COSC2626 Cloud Computing

Assignment 2 Report

Weather Today

Table of Contents

Members and Contribution

S3577189 Ahnaf Shahriar Abir (Front end) - 50% contribution

- Design website layout and write codes to implement the design
- Link google data studio to the website
- Create clickable image maps
- Link Google BigQuery api to the website
- Write codes to write user searches into bucket storage

S3615907 Huirong Huang (Back end) - 50% contribution

- Design backend for login and registration system
- Manage database by using Mysql client
- Link database through PHP
- Read/Write data into database
- Get real time weather data from Google Cloud Bigquery

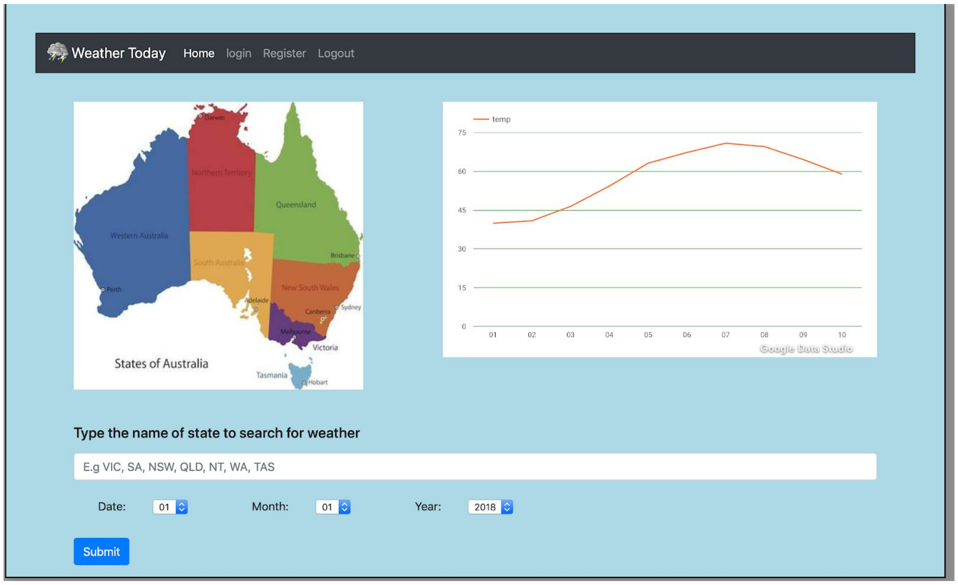
Links

Live url: **https://project-1558.appspot.com**

Repository url (github): **https://github.com/shahriarabir004/cloudComputing2**

Public dataset: **bigquery-public-data:noaa_gsod.gsod2018**

Introduction



Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

Date: 01 Month: 01 Year: 2018

From going out to planning for a trip, nowadays, people rely on the weather data as it has a crucial role in making the plan from good to great. That's why we came up with the idea of implementing an user friendly website and app to show the desired data.

The objective of this project was to build a php web application and a website which will focus on analysing the weather over the past years in Australia's seven states. When an user will search for weather with states name and date, month and year, the website will show his desired data.

On selection of date, month, year and state, SQL queries, written in the php app, are run which are linked with the public dataset “bigquery-public-data:noaa_gsod” and provides with desired information.

The app includes google bucket storage also which writes the search history and the data and time, the searches were made by the user and if the user is logged in, the searches are written with user's username.

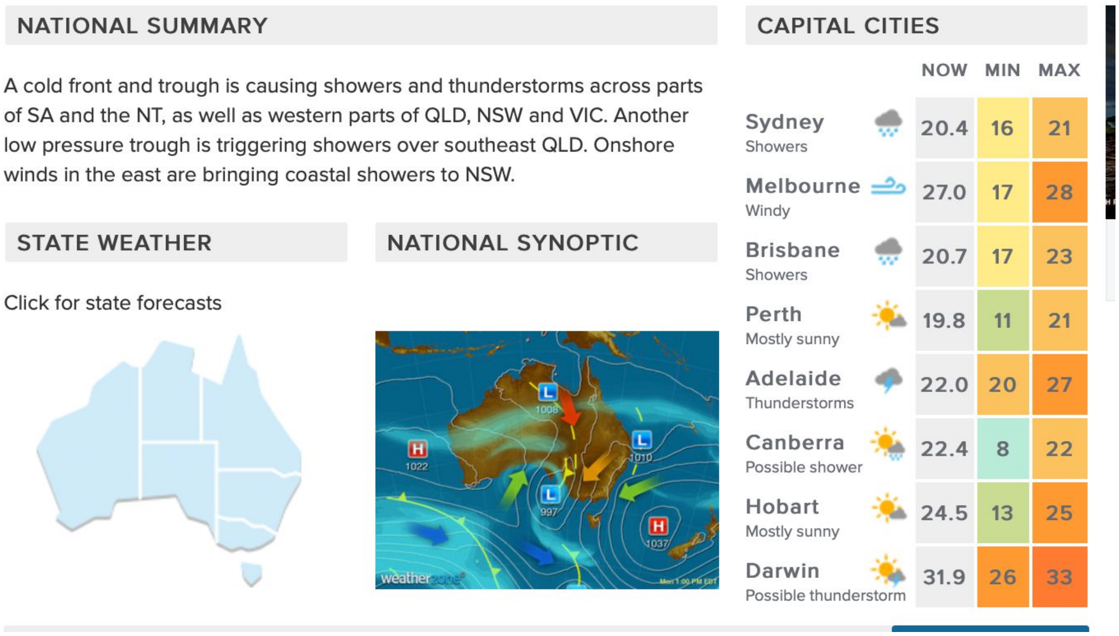
There are some visual graphs implemented on the project as well which shows temperature over the months this year in states which can seen in the homepage and on clicking the image map.

Related work

Weather Zone website : http://www.weatherzone.com.au

Similarities: Both of websites show real-time weather data where user can choose the state to see the data.

Differences: Weatherzone shows the temperatures for cities and we showed for states.



NATIONAL SUMMARY

A cold front and trough is causing showers and thunderstorms across parts of SA and the NT, as well as western parts of QLD, NSW and VIC. Another low pressure trough is triggering showers over southeast QLD. Onshore winds in the east are bringing coastal showers to NSW.

STATE WEATHER

Click for state forecasts

NATIONAL SYNOPTIC

CAPITAL CITIES

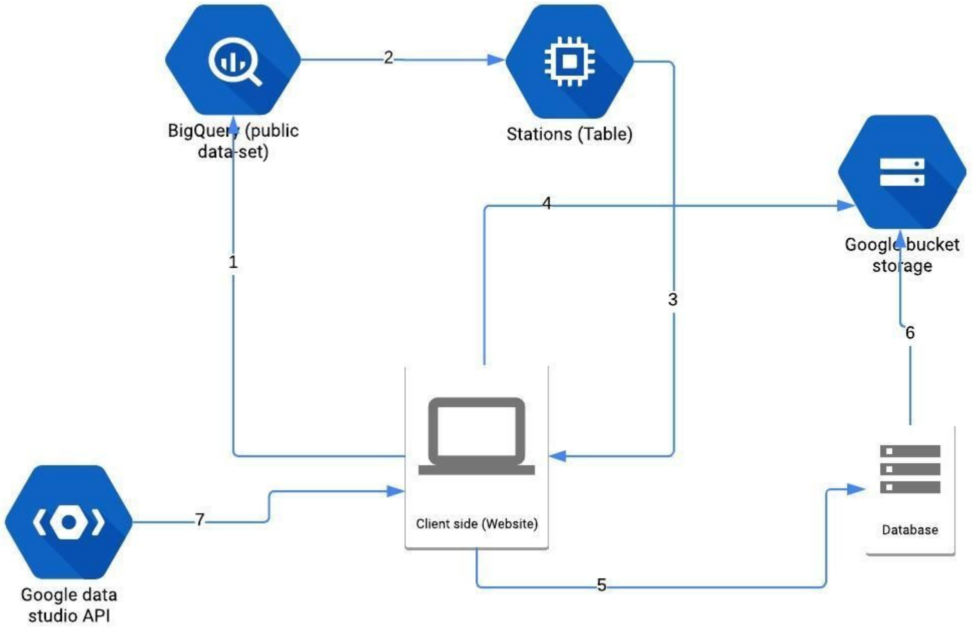
	NOW	MIN	MAX
Sydney Showers	20.4	16	21
Melbourne Windy	27.0	17	28
Brisbane Showers	20.7	17	23
Perth Mostly sunny	19.8	11	21
Adelaide Thunderstorms	22.0	20	27
Canberra Possible shower	22.4	8	22
Hobart Mostly sunny	24.5	13	25
Darwin Possible thunderstorm	31.9	26	33

Software Design/Architecture

Google data studio api: Connect and visualize the weather data in Data Studio

Public dataset "noaa_gsod": This public dataset was created by the National Oceanic and

Atmospheric Administration (NOAA) and includes global data obtained from the USAF Climatology Center.



1. User sends the queries to the BigQuery.
2. BigQuery finds the name of the states linked with each stations.
3. Shows the weather information back to the user.
4. Writes user’s queries into bucket with system date, month and year.
5.
    a. Register: User registers with username, id, password and email and this data is saved into database
    b. Login: User logins with previously created id and password.

6. Writes user’s queries with username if the user is logged in else writes Anonymous.

7. Shows graph of the weather over the year from Google data studio which is linked with BigQuery.

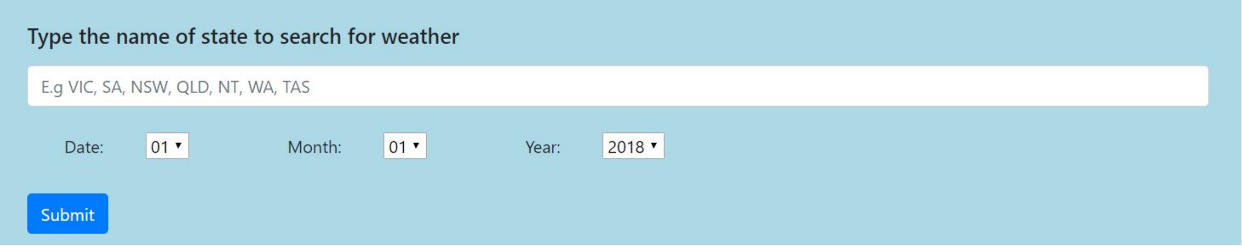
Implementation - Developer Manual

a. PHP framework

To start the project, we develop a framework with PHP language. This framework is fundamental at the first time, which includes index.php (for the contents showed on homepage), second.php (for showing the weather data details). Both of them work for weather information searching system.

b. Weather information searching system

For a weather application, we want to achieve the goal that users can get related weather data by searching with specific date, month, year and name of state.

