Database Management

Final Project Report
PharmaSeek - a pharmic web search application

group member

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1.Overview

PharmaSeek is a data-driven web application that aims to help users to look up or modify medicine info by searching medicine name, retailer or illness. This application is targeted at two groups of people. The first group is the everyday users who are looking for medicined related info including details of a specific medicine, its treating illness, sell by which retailers, and etc. Everyday users do not need to log in the system at all. Hence in our design, the homepage is always the user's search mode unless you log in as an administrator.

The second group is the administrators of this database. Administrators need to login through the login page in order to access the administrator mode. Administrators could modify (delete, add, or update) the current database within administrator mode.

2. Database

The raw data is retrieved from various places such as the FDA (U.S Food and Drug Administration) website, top ranking retailers, or randomized based on our demand. PhamaSeek database has 10 tables (including 2 junction tables). The database includes 11,916 records. The database was created based on 2NF. The structure of the database is shown in Figure 1, and the E-R diagram is shown in Figure 2. The full DDL statement can be found at the end of this report.

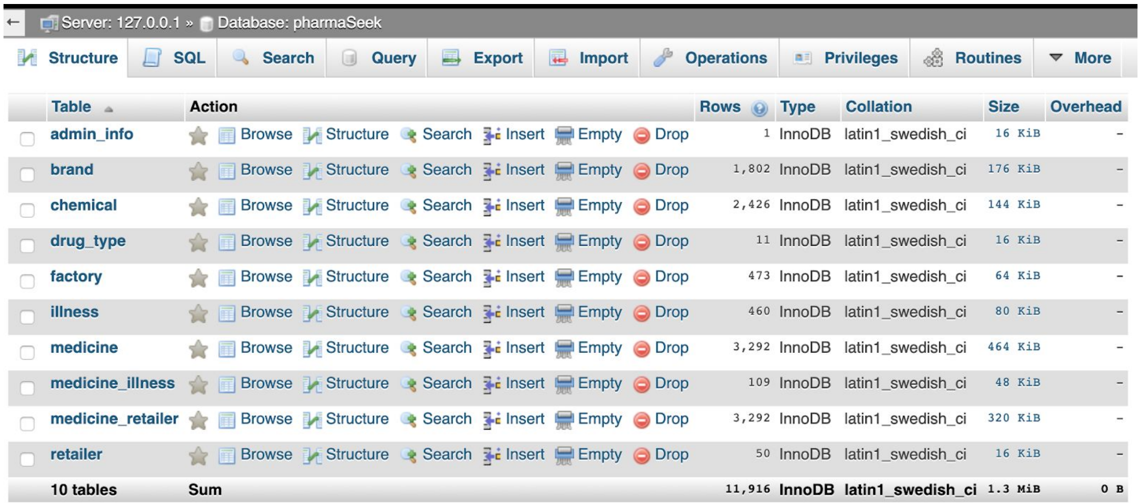


	Table	Action	Rows	Type	Collation	Size	Overhead
□	admin_info	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	16 KiB	-
□	brand	Browse Structure Search Insert Empty Drop	1,802	InnoDB	latin1_swedish_ci	176 KiB	-
□	chemical	Browse Structure Search Insert Empty Drop	2,426	InnoDB	latin1_swedish_ci	144 KiB	-
□	drug_type	Browse Structure Search Insert Empty Drop	11	InnoDB	latin1_swedish_ci	16 KiB	-
□	factory	Browse Structure Search Insert Empty Drop	473	InnoDB	latin1_swedish_ci	64 KiB	-
□	illness	Browse Structure Search Insert Empty Drop	460	InnoDB	latin1_swedish_ci	80 KiB	-
□	medicine	Browse Structure Search Insert Empty Drop	3,292	InnoDB	latin1_swedish_ci	464 KiB	-
□	medicine_illness	Browse Structure Search Insert Empty Drop	109	InnoDB	latin1_swedish_ci	48 KiB	-
□	medicine_retailer	Browse Structure Search Insert Empty Drop	3,292	InnoDB	latin1_swedish_ci	320 KiB	-
□	retailer	Browse Structure Search Insert Empty Drop	50	InnoDB	latin1_swedish_ci	16 KiB	-
	10 tables	Sum	11,916	InnoDB	latin1_swedish_ci	1.3 MiB	0 B

