

VIET NAM NATIONAL UNIVERSITY HO CHI MINH CITY  
HO CHI MINH UNIVERSITY OF TECHNOLOGY



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PROGRAMMING INTERGRATION  
PROJECT

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Ho Chi Minh city, 12/2022

## CONTRIBUTIONS

Name	Student ID	Workload	Contribution
Nguyễn Nam Kha	2052515	Define Hook in React. Handle interactions between front-end and back-end, manipulate data get by calling API from server and Swagger	100%
Nguyễn Trần Minh Phước	2052662	Define front-end routes using React router, styling page using Sass, drawing chart using Chart.js	100%
Nguyễn Duy Thành	1952456	Define model ( <i>user</i> , <i>project</i> , <i>group</i> , <i>baipost</i> ) of the app using MongoDB Atlas. Write instruction markdown.	100%
Phan Mai Tấn Lợi	2052158	Add logic, CRUD operation for <i>user</i> , <i>project</i> by using Node.js. Draw use case diagram, class diagram, MVC .	100%
Cao Anh Huân	1952712	Add logic, CRUD operation for <i>group</i> , <i>baipost</i> by using Node.js. Draw activity diagram.	100%

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## 1. Introduction

Crawl data is the practice of gathering data and information from websites for a variety of uses. As a result, all pages on the website as well as relevant links will be accessed by search engine bots (Search Engine) like Google, Bing, etc. for data statistics.

This is a crucial step for both SEO and search engine optimization because it provides the most accurate evaluation of the website's quality. Search rankings are improved and made more precisely as a result.

Web crawlers in particular are extremely "sensitive" to new websites or updates to well-known websites. These technologies also have strict control over links that are no longer available because they directly affect the caliber of the pertinent website.

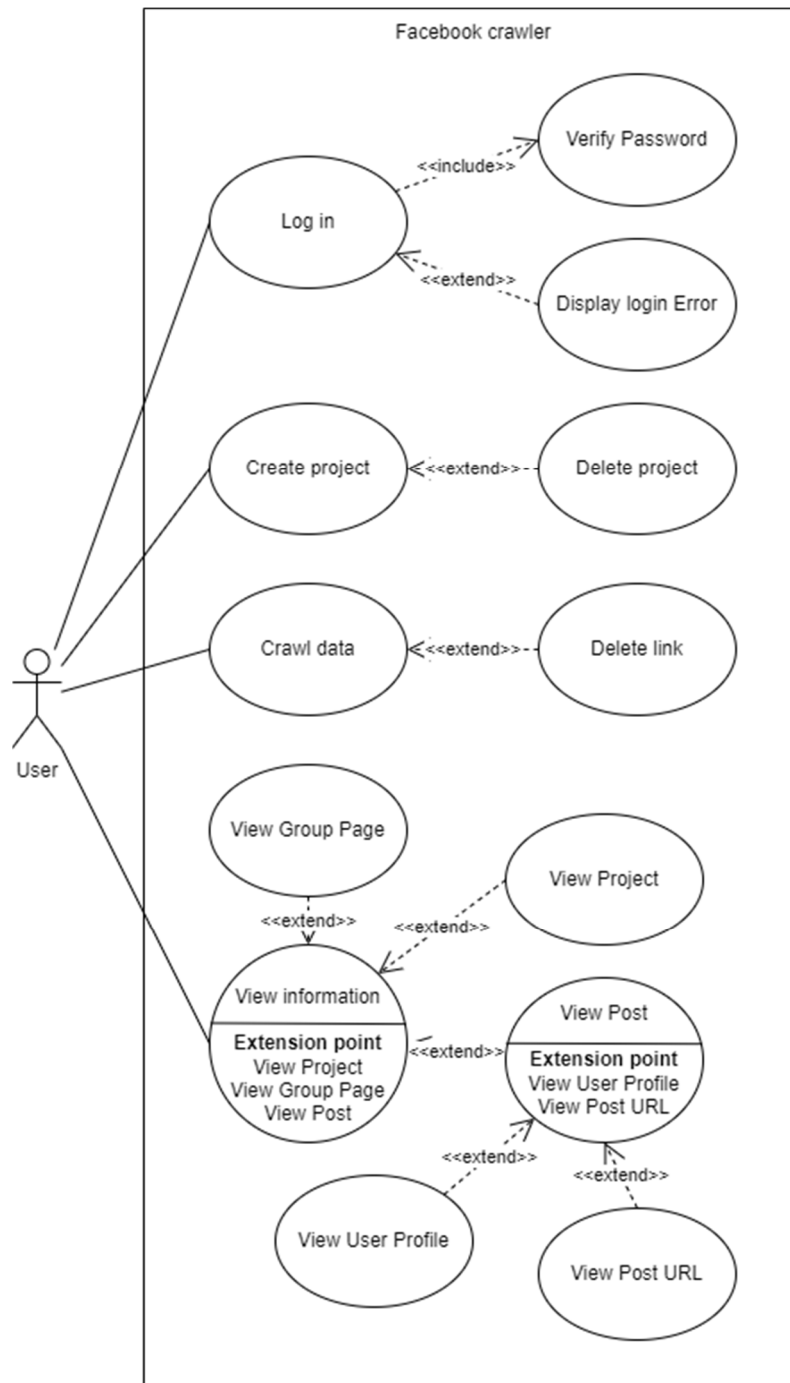
Currently, search engines frequently perform data crawling automatically and independently. In other words, it is challenging for any user or company to obstruct Google, Bing, etc. from collecting data.

In this project, we will try to crawl data from facebook to understand better how big companies we mentioned earlier collect data. With the help of Swagger API, which was created by Mr Huynh Ngoc Thien, we only need to create a database to store data and an app to display this data.