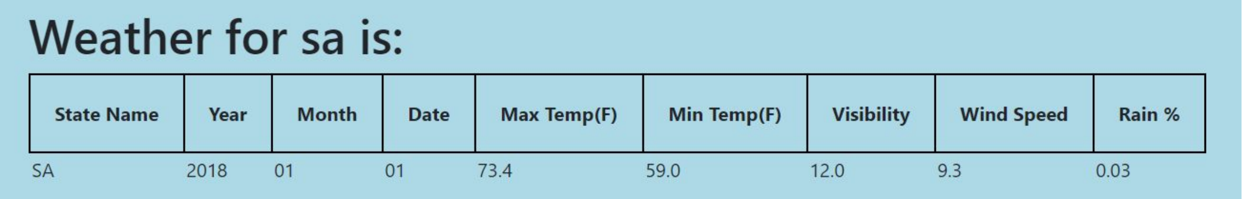


Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

Date: 01 ▾ Month: 01 ▾ Year: 2018 ▾

The result page will show related weather data, including maximum temperature, minimum temperature, visibility, wind speed and raining possibility.



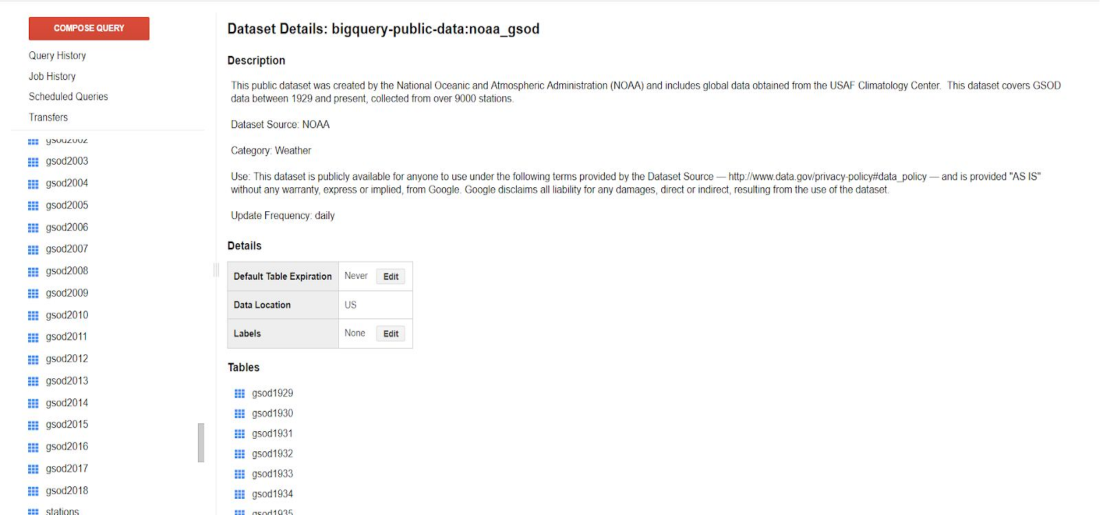
Weather for sa is:

State Name	Year	Month	Date	Max Temp(F)	Min Temp(F)	Visibility	Wind Speed	Rain %
SA	2018	01	01	73.4	59.0	12.0	9.3	0.03

c. Getting real time weather data from public database

We first researched Australia's official weather website: http://www.bom.gov.au/

We tried to get relevant weather data from BOM database, however, the real time data from that database is not accessible. Then we studied the tutorial of how to process weather satellite data in real time in Google Cloud Bigquery, and figured out the usage of public dataset: noaa_gsod.



Dataset Details: bigquery-public-data:noaa_gsod

Description

This public dataset was created by the National Oceanic and Atmospheric Administration (NOAA) and includes global data obtained from the USAF Climatology Center. This dataset covers GSOD data between 1929 and present, collected from over 9000 stations.

Dataset Source: NOAA

Category: Weather

Use: This dataset is publicly available for anyone to use under the following terms provided by the Dataset Source — http://www.data.gov/privacy-policy#data_policy — and is provided "AS IS" without any warranty, express or implied, from Google. Google disclaims all liability for any damages, direct or indirect, resulting from the use of the dataset.

Update Frequency: daily

Details

Default Table Expiration	Never	Edit
Data Location	US	
Labels	None	Edit

Tables

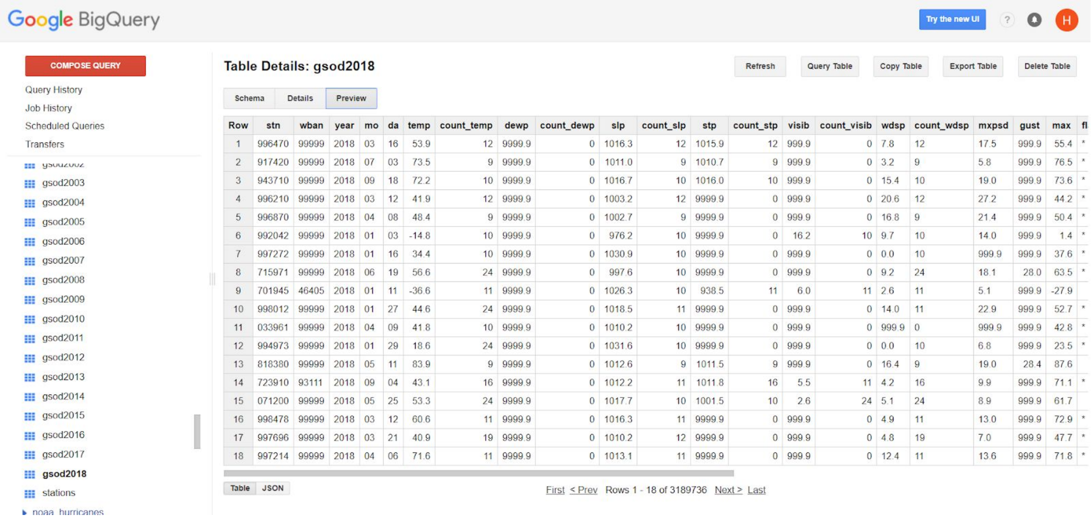


Table Details: gsod2018

Row	stn	wban	year	mo	da	temp	count_temp	dewp	count_dewp	slp	count_slp	stp	count_stp	visib	count_visib	wdsp	count_wdsp	mxpsd	gust	max	fl
1	996470	99999	2018	03	16	53.9	12	9999.9	0	1016.3	12	1015.9	12	999.9	0	7.8	12	17.5	999.9	55.4	*
2	917420	99999	2018	07	03	73.5	9	9999.9	0	1011.0	9	1010.7	9	999.9	0	3.2	9	5.8	999.9	76.5	*
3	943710	99999	2018	09	18	72.2	10	9999.9	0	1016.7	10	1016.0	10	999.9	0	15.4	10	19.0	999.9	73.6	*
4	996210	99999	2018	03	12	41.9	12	9999.9	0	1003.2	12	9999.9	0	999.9	0	20.6	12	27.2	999.9	44.2	*
5	996870	99999	2018	04	08	48.4	9	9999.9	0	1002.7	9	9999.9	0	999.9	0	16.8	9	21.4	999.9	50.4	*
6	992042	99999	2018	01	03	-14.8	10	9999.9	0	976.2	10	9999.9	0	16.2	10	9.7	10	14.0	999.9	1.4	*
7	997272	99999	2018	01	16	34.4	10	9999.9	0	1030.9	10	9999.9	0	999.9	0	0.0	10	999.9	999.9	37.6	*
8	715971	99999	2018	06	19	56.6	24	9999.9	0	997.6	10	9999.9	0	999.9	0	9.2	24	18.1	28.0	63.5	*
9	701945	46405	2018	01	11	-36.6	11	9999.9	0	1026.3	10	938.5	11	6.0	11	2.6	11	5.1	999.9	-27.9	
10	998012	99999	2018	01	27	44.6	24	9999.9	0	1018.5	11	9999.9	0	999.9	0	14.0	11	22.9	999.9	52.7	*
11	033961	99999	2018	04	09	41.8	10	9999.9	0	1010.2	10	9999.9	0	999.9	0	999.9	0	999.9	999.9	42.8	*
12	994973	99999	2018	01	29	18.6	24	9999.9	0	1031.6	10	9999.9	0	999.9	0	0.0	10	6.8	999.9	23.5	*
13	818380	99999	2018	05	11	83.9	9	9999.9	0	1012.6	9	1011.5	9	999.9	0	16.4	9	19.0	28.4	87.6	
14	723910	93111	2018	09	04	43.1	16	9999.9	0	1012.2	11	1011.8	16	5.5	11	4.2	16	9.9	999.9	71.1	*
15	071200	99999	2018	05	25	53.3	24	9999.9	0	1017.7	10	1001.5	10	2.6	24	5.1	24	8.9	999.9	61.7	
16	998478	99999	2018	03	12	60.6	11	9999.9	0	1016.3	11	9999.9	0	999.9	0	4.9	11	13.0	999.9	72.9	*
17	997696	99999	2018	03	21	40.9	19	9999.9	0	1010.2	12	9999.9	0	999.9	0	4.8	19	7.0	999.9	47.7	*
18	997214	99999	2018	04	06	71.6	11	9999.9	0	1013.1	11	9999.9	0	999.9	0	12.4	11	13.6	999.9	71.8	*

Rows 1 - 18 of 3189736

We found that the key to confirm the weather of a location is station number in the public dataset, so we need to link station number to name of the state. We then created a private table “stations” in Google Cloud Bigquery to make use of it. We researched for the station number to make sure that the station is exactly in that state.