Figure 1: List of all tables in the pharmaSeek

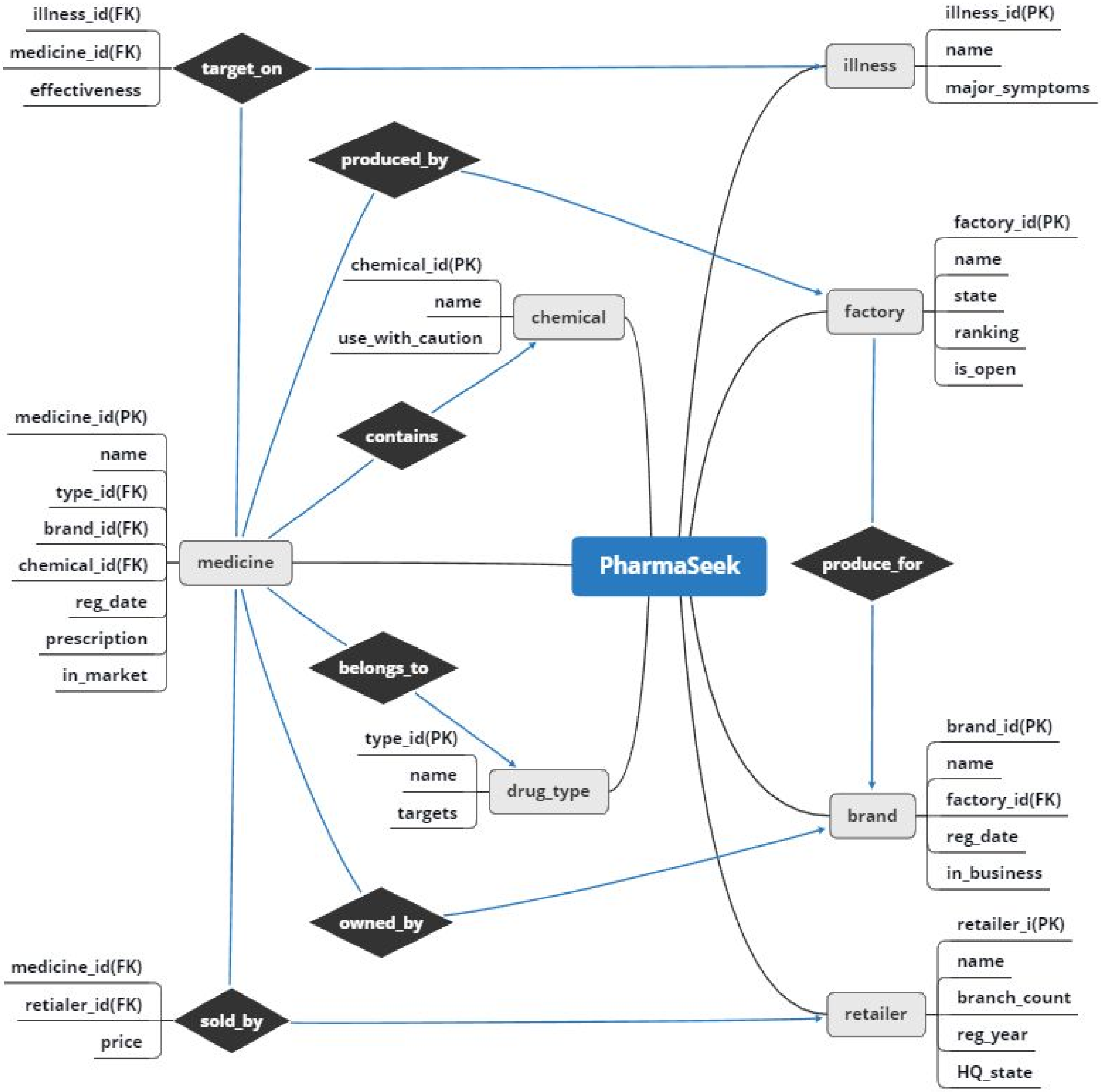


Figure 2: E-R Diagram

2.1 Database Schema

Table name Primary key Foreign key Attributes

medicine
medicine_id
name
brand_id
type_id
chemical_id
reg_date
prescription
in_market

illness
illness_id
name
major_symptoms

retailer
retailer_id
name
branch_count
reg_year
state

brand
brand_id
name
factory_id
reg_date
in_business

factory
factory_id
name
ranking
is_open
state

drug_type
type_id
name
targets

chemical
chemical_id
name
use_with_caution

medicine_illness
illness_id
factory_id
effectiveness

medicine_illness
illness_id
factory_id
effectiveness

medicine_retailer
medicine_id
retailer_id
price

2.2 Assumptions

- Each brand can sell multiple medicines.
- Each factory can produce for multiple brands.
- Each medicine is produced by only one factory and owned by one brand.
- Each medicine can target multiple illnesses and each illness can be targeted by multiple medicines.
- Each retailer can sell multiple medicines and brands.
- Only the administrator has the authority to add, update and delete data, normal users only have the authority to browse and search info

3. Front-end design & front-end to back-end connection

1. Front-end design

   We used the bootstrap framework, HTML to implement front-end design.

2. Front -end to back- end connection

   we used Javascript and PHP to implement the connection between front-end and backend. First, html and Javascript passed parameters to the php files. Then, we used PHP to insert, delete, search, update and so on in the database. Finally, HTML capture the server return data and visualized it.

3. Connection and Settings

   servername = "localhost";

   username = "root";

   password = "mysql”;

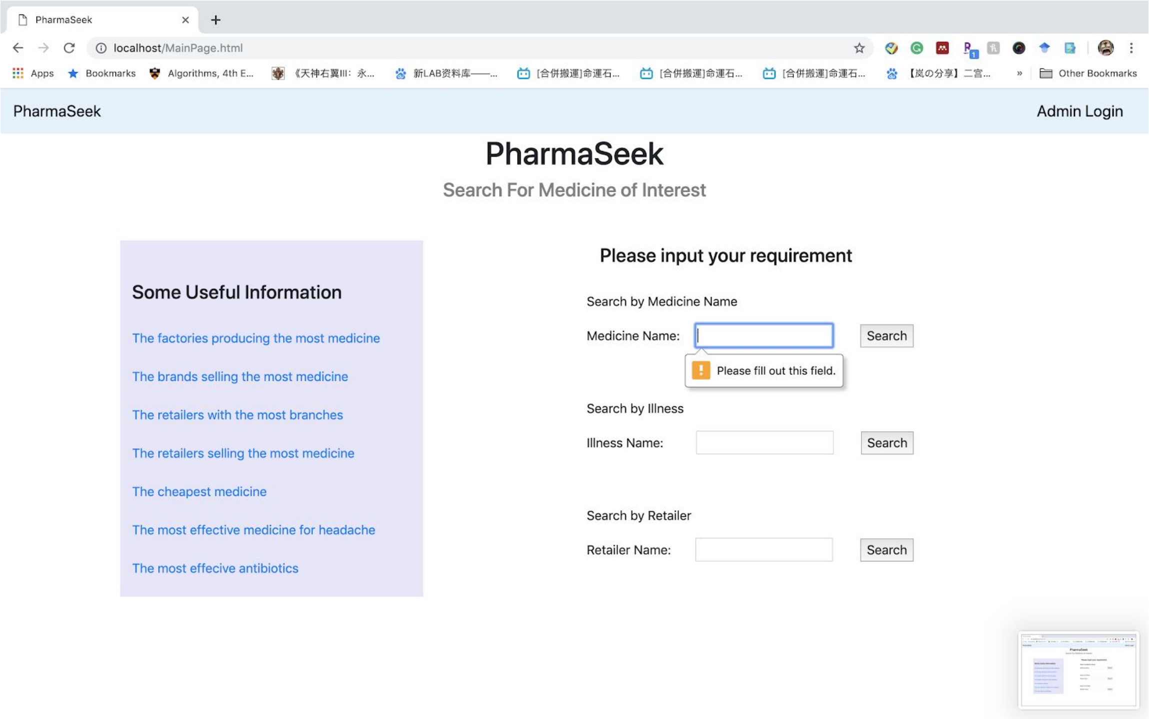
   database = "pharmaSeek";

4. Operations

4.1 Browsing

The main page of our web is a direct view from everyday users perspective. On this page, the users could browse/search medicine info as shown in Figure 3. To do so, users can search for medicine by medicine name, retailer name or illness name. User needs to input info in order to proceed the search process. Otherwise, an error message stating “ Please fill out this filed” will pops.

Once the user entered the search target and hit search, he/she will be directed to a newly generated page containing the results (Figure 3.1, 3.2, 3.3.). The user could choose to see the detailed info of a medicine. Besides that, one could also find all the retailers that sell this medicine or all kinds of illness this medicine can treat (Figure 3.4, 3.5, 3.6.).



PharmaSeek | Admin Login

PharmaSeek

Search For Medicine of Interest

Some Useful Information

- The factories producing the most medicine
- The brands selling the most medicine
- The retailers with the most branches
- The retailers selling the most medicine
- The cheapest medicine
- The most effective medicine for headache
- The most effecive antibiotics

Please input your requirement

Search by Medicine Name

Medicine Name: [ ] Search

! Please fill out this field.

