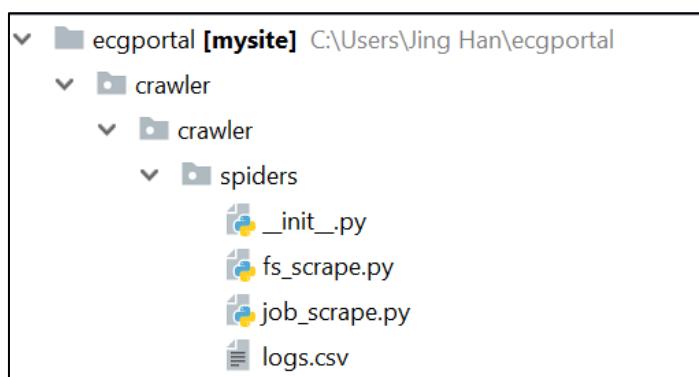


The CSS scripts are also stored inside the static folder because they don't affect the functionality of our portal. If the design of our portal needs to be improved, the CSS scripts can be edited.



Scraping Tool;

The scraping tool is stored in a folder different from our main code to prevent confusion between the both. There are 2 different scraping functions, job scrape to scrape job postings and fs_scrape to scrape related university courses. They are separated because both targets different functions of our portal. If the job scraping function faces an issue, we only need to look into the code of job_scrape.py, likewise if the scraping of university courses faces an issue, we would only look into the code of fs_scrape.py. The errors of both files would not affect each other, making it easier for us to troubleshoot for errors as well as improve the functionality of our scraping tool.



4.3.4 Hardware/Network

Hardware; At the current moment, since we are the first batch of students involved in developing the ECG Portal, the development was done on our

personal machines. No other external hardware were used in the process of developing the portal.

However in the future, when the portal is completed, the school may want to deploy it onto a virtual machine using a server in the school. The students that are continuing on with our project would have to work together with the school's technician to deploy it so that it will be available for access to all the students of our school.

Network; The database used to store all information of our portal is also stored locally. The main reason why both hardware and network is worked on locally is because we are working on the initial phase of development and ensuring that all the functions are working is very important. This means that testing has to be constantly carried out and if the database is connected to the school's network, if we were to re-configure the database it would be very time consuming to do it across the school's network. Therefore, we opted to keeping it local so that changes can be easily implemented.

However, when everything is completed and no further changes are required, the next batch of students should deploy the database up to the school's network so that our portal would be able to work together with the school's database of student information.

Another alternative would be to deploy it to online cloud services such as Amazon Web Services (AWS) or Digital Ocean. The reason why we didn't deploy it to the cloud was because services like those require subscriptions. Since the portal isn't fully developed yet and still has space for improvement, it would be best to hold off such deployment until the portal is fully functional.

4.4 Tools & Techniques



PyCharm;

PyCharm will be the IDE (Integrated Development Framework) that we will be using to code the program for our portal. Since we are using python as the coding language, PyCharm is beneficial to us because it is used specifically for Python



Django Framework;

Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. The framework uses Model-View-Template (MVT) as their standard, instead of the normal framework of Model-View-Controller (MVC) that we are used to. Django's goal is to ease the creation of complex, database-driven websites. Since our portal is heavily reliant on its database to store information scrapped from various websites, Django helps us perform our tasks easily.

Python Library;

WhiteNoise - WhiteNoise allows your web app to serve its own static files, making it a self-contained unit that can be deployed anywhere without relying on nginx, Amazon S3 or any other external service.

MySQL client - MySQL dB is an interface to the popular MySQL database server for Python. It allows our program to execute sql commands to our database.



Beautifulsoup - Beautifulsoup automatically converts incoming documents to Unicode and outgoing documents to UTF - 8. You don't have to think about encodings, unless the document doesn't specify an encoding and Beautifulsoup can't auto detect one. Beautiful Soup sits on top of popular Python parsers like

lxml and html5lib, allowing you to try out different parsing strategies or trade speed for flexibility.



WampServer;

WampServer is an open source project. It is a Windows web development environment. It allows you to create web applications with Apache, MySQL Database and PHP configuring them to work together. WampServer would be used to handle our database model.



Scrapy;

Initially when we were first tasked into creating a web crawler / scraper for our ECG Portal, we looked into Scrapy which was an open source and collaborative framework for extracting the data we need from websites. While using Scrapy, we realize that although it is already a completed scraping tool, we still needed to change the code in order to scrap for the websites we intended to use it for. This led us to writing out a personal scraping tool using their algorithm as a base skeleton. We felt that although we could use an already developed tool, there were still parts to be changed. So it would be better for us to write a scraping tool of our own so that we can fully understand its uses and change it to our liking.

Additionally, since capstone is a platform for students to learn and improve their skills, creating a unique scraping tool is also beneficial for us. It helps adopt a more professional approach towards the project because in the working world, being professional means developing a solution with your own knowledge and not being dependent on readymade solutions.



HTML & CSS;

Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript it forms a triad of cornerstone technologies for the World Wide Web. Therefore, we will be using HTML and CSS to develop the web application.

5. Limitations and Future Work

5.1 Limitations and Impacts

Limitations for Job Scraping

The first limitation of our current solution would be that the job scraping is to be manually executed. Because of the time needed to scrape all the jobs for each keyword, it is inefficient to run it synchronously with the portal itself. The scraping tool is to be executed on a scheduled basis depending on how frequently the school decides to update the database with new jobs.

Additionally, we've only developed the scraping tool for the job street website. Currently, all the jobs displayed would be directed to job streets website. Therefore, there is a limitation of the job pool belonging only to Job Street.

Impact for Job Scraping

The above limitation has a large impact on meeting the usability needs of the user. If the administrator does not execute the scraping tool frequently, the jobs displayed on the portal may be not available anymore and they would be unable to view the full job listing on Job Street.

It is also very inconvenient for the administrator to constantly use the scraping tool to update the database with new jobs. There's an unnecessary need for manpower due to the limitation caused by our job scraping tool.

Limitations for Further Studies

Another limitation of our solution would be the recommendation of courses for further studies. Currently, the courses recommended are from local universities like NUS, NTU, SMU and DigiPen. We have not implemented the scraping of courses from overseas universities due to the time constraint.

Furthermore, the courses have been scrapped rather generally targeting only at Information Technology and Art based courses. Specific courses in universities that are related to the 5 different courses of ICT have not been scrapped yet.

Impacts for Further Studies

This would restrict the students who are looking far into their future, thinking about what courses to take for their university education. The recommendations are limited and may not be suitable for the student. Since specific courses that are related to our student's current course of study, they may get misguided by our recommendations and end up going for a course that they have no interest in.

5.2 Justification

The main reason why we developed our portal with the above limitations is due to the fact that we are the first batch involved in this project. By being the first batch working on this project, we were focused on ensuring that all the functions are working on a basic level. Therefore, we only tested our scraping tool with Job Street's website. When the basic functions of a website are developed properly, it would be easier for future developers to build upon that basic function into a more advanced function.

5.3 Detailed Recommendation

Firstly, the developers carrying on with the future development of our portal could look into the code of our scraping tool. They can add different URLs into a variable and run our algorithm through using the different URLs they added. However, a problem may be faced because different websites have different html layout and our algorithm is used for Job Street's html layout. The

developers might then have to duplicate our scraping tool for Job Street and modify the code to fit the html layout for the websites they decide to scrape.

Secondly, for further studies recommendation, they can start by looking into overseas universities that offer courses related to the 5 courses that we have in ICT. It is recommended for them to search for pages that contain different courses and links are provided for each of the courses displayed on the website. This way that can write a scraping function to scrape the website itself and retrieve the information of all the courses in that particular page.

Thirdly, for the Course Planner recommendation, they can first identify all the modules for each Course in ICT. After that map the modules together with the course. For now, the course planner is hardcoded, therefore, the next batch can try to make the course planner dynamic instead of static. Another recommendation is to let the end-users click on a particular module to display module information.

6. Discussion of Learning Experience

6.1 Scope and Contribution

The project aims to provide a web platform to provide guidance for students and tutors of ICT and help to plan for their future career path.

Jing Han's Contribution

The pages of the portal that I worked on was the Home Page, Bookmarks Page as well as the Further Studies page. The pages that I involved myself in makes use of the main feature of our portal which is its job scraping functionality. I worked on the scraping tool by myself and implemented it so that both the Home Page and Further Studies page would be able to retrieve the right information from the database and display the job posting on our portal.

In the 3 pages that I have listed above, I also wrote each and every one of the java scripts that allows the interactivity of the elements in our portal. An example would be retrieving all the checked filter values and filter the values retrieved from the database so that the portal would only display jobs that matched the filters.

Most of the view functions were also written by me. One example would be the index function that redirects the user to the home page matching their course code. Another example would be the authentication function that reads in the username and password input upon login and validate whether the user exists within the database and whether the password is correct. If any validation fails, appropriate error messages will be shown. There are also many functions that retrieve objects from our database. The objects retrieved will then be sent over to the java scripts in our html pages as responses. Allowing the html pages to display the values contained in our objects.