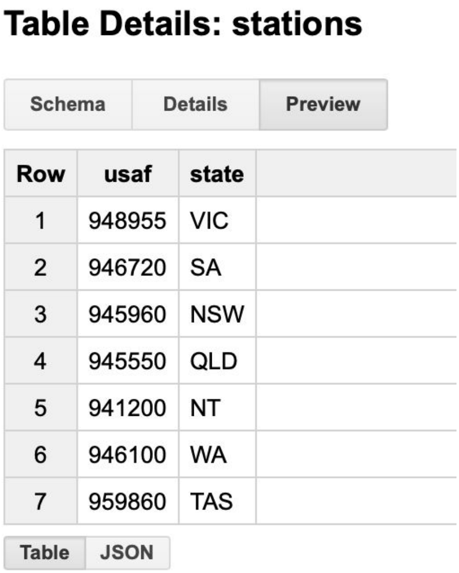
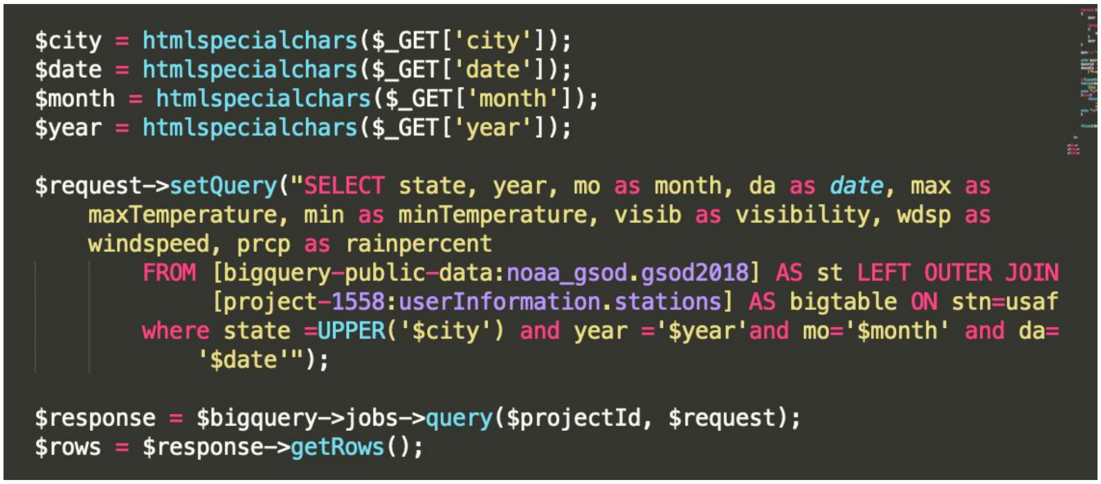


Table Details: stations

Row	usaf	state
1	948955	VIC
2	946720	SA
3	945960	NSW
4	945550	QLD
5	941200	NT
6	946100	WA
7	959860	TAS

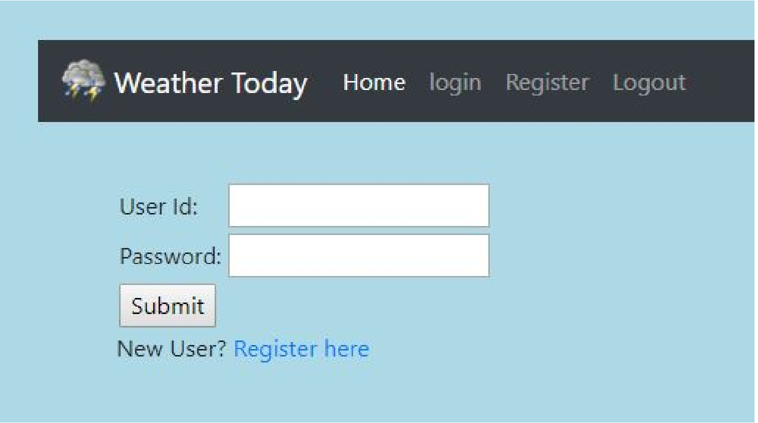
After applying Google Cloud client api for Bigquery, we can get data from public dataset by these codes.

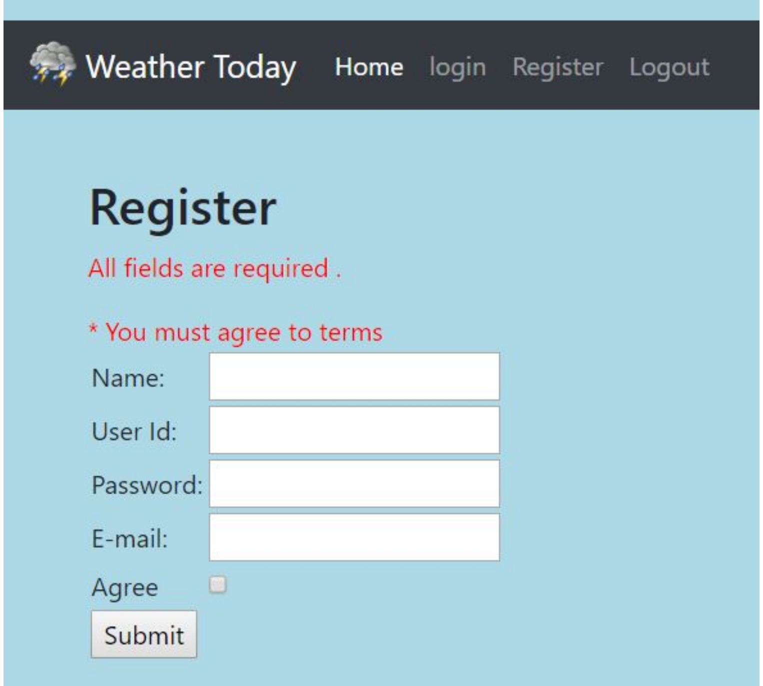


```
$city = htmlspecialchars($_GET['city']);
$date = htmlspecialchars($_GET['date']);
$month = htmlspecialchars($_GET['month']);
$year = htmlspecialchars($_GET['year']);

$request->setQuery("SELECT state, year, mo as month, da as date, max as
    maxTemperature, min as minTemperature, visib as visibility, wdsp as
    windspeed, prcp as rainpercent
        FROM [bigquery-public-data:noaa_gsod.gsod2018] AS st LEFT OUTER JOIN
             [project-1558:userInformation.stations] AS bigtable ON stn=usaf
        where state =UPPER('$city') and year ='$year'and mo='$month' and da=
            '$date'");

$response = $bigquery->jobs->query($projectId, $request);
$rows = $response->getRows();
```

d. User login and registration system

We then implemented a user login and registration system, which added login.php (for user's login), register.php (for user's registration), logout.php (for user's log out) to our framework.





Register

All fields are required .

* You must agree to terms

Name:

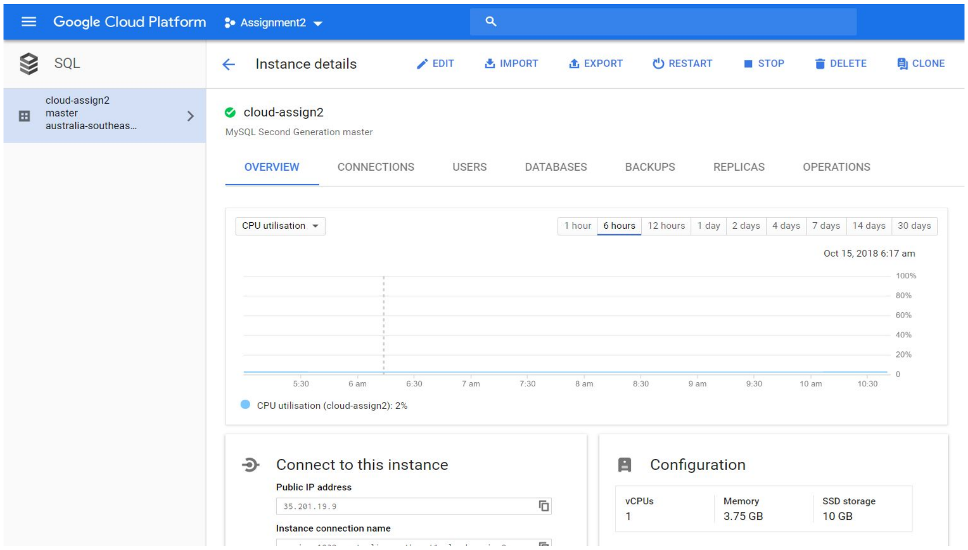
User Id:

Password:

E-mail:

e. Google Cloud Mysql Instance / Third party mysql database

For storing the user data, we first tried Google Cloud Mysql Instance.



cloud-assign2
master
australia-southeas...