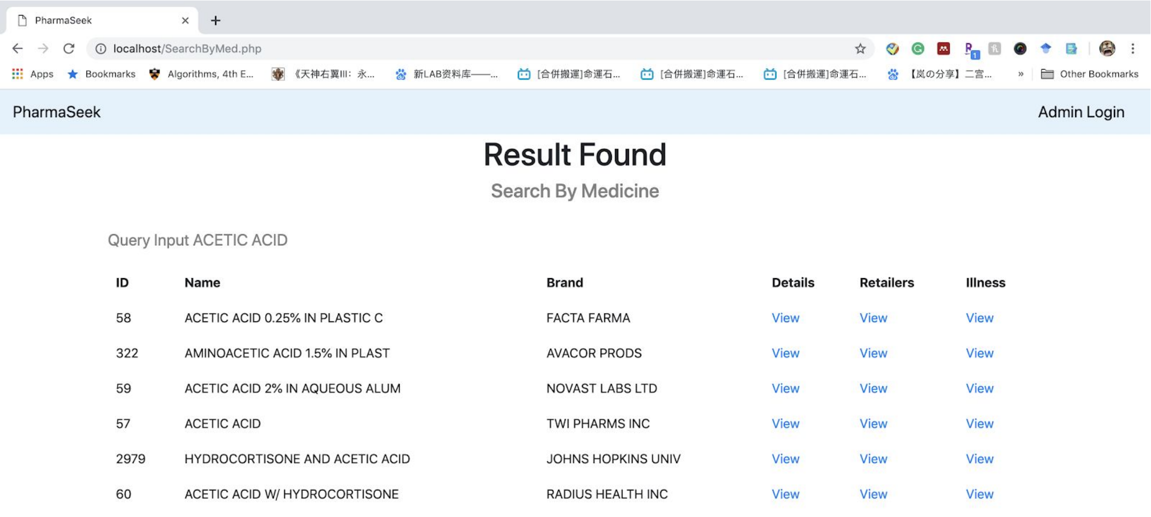
Search by Illness

Illness Name: [ ] Search

Search by Retailer

Retailer Name: [ ] Search

Figure 3: Main Page



PharmaSeek | Admin Login

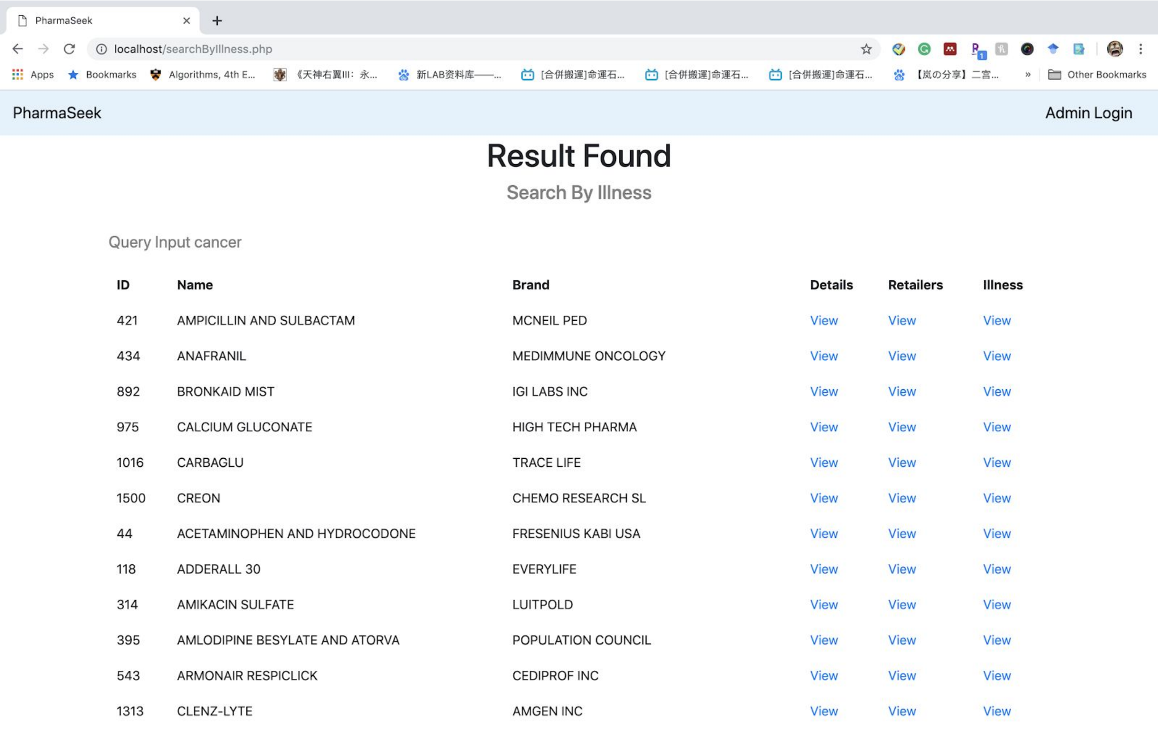
Result Found

Search By Medicine

Query Input ACETIC ACID

ID	Name	Brand	Details	Retailers	Illness
58	ACETIC ACID 0.25% IN PLASTIC C	FACTA FARMA	View	View	View
322	AMINOACETIC ACID 1.5% IN PLAST	AVACOR PRODS	View	View	View
59	ACETIC ACID 2% IN AQUEOUS ALUM	NOVAST LABS LTD	View	View	View
57	ACETIC ACID	TWI PHARMS INC	View	View	View
2979	HYDROCORTISONE AND ACETIC ACID	JOHNS HOPKINS UNIV	View	View	View
60	ACETIC ACID W/ HYDROCORTISONE	RADIUS HEALTH INC	View	View	View