Finally, I also improved the user interface of our portal by performing appropriate alignment of the elements to prevent it from looking messy. I made sure that the navigation bar was well maintained throughout all the pages of our portal and the user could access to a different tab no matter which page he/she was in.

Shi Yan's Contribution

In this project, my role is to design the ECG portal website, provide documentation for database and assist Jing Han in more technical areas such as debugging and implementing of some features. The pages that I have worked on were Login, Home, Personality Test and Course Planner. As mention by Jing Han who worked on the scraping tool, I was doing some referencing from different job portals and government website. By using the source code from SkillsFuture website, I was able to create a navigation bar with effects, display an image banner in part of the webpage and creating a dynamic search bar. However, the design was overwritten as our user journey changes.

After a discussion with our academic supervisor, I have implemented a default template that is used throughout the whole ECG portal. Besides that, I have also implemented five Homepages based on the Course provided in ICT. In each homepage, research has to be done, in order to program the most common jobs in IT. Gathering skill sets of each job were tedious as there are no specific skill sets for a particular job. Therefore, I spend most of the time in

designing for the 5 homepages and pass the job recommendation portion to my partner.

Next, I have also implemented the whole Personality Test feature. Challenges such as appending the 16 personality button were faced initially. With the reference from a tutorial platform such as W3School and source code from the previous batch, the challenge was overcome successfully.

Finally, I have also implemented the minimal criteria by hardcoded the course planner which allows the students to view the modules. Initially, I have tried to make the course planner dynamic by linking five database table together. However, only Year 1 modules were displayed. After a week of debugging, the issue was not solved. Hence alternative solution was to hardcode.

6.2 Skills

Jing Han

The technical skills that were required was strong understanding of the Django framework written in python as well as understanding of JavaScript, Hypertext Markup Language (HTML) and Cascading Style Sheet (CSS). Although we were taught python in some of our modules, it was very basic and we aren't able to develop a website using basic knowledge of python. Since it was quite a high jump in terms of technical skills required, I had to spend a lot of my time learning the Django framework itself as well as JavaScript functions.

I've learnt that similarly to our internship, capstone projects forces us out of our comfort zone and requires us to act independently. I couldn't just sit back and wait for someone to teach me how to develop a website. I had to learn the skills myself and overcome the challenges that I faced along the way.

The second skill would be requirements gathering. In order to develop a portal that is able to solve all our users' problems, we had to gather their requirements. The requirements that we gathered was able to help us develop a portal that is able to satisfy the user experience needs of our users. By having opinions from different people, we were also able to get a better idea of how our final product would be like. Feedback from the users also helped us implement the features that we never thought of before.

I've learnt that carrying out requirements gathering is a very delicate and important process. It can be very delicate because the requirements gathered may go against the initial scope of the project. The developers will then have to make a compromise between meeting the requirements and keeping within the scope of the project. It is important because without knowing the user requirements, we would not know what the users are expecting from our end product. Once it gets deployed if the users are unsatisfied, we will then have to re-configure our product to cater to their needs and it will be very time consuming.

The third skill I would be troubleshooting and learning the code through failure. At the initial development phase I was faced with many errors and couldn't identify what went wrong with my program. I troubleshooted my code by commenting out different lines trying to find out which line was causing the issue. I also learnt that I can view the console log of a page in my browser by inspecting it. The console will show an error message and depending on the error message, I proceeded with the correct troubleshooting method. There were times where the directory I wrote in my code didn't match the directory a static file was in, causing the webpage to load without proper styling. In another scenario, while trying to retrieve the values of objects in my database, I had to troubleshoot the values retrieved to ensure that I was retrieving the values intended. This was done by printing out the values onto my console.

I've learnt that troubleshooting is a very important process when developing websites because there are many elements that may cause failure. Since websites are written with many different languages such as python, JavaScript, HTML and CSS, all of the different codes used has to be properly troubleshooted to ensure that the website is able to be run.

Shi Yan

As mentioned by Jing Han, this project required someone with strong understanding of the Django framework written in python as well as other languages such as JavaScript, HTML, and CSS. Besides that project management and database knowledge was also applicable to this project. Therefore, some revision has to be done. Although most of the programming

modules did touch on Python, HTML, and CSS, the practical teaching was not as high level compare to developing the ECG Portal. Since it was my first time hearing of Django framework and Pycharm, I have spent most of the time understanding the syntax and do some research on creating the CSS style.

The second skills would be Time Management. As Capstone only have a session to meet our academic supervisor, it is very important to produce quality work and make some progress. Therefore, we have come out with a project schedule plan to make sure we are all the right track. Besides that, individuals assigned to work on particular parts have to be produced in time so that our partner can proceed from there.

Lastly, the third skills would also be Requirement Gathering. During the past five semesters, assignments given do not require us to gather requirements as it is all stated in the assignment specifications. Through this Capstone project, we are required to gather information from end-users. For example their expectation in a particular feature and the opinion on our implemented features. Having feedbacks from a different perspective will help to enhance the portal significantly. Besides that, I have also learned that requirements may subject to changes which go against with the initial idea of the ECG portal. Furthermore, gathering too many requirements can cause the out of scope as we think too much.

6.3 Reflection

Jing Han

The capstone project was a very stressful project for me due to its steep learning curve. Because we weren't taught how to develop websites during our education in polytechnic, many of the knowledge had to be self-taught. Being able to communicate well and work well with my partner was also another challenge due to us being occupied by our other modules as well. Since we are the first batch working on this project, it helped me gain a very good understanding of a real life working scenario similar to that of internship. I learned how to properly plan for a project from start to finish and designing an algorithm so that when the next batch continues with our project they'll be able to modify our algorithm to make it even better.

The experience of this project improved my thought process on how to approach developing websites as well as my technical skills. Because I was heavily concentrated on writing the code for the main function of our portal, I was able to overcome the steep learning curve and utilize all the coding languages required for our portal. Additionally the use of different research methods as well as requirements gathering helped me understand more about what was missing from our portal and what could be improved as well.

All in all, the learning journey through this project was definitely a tough one because of my lack of knowledge coming into the project. Since we still have assignments from our other modules as well, ensuring that I had very good time management was also very important. Because of the weekly meetups with our supervisor, I had to constantly be completing the features of our portal and I could not be procrastinating. If my time management falls off short, either my other modules would be affected or I wouldn't be able to show our supervisor the features on time. Communication is also very important because if both of us have a miscommunication between a certain features, it may disrupt the flow of development of our portal. As long as both developers are on the right track and are constantly providing quality work, the product should fulfil the requirements needed.

Shi Yan

Picking up Capstone project was a good choice as I get to learn new skills and programming languages that was not taught in the past five semesters. Although programming was not really my forte, it was a good learning point whereby I have to step out of my comfort zone to force myself to self-learn new technologies knowledge. Working together well was quite a challenge as well are preoccupied with our other modules. For example, as many of our final assignment deadlines were packed together, we do not have enough time to communicate and help out with one another.

Lastly, in my opinion, it was good to keep in touch with other Capstone project teammate to know their project progression and learn new knowledge. For example, one the Capstone team was working on the One Journey Attendance

mobile application. I get to touch on Beacon and android programming which very useful if we want to create our own mobile application.

Appendix A – ECG Portal Survey's Responses

Timestamp	Course Of Study	Year Of Study	Do you think the above function is useful ?	If you answered "Yes", how can we improve the function ?	If you answered "No", why isn't it useful ?
11-06-17 23:27	Information Technology	Year 3	Yes	Provide more information about the job. For example, salary, career path, job scope etc.	
11-07-17 9:50	Information Technology	Year 3	Yes	You can improve it by also asking for the person's area of interest and take that into account	
11-07-17 15:25	Information Technology	Year 3	Yes	Maybe have a filter to filter what we are looking for	
11-07-17 16:04	Information Technology	Year 3	Yes	More filters	
11-07-17 17:41	Information Security & Forensics	Year 2	Yes	Add filters	
11-07-17 21:30	Information Technology	Year 3	Yes	The portal could be user specific and provide insights on the jobs/programmes that the student have interest on. Not only that it can provide more in-depth information about the company and create a chatter box so that people with same interest can communicate with each other	
11-07-17 21:33	Multi Media Animation	Year 2	Yes	help narrow down the jobs by using a survey	
11-07-17 21:37	Animation & 3D Arts	Year 1	Yes	Include alternate jobs that may not be closely related to the student's course of study.	

11-07-17 21:37	Information Technology	Year 2	Yes	Ease of access and great UX	
11-07-17 21:43	Information Technology	Year 3	Yes	Ask for student's special interest too	
11-07-17 21:44	Information Technology	Year 3	Yes	Have the ability to narrow down deeper into working sectors such as type of job (administrative/technical) and show the number of jobs found in each sector.	
11-07-17 22:57	Information Technology	Year 3	Yes	Maybe the possible certifications and roadmap to better help us visualise how to get to our job. Like how Microsoft is doing.	
11-08-17 7:49	Information Technology	Year 3	Yes	Submitting my CV with the jobs so that I know how I did	
11-08-17 8:59	Information Technology	Year 3	No		The jobs generated may not be the desired job that he/she wants to work as.