## 2. Design and technology

### 2.1. Use case diagram

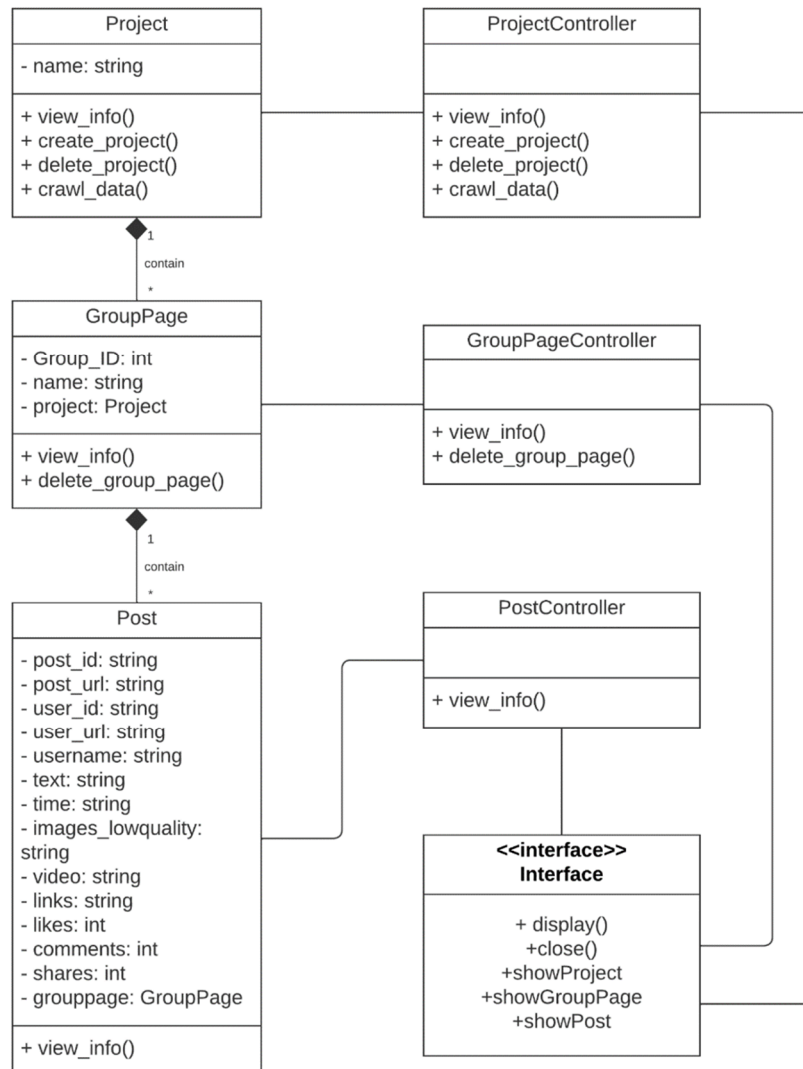
This is all use cases of our application:



Use-case scenario for *Crawl data module*:

<b>Use - case name:</b>	Crawl Data
<b>Description:</b>	User crawls data from a group page by giving the group page link and Facebook cookie.
<b>Actor:</b>	User
<b>Trigger:</b>	Click on “Create” button below the Input Links bar
<b>Preconditions:</b>	<ul style="list-style-type: none"><li>• Input Links must be correct and directed to the available group page (chosen group page must be public).</li><li>• Facebook cookie text file is required.</li></ul>
<b>Postconditions:</b>	The user successfully crawls data.
<b>Normal flow:</b>	<ol style="list-style-type: none"><li>1. The system shows an Input Links box to receive links and a list of links from which the system has crawled data.</li><li>2. The user gives the chosen link in the Input Links bar and cookie text file by clicking Choose file.</li><li>3. The user clicks the “Create” button to begin crawling data progress.</li><li>4. The loading icon appears and the “Create” button gets disabled.</li><li>5. The system crawls data and stores them in the database.</li><li>6. The system updates the link list and shows them to the user.</li></ol>
<b>Alternative flow:</b>	
<b>Exceptions:</b>	

## 2.2. Class diagram

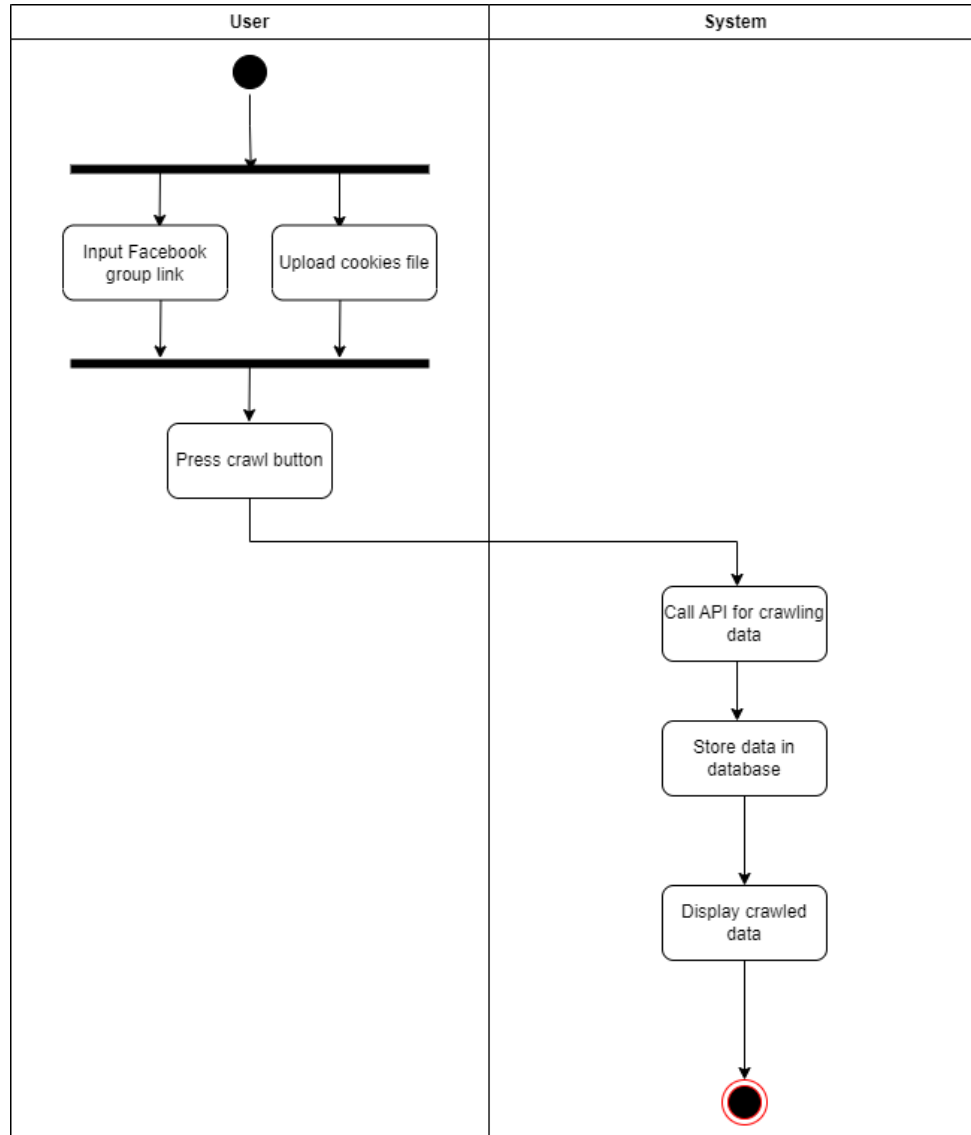


### Description:

- The user can view the project, group page or post using `view_info()`.
- The user can create any project using `create_project()`.
- The user cannot create a group page or post. New group pages and posts can only be created via crawling data progress in the project.
- Posts are attached to the group page and group pages are attached to the project, which means deleting a group page also deleting all posts in that group page and deleting a project also deleting all group pages in that project. The user cannot delete posts.