cloud-assign2
MySQL Second Generation master

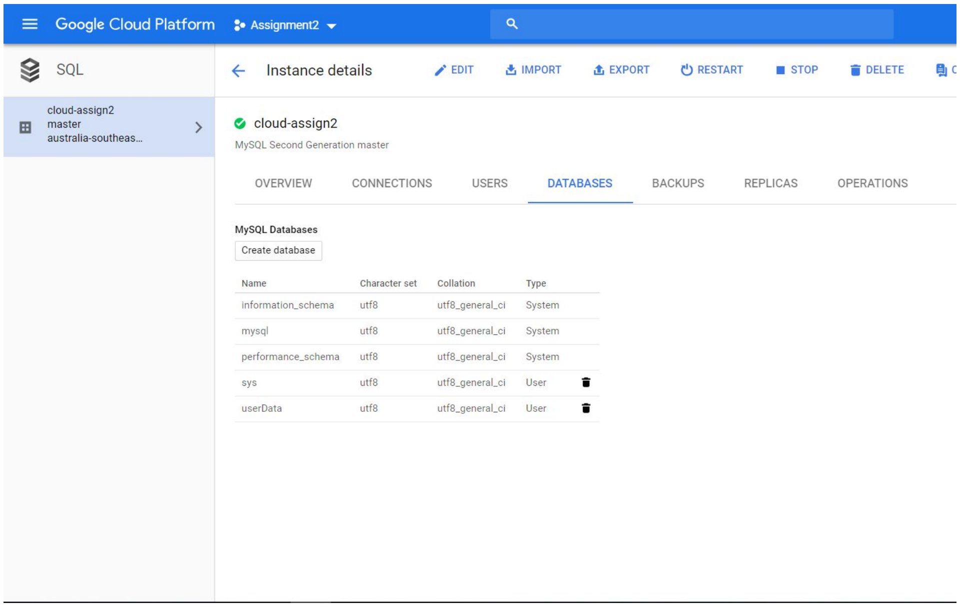
Oct 15, 2018 6:17 am

CPU utilisation (cloud-assign2): 2%

Public IP address
35.201.19.9

Instance connection name

vCPUs	Memory	SSD storage
1	3.75 GB	10 GB

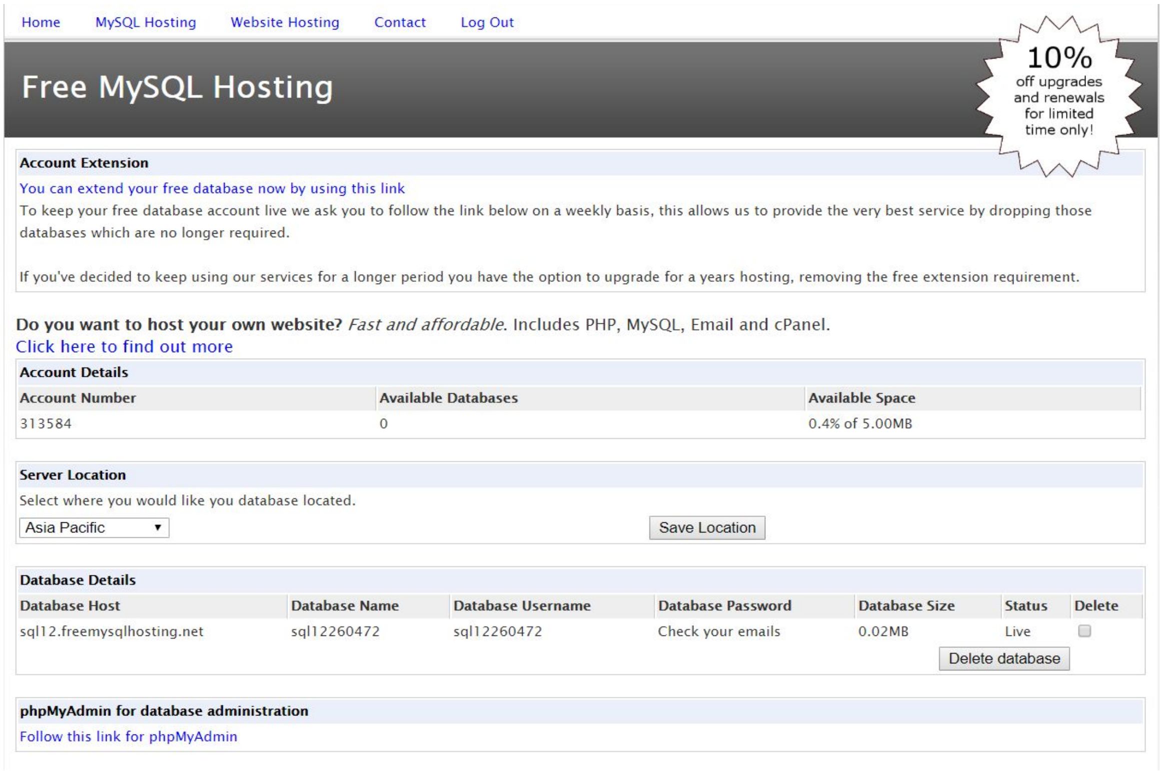


cloud-assign2
MySQL Second Generation master

MySQL Databases

Name	Character set	Collation	Type
information_schema	utf8	utf8_general_ci	System
mysql	utf8	utf8_general_ci	System
performance_schema	utf8	utf8_general_ci	System
sys	utf8	utf8_general_ci	User
userData	utf8	utf8_general_ci	User

Due to some technical problems, we cannot get access to that Mysql database through php. So we do it in alternative way, which is to use a third party database: https://www.freemysqlhosting.net/



Account Extension

You can extend your free database now by using this link

To keep your free database account live we ask you to follow the link below on a weekly basis, this allows us to provide the very best service by dropping those databases which are no longer required.

If you've decided to keep using our services for a longer period you have the option to upgrade for a years hosting, removing the free extension requirement.

Do you want to host your own website? *Fast and affordable.* Includes PHP, MySQL, Email and cPanel.
Click here to find out more

Account Details

Account Number	Available Databases	Available Space
313584	0	0.4% of 5.00MB

Server Location

Select where you would like you database located.

Asia Pacific ▾

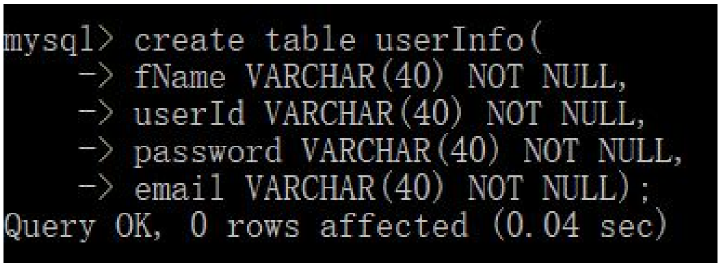
Database Details

Database Host	Database Name	Database Username	Database Password	Database Size	Status	Delete
sql12.freemysqlhosting.net	sql12260472	sql12260472	Check your emails	0.02MB	Live	□

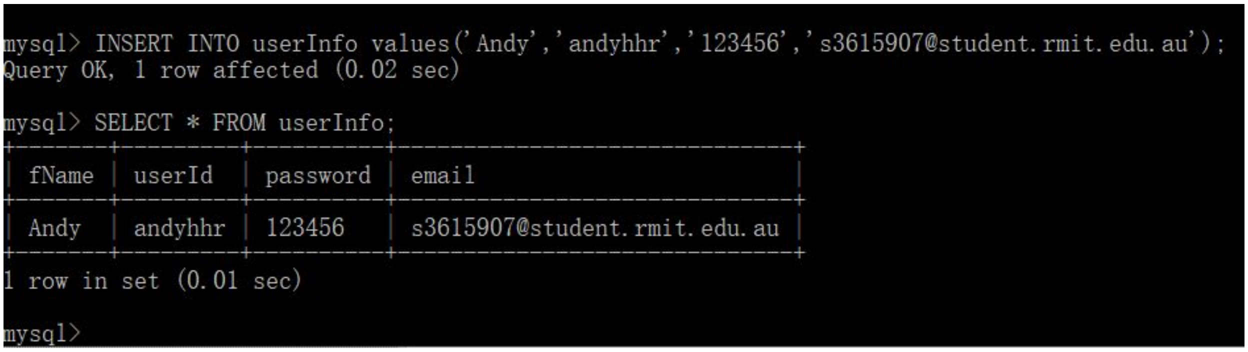
phpMyAdmin for database administration

Follow this link for phpMyAdmin

We generated a database “userData” and created a table “userInfo” in it for storing all the data of users who have registered our application on the website. The mysql client is used for operations of that database.



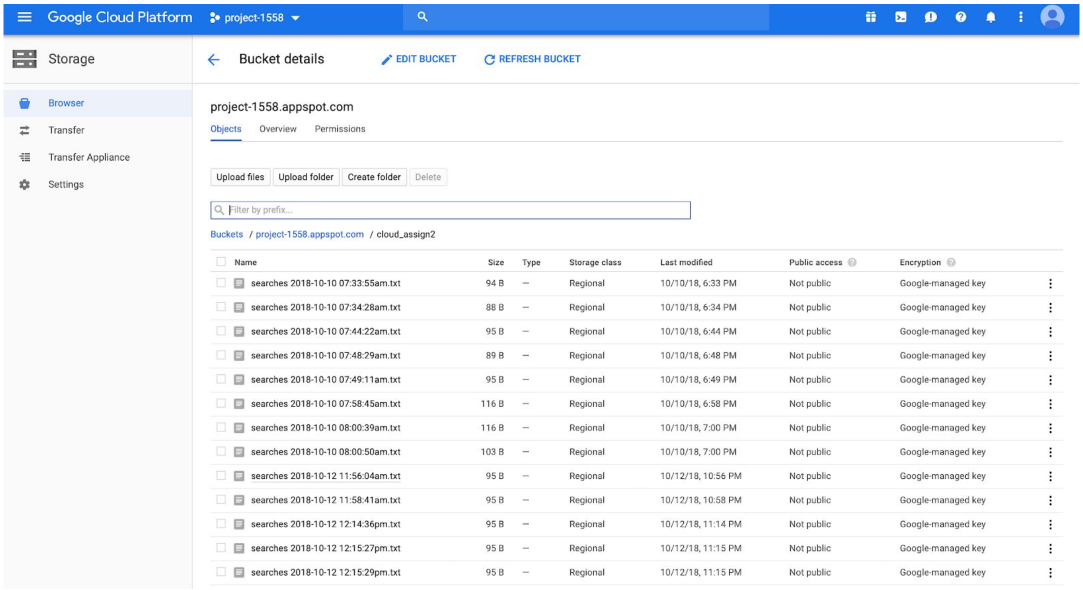
```
mysql> create table userInfo(
    -> fName VARCHAR(40) NOT NULL,
    -> userId VARCHAR(40) NOT NULL,
    -> password VARCHAR(40) NOT NULL,
    -> email VARCHAR(40) NOT NULL);
Query OK, 0 rows affected (0.04 sec)
```



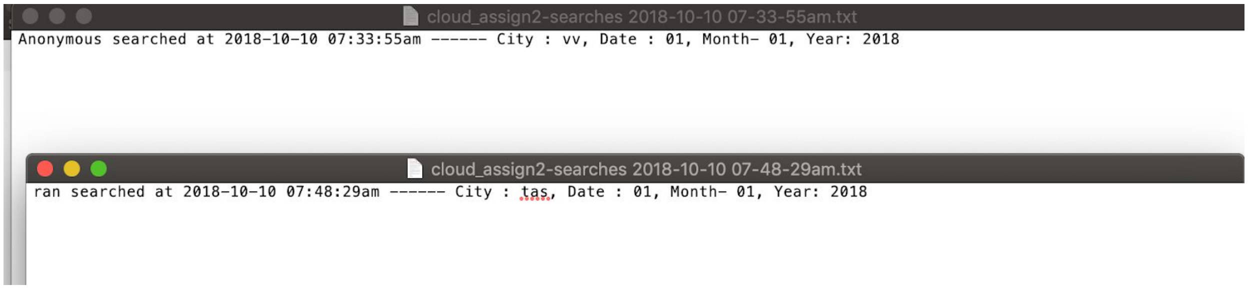
```
mysql> INSERT INTO userInfo values('Andy','andyhhr','123456','s3615907@student.rmit.edu.au');
Query OK, 1 row affected (0.02 sec)

mysql> SELECT * FROM userInfo;
+-------+---------+----------+-----------------------------+
| fName | userId  | password | email                       |
+-------+---------+----------+-----------------------------+
| Andy  | andyhhr | 123456   | s3615907@student.rmit.edu.au |
+-------+---------+----------+-----------------------------+
1 row in set (0.01 sec)

mysql>
```

f. Google Cloud storage Bucket usage (anonymous and identified users)

For the purpose that to store user search history online, we created a Google Cloud storage Bucket. There are two cases, one is for anonymous users who haven’t logged in and the other is for identified users who have already logged in. We record the name of the user (anonymous if not logged in), the name of the city searched, the specific date, month and year that user selected.