11-08-17 22:42	Animation & 3D Arts	Year 3	Yes	Give alternatives and have a broader possibilities? Like maybe let's say I'm looking for a art and science related job, maybe there could be a function to search for combinations	
11-09-17 10:24	Information Technology	Year 3	Yes	Implement filter function. E.g Sort by Education qualification	

Do you think the above function is useful ?	If you answered "Yes", how can we improve the function ?	If you answered "No", why isn't it useful ?	Do you think the above function is useful ?	If you answered "Yes", how can we improve the function ?	If you answered "No", why isn't it useful ?
Yes	Show how much skill the person requires. Beginner, Intermediate, Expert.		No		It restricts the jobs being recommended.
Yes	I'm not capable to answer this question		Yes	Also do a disc test	
Yes	Explain the electives to us or link us there		Yes	Explain what is the real expectations based on the personality.	
Yes	No idea		Yes	No idea	
No		No point. Filters in the first qns can filter by electives	No		cannot recommend jobs based on personality
Yes	Nil		Yes	Not sure how to improve	
Yes	Let them know what to expect from the job as well		Yes	Nil	
No		I don't think that the student should only have electives that are relates to their desired job. The students should be able to choose what electives they'd like to take	Yes	Display what kind of jobs require what kind of personality type and the values needed for the job.	

No		Students don't really pick electives due to their desired job in year 3	Yes	Speed	
Yes	Don't need improve		No		In all job sectors, there will be many personalities. So restricting certain personalities is not a solution
Yes	Have description of what the electives will teach and what is the outcome of taking it (e.g. be able to develop software, be able to design/draw on software)		Yes	Indicating why it was recommended for that particular personality will be useful, and have a list/rank of recommended jobs so that even those that do not suit the personality perfectly can show up as other suggestions.	
Yes	With detailed explanation		No		Personality don't determine everything. It's good to have but useless in practice. Especially during our age where our personality are prone to changes

Yes	But telling you the reason why the elective is important		No		Your personality changes over time therefore having jobs recommend isn't really accurate
Yes	Actually, it depends whether the student wants to use their course to find a desired job or skills set or just their own preference.		Yes	It helps him/her to realise how they are like.	

Yes	But give some electives that are not related much but are for their interest		No		Maybe sometimes it doesn't work that way all the time. Just think that sometimes there's a need of a mixture of personalities in a workplace for it to function properly
Yes	I not sure, sorry.		No		Because personality doesn't determine your work skills.

Do you think the above function is useful ?	If you answered "Yes", how can we improve the function ?	If you answered "No", why isn't it useful ?
Yes	Show the length of study and roughly how much the course cost.	
Yes	Also take into the students current grades and show them which uni course they can apply for and which they can not	
Yes	Show subjects required to take in uni also	
Yes	No idea	
Yes	Help students see which universities are suitable.	
Yes	Maybe with the university recommendation, there could be another tab which states the total number of seat available for the specific course so that students can easily compare with other universities.	
Yes	Nil	
Yes	Include recognized universities all over the world	

No		Not really needed
Yes	Show the world ranking of universities also	
Yes	Show location of universities and also have the link to the respective course page of the university so that more information can be looked at.	

Yes	Can help to plan how we want to progress in our life. Can also recommend MOOCs for additional learning.	
Yes	Also show what type of cca, and certificate will improve on your chances of getting the job	
No		Going to universities doesn't required to go through based on the job he/she selected to work in future.

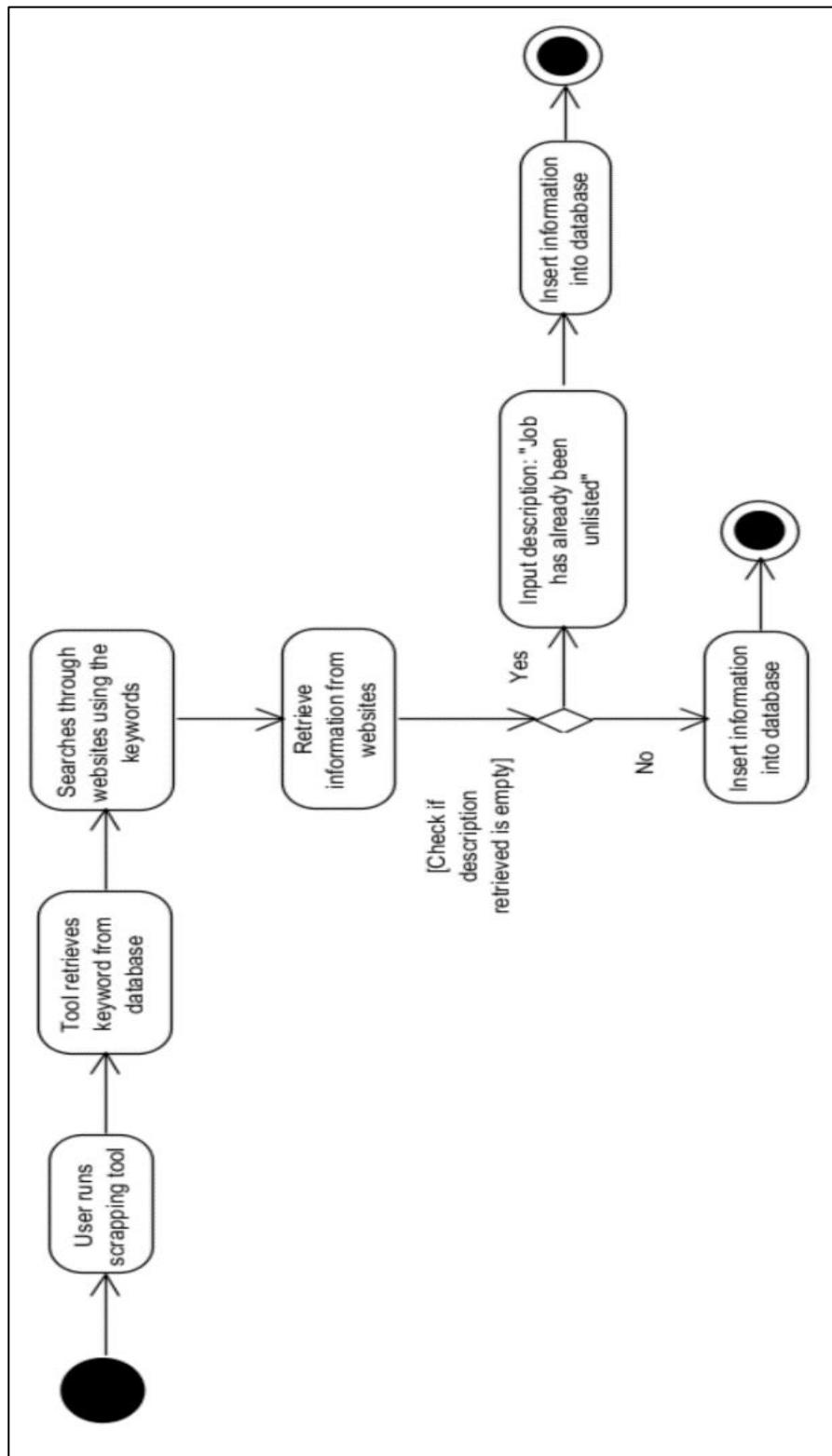
Yes	Show the information about the course , pricing, dormitory info, is it overseas, vacancies?	
No		Because there's no need to.