## 2.3. Activity diagram

This is the activity diagram for Crawling data function:



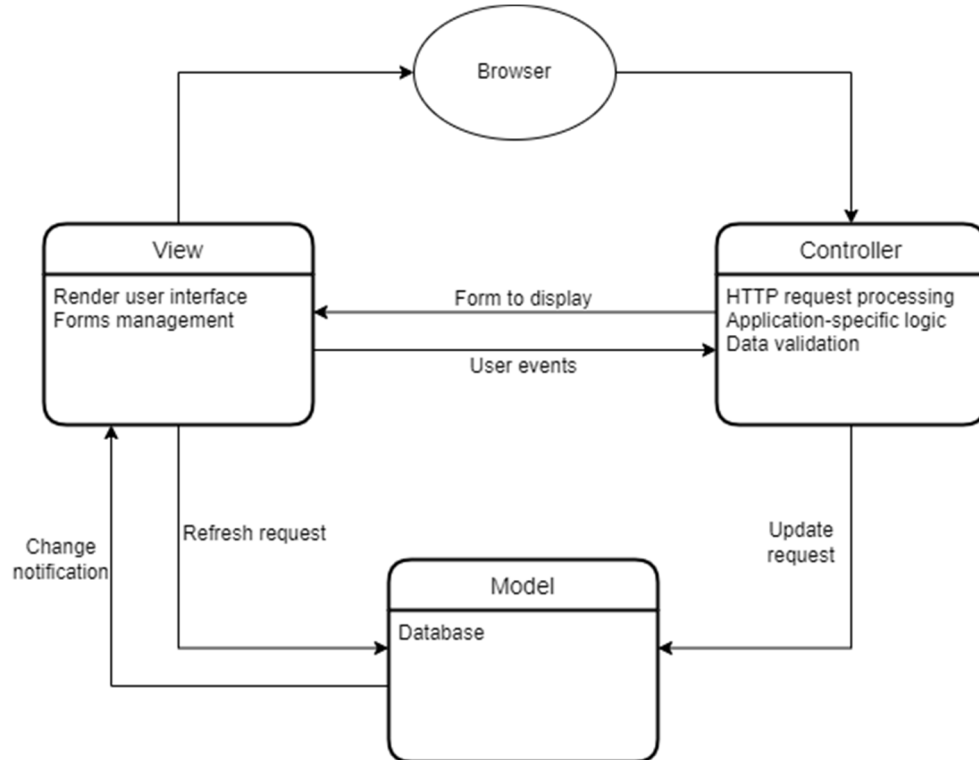
### *Description:*

- The user can start crawling data by giving out a Facebook group link and upload cookies file, then press the Crawl button.
- The crawling progress includes calling the API for crawling data and storing them in the database.
- The system finally displays the result to the user.



## 2.4. Architectural approach

Our application follows MVC pattern as bellow:



	Description
<b>Model</b>	<p>Model is responsible for managing system data and interacting with databases as well as responding to requests from Controller.</p> <ul style="list-style-type: none"> <li>- Database: Functions that interact with the database such as create or update data ( project, group page, post,...).</li> </ul>
<b>View</b>	<p>View defines layout, displays application data through UI, processes user's interaction (click, scroll,...) and sends them to controller.</p> <ul style="list-style-type: none"> <li>- Render user interface: Provide UI to display data. In our application, it is responsible for displaying login screens, project lists, group page lists, post lists, posts' contents,...</li> <li>- Forms management: Handle user's input and send to controller.</li> </ul>
<b>Controller</b>	<p>Controller manages user's interaction and contains logic that updates the Model or View in response to input from the users.</p> <ul style="list-style-type: none"> <li>- Application-specific logic: Mapping user's action to model updates or view updates.</li> <li>- Data validation: Validate user's input such as username, password,...</li> </ul>

## 2.5. Technologies

We use **Node.js**, **Express** for Backend; **React** for Frontend; **MongoDB Atlas** for databases; **Swagger API** for crawling data.



**Node.js** is an open-source, cross-platform JavaScript runtime environment. With **npm(Node Package Manager)**, we have installed many useful packages that supported us during the development of the app, such as **bcrypt**, **cors**, **jsonwebtoken**, **mongoose**, **axios**, **chart.js**, **form-data**, **sass**,...



**Express** is a minimal and flexible **Node.js** web application framework that provides a robust set of features for web and mobile applications such as building RESTful APIs



**React** is a JavaScript library for building user interfaces based on UI components. The most characteristic feature of React is that it supports developing a Single-page application (SPA), which interacts with the user by dynamically rewriting the current web page with new data from the web server, instead of loading entire new pages, thereby providing faster transitions between pages and avoid wasting resources.



**MongoDB** is a NoSQL database using JSON-like documents with optional schemas, so it offers a more flexible way in designing the data structures comparing to relational database tables. **MongoDB Atlas** is a fully-managed cloud database that handles all the complexity of deploying, managing, and healing your deployments on the cloud service provider of your choice (AWS , Azure, and GCP). **MongoDB Atlas** is the best way to deploy, run, and scale MongoDB in the cloud.



**Swagger API** is a simplified API developed by Mr. Huynh Ngoc Thien, who is our advisor for this project. Swagger is an open source and professional toolset for users, teams, and enterprises. Mr. Thien's API allows our website to crawl data of a specific Facebook group based on input of the user.

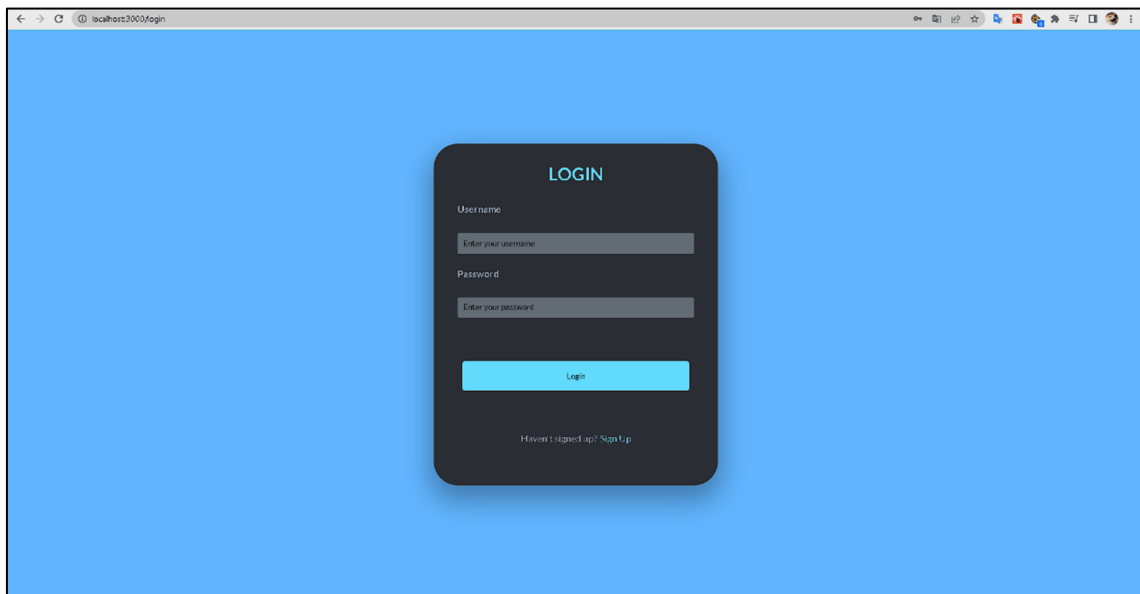
### 3. Project outcome

All of our code and set up instruction can be found here:

<https://github.com/VideySora/fb-crawler>

#### 3.1. Log in / Sign up page

##### *Log in*



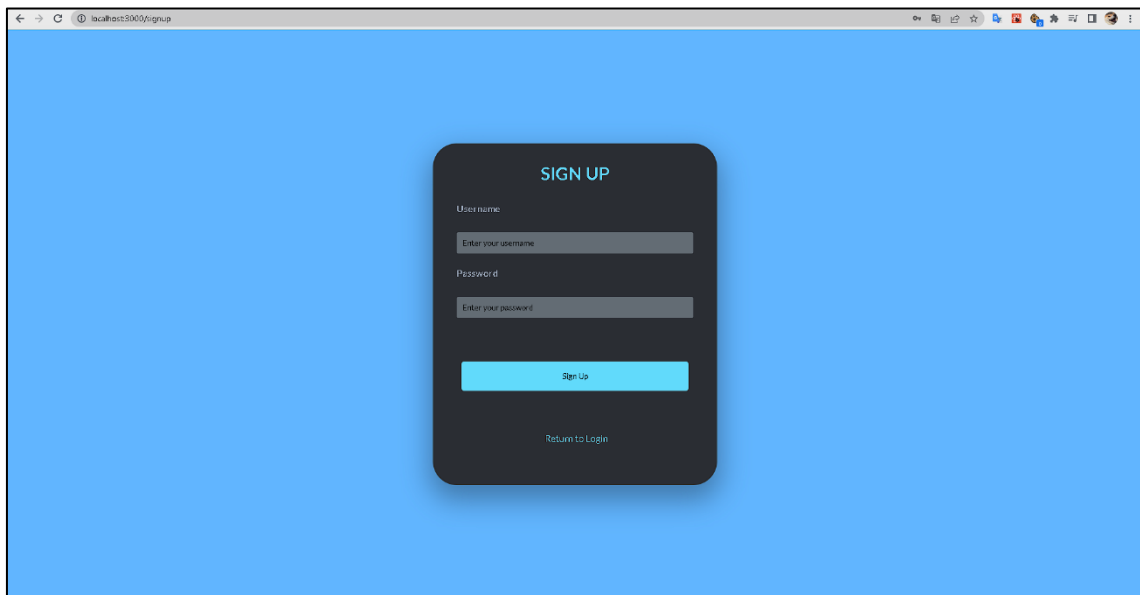
Login form contains a username, a password and a login button which is required to check identity.

To login successfully, an account is required, we can create an account via sign up button

##### *Sign up*

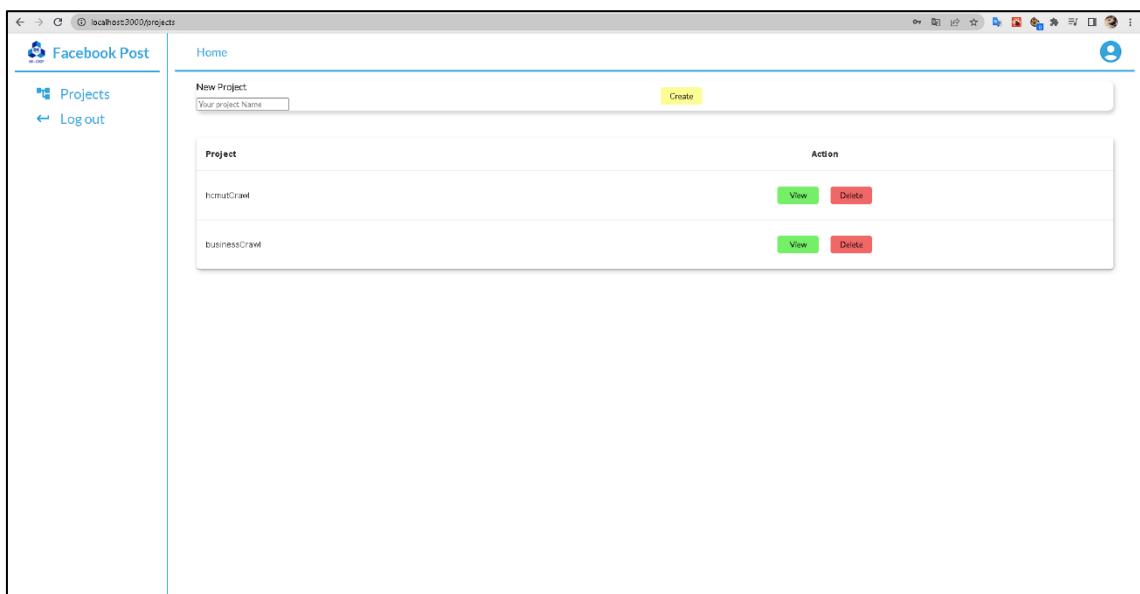
Similar to log in, sign up form requires a username and a password; pressing the Sign up button to send the form to the back end. We can always go back to the login interface by clicking the “Return to Login” button.

After successful login confirmation, the home interface which is also the Create project interface will be displayed.



### 3.2. Home page

#### *Home interface*



This is the home interface, which is also the project list. Here we can create and view our projects. The created projects will be stored and displayed once we create them.

### *Create project*

Below the “New Project” on the top is the New project Name bar which indicates the name of the project we want to create. To create a new project, we enter the name into the mentioned bar and press the Create button, the newly created project will be displayed as below:

New Project

Create



Project	Action
hcmutCrawl	<button>View</button> <button>Delete</button>
businessCrawl	<button>View</button> <button>Delete</button>
<b>newSampleProject</b>	<button>View</button> <button>Delete</button>

### *Delete project*

Delete button in the project section sends a delete request to the controller to remove the project from the database.