Name	Size	Type	Storage class	Last modified	Public access	Encryption
searches 2018-10-10 07:33:55am.txt	94 B	–	Regional	10/10/18, 6:33 PM	Not public	Google-managed key
searches 2018-10-10 07:34:28am.txt	88 B	–	Regional	10/10/18, 6:34 PM	Not public	Google-managed key
searches 2018-10-10 07:44:22am.txt	95 B	–	Regional	10/10/18, 6:44 PM	Not public	Google-managed key
searches 2018-10-10 07:48:29am.txt	89 B	–	Regional	10/10/18, 6:48 PM	Not public	Google-managed key
searches 2018-10-10 07:49:11am.txt	95 B	–	Regional	10/10/18, 6:49 PM	Not public	Google-managed key
searches 2018-10-10 07:58:45am.txt	116 B	–	Regional	10/10/18, 6:58 PM	Not public	Google-managed key
searches 2018-10-10 08:00:39am.txt	116 B	–	Regional	10/10/18, 7:00 PM	Not public	Google-managed key
searches 2018-10-10 08:00:50am.txt	103 B	–	Regional	10/10/18, 7:00 PM	Not public	Google-managed key
searches 2018-10-12 11:56:04am.txt	95 B	–	Regional	10/12/18, 10:56 PM	Not public	Google-managed key
searches 2018-10-12 11:58:41am.txt	95 B	–	Regional	10/12/18, 10:58 PM	Not public	Google-managed key
searches 2018-10-12 12:14:36pm.txt	95 B	–	Regional	10/12/18, 11:14 PM	Not public	Google-managed key
searches 2018-10-12 12:15:27pm.txt	95 B	–	Regional	10/12/18, 11:15 PM	Not public	Google-managed key
searches 2018-10-12 12:15:29pm.txt	95 B	–	Regional	10/12/18, 11:15 PM	Not public	Google-managed key


cloud_assign2-searches 2018-10-10 07-33-55am.txt

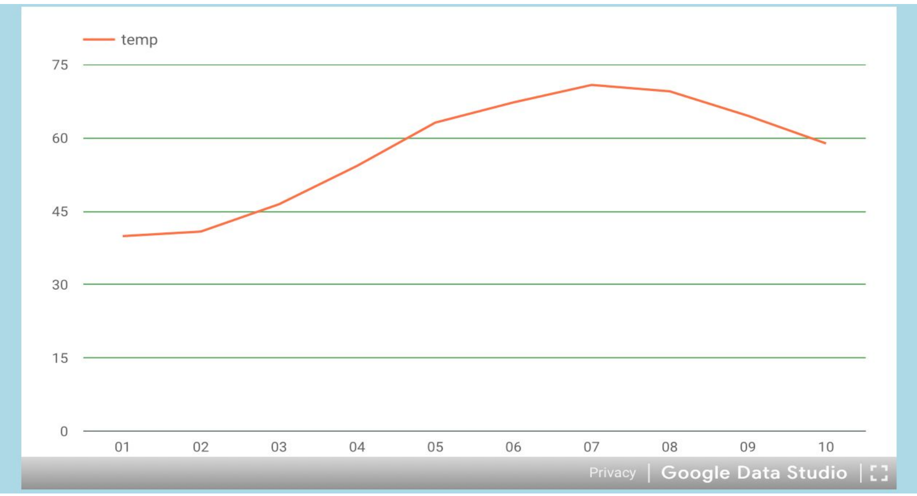
```
Anonymous searched at 2018-10-10 07:33:55am ------ City : vv, Date : 01, Month- 01, Year: 2018
```

cloud_assign2-searches 2018-10-10 07-48-29am.txt

```
ran searched at 2018-10-10 07:48:29am ------ City : tas, Date : 01, Month- 01, Year: 2018
```

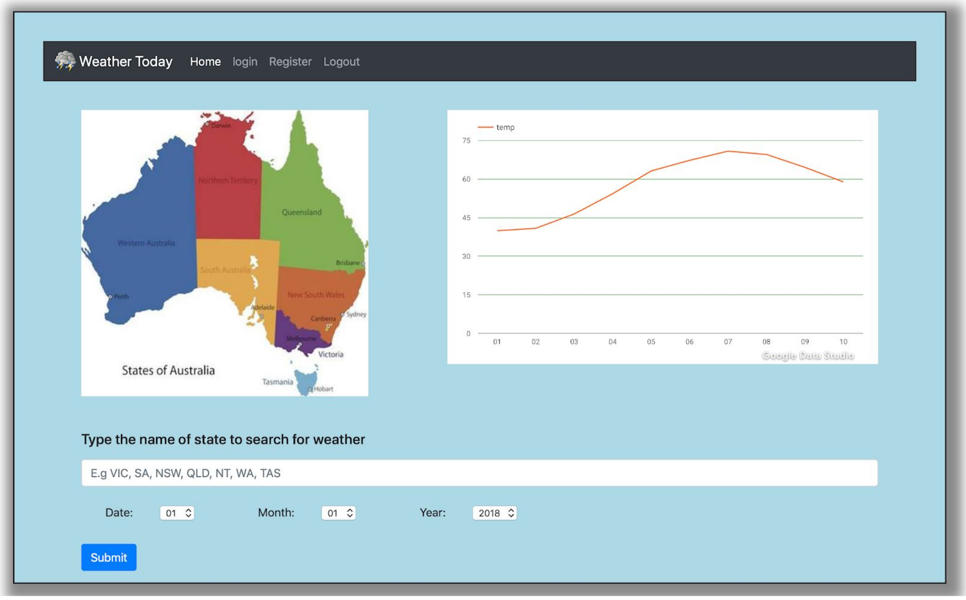
g. Weather data summary graph

We apply Google data studio api to generate graph of weather summary, using the weather data of public dataset.



h. UI design

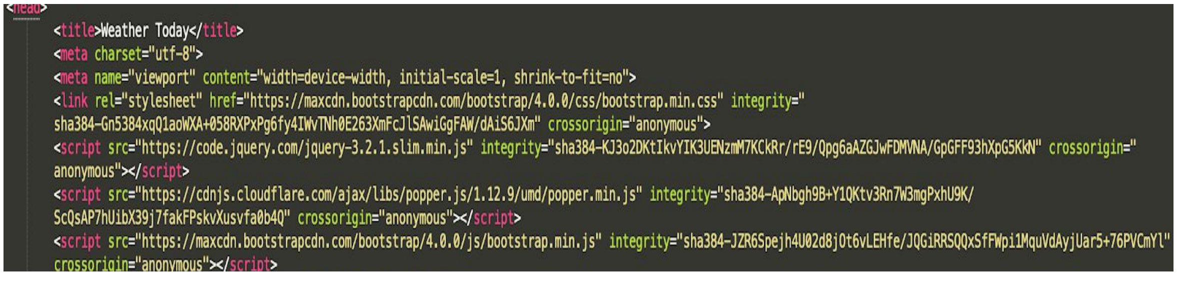
The website was created from scratch with the help of Bootstrap, JavaScripts CDN. Also we wrote extra addition codes to make the containers and element look more visually appealing.



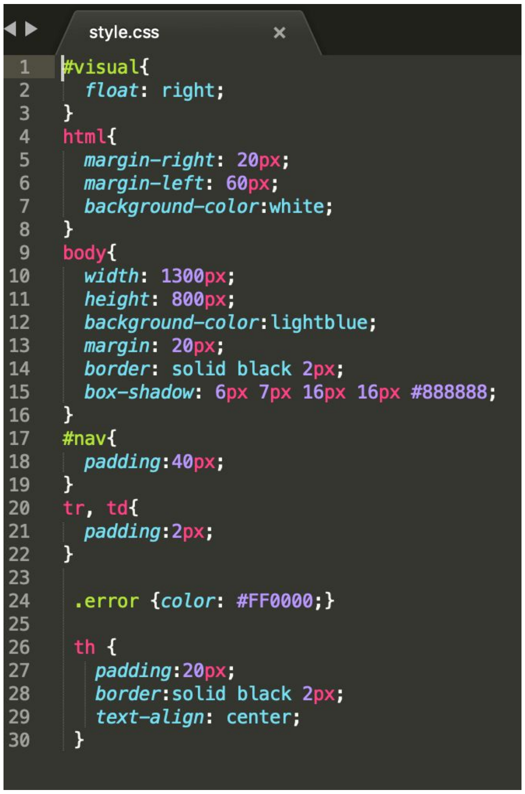
Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

Date: 01 Month: 01 Year: 2018

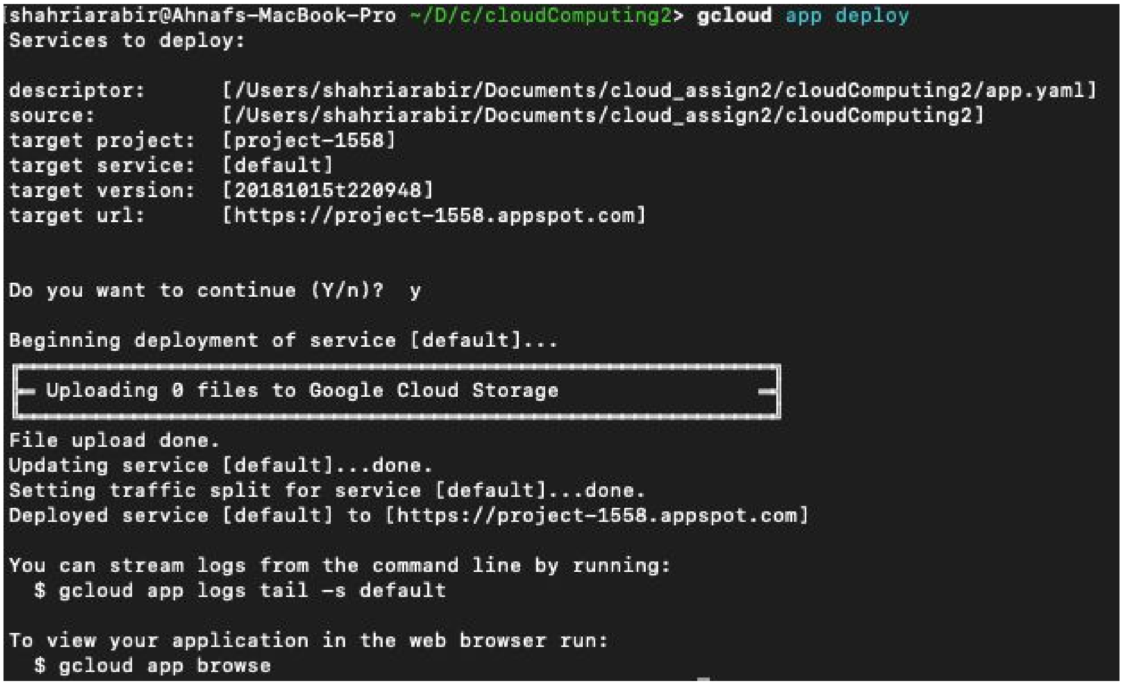


```
<head>
    <title>Weather Today</title>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
    <link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css" integrity="
    sha384-Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGgFAW/dAiS6JXm" crossorigin="anonymous">
    <script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-KJ3o2DKtIkvYIK3UENzmM7KCkRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN" crossorigin="
    anonymous"></script>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/popper.min.js" integrity="sha384-ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/
    ScQsAP7hUibX39j7fakFPskvXusvfa0b4Q" crossorigin="anonymous"></script>
    <script src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootstrap.min.js" integrity="sha384-JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5+76PVCmYl"
    crossorigin="anonymous"></script>
```



```css
#visual{
  float: right;
}
html{
  margin-right: 20px;
  margin-left: 60px;
  background-color:white;
}
body{
  width: 1300px;
  height: 800px;
  background-color:lightblue;
  margin: 20px;
  border: solid black 2px;
  box-shadow: 6px 7px 16px 16px #888888;
}
#nav{
  padding:40px;
}
tr, td{
  padding:2px;
}

 .error {color: #FF0000;}

 th {
   padding:20px;
   border:solid black 2px;
   text-align: center;
 }
```