Appendix B – Paper Prototype

Profile	Course Planner	Further Studies																
<p><u>Further Studies</u></p> <hr/> <hr/> <hr/> <hr/> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>SIMU (<u> </u>)</p> <p>SUTD (<u> </u>)</p> </div> <div style="width: 45%; text-align: right;"> Find out more </div> </div>																		
<p>L> Personality Test</p> <p><u>b. My Personality</u></p> <hr/> <hr/> <p><u>Personality Test Link</u></p> <p><u>Select personality combination</u></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>ISTJ (The Inspector) <u>Link</u></td> <td>INFJ (The Counsellor) <u>Link</u></td> <td>INTJ (The Mastermind) <u>Link</u></td> <td>ENFJ (The Giver) <u>Link</u></td> </tr> <tr> <td>ISTP (The Craftsman) <u>Link</u></td> <td>ESFJ (The Provider) <u>Link</u></td> <td>INFP (The Idealist) <u>Link</u></td> <td>ESFP (The Performer) <u>Link</u></td> </tr> <tr> <td>ENFP (The Champion) <u>Link</u></td> <td>ESTP (The Doer) <u>Link</u></td> <td>ESTJ (The Supervisor) <u>Link</u></td> <td>ENTJ (The Commander) <u>Link</u></td> </tr> <tr> <td>INTP (The Thinker) <u>Link</u></td> <td>ISFJ (The Nurturer) <u>Link</u></td> <td>ENTP (The Visionary) <u>Link</u></td> <td>ISFP (The Composer) <u>Link</u></td> </tr> </table>			ISTJ (The Inspector) <u>Link</u>	INFJ (The Counsellor) <u>Link</u>	INTJ (The Mastermind) <u>Link</u>	ENFJ (The Giver) <u>Link</u>	ISTP (The Craftsman) <u>Link</u>	ESFJ (The Provider) <u>Link</u>	INFP (The Idealist) <u>Link</u>	ESFP (The Performer) <u>Link</u>	ENFP (The Champion) <u>Link</u>	ESTP (The Doer) <u>Link</u>	ESTJ (The Supervisor) <u>Link</u>	ENTJ (The Commander) <u>Link</u>	INTP (The Thinker) <u>Link</u>	ISFJ (The Nurturer) <u>Link</u>	ENTP (The Visionary) <u>Link</u>	ISFP (The Composer) <u>Link</u>
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Profile	Course Planner	Further studies									
<p>L> E-portfolio</p> <p>L> Personality Test</p> <p>Diploma in Information Technology</p> <p>Select desired working sector</p> <div style="display: flex; justify-content: space-around;"> < Retail Security Marketing > </div> <p>List of Careers:</p> <div style="display: flex; align-items: center;"> <div style="flex-grow: 1;"> <p>IT Advisor (Company)</p> <p>System Analyst (Company)</p> <p>IT Administrator (Company)</p> </div> <div style="margin-left: 10px;"> <input type="button" value="Search"/> </div> </div> <div style="text-align: right; margin-top: 10px;"> <input type="button" value="Save"/> </div>											
<p>Diploma in Information Technology</p> <p>IT Advisor</p> <hr/> <hr/> <hr/> <p>Requirements</p>											
<p>Course Planner</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>Year 1</th> <th>Year 2</th> <th>Year 3</th> </tr> </thead> <tbody> <tr> <td>1:1</td> <td>2:1</td> <td>3:1</td> </tr> <tr> <td colspan="3" style="text-align: center;">Elective module <input checked="" type="checkbox"/></td> </tr> </tbody> </table> <p>Recommendation</p> <hr/> <hr/> <hr/> <div style="text-align: right; margin-top: 10px;"> <input type="button" value="Signup for IPREP"/> </div>			Year 1	Year 2	Year 3	1:1	2:1	3:1	Elective module <input checked="" type="checkbox"/>		
Year 1	Year 2	Year 3									
1:1	2:1	3:1									
Elective module <input checked="" type="checkbox"/>											
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Appendix C – Web Scarping Activity Flow Diagram



Appendix D – Data Dictionary for ecgdb

User relation: Store details of all users

Attribute Name	Description	Data Type and Length	Constraint	Null Value
user_id	Unique identifier of each user	varchar(100)	Primary Key	No
password	Password of user	varchar(100)		No
role	Role of user	int(11)		No

MBTI relation: Store details of all MBTI

Attribute Name	Description	Data Type and Length	Constraint	Null Value
mbti_code	Unique identifier of each MBTI	varchar(4)	Primary Key	No
mbti_description	Description of MBTI	longtext		No
possible_job_sector	Possible job sector description	longtext		No

Job Category relation: Stores details of all job category

Attribute Name	Description	Data Type and Length	Constraint	Null Value
job_category_id	Unique identifier of each job category	int(11)	Primary Key	No
job_category	Job category description	varchar(200)		No
course_code_id	Identifies course of student	int(11)	Foreign Key → Course (course_code)	No

Student relation: Store details of all students

Attribute Name	Description	Data Type and Length	Constraint	Null Value
user_id_id	Unique identifier of each student	varchar(100)	Primary Key	No
name	Name of student	varchar(128)		No
email	Email of student	varchar(128)		No
current_semester	Current semester of student	int(11)		No
course_code_id	Identifies course of student	varchar(6)	Foreign Key → Course (course_code)	Yes
mbti_code_id	Identifies MBTI of student	varchar(4)	Foreign Key → MBTI (mbti_code)	No

Job relation: Stores details of all job

Attribute Name	Description	Data Type and Length	Constraint	Null Value
job_id	Unique identifier of each job	varchar(255)	Primary Key	No
job_url	Container for URL	longtext		Yes
job_position	Job position name	longtext		Yes
job_company	Job company name	longtext		Yes
job_category	Job category name	longtext		Yes
job_description	Description of job	longtext		Yes
job_date	Date of job posted	date		No

job_keyword	Keyword description	varchar(255)		Yes
job_mbti	Job's MBTI	varchar(255)		Yes

Further Studies relation: Store details of further studies

Attribute Name	Description	Data Type and Length	Constraint	Null Value
fs_id	Unique identifier of each further studies	varchar(255)	Primary Key	No
fs_school	Universities name	varchar(10)		No
fs_name	Further studies course name	longtext		No
fs_url	URL of the course information	longtext		No
fs_description	Description of the further studies course	longtext		No
fs_coursecode	Course code of the further studies course	varchar(15)		No

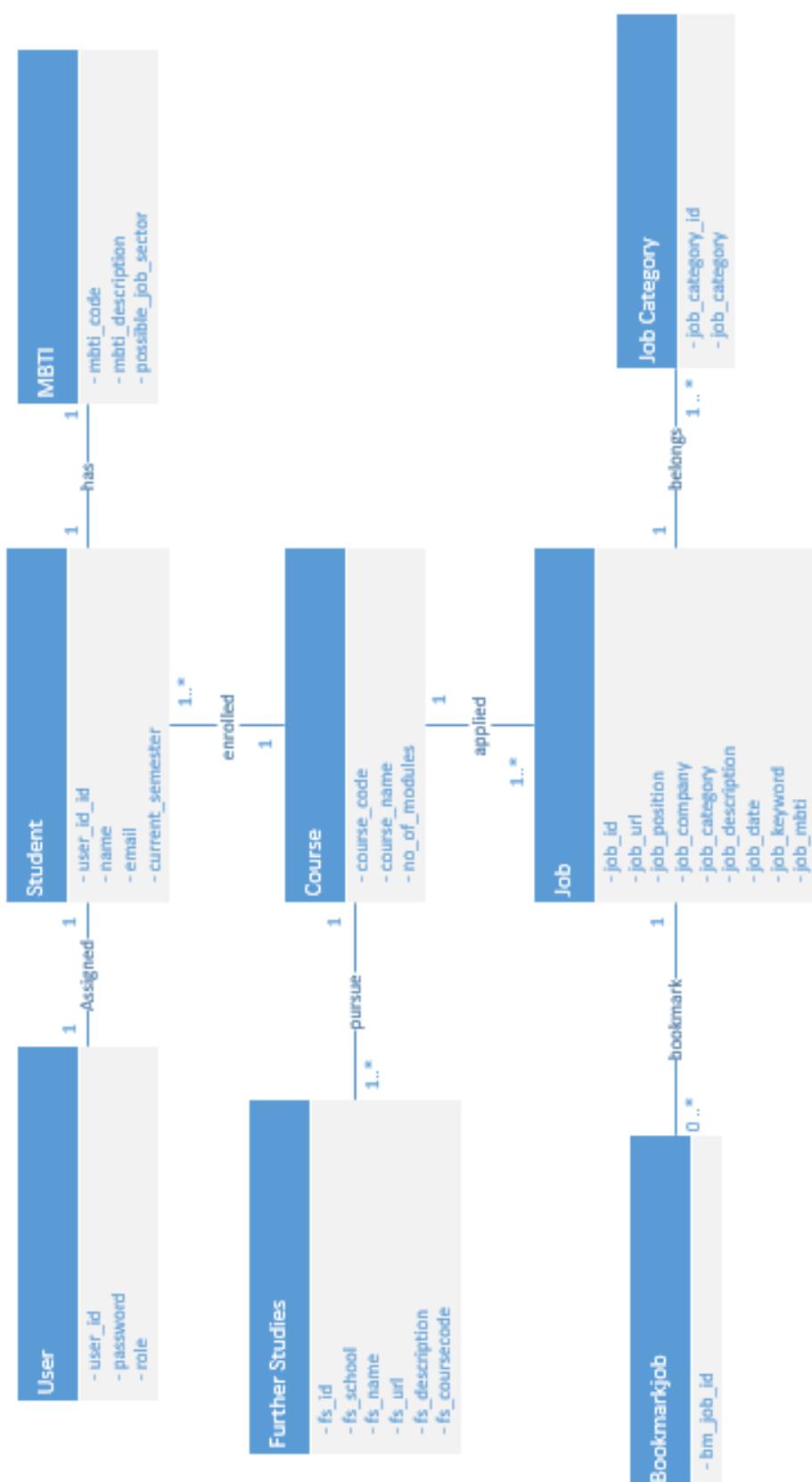
Course relation: Store details of course

Attribute Name	Description	Data Type and Length	Constraint	Null Value
course_code	Unique identifier of each course	varchar(16)	Primary Key	No
course_name	Description of course	varchar(128)		No
no_of_modules	Number of module in the course	int(11)		Yes

Bookmarkjob relation: Store details of job bookmark

Attribute Name	Description	Data Type and Length	Constraint	Null Value
bm_job_id	Unique identifier of each bookmark	int(11)	Primary Key	No
job_id	Unique identifier of each job	longtext		No
job_url	Container for URL	longtext		Yes
job_position	Job position name	longtext		Yes
job_company	Job company name	longtext		Yes
job_category	Job category name	longtext		Yes
job_description	Description of job	longtext		Yes
job_date	Date of job posted	date		No
job_keyword	Keyword description	varchar(255)		Yes
job_mbti	Job's MBTI	varchar(255)		Yes
user_id_id	Identifies user	varchar(100)	Foreign Key → User (user_id)	No

Appendix E – Class Diagram of ecgdb



Appendix F – User Interfaces

Education &
Career Guidance

LOG IN

Education &
Career Guidance

LOG IN

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- Home
- Personality Test
- Bookmarks
- Course Planner
- Further Studies
- My Account

My Personality

Personality is defined as the set of habitual behaviors, cognitions and emotional patterns that evolve from biological and environmental factors. Get to know what possible career suits your current interest!