Project	Action
hcmutCrawl	<button>View</button> <button>Delete</button>
businessCrawl	<button>View</button> <button>Delete</button>
newSampleProject	<button>View</button> <b><button>Delete</button></b>



Project	Action
hcmutCrawl	<button>View</button> <button>Delete</button>
businessCrawl	<button>View</button> <button>Delete</button>

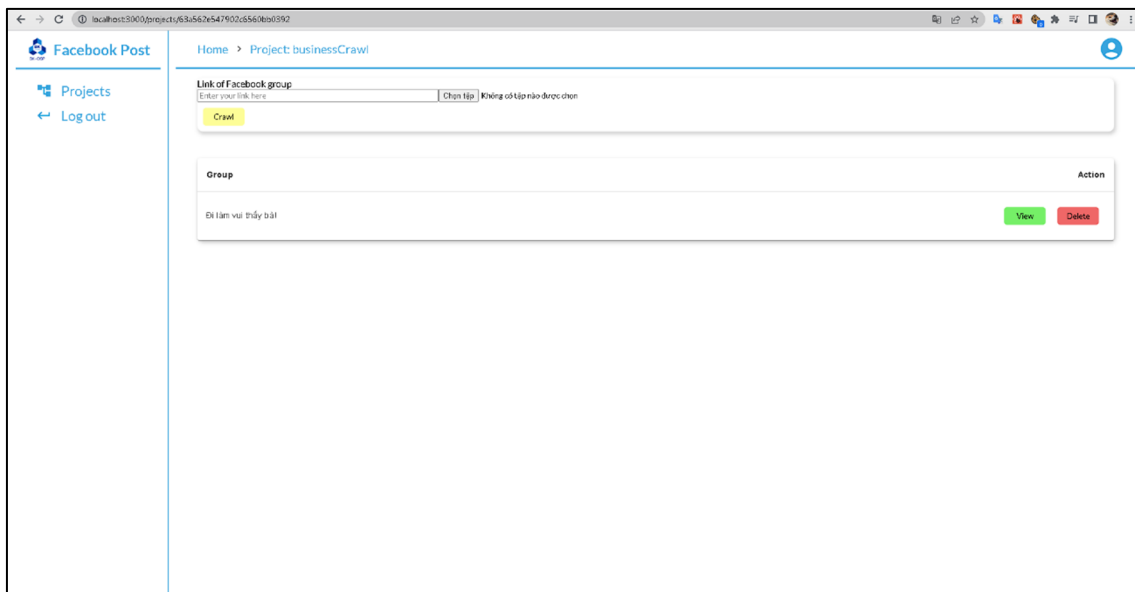
Deleting a project includes deleting all data which were stored in the project, such data will be discussed further down below.

### 3.3. Project page

#### *View project*

From the Home page, we can view a project by pressing the View button, which navigates to the information page of that project

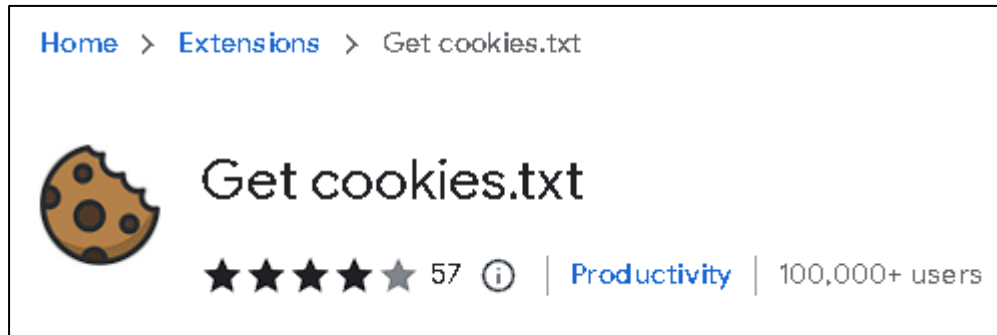
Project	Action
hcmutCrawl	<button>View</button> <button>Delete</button>
businessCrawl	<button>View</button> <button>Delete</button>



This is the information page of project *businessCrawl*. The page show information of all crawled groups. Currently in this project there is only one group called “Đi làm vui thấy bà”. Now we will try crawling another group called “Ăn sập Sài Gòn”, which has the following url: <https://www.facebook.com/groups/219499848640636>

## Download cookie file

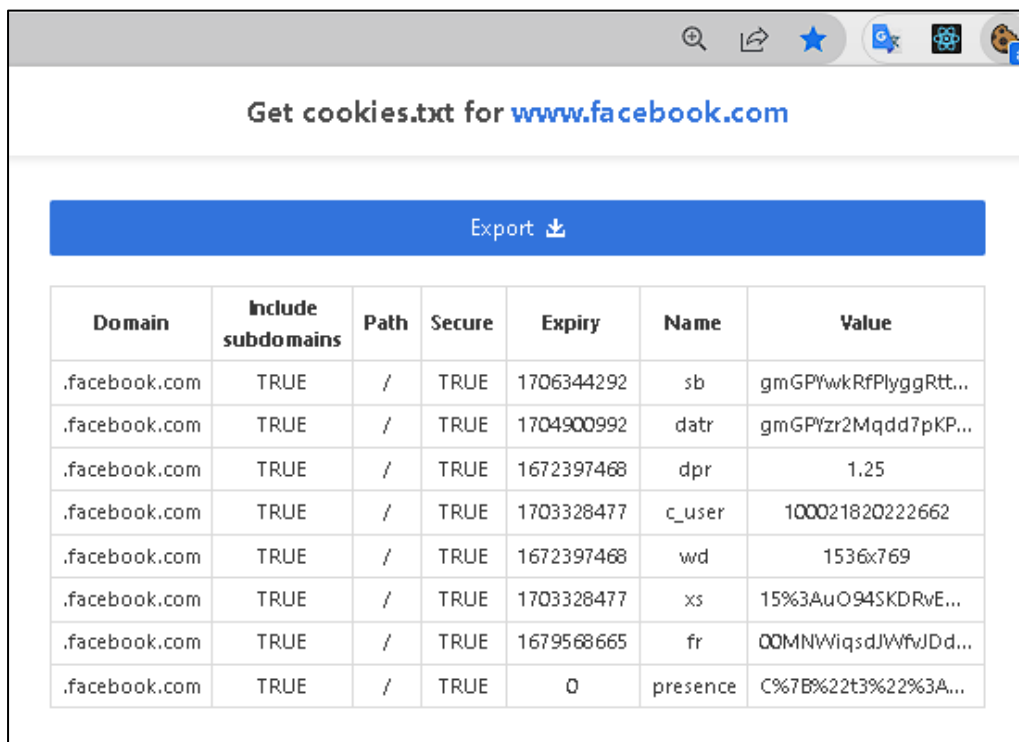
First, we have to download the cookie file. To download cookie, we use this extension from Chrome



Here is the link to install the extension:

<https://tinyurl.com/yjmmmxfx>

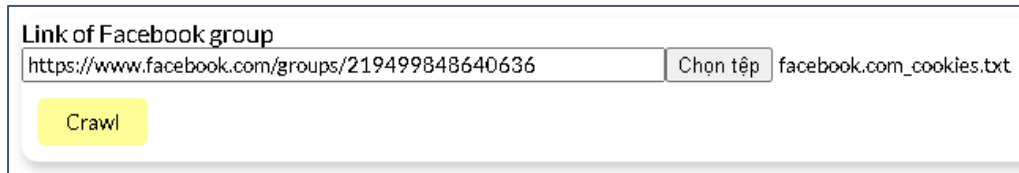
Then open Facebook on your browser, click on the Extension icon, we can see an interface like this:



Click the *Export* button, the *.txt* cookie file will be downloaded to your device.