i. Google Cloud deployment



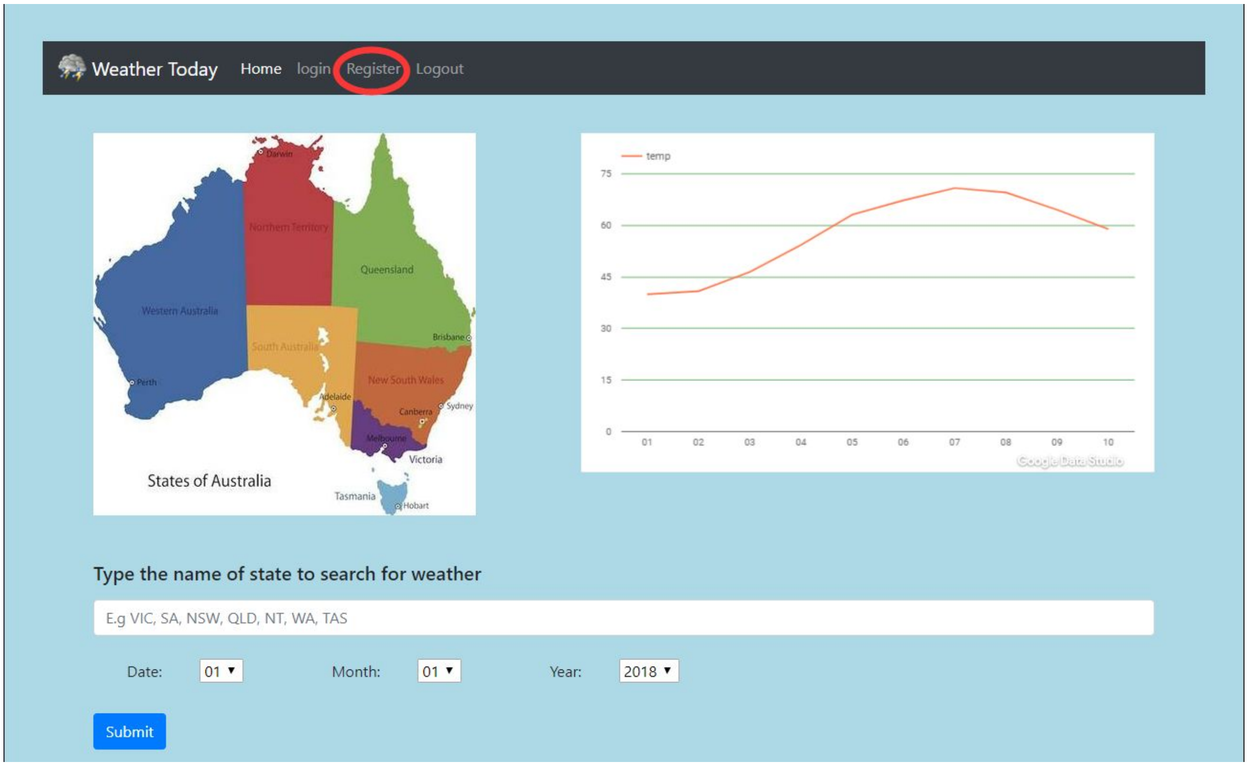
```
shahriarabir@Ahnafs-MacBook-Pro ~/D/c/cloudComputing2> gcloud app deploy
Services to deploy:

descriptor:      [/Users/shahriarabir/Documents/cloud_assign2/cloudComputing2/app.yaml]
source:          [/Users/shahriarabir/Documents/cloud_assign2/cloudComputing2]
target project:  [project-1558]
target service:  [default]
target version:  [20181015t220948]
target url:      [https://project-1558.appspot.com]


Do you want to continue (Y/n)?  y

Beginning deployment of service [default]...
╔════════════════════════════════════════════════════════════╗
╠═ Uploading 0 files to Google Cloud Storage                ═╣
╚════════════════════════════════════════════════════════════╝
File upload done.
Updating service [default]...done.
Setting traffic split for service [default]...done.
Deployed service [default] to [https://project-1558.appspot.com]

You can stream logs from the command line by running:
  $ gcloud app logs tail -s default

To view your application in the web browser run:
  $ gcloud app browse
```

User manual

Step 1: Go to website link of our app: https://project-1558.appspot.com.

- *Register and login (Alternative)*

Step i: Click “Register” in the navigation bar.

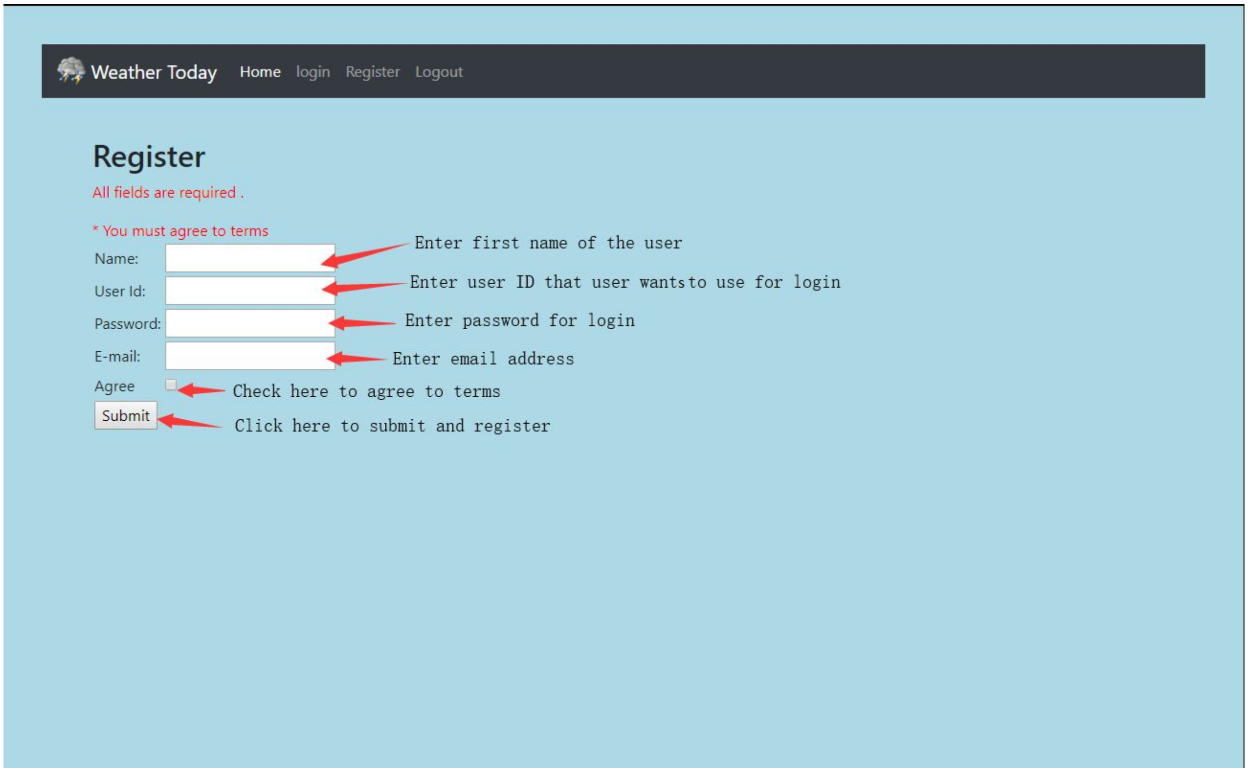


Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

Date: 01 ▼ Month: 01 ▼ Year: 2018 ▼

Step ii: On registration page, enter first name of the user, enter user ID that user wants to use for login, enter password for login, enter email address, check to agree to terms, and click “Submit” to finish registration.



Register

All fields are required .