Click on 'Do Test' if you do not have your MBTI results on hand. Once done, select your test result to proceed.

ENFJ	ENFP	ENTJ	ENTP	ESFJ	ESFP	ESTJ	ESTP
INFJ	INFP	INTJ	INTP	ISFJ	ISFP	ISTJ	ISTP

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Welcome to Education & Career Guidance!

A Platform that Brings You Closer to the Jobs You Wish To Explore!

Common Jobs in IT



Software Developer

Related Skillsets:

- Object Oriented Design
- Algorithms & Data Structures
- Debugging
- Testing
- Build and Deployment

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Systems Administrator

Related Skillsets:

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- Identity & Access Management
- Cloud services
- Scripting/Automation
- ITIL Certification

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Network Architect

Related Skillsets:

- Database
- Network Architecture
- Network Security
- Basic Programming
- Documentation

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Data Analyst

Related Skillsets:

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- Scripting Language
- Statistical Language
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- SQL Programming

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Filter Based On: [Course](#) [Skill Sets](#) [Personality](#)

Interest:

Business & Data Analytics Cloud Computing

Enterprise Solutioning Games Programming Mobile Business Applications

Infocomm Sales & Marketing Solutions Architect List All

[Filter](#)

Talent Trader Group Pte Ltd - IT
IT Manager (Infra / IoT / Cloud Computing / TCP / IP)

[View Job Listing](#)

Responsibilities In charge in improving the IT team Responsible in the development of data management and implementation in the business division Requirements Degree in Information Technology or equivalent Experience in managing the Infrastructure Team Experience in SAP, any solution (ERP is an advantage) Good exposure in mobile application such as ...

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This page shows the jobs that you have bookmarked down

The Supreme HR Advisory Pte. Ltd.
Software QA Engineer [Operating system // 5 Working days]

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Work Life Balance
 Career Progression Opportunities
 Attractive Salary Package Interested applicants can send your resume to and allow our Consultants to match you with our Clients
 No Charges will be incurred by Candidates for any service rendered
 ROLE - Manage creation and execution of test suite/cases based on product requirements- Document defects using a defect tracking system- Evaluate product for errors and stability and feedback to th...
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View prescribed modules of your course. Select a specialization & plan your specialization electives.

 Year 1	 Year 2	 Year 3
Semester 1	Semester 3	Semester 5
Computing Mathematics	Fundamentals for IT Professional II	Internship
Fundamentals for IT Professionals I	Web Application Development	Final Year Project
Programming I	Information Security	
Enterprise Information Systems	Object-Oriented Analysis & Design	
Operating Systems Fundamentals	Elective Modules	
Sports & Wellness	Elective Modules	
Innovation Toolkit	Career & Professional Preparation	
	Interdisciplinary Studies Elective	
Semester 2	Semester 4	Semester 6
Databases	Full-Stack Development	Elective Modules
Front End Development	Fundamentals for IT Professionals III	Elective Modules
Networking Fundamentals	User Experience	Elective Modules
Portfolio I	Portfolio II	Elective Modules
Programming II	Elective Modules	Capstone Project
Communication & Contemporary Issues	Elective Modules	Interdisciplinary Studies Elective
		World Issues: A Singapore Perspective

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Further Studies

These are the university courses relevant to your studies

NUS Bachelor of Computing in Computer Science (with Honours)* View Program Listing
Life as a Computer Science student Developing cutting edge web applications Studying the latest developments in AI and machine learning Working with industry leaders in software, social media and gaming These are just a few of the opportunities you'll have as a Computer Science student at NUS With deep connections at leading companies, NUS offers a truly immersive Computer Science education We pride ourselves on providing the strongest techni... Show More
NUS Bachelor of Computing in Information Systems (with Honours)* View Program Listing

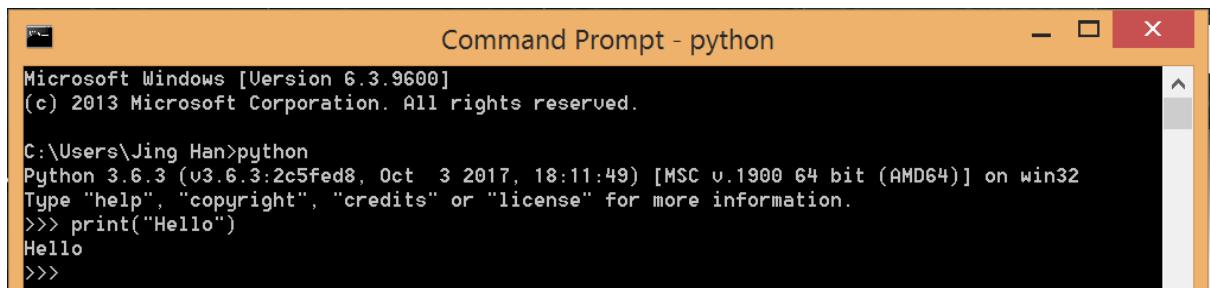
Appendix G – Installation Guide

In this section, you will be shown guide on the installation of Python 3 and PyCharm. It is recommended to use PyCharm as your to-go Integrated Development Environment (IDE).

1. **Python 3** - Proceed to download the latest version of Python 3 from:
<https://www.python.org/downloads/>



- Check the checkbox “Add Python 3.6 to PATH”.
- Click “Install now” to begin installation.
- Click “Close” after the installation.



After the installation, proceed to verify whether the installation is successful. Open command prompt and enter python. The python command prompt should be executed and you can enter a simple print command to test whether it is functional.

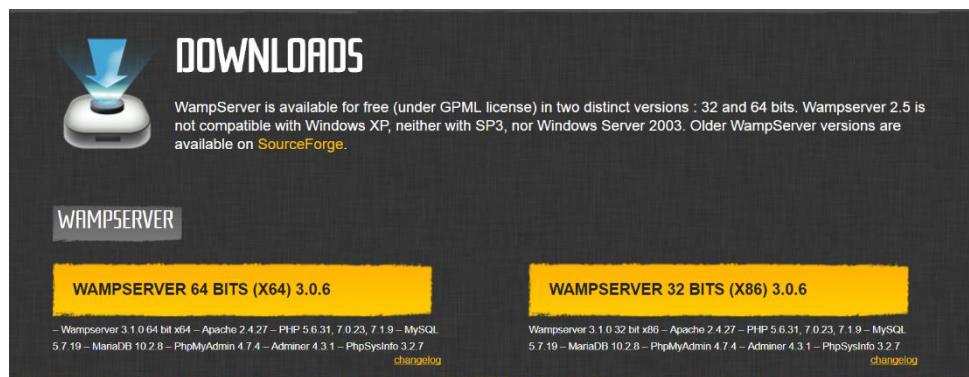
2. **PyCharm Professional** - You can get a copy of PyCharm Professional by registering for an educational license. Please proceed to this website for

registration: <https://www.jetbrains.com/shop/eform/students>. After which, download and install PyCharm Professional with the default settings provided.

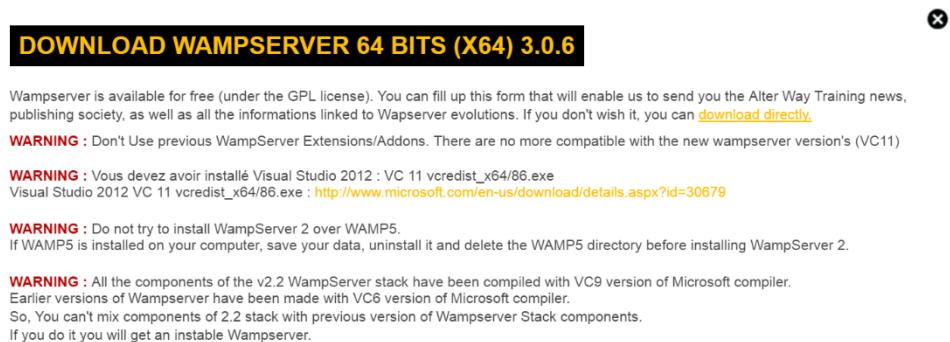
3. **WampServer** - Proceed to the following link to install the latest version of WampServer. <http://www.wampserver.com/en/>



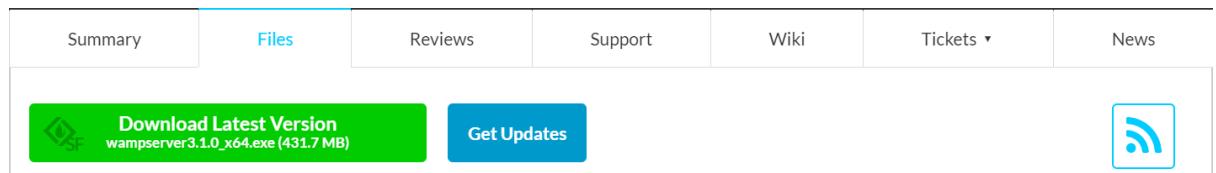
Step 1: Click on “Start using WampServer”.