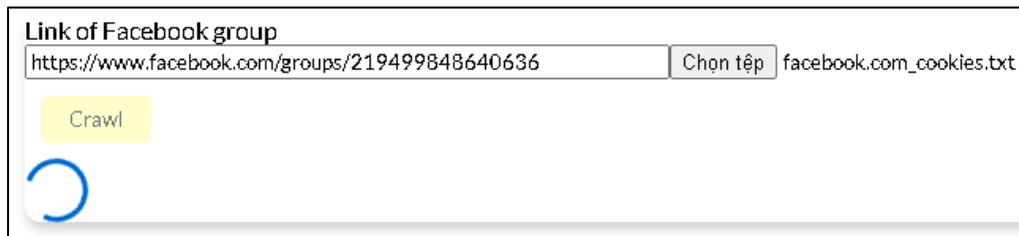
### *Crawl data*

Navigate back to fb-crawler website, upload the .txt cookie file and input link of your desired facebook group to the input field, like below:



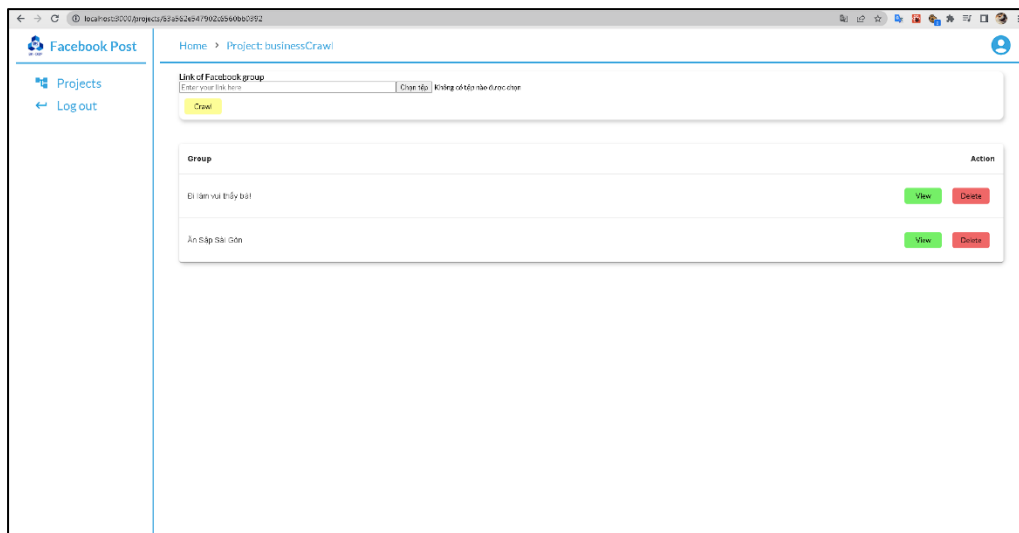
The screenshot shows a web form titled "Link of Facebook group". It contains a text input field with the URL "https://www.facebook.com/groups/219499848640636", a file selection button labeled "Chọn tệp" with the file "facebook.com\_cookies.txt" selected, and a yellow "Crawl" button.

After clicking the *Crawl* button, the interface will show a spinning circle indicating that the crawling data is in progress. During this time, the Crawl button will be grayed out so users cannot spam the Crawl button. The progress may take some time, from a few seconds up to a few minutes.



The screenshot shows the same web form as before, but the "Crawl" button is now grayed out. A blue circular loading spinner is visible in the bottom left corner of the form area.

Once finished crawling, the group list will be updated immediately and show group page names and actions that the user can do optionally.



The screenshot shows the full web application interface. On the left is a sidebar with "Facebook Post", "Projects", and "Log out" links. The main content area is titled "Home > Project: businessCrawl". It contains the same input form as before. Below the form is a table with the following data:

Group	Action
Đi làm vui thấy bất	<a href="#">View</a> <a href="#">Delete</a>
Ăn Sắp Sắp Sắp	<a href="#">View</a> <a href="#">Delete</a>

### *Delete group*

Similar to projects, we can View or Delete Group pages whenever we want.



Group	Action
Đi làm vui thấy bài	View Delete
Ăn Sắp Sài Gòn	View Delete



Group	Action
Ăn Sắp Sài Gòn	View Delete

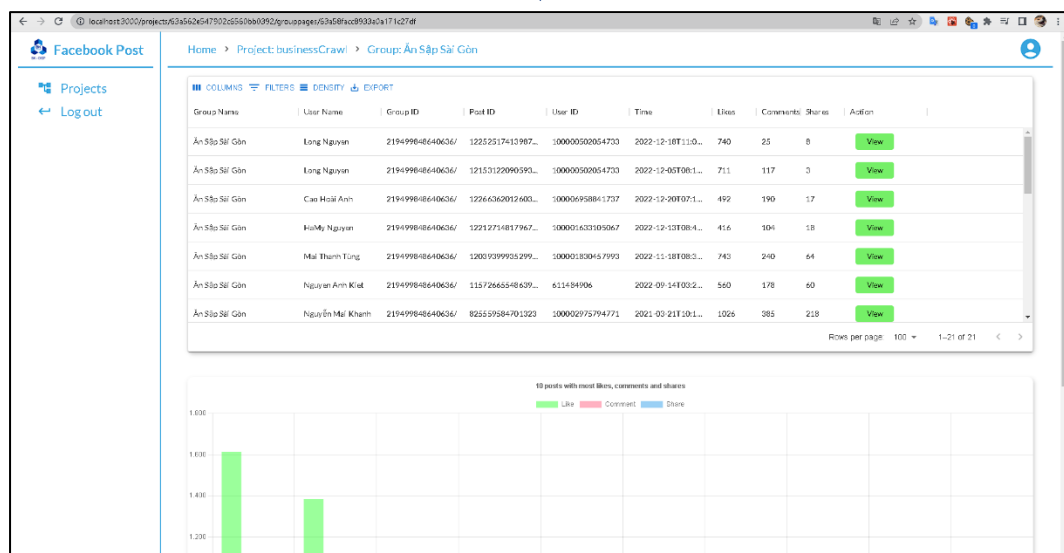
The system will remove the link and its data in the link list from the database and update the shown link list to the user.

### 3.4. Group page

#### View group

From the Project page, we can view a specific group by pressing the View button, which navigates to the information page of that group.

Group	Action
Ăn Sắp Sài Gòn	View Delete



The Group page section contains a table of posts that we were trying to get the data from. The list shows the information of each post, which includes Post ID, User name, Time, number of Likes, Comments and Shares.