Figure 3.1: search by medicine



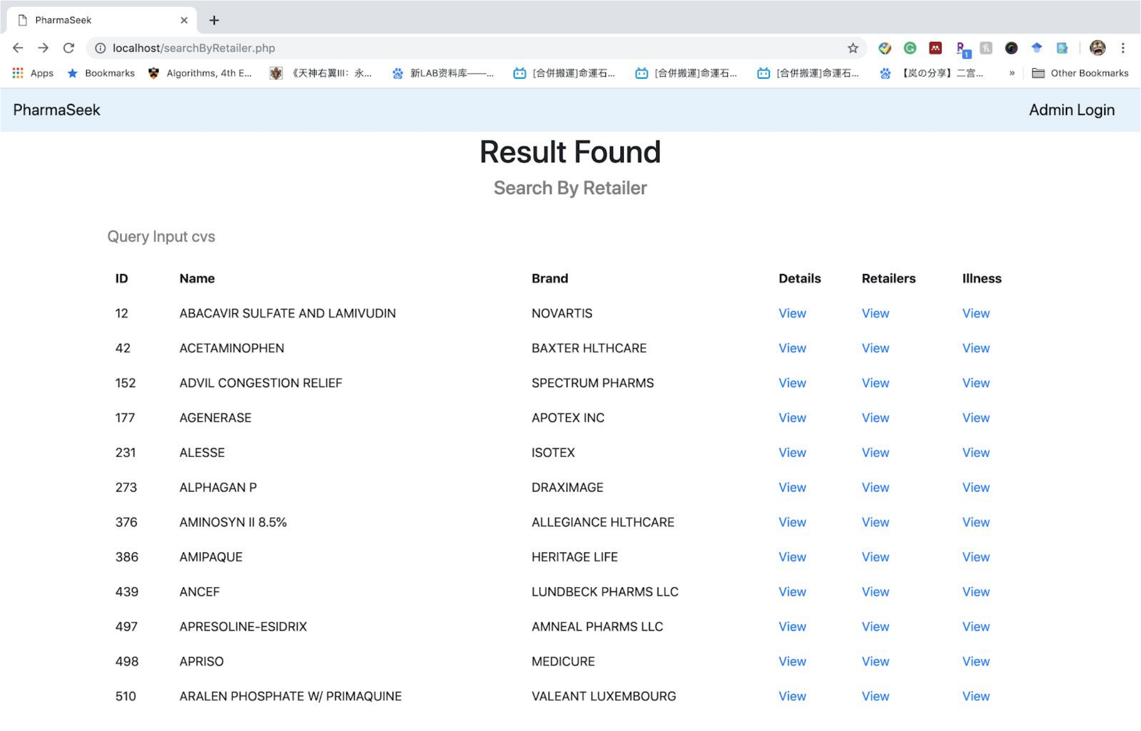
Result Found

Search By Illness

Query Input cancer

ID	Name	Brand	Details	Retailers	Illness
421	AMPICILLIN AND SULBACTAM	MCNEIL PED	View	View	View
434	ANAFRANIL	MEDIMMUNE ONCOLOGY	View	View	View
892	BRONKAID MIST	IGI LABS INC	View	View	View
975	CALCIUM GLUCONATE	HIGH TECH PHARMA	View	View	View
1016	CARBAGLU	TRACE LIFE	View	View	View
1500	CREON	CHEMO RESEARCH SL	View	View	View
44	ACETAMINOPHEN AND HYDROCODONE	FRESENIUS KABI USA	View	View	View
118	ADDERALL 30	EVERYLIFE	View	View	View
314	AMIKACIN SULFATE	LUITPOLD	View	View	View
395	AMLODIPINE BESYLATE AND ATORVA	POPULATION COUNCIL	View	View	View
543	ARMONAIR RESPICLICK	CEDIPROF INC	View	View	View
1313	CLENZ-LYTE	AMGEN INC	View	View	View

Figure 3.2: Search result by illness



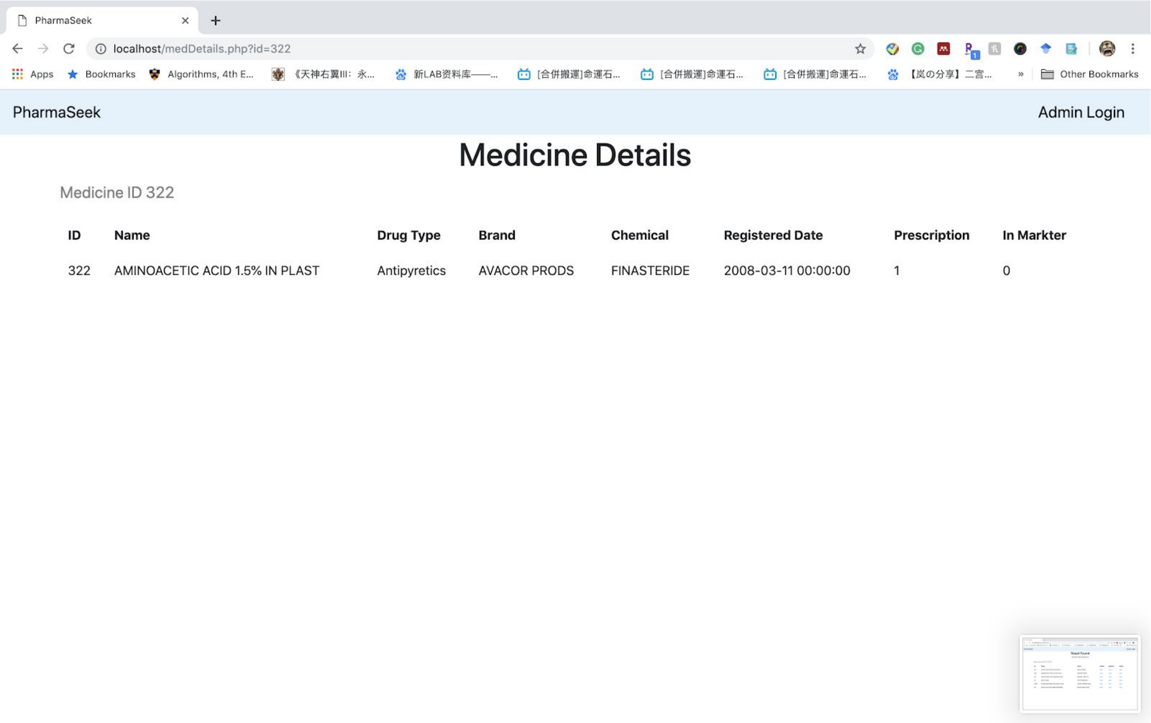
Result Found

Search By Retailer

Query Input cvs

ID	Name	Brand	Details	Retailers	Illness
12	ABACAVIR SULFATE AND LAMIVUDIN	NOVARTIS	View	View	View
42	ACETAMINOPHEN	BAXTER HLTHCARE	View	View	View
152	ADVIL CONGESTION RELIEF	SPECTRUM PHARMS	View	View	View
177	AGENERASE	APOTEX INC	View	View	View
231	ALESSE	ISOTEX	View	View	View
273	ALPHAGAN P	DRAXIMAGE	View	View	View
376	AMINOSYN II 8.5%	ALLEGIANCE HLTHCARE	View	View	View
386	AMIPAQUE	HERITAGE LIFE	View	View	View
439	ANCEF	LUNDBECK PHARMS LLC	View	View	View
497	APRESOLINE-ESIDRIX	AMNEAL PHARMS LLC	View	View	View
498	APRISO	MEDICURE	View	View	View
510	ARALEN PHOSPHATE W/ PRIMAQUINE	VALEANT LUXEMBOURG	View	View	View