Step 2: Select either the 64-Bits or 32-Bits based on your system type.

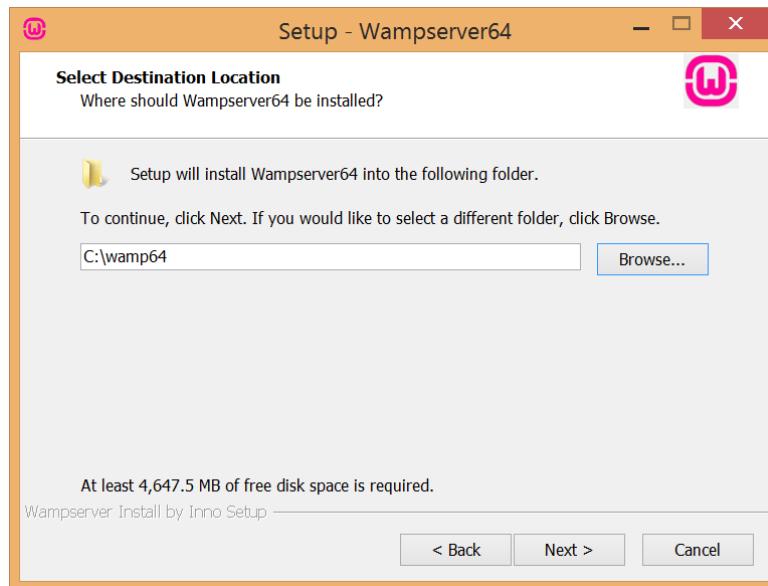


Step 3: Click the download directly hyperlink.

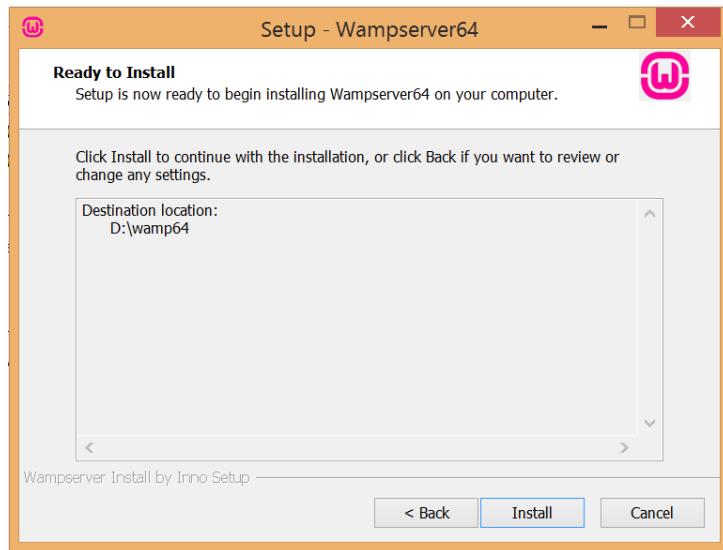


Step 4: Click on Download Latest Version

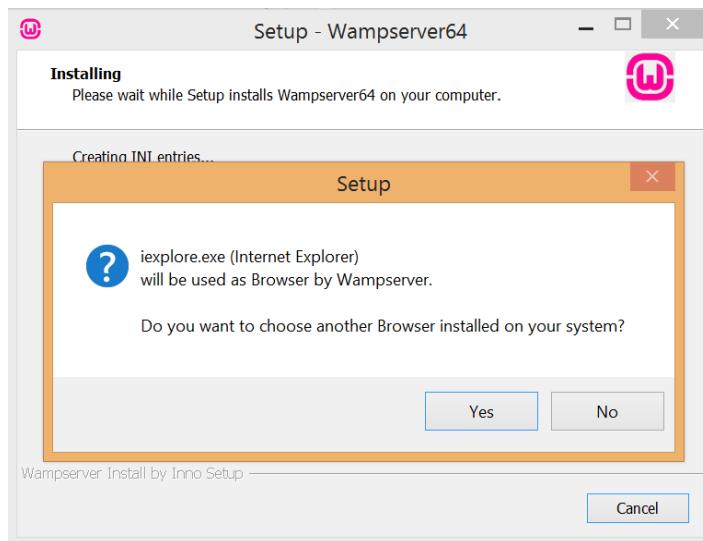
Step 5: Run the application as administrator, select your preferred language and accept the agreements.



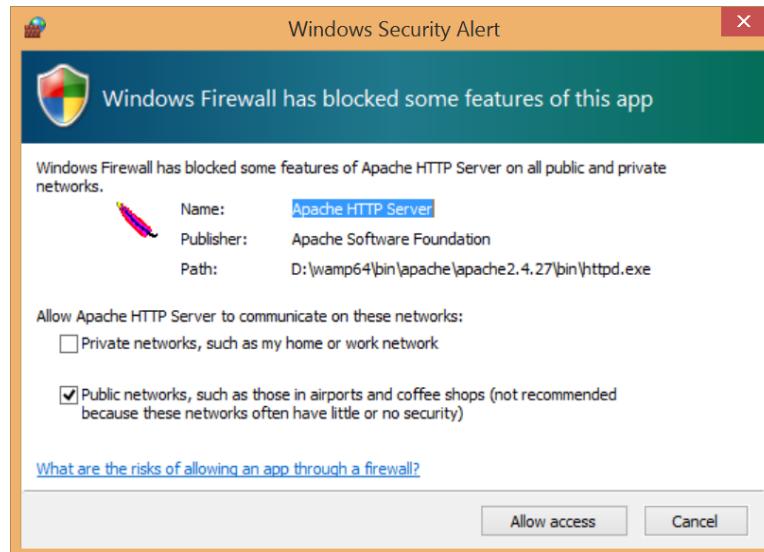
Step 6: The setup will install WampServer 2 into c:\wamp by default. You may choose a different destination folder by editing the text field. You should put it in a folder that does not contain any spaces as some browsers/servers have issues handling spaces in filenames. Remember that this folder will be the one that holds your web files under a directory called 'www'. Click 'Next'.



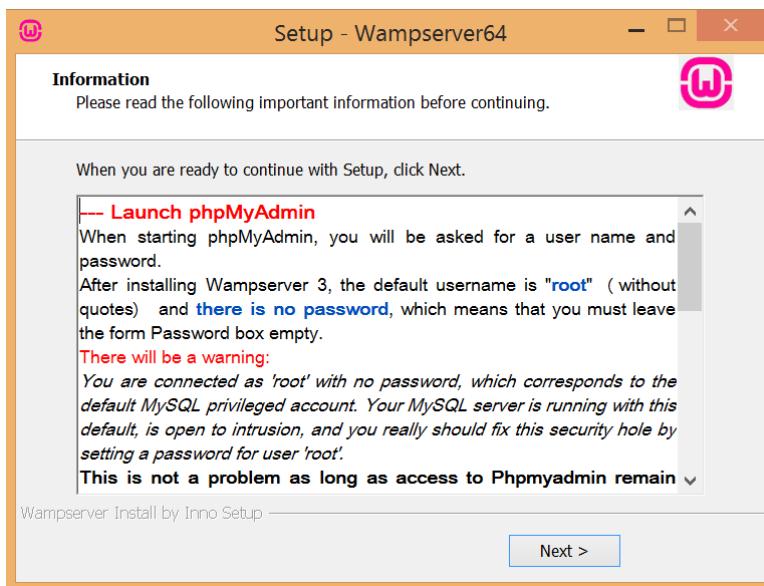
Step 7: Click 'Install' in the Ready to Install window that appears. The setup will start installing the necessary files.



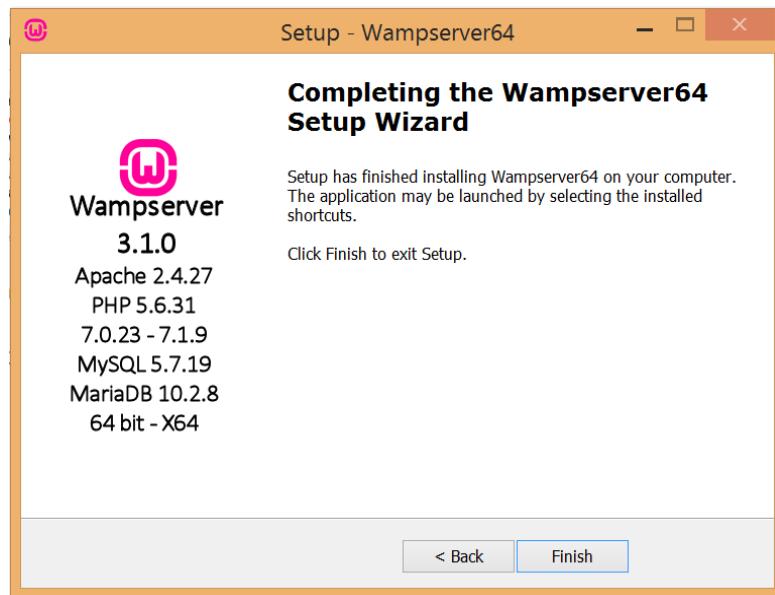
Step 8: In the process of installation, a dialog box prompting for the choice of your WampServer default browser will be displayed. You may choose your favorite browser by clicking yes and selecting your favorite browser or click No in which case Internet Explorer is added as the default choice. There would also be a dialog box prompting you to select your preferred text editor.