* You must agree to terms

Enter first name of the user

Enter user ID that user wantsto use for login

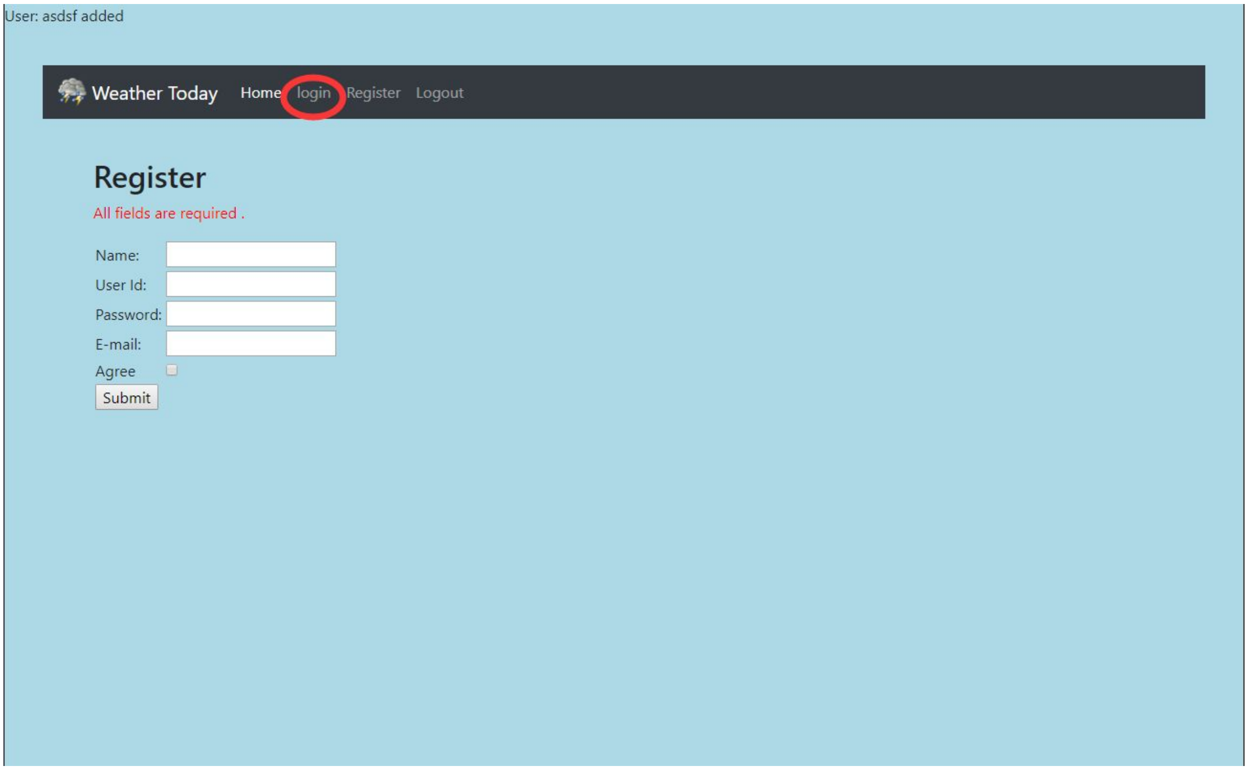
Enter password for login

Enter email address

Check here to agree to terms

Click here to submit and register

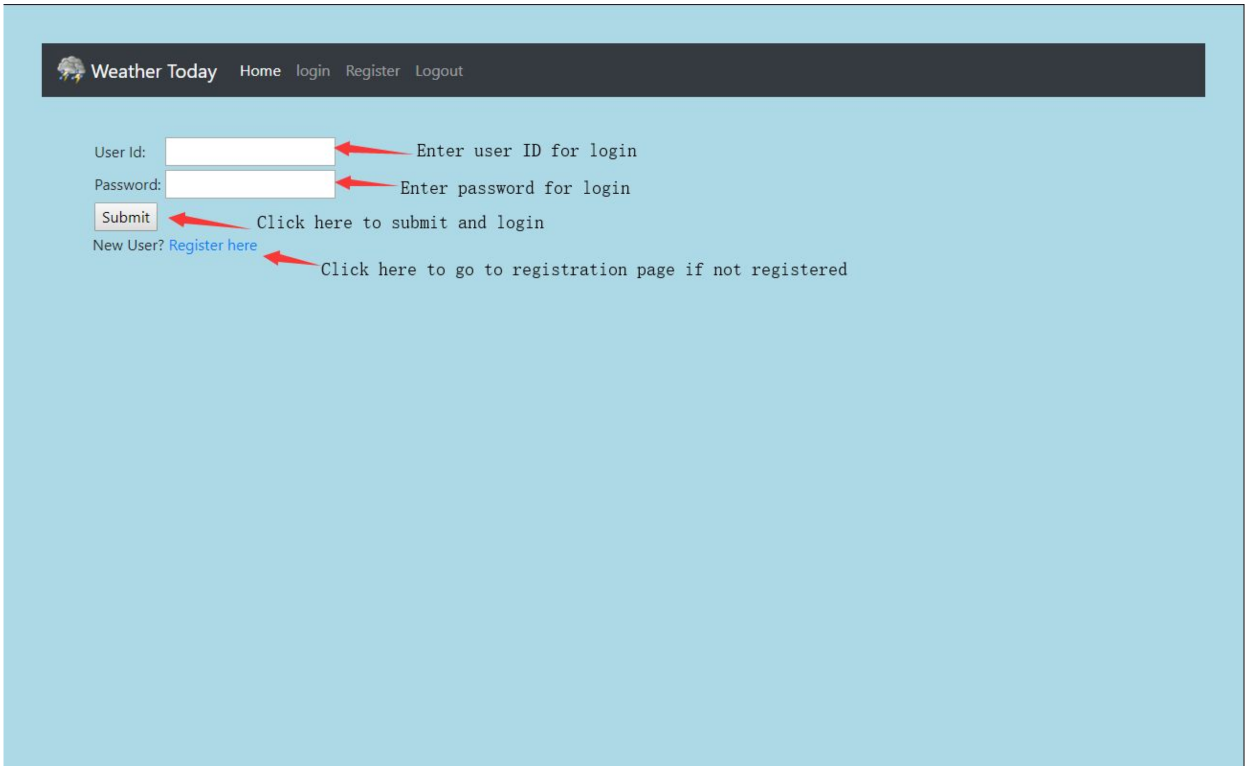
Step iii: Click “login” in the navigation bar.


User: asdsf added

Register

All fields are required .

Step iv: Enter user ID for login, enter password for login, click “Submit” to login.



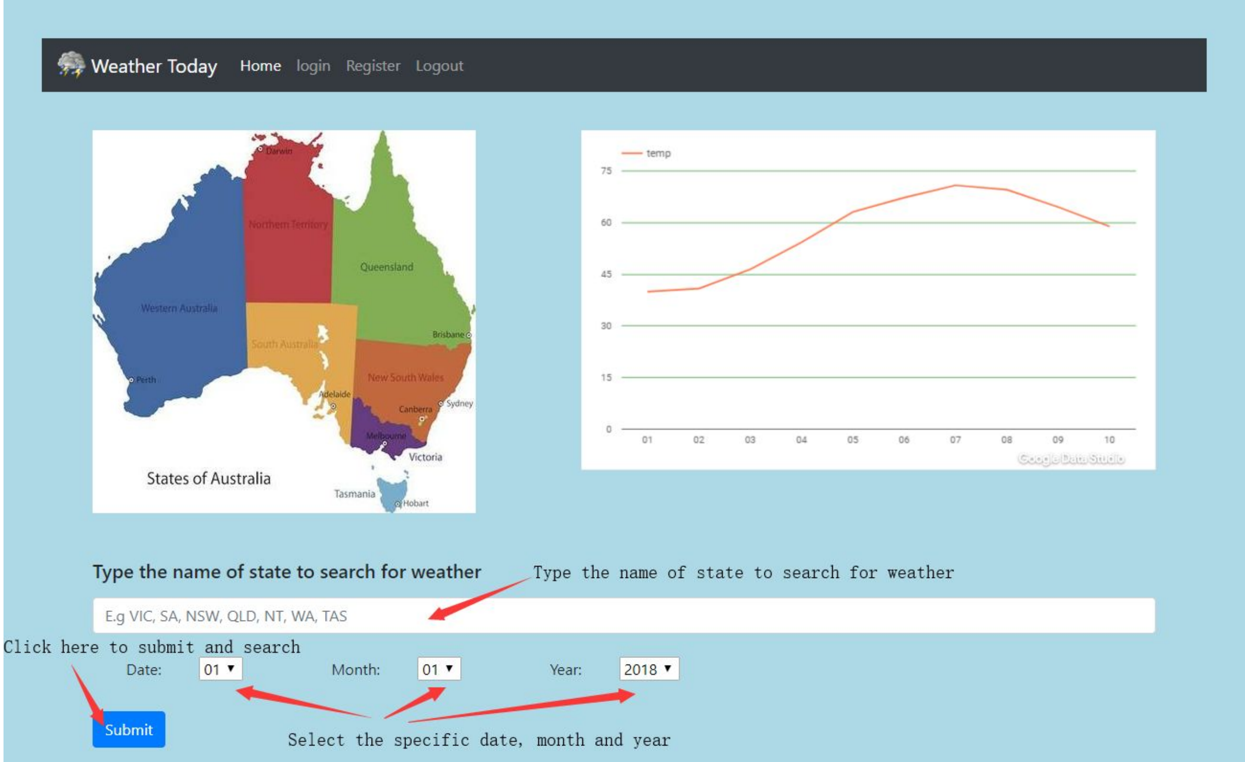
Enter user ID for login

Enter password for login

Click here to submit and login

Click here to go to registration page if not registered

Step 2: Type the name of state to search for weather in the search bar, select the specific date, month and year, then click “Submit” to search for the related weather data.