Figure 3.3: Search result by retailer

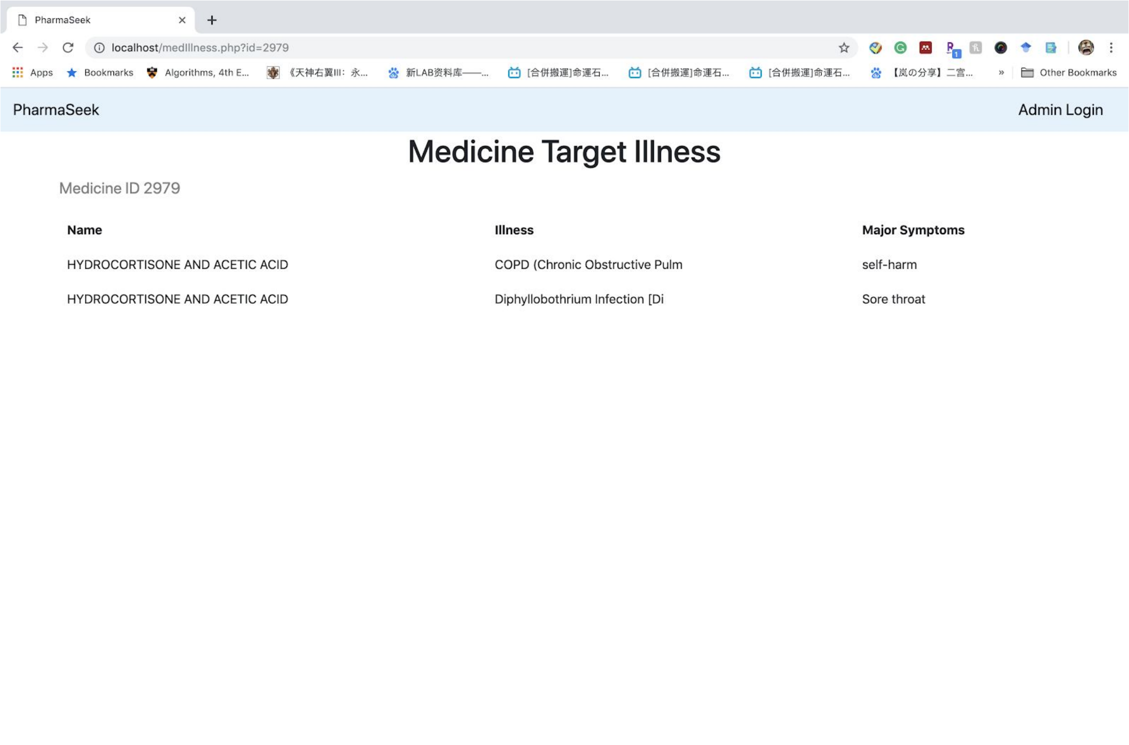


Medicine Details

Medicine ID 322

ID	Name	Drug Type	Brand	Chemical	Registered Date	Prescription	In Markter
322	AMINOACETIC ACID 1.5% IN PLAST	Antipyretics	AVACOR PRODS	FINASTERIDE	2008-03-11 00:00:00	1	0

Figure 3.4: Medicine Details of “Aminoacetic Acid”

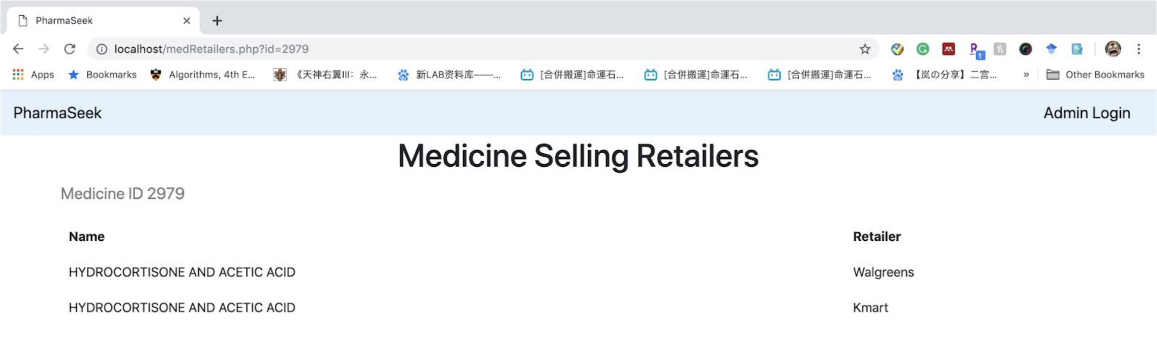


Medicine Target Illness

Medicine ID 2979

Name	Illness	Major Symptoms
HYDROCORTISONE AND ACETIC ACID	COPD (Chronic Obstructive Pulm	self-harm
HYDROCORTISONE AND ACETIC ACID	Diphyllobothrium Infection [Di	Sore throat

Figure 3.5: target illness of “Acetic Acid”



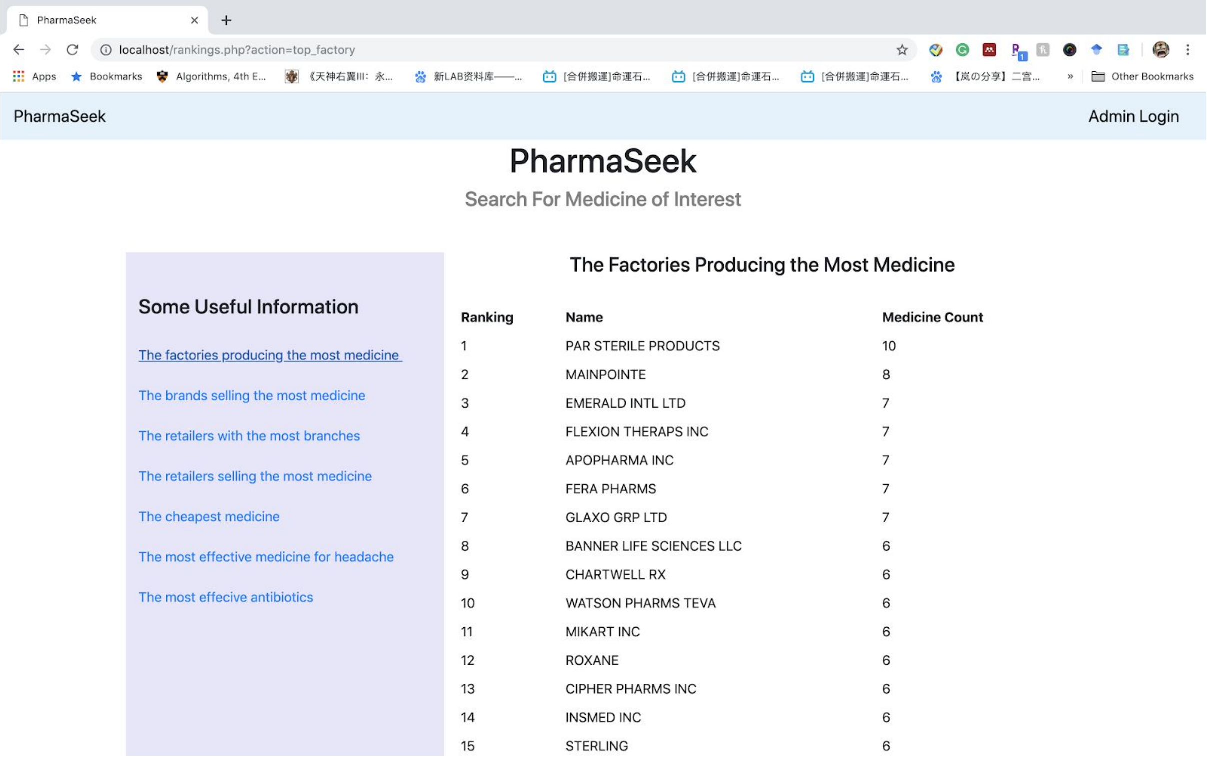
Medicine Selling Retailers

Medicine ID 2979

Name	Retailer
HYDROCORTISONE AND ACETIC ACID	Walgreens
HYDROCORTISONE AND ACETIC ACID	Kmart