Step 9: Setup will prompt for Windows Security Alert while configuring Apache HTTP Server if your windows firewall is active. Click 'Allow Access'.



Step 10: Click 'next' to proceed.



Step 11: Click 'finish' to complete the installation process.

4. Installing Python Libraries

Django - To install Django, run Windows Command Prompt and enter the following command: pip install Django

A screenshot of a Windows Command Prompt window titled 'Command Prompt'. The output shows the command 'pip install django' being run, followed by the download and installation process. The terminal shows: Microsoft Windows [Version 6.3.9600], (c) 2013 Microsoft Corporation. All rights reserved. C:\Users\Tan Han Zhong>pip install django Collecting django Downloading Django-1.11.7-py2.py3-none-any.whl (6.9MB) 100% |██████████| 7.0MB 175kB/s Requirement already satisfied: pytz in c:\users\tan han zhong\appdata\local\programs\python\python36\lib\site-packages (from django) Installing collected packages: django Successfully installed django-1.11.7

WhiteNoise - pip install whitenoise

A screenshot of a Windows Command Prompt window showing the command 'pip install whitenoise' being run. The output shows the download and installation process. The terminal shows: C:\Users\Tan Han Zhong>pip install whitenoise Collecting whitenoise Downloading whitenoise-3.3.1-py2.py3-none-any.whl Installing collected packages: whitenoise Successfully installed whitenoise-3.3.1 C:\Users\Tan Han Zhong>

Mysqlclient - pip install mysqlclient

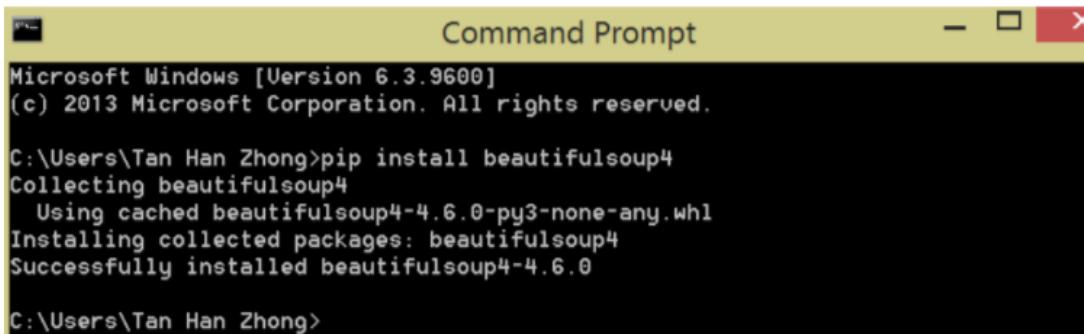
```
C:\Users\Tan Han Zhong>pip install mysqlclient
Collecting mysqlclient
  Downloading mysqlclient-1.3.12-cp36-cp36m-win_amd64.whl (1.3MB)
    100% |██████████| 1.3MB 564kB/s
Installing collected packages: mysqlclient
Successfully installed mysqlclient-1.3.12

C:\Users\Tan Han Zhong>
```

Django Database - pip install dj-database-url

```
C:\Users\Tan Han Zhong>pip install dj-database-url
Collecting dj-database-url
  Using cached dj_database_url-0.4.2-py2.py3-none-any.whl
Installing collected packages: dj-database-url
Successfully installed dj-database-url-0.4.2
```

BeautifulSoup4 - pip install beautifulsoup4



A screenshot of a Windows Command Prompt window titled "Command Prompt". The title bar is yellow. The window contains the following text:

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\Tan Han Zhong>pip install beautifulsoup4
Collecting beautifulsoup4
  Using cached beautifulsoup4-4.6.0-py3-none-any.whl
Installing collected packages: beautifulsoup4
Successfully installed beautifulsoup4-4.6.0

C:\Users\Tan Han Zhong>
```

html5lib - pip install html5lib

```
C:\Users\Tan Han Zhong>pip install html5lib
Collecting html5lib
  Using cached html5lib-0.999999999-py2.py3-none-any.whl
Requirement already satisfied: setuptools>=18.5 in c:\users\tan han zhong\appdata\local\programs\python\python36\lib\site-packages (from html5lib)
Requirement already satisfied: six in c:\users\tan han zhong\appdata\local\programs\python\python36\lib\site-packages (from html5lib)
Collecting webencodings (from html5lib)
  Using cached webencodings-0.5.1-py2.py3-none-any.whl
Installing collected packages: webencodings, html5lib
Successfully installed html5lib-0.999999999 webencodings-0.5.1

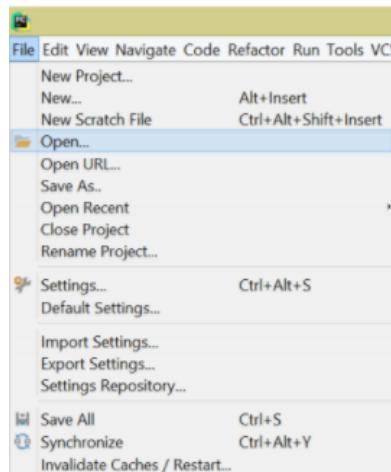
C:\Users\Tan Han Zhong>
```

request - pip install request