### Export CSV

Group Name	User Name	Post ID	User ID	Time	Likes	Comments	Shares	Action
Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	12252517413987...	2022-12-18T11:0...	740	25	8	<a href="#">View</a>
Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	12153122090593...	2022-12-05T08:1...	711	117	3	<a href="#">View</a>
Ấn Sập Sài Gòn	Cao Hoài Anh	219499848640636/	12266362012603...	2022-12-20T07:1...	492	190	17	<a href="#">View</a>
Ấn Sập Sài Gòn	HaMy Nguyen	219499848640636/	12212714817967...	2022-12-13T08:4...	416	104	18	<a href="#">View</a>
Ấn Sập Sài Gòn	Mai Thanh Tùng	219499848640636/	12039399935299...	2022-11-18T08:3...	743	240	64	<a href="#">View</a>
Ấn Sập Sài Gòn	Nguyen Anh Kiet	219499848640636/	11572665548639...	2022-09-14T03:2...	560	178	60	<a href="#">View</a>
Ấn Sập Sài Gòn	Nguyễn Mai Khanh	219499848640636/	825559584701323	2021-03-21T10:1...	1026	385	218	<a href="#">View</a>

The user can export the list as a CSV file or print it, which will contain all the information shown in the table.

Here is the .csv file displayed in VS Code, every data entry is separated by commas:

```
C:\Users\APC\Desktop> fb.csv
1 Group Name,User Name,Group ID,Post ID,User ID,Time,Likes,Comments,Shares
2 Ấn Sập Sài Gòn,Long Nguyen,219499848640636/,1225251741398770,100000502054733,2022-12-18T11:02:10,740,25,8
3 Ấn Sập Sài Gòn,Long Nguyen,219499848640636/,1215312209059390,100000502054733,2022-12-05T08:15:41,711,117,3
4 Ấn Sập Sài Gòn,Cao Hoài Anh,219499848640636/,1226636201260324,100006958841737,2022-12-20T07:16:28,492,190,17
5 Ấn Sập Sài Gòn,HaMy Nguyen,219499848640636/,1221271481796796,100001633105067,2022-12-13T08:44:27,416,104,18
6 Ấn Sập Sài Gòn,Mai Thanh Tùng,219499848640636/,1203939993529945,100001830457993,2022-11-18T08:34:31,743,240,64
7 Ấn Sập Sài Gòn,Nguyen Anh Kiet,219499848640636/,1157266554863956,611484906,2022-09-14T03:25:03,560,178,60
8 Ấn Sập Sài Gòn,Nguyễn Mai Khanh,219499848640636/,825559584701323,100002975794771,2021-03-21T10:12:52,1026,385,218
9 Ấn Sập Sài Gòn,Luu Anh Khoa,219499848640636/,753494771907805,100006553174513,2020-11-21T01:55:24,123,211,85
10 Ấn Sập Sài Gòn,HaMy Nguyen,219499848640636/,1211801369410474,100001633105067,2022-11-30T04:31:28,406,499,57
11 Ấn Sập Sài Gòn,Nhân Đồ,219499848640636/,670395580217725,100005025181615,2020-08-03T15:54:29,156,17,7
12 Ấn Sập Sài Gòn,Đỗ Nguyễn Phát Đạt,219499848640636/,1094027187854560,100016543657583,2022-06-07T13:52:33,907,76,41
13 Ấn Sập Sài Gòn,HaMy Nguyen,219499848640636/,1225223724734905,100001633105067,2022-12-18T10:06:32,1026,713,56
14 Ấn Sập Sài Gòn,Lê Thư Lâm,219499848640636/,563901594200458,100002650015153,2020-02-14T11:43:10,839,7,4
15 Ấn Sập Sài Gòn,Đỗ Nguyễn Phát Đạt,219499848640636/,1127197404537538,100016543657583,2022-07-28T13:12:58,1076,341,230
16 Ấn Sập Sài Gòn,HaMy Nguyen,219499848640636/,1222063771717567,100001633105067,2022-12-14T08:06:25,409,179,61
17 Ấn Sập Sài Gòn,Long Nguyen,219499848640636/,1225251741398770,100000502054733,2022-12-18T11:02:10,290,25,8
18 Ấn Sập Sài Gòn,Trần Tuấn,219499848640636/,1216897235567554,100015507585201,2022-12-07T15:31:15,580,699,35
19 Ấn Sập Sài Gòn,Phúc Nguyễn,219499848640636/,754864378437511,100002789971500,2020-11-23T03:11:26,1090,447,266
20 Ấn Sập Sài Gòn,Lê Thảo Trân,219499848640636/,976590976264849,100030832593421,2021-11-26T16:54:46,1602,1052,472
21 Ấn Sập Sài Gòn,Trần Trường,219499848640636/,759936864596929,100045860692115,2020-11-30T13:36:48,103,59,43
22 Ấn Sập Sài Gòn,Nguyễn Trung Lộc,219499848640636/,1227432274514050,100000193157368,2022-12-21T08:23:39,209,24,7
```

Here is the .csv file displayed in Excel:

File	Home	Insert	Page Layout	Formulas	Data	Review	View	Automate	Help	Table Design		Query
Table Name: <div>fb</div>		Summarize with PivotTable		Insert Slicer		Export  Refresh  Open in Browser		<input checked="" type="checkbox"/> Header Row <input type="checkbox"/> First Column <input checked="" type="checkbox"/> Filter Button				
Resize Table		Remove Duplicates  Convert to Range				Unlink		<input type="checkbox"/> Total Row <input type="checkbox"/> Last Column				
								<input checked="" type="checkbox"/> Banded Rows <input type="checkbox"/> Banded Columns				
Properties		Tools		External Table Data				Table Style Options				
	A	B	C	D	E	F	G	H	I			
1	<div>Group Name</div>	<div>User Name</div>	<div>Group ID</div>	<div>Post ID</div>	<div>User ID</div>	<div>Time</div>	<div>Likes</div>	<div>Comments</div>	<div>Shares</div>			
2	Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	1.22525E+15	1.00001E+14	12/18/2022 11:02	740	25	8			
3	Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	1.21531E+15	1.00001E+14	12/5/2022 8:15	711	117	3			
4	Ấn Sập Sài Gòn	Cao Hoài Anh	219499848640636/	1.22664E+15	1.00007E+14	12/20/2022 7:16	492	190	17			
5	Ấn Sập Sài Gòn	HaMy Nguyen	219499848640636/	1.22127E+15	1.00002E+14	12/13/2022 8:44	416	104	18			
6	Ấn Sập Sài Gòn	Mai Thanh Tùng	219499848640636/	1.20394E+15	1.00002E+14	11/18/2022 8:34	743	240	64			
7	Ấn Sập Sài Gòn	Nguyen Anh Kiet	219499848640636/	1.15727E+15	611484906	9/14/2022 3:25	560	178	60			
8	Ấn Sập Sài Gòn	Nguyễn Mai Khanh	219499848640636/	8.2556E+14	1.00003E+14	3/21/2021 10:12	1026	385	218			
9	Ấn Sập Sài Gòn	Luu Anh Khoa	219499848640636/	7.53495E+14	1.00007E+14	11/21/2020 1:55	123	211	85			
10	Ấn Sập Sài Gòn	HaMy Nguyen	219499848640636/	1.2118E+15	1.00002E+14	11/30/2022 4:31	406	499	57			
11	Ấn Sập Sài Gòn	Nhân Đỗ	219499848640636/	6.70396E+14	1.00005E+14	8/3/2020 15:54	156	17	7			
12	Ấn Sập Sài Gòn	Đỗ Nguyễn Phát Đạt	219499848640636/	1.09403E+15	1.00017E+14	6/7/2022 13:52	907	76	41			
13	Ấn Sập Sài Gòn	HaMy Nguyen	219499848640636/	1.22522E+15	1.00002E+14	12/18/2022 10:06	1026	713	56			
14	Ấn Sập Sài Gòn	Lê Thư Lâm	219499848640636/	5.63902E+14	1.00003E+14	2/14/2020 11:43	839	7	4			
15	Ấn Sập Sài Gòn	Đỗ Nguyễn Phát Đạt	219499848640636/	1.1272E+15	1.00017E+14	7/28/2022 13:12	1076	341	230			
16	Ấn Sập Sài Gòn	HaMy Nguyen	219499848640636/	1.22206E+15	1.00002E+14	12/14/2022 8:06	409	179	61			
17	Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	1.22525E+15	1.00001E+14	12/18/2022 11:02	290	25	8			
18	Ấn Sập Sài Gòn	Trần Tuấn	219499848640636/	1.2169E+15	1.00016E+14	12/7/2022 15:31	580	699	35			
19	Ấn Sập Sài Gòn	Phúc Nguyễn	219499848640636/	7.54864E+14	1.00003E+14	11/23/2020 3:11	1090	447	266			
20	Ấn Sập Sài Gòn	Lê Thảo Trần	219499848640636/	9.76591E+14	1.00031E+14	11/26/2021 16:54	1602	1052	472			
21	Ấn Sập Sài Gòn	Trần Trường	219499848640636/	7.59937E+14	1.00046E+14	11/30/2020 13:36	103	59	43			
22	Ấn Sập Sài Gòn	Nguyễn Trung Lộc	219499848640636/	1.22743E+15	1E+14	12/21/2022 8:23	209	24	7			