Figure 3.6: retailers that sell “Acetic Acid”

On the left side of the page, there is a list of useful links we think general users might be interested in. For instance, there is a link that gives the rank of factories that produced the most kinds of medicine. Figure 3.7 shows the result of such links (details of the aggregation functions can be found at the end of this section).



PharmaSeek

Search For Medicine of Interest

Some Useful Information

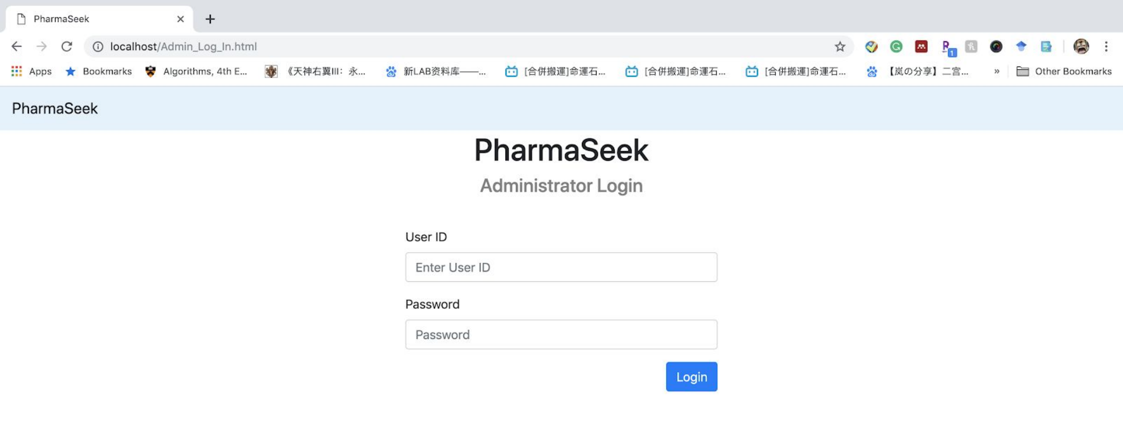
- The factories producing the most medicine
- The brands selling the most medicine
- The retailers with the most branches
- The retailers selling the most medicine
- The cheapest medicine
- The most effective medicine for headache
- The most effecive antibiotics

The Factories Producing the Most Medicine

Ranking	Name	Medicine Count
1	PAR STERILE PRODUCTS	10
2	MAINPOINTE	8
3	EMERALD INTL LTD	7
4	FLEXION THERAPS INC	7
5	APOPHARMA INC	7
6	FERA PHARMS	7
7	GLAXO GRP LTD	7
8	BANNER LIFE SCIENCES LLC	6
9	CHARTWELL RX	6
10	WATSON PHARMS TEVA	6
11	MIKART INC	6
12	ROXANE	6
13	CIPHER PHARMS INC	6
14	INSMED INC	6
15	STERLING	6

Figure 3.7： The Factories Producing the Most Kinds of Medicine

Every page has two buttons at the top of the page, “PharmaSeek” which contains a link back to the main page. The other button on the right side of the top “AdminLogin” contains a link to the login page (Figure 3.8)for the administrator to enter administrator mode.



PharmaSeek

Administrator Login

User ID

Enter User ID

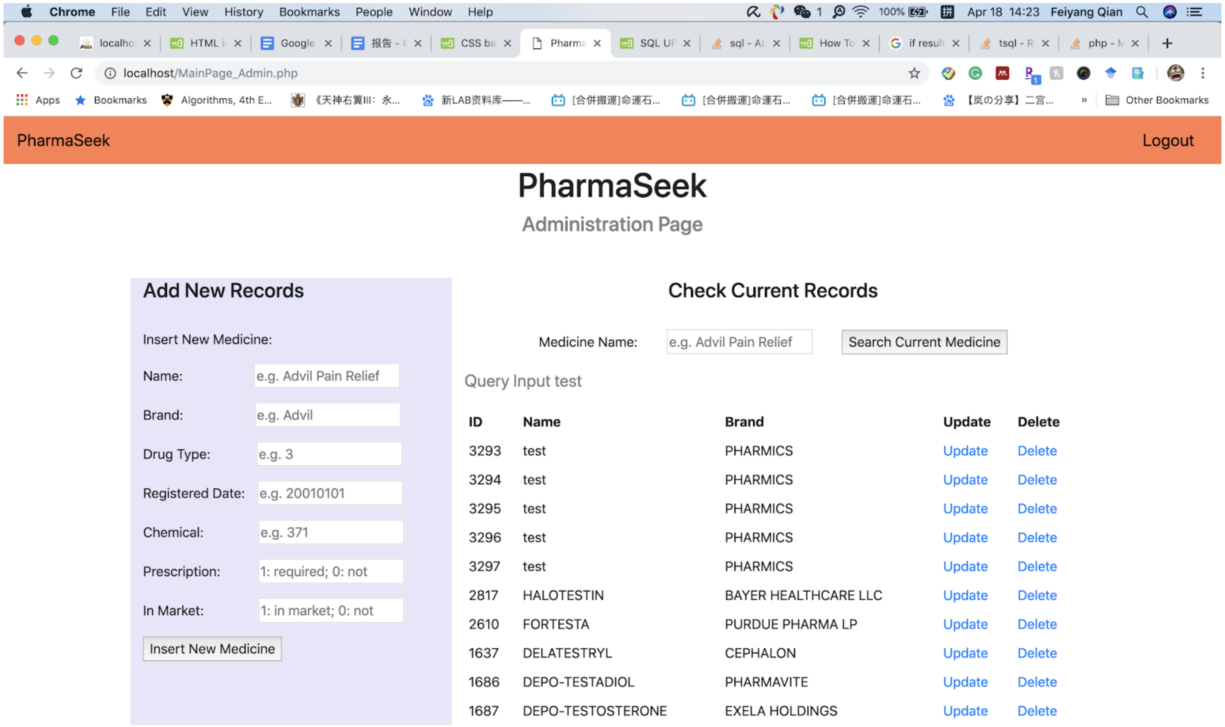
Password

Password

Figure 3.8: Login Page for Administrators

4.2 Update Transactions

The administrator page has been differentiated by using red theme color. Once logged in, the administrator can check the current existing record by searching the name of medicine. Once the result returned, the administrator can proceed to update or delete the medicine data. As shown in Figure 3.9. the left form section is designed for the administrator to insert new data.