```
C:\Users\Tan Han Zhong>pip install requests
Collecting requests
  Downloading requests-2.18.4-py2.py3-none-any.whl (88kB)
    100% |██████████| 92kB 194kB/s
```

Running the Project

Run WampServer and PyCharm Professional IDE. From PyCharm, open up the project file.

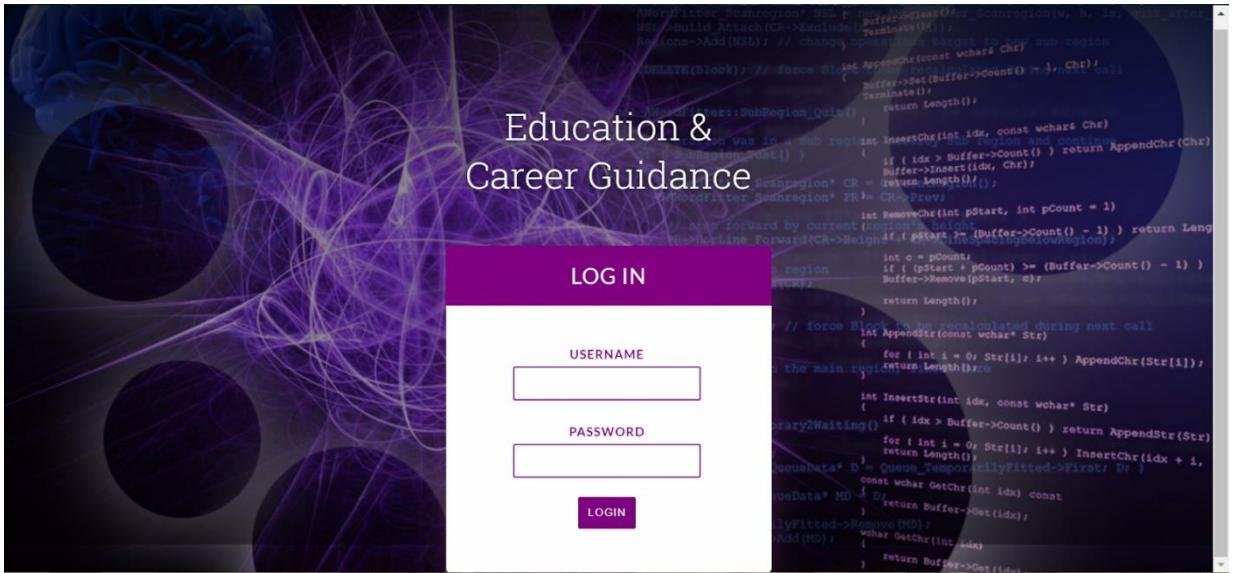


Click on terminal at the bottom of PyCharm, and enter the following command:
`python manage.py runserver`.

A screenshot of the PyCharm terminal window. It shows the command `python manage.py runserver` being run, followed by system check results, the start date and time, Django version, development server address, and instructions to quit the server.

Manage.py is Python file that is automatically created every time a Django project is created. You will need to use manage.py in any of your administration functions such as running your localhost server or migrating your databases.

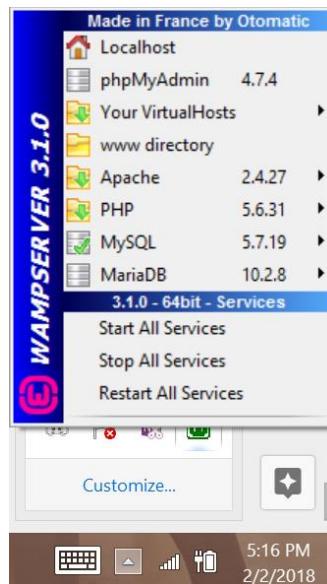
Enter the website using the URL given. In the example here, it will be <http://127.0.0.1:8000/>. The browser will be directed to the project's login page. However, you are unable to login as of now as the database has yet been set up.



Setting up the database

In this section, we will be creating the database and its necessary tables.

Firstly, open phpmyadmin from the wamp server.



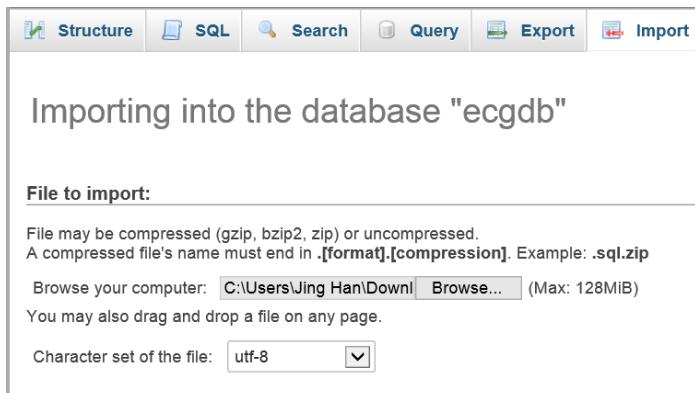
Login to phpmyadmin using a root account with user id as "root" and an empty password.

Navigate to “Databases” tab and create a new database with the following details:

- Database Name: ecgdb
- Collation: utf8_general_ci

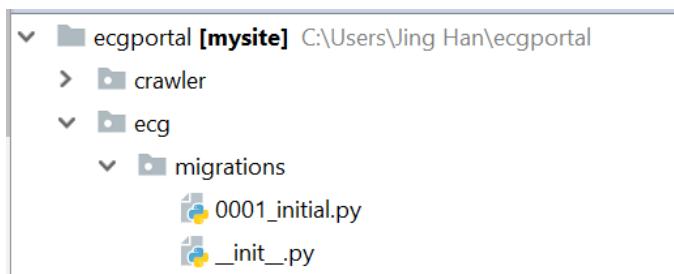


Click on the newly created ecgdb and navigate to the import tab.



Select the sql script provided by us and click go at the bottom of the tab to import the script. The database should now be populated with tables from our script.

Now, in order to match the models within our python program with the tables in our database, we will be using Django’s functionality of makemigrations. First and foremost, locate “001_initial.py” file under the folder named “migrations” and delete it.



Navigate to PyCharm terminal. End the current session or run using your keyboard: Ctrl + C. At the terminal, key in the following commands step by step:

1. python manage.py makemigrations

makemigrations is responsible for creating new migrations based on the changes you have made to your models.

```
C:\Users\Jing Han\ecgportal>python manage.py makemigrations
Migrations for 'ecg':
  ecg\migrations\0001_initial.py
    - Create model BookmarkJob
    - Create model Course
    - Create model FurtherStudies
    - Create model Job
    - Create model JobCategory
    - Create model Mbti
    - Create model User
    - Create model Student
    - Add field user_id to bookmarkjob
```

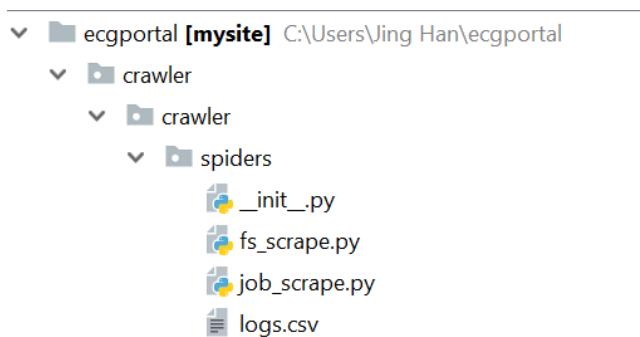
2. python manage.py migrate

Synchronizes the database state with the current set of models and migrations.

```
C:\Users\Jing Han\ecgportal>python manage.py migrate
Operations to perform:
  Apply all migrations: admin, auth, contenttypes, ecg, sessions
Running migrations:
  No migrations to apply.
```

Executing the scraping tool

Since the database has been created, the tables used to store job details are available. Within the project, navigate into the spider folder within the crawler folder.



Within the spider folder contains our scraping tool `fs_scrape.py` and `job_scrape.py`. Open the `fs_scrape` project.

Right click anywhere in the project and click the green arrow (Run ‘fs_scrape’) to execute the scraping script.

```
"C:\Users\Jing Han\AppData\Local\Programs\Python\Python36\python.exe" "C:/Users/Jing Han/ecgportal/crawler/crawler/spiders/fs_scrape.py"
Truncating Further Studies contents...
Running Scraping for NUS
Inserting data...
Running Scraping for NTU
Inserting data...
Running Scraping for SMU
Inserting data...
Running Scraping for Digipen
Inserting data...
----- Further Studies Scraping End -----
Process finished with exit code 0
```

The scraping for further studies takes only about a few seconds. After the scraping run is completed, the details would have been populated within the database further studies table.

	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	fs_id	fs_school	fs_name	fs_url	fs_description	fs_coursecode
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	FS-NUS-01	NUS	Bachelor of Computing in Computer Science (with Ho...	http://www.comp.nus.edu.sg/programmes/ug/cs	Life as a Computer Science student Developing cutt...	N54,N81,N94
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	FS-NUS-02	NUS	Bachelor of Computing in Information Systems (with...	http://www.comp.nus.edu.sg/programmes/ug/is	Life as an Information Systems student Imagine des...	N54,N81,N94
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	FS-NUS-03	NUS	Bachelor of Engineering in Computer Engineering (w...	http://www.comp.nus.edu.sg/programmes/ug/ceg	Life as a Computer Engineering student You're a co...	N54,N81,N94
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	FS-NUS-04	NUS	Bachelor of Science in Business Analytics (with Ho...	http://www.comp.nus.edu.sg/programmes/ug/ba	Life as a Business Analytics student Today's busin...	N54,N81,N94
<input type="checkbox"/>	<input type="button" value="Edit"/>	<input type="button" value="Copy"/>	<input type="button" value="Delete"/>	FS-NUS-05	NUS	Bachelor of Computing in Information Security (wit...	http://www.comp.nus.edu.sg/programmes/ug/isc	Life as an Information Security student Identifyin...	N54,N81,N94

Next, proceed to the job_scrape project and execute it by right clicking anywhere on the project and clicking the green arrow (Run ‘job_scrape’) as well.

```
"C:\Users\Jing Han\AppData\Local\Programs\Python\Python36\python.exe" "C:/Users/Jing Han/ecgportal/crawler/crawler/spiders/job_scrape.py"
Truncating Job contents...
Running: Retrieving keywords for Jobs
Running: Job Keyword Scraping from JobStreet
Clearing database...
Inserting data...
Running: Job Mbti Scraping from JobStreet
Clearing database...
Inserting data...
----- Job Scraping End -----
Process finished with exit code 0
```

The scraping for jobs takes around 35 mins. After the run is completed, all the jobs would have been populated into the database job table.

	<input type="button" value="←"/> <input type="button" value="→"/>	<input type="button" value="▼"/> job_id	job_url	job_position	job_company	job_category
<input type="checkbox"/>	 Edit  Copy  Delete	JS-SECURITYANALYST001	https://www.jobstreet.com.sg/en/job/cyber-security...	Cyber Security Analyst (Junior to Senior roles)	BGC Group (Recruitment)	HR Mgmt / Consulting
<input type="checkbox"/>	 Edit  Copy  Delete	JS-SECURITYANALYST002	https://www.jobstreet.com.sg/en/job/soc-l1-securit...	SOC L1 Security Analyst - Alexandra	Globesoft Services Pte Ltd	Banking / Finance
<input type="checkbox"/>	 Edit  Copy  Delete	JS-SECURITYANALYST003	https://www.jobstreet.com.sg/en/job/cyber-security...	Cyber Security Analyst - GSD	NEC Asia Pacific Pte Ltd	IT / Hardware
<input type="checkbox"/>	 Edit  Copy  Delete	JS-SECURITYENGINEER001	https://www.jobstreet.com.sg/en/job/senior-network...	Senior Network Security Engineer	PRIMESTAFF MANAGEMENT SERVICES PTE LTD	Telecommunication

After finishing the installation process as well as scraping process, you can proceed to login in the portal. Enter the following credentials, Username: demoit, Password: 123. You would be directed to the IT Home Page. From there onwards, you'll be able to access the different functions of our portal.