Type the name of state to search for weather

Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

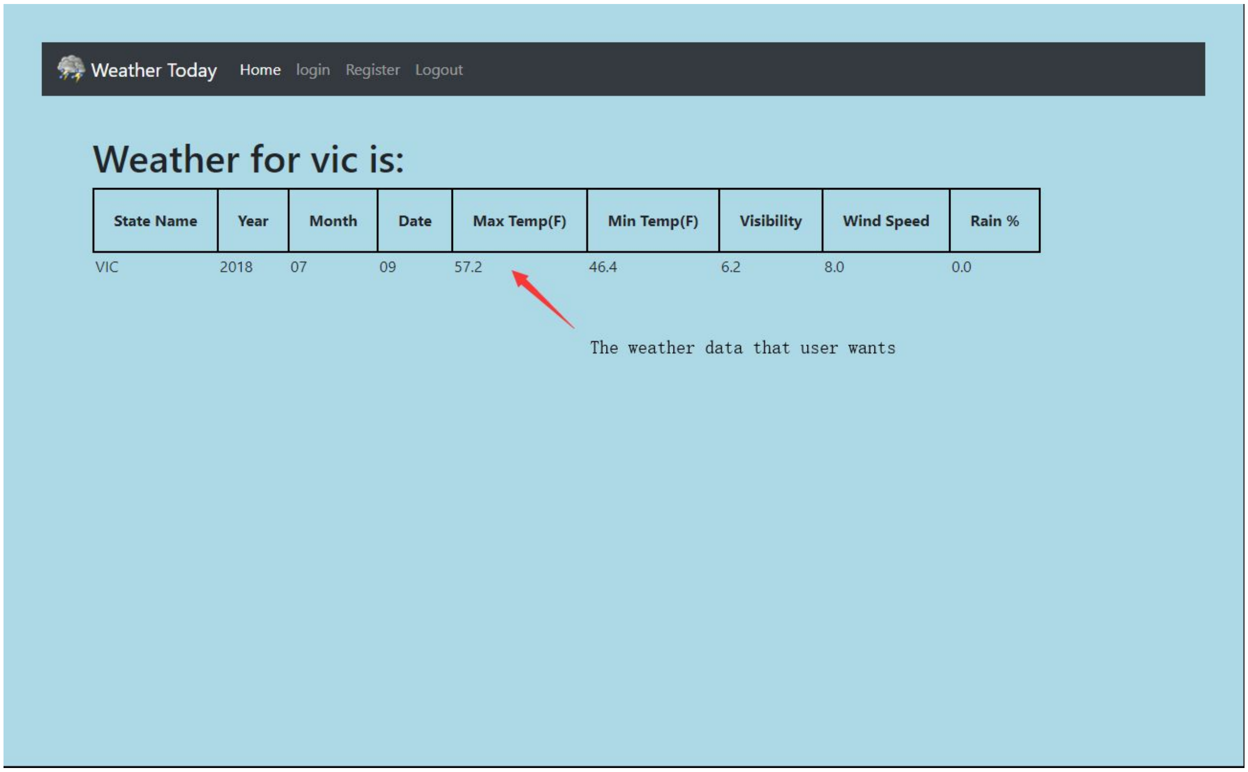
Click here to submit and search

Date: 01 ▾ Month: 01 ▾ Year: 2018 ▾

Submit

Select the specific date, month and year

Step 3: The result page will show the weather data that user wants



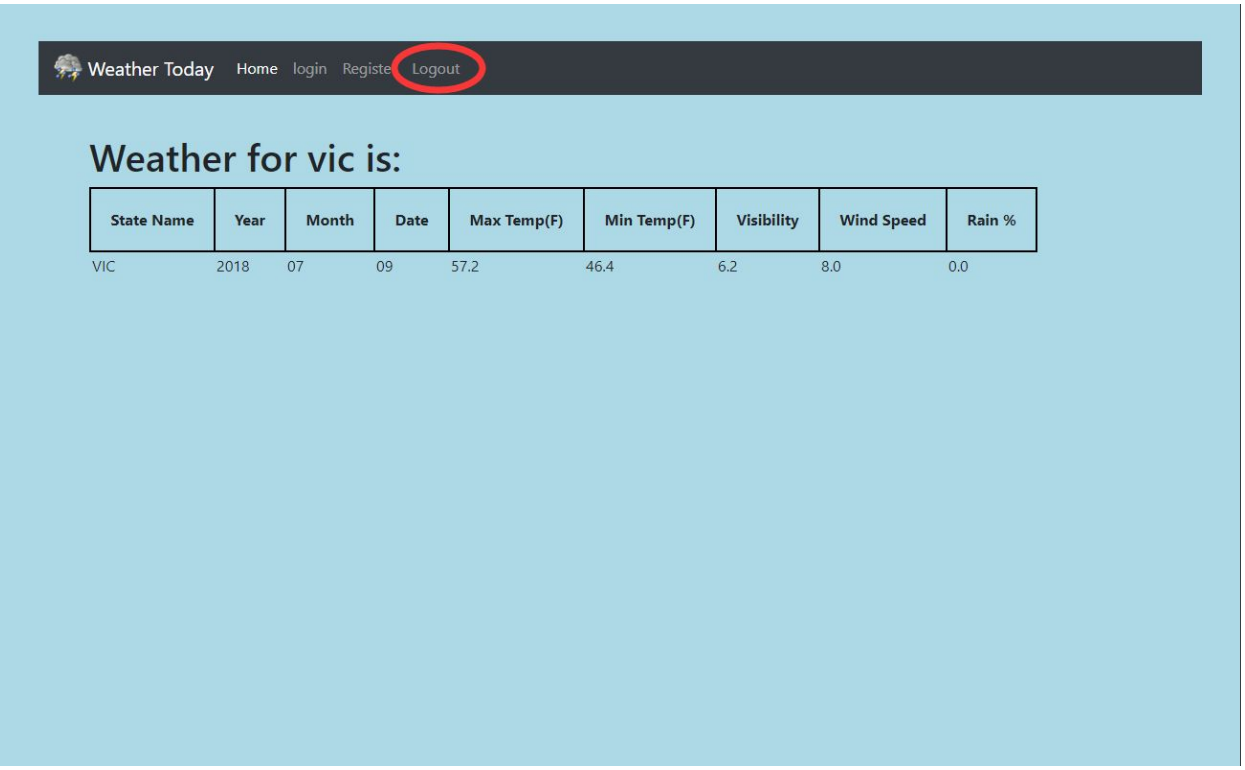
Weather for vic is:

State Name	Year	Month	Date	Max Temp(F)	Min Temp(F)	Visibility	Wind Speed	Rain %
VIC	2018	07	09	57.2	46.4	6.2	8.0	0.0

The weather data that user wants

- *Log out (Alternative)*

  Step: Click "Logout" to log out (become anonymous)

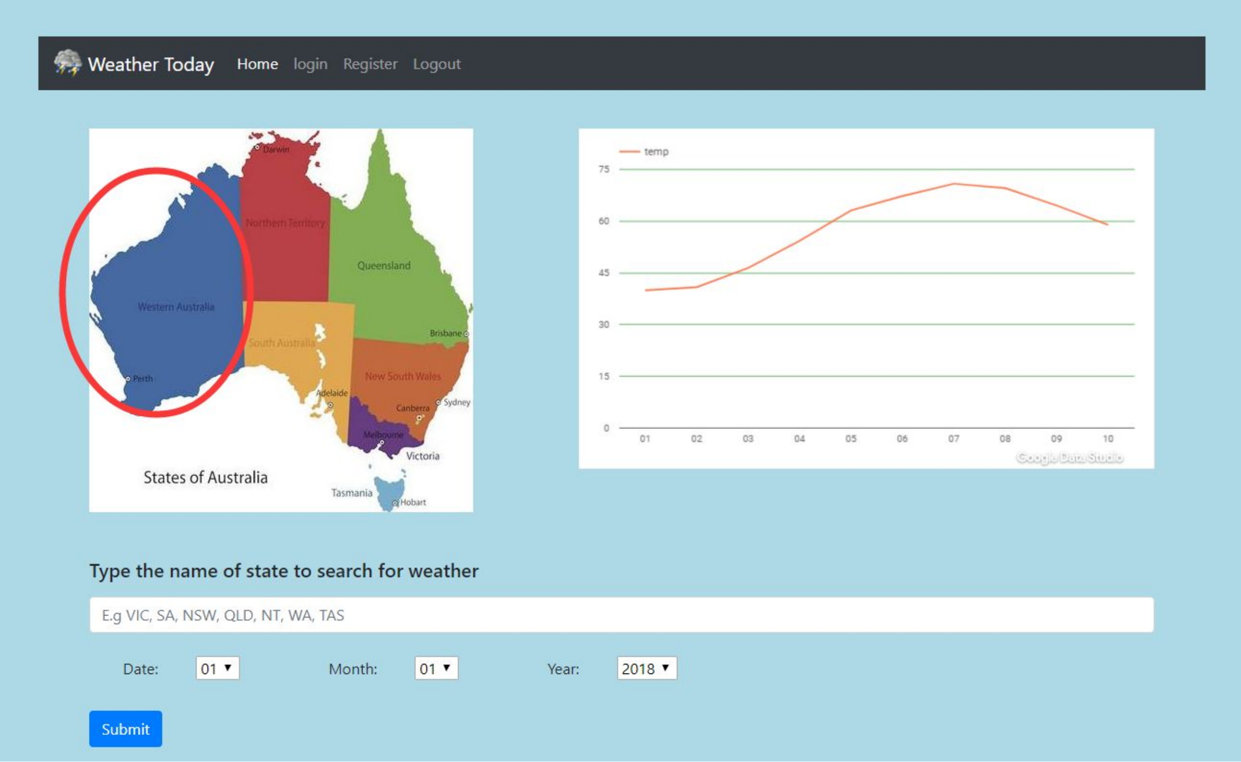


Weather for vic is:

State Name	Year	Month	Date	Max Temp(F)	Min Temp(F)	Visibility	Wind Speed	Rain %
VIC	2018	07	09	57.2	46.4	6.2	8.0	0.0

- *Get weather summary graph (Alternative)*

  Step i: Click any part user likes to search for a weather summary graph

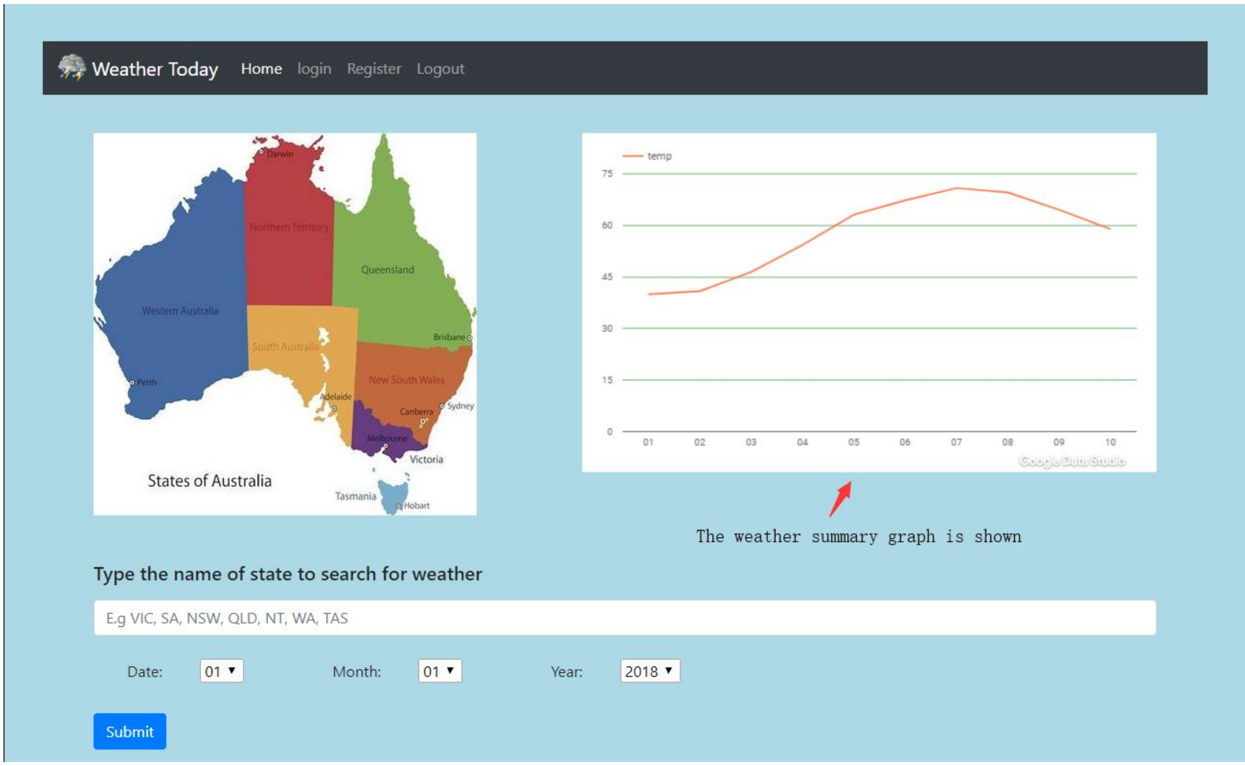


Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

Date: 01 ▾ Month: 01 ▾ Year: 2018 ▾

Step ii: The graph on the left is shown



The weather summary graph is shown

Type the name of state to search for weather

E.g VIC, SA, NSW, QLD, NT, WA, TAS

Date: 01 ▾ Month: 01 ▾ Year: 2018 ▾

References

Learnt basic PHP- MySQL from **https://www.tutorialspoint.com/php/php_mysql_login.htm**

How to process weather satellite data in real-time in BigQuery -

https://cloud.google.com/blog/products/gcp/how-to-process-weather-satellite-data-in-real-time-in-bigquery

Google Data studio - **https://datastudio.google.com/u/0/navigation/reporting**

HTML imagemap - **https://www.w3schools.com/tags/tag_map.as**