Chrome File Edit View History Bookmarks People Window Help
Apr 18 14:23 Feiyang Qian
localhost/MainPage_Admin.php
PharmaSeek
Logout
Search Current Medicine
Insert New Medicine

PharmaSeek

Administration Page

Add New Records

Insert New Medicine:

Name:	e.g. Advil Pain Relief
Brand:	e.g. Advil
Drug Type:	e.g. 3
Registered Date:	e.g. 20010101
Chemical:	e.g. 371
Prescription:	1: required; 0: not
In Market:	1: in market; 0: not

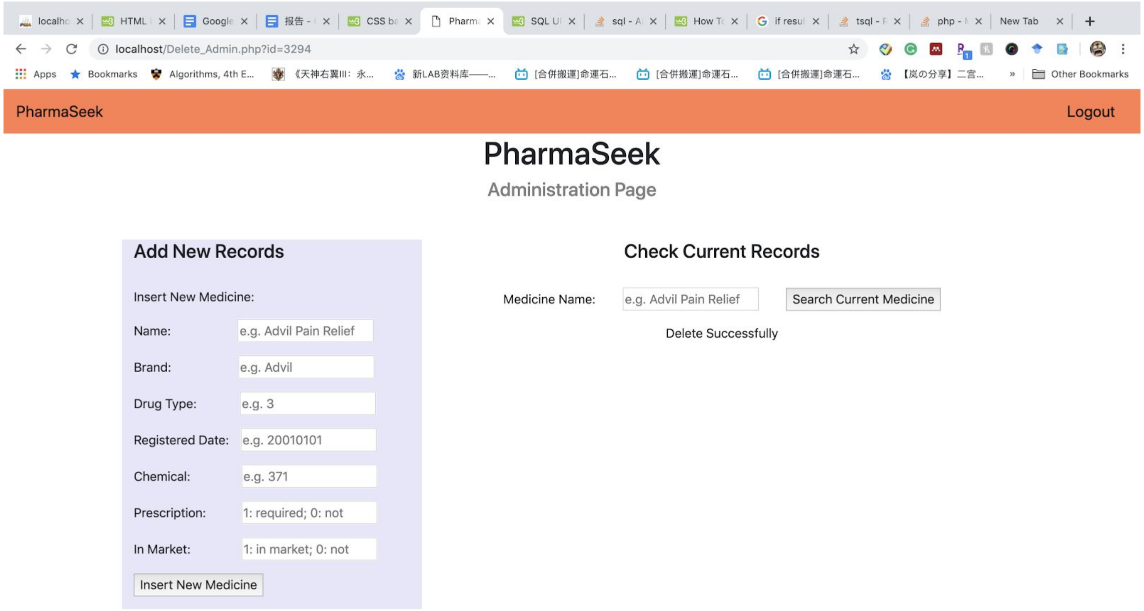
Check Current Records

Medicine Name: e.g. Advil Pain Relief

Query Input test

ID	Name	Brand	Update	Delete
3293	test	PHARMICS	Update	Delete
3294	test	PHARMICS	Update	Delete
3295	test	PHARMICS	Update	Delete
3296	test	PHARMICS	Update	Delete
3297	test	PHARMICS	Update	Delete
2817	HALOTESTIN	BAYER HEALTHCARE LLC	Update	Delete
2610	FORTESTA	PURDUE PHARMA LP	Update	Delete
1637	DELATESTRYL	CEPHALON	Update	Delete
1686	DEPO-TESTADIOL	PHARMAVITE	Update	Delete
1687	DEPO-TESTOSTERONE	EXELA HOLDINGS	Update	Delete

Figure 3.9: Administrator page



PharmaSeek

Administration Page

Add New Records

Insert New Medicine:

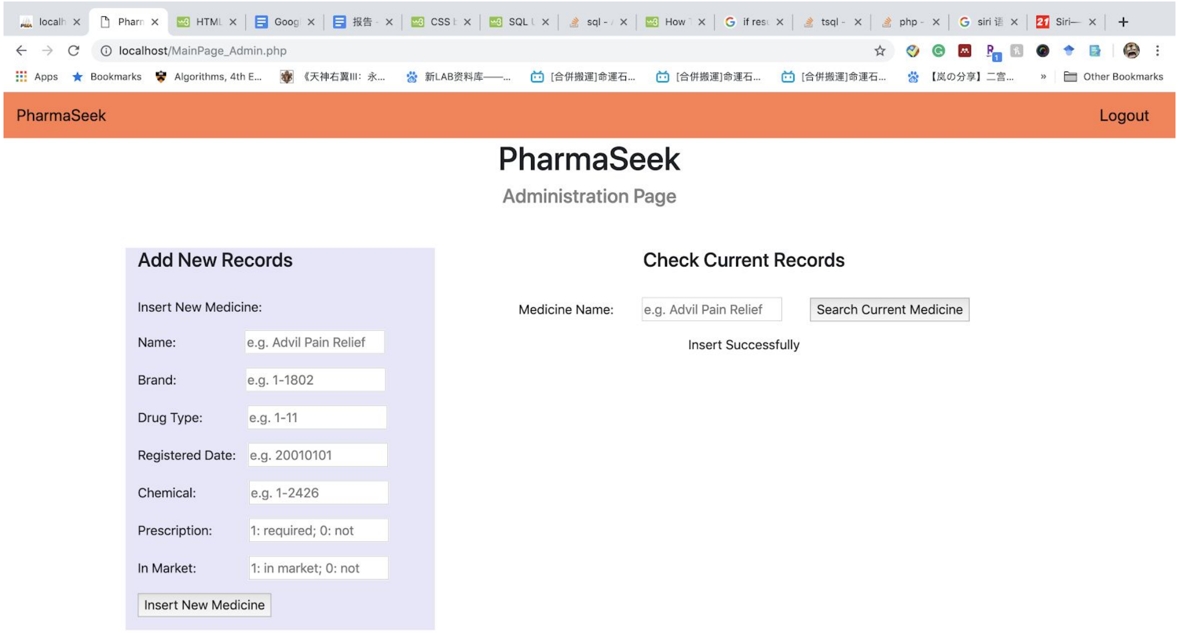
Name:	e.g. Advil Pain Relief
Brand:	e.g. Advil
Drug Type:	e.g. 3
Registered Date:	e.g. 20010101
Chemical:	e.g. 371
Prescription:	1: required; 0: not
In Market:	1: in market; 0: not