## Bar chart

We draw a bar chart to display 10 posts with most likes, comments and shares.



### 3.5. Post page

From the Group page, we can view a specific post by pressing the View button, which navigates to the information page of that post.

Columns Filters Density Export									
Group Name	User Name	Group ID	Post ID	User ID	Time	Likes	Comments	Shares	Action
Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	12252517413987...	100000502054733	2022-12-18T11:0...	740	25	8	<button>View</button>
Ấn Sập Sài Gòn	Long Nguyen	219499848640636/	12153122090593...	100000502054733	2022-12-05T08:1...	711	117	3	<button>View</button>
Ấn Sập Sài Gòn	Cao Hoài Anh	219499848640636/	12266362012603...	100006958841737	2022-12-20T07:1...	492	190	17	<button>View</button>
Ấn Sập Sài Gòn	HaMy Nguyen	219499848640636/	12212714817967...	100001633105067	2022-12-13T08:4...	416	104	18	<button>View</button>
Ấn Sập Sài Gòn	Mai Thanh Tùng	219499848640636/	12039399935299...	100001830457993	2022-11-18T08:3...	743	240	64	<button>View</button>
Ấn Sập Sài Gòn	Nguyen Anh Kiet	219499848640636/	11572665548639...	611484906	2022-09-14T03:2...	560	178	60	<button>View</button>
Ấn Sập Sài Gòn	Nguyễn Mai Khanh	219499848640636/	825559584701323	100002975794771	2021-03-21T10:1...	1026	385	218	<button>View</button>



**Facebook Post**

Home > Project: businessCrawl > Group: Ăn Sập Sài Gòn > Post ID: 1226636201260324

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- Projects
- Log out

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**Name of Group :** Ăn Sập Sài Gòn  
**Name of User :** Cao Hoài Anh  
**Title posting:** 2022-12-20T07:16Z8  
**See Post on Facebook:** <https://facebook.com/groups/219499648640636/posts/1226636201260324>  
**Content:**  
 CHƯA GIỎ TỐI TỆ, RA JOLIBEE ĐÓN COMBO AN KHANG SUM VẬY BÙ ĐÁ CHỈ CỐ TU 69K THÔI!!!!!! Chiến này là tới công chiến với fan nhà Jollibee rồi, mùa Tết này Jollibee ra combo mới sữa tiết kiệm nên tui đơm thêm phần chay rá thử rềnn ☺️ Có bạn order Combo An Khang 69K (1 gà rán giòn, 1 mì ý sốt bò bằm, 1 khoai tây BBQ vừa và 1 Pepsi) ăn với Combo Sum Vầy 99K (2 gà rán giòn, 1 mì ý sốt bò bằm, 1 khoai BBQ vừa và 1 Pepsi), ta nói 1 combo vậy thôi mà đi chung họ bỏ hay nhỡ bạn thân ăn thứ gì luôn chứ áaa, sữa tiết kiệm su hời, lần nào mà tôi mua lễ gì là được Jollibee khao vẩy hoài sao chịu nổi 🤔 Gà rán giòn rum ở bên ngoài, bên trong thì mềm mọng nước đã lắm, nóng hôi hổi lủn, mì ý thì thơm quá thơm, sốt nằm nền vào ăn rất ngon, mỗi chúng tôi lâu lâu mới có đãi hội như là mình cứ phải ăn mãi thếa!!!!!! 🍴 Tập dùng toàn chỉ nhóm Jollibee 69k đó Ché Mầm cho mua tại cửa hàng và giao hàng tận nơi luôn nhaaaaaaaa 🥰 Á đến hết 31/12 thôi nè nên mau tranh thủ rõ hồi bạn @ ăn nhe  
  
**Likes :** 492  
**Comments :** 190  
**Shares :** 17

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**Images :**

◀ #FB-vietnam      1 / 4      NEXT ▶

Post interface displays the Name of group and user, Time posting, Post profile url, the content and number of Like, Comments and Shares. It also shows the images of that post, displayed in an Image Slider.

## 4. Summary and further development

Favor:

- Swagger API supports crawling data.
- Advisors support with care.
- Have a good view of expected results from the beginning.

Difficulty:

- Study many programming languages in a short time.

To crawl data more efficiently, our application would need to be able to crawl data from other websites than Facebook. This method extends the research range so that our application can crawl more data. However, we still need to manage a large amount of data, especially when people upload more and more data everyday. To resolve this, our group suggests using another method in which the bot starts crawling data from the most popular or recent data and links to other pages.

Our group discovered a lot of important information from this subject. The first is specialized knowledge of the software development process, including understanding of UML diagrams, github, and a recent application called Swagger API. Not only that, the difficulties encountered during the working process also gave the participants a chance to hone their self-study techniques, teamwork coordination, and time management abilities. A helpful experience for future employment is also having first-hand knowledge of the procedures involved in running a restaurant or how to create a stunning user interface.