Check Current Records

Medicine Name: e.g. Advil Pain Relief

Delete Successfully

Figure 3.10: Administrator page- Detele Successfully



PharmaSeek

Administration Page

Add New Records

Insert New Medicine:

Name: e.g. Advil Pain Relief

Brand: e.g. 1-1802

Drug Type: e.g. 1-11

Registered Date: e.g. 20010101

Chemical: e.g. 1-2426

Prescription: 1: required; 0: not

In Market: 1: in market; 0: not

Insert New Medicine

Check Current Records

Medicine Name: e.g. Advil Pain Relief

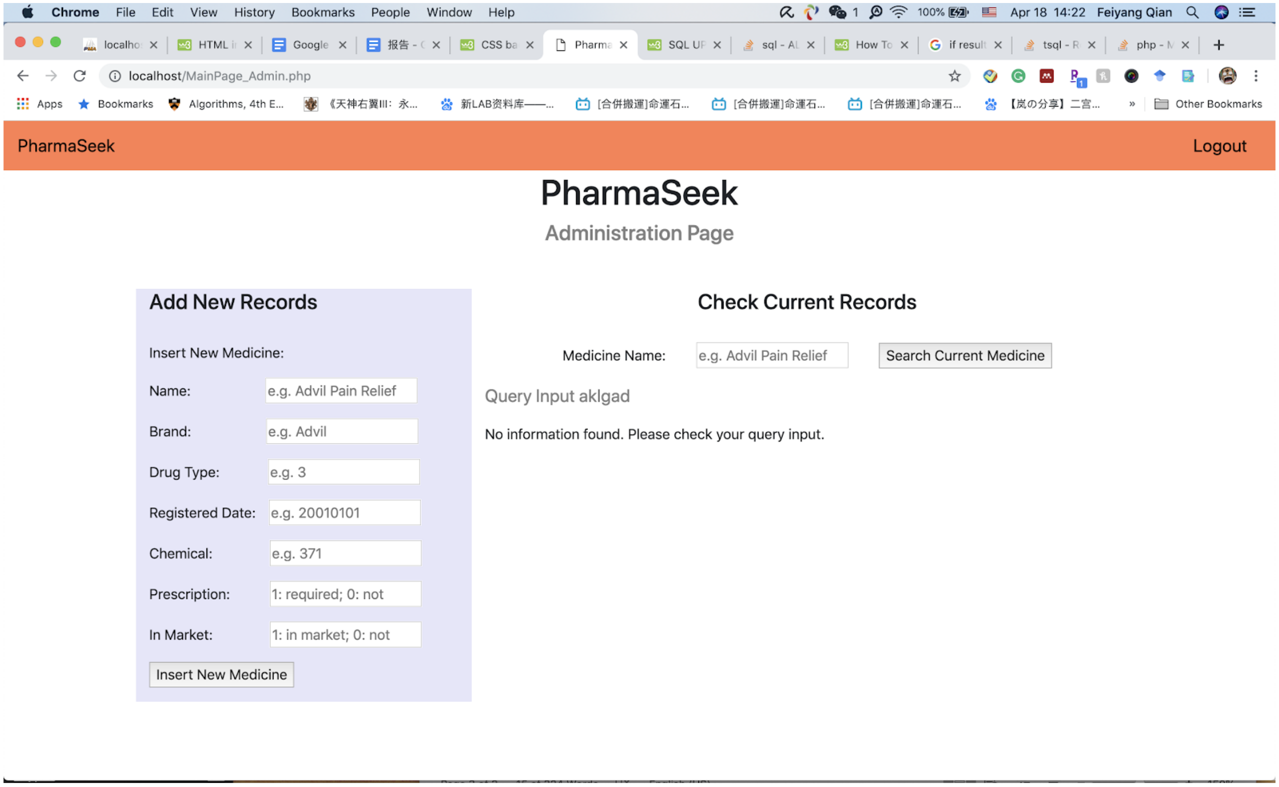
Search Current Medicine

Insert Successfully

Figure 3.11: Administrator page - Insert Successfully

4.3 Error Checking

While searching, adding or updating data, it offers error checking functions in the front-end, such as missing info checking and format error checking.


Chrome File Edit View History Bookmarks People Window Help
Apr 18 14:22 Feiyang Qian
localhost/MainPage_Admin.php
PharmaSeek
Logout
Insert New Medicine
Search Current Medicine

PharmaSeek

Administration Page

Add New Records

Insert New Medicine:

Name: e.g. Advil Pain Relief

Brand: e.g. Advil

Drug Type: e.g. 3

Registered Date: e.g. 20010101

Chemical: e.g. 371

Prescription: 1: required; 0: not

In Market: 1: in market; 0: not

Check Current Records

Medicine Name: e.g. Advil Pain Relief

Query Input aklgad

No information found. Please check your query input.

Figure 3.12: Administrator page - input error checking

4.4 Data Aggregation

ParmaSeek offers several data aggregation functions to help users look up some common info as shown in “Some Useful Information” in Figure 3.

1) Top retailers: return retailers that sell most kinds of medicine.

SQL:

SELECT retailer.name, COUNT(medicine_retailer.retailer_id)FROM retailer JOIN medicine_retailer

ON retailer.retailer_id = medicine_retailer.retailer_id

GROUP BY retailer.retailer_id

```
ORDER BY COUNT(medicine_retailer.retailer_id) DESC;
```

2) Retailer with most branches: return retailers sell most brands.

   SQL:

```
SELECT * FROM retailer WHERE reg_year > 2000

ORDER BY branch_count DESC;
```

3) The cheapest of medicine in average: return the cheapest medicine in average.

   SQL:

```
SELECT medicine.name, AVG(medicine_retailer.price) FROM medicine JOIN
medicine_retailer ON medicine.medicine_id = medicine_retailer.medicine_id

GROUP BY medicine.name ORDER BY AVG(medicine_retailer.price) DESC;
```

4) Most effective medicine for headache: return the most effective medicine for headache.

   SQL:

```
SELECT medicine.name, illness.major_symptoms,
medicine_illness.effectiveness

FROM medicine JOIN medicine_illness

ON medicine.medicine_id = medicine_illness.medicine_id

JOIN illness ON medicine_illness.illness_id = illness.illness_id

WHERE illness.major_symptoms LIKE '%headache%'

ORDER BY medicine_illness.effectiveness DESC;
```

5) Most effective antibiotics: return the most effective antibiotics.

SQL:

```
SELECT medicine.name, drug_type.name, medicine_illness.effectiveness,
medicine.in_market FROM medicine JOIN medicine_illness

ON medicine.medicine_id = medicine_illness.medicine_id

JOIN drug_type ON drug_type.type_id = medicine.type_id

WHERE drug_type.name = 'Antibiotics'

ORDER BY medicine_illness.effectiveness DESC;
```

6) Top brands: return brands that own most kinds of medicine.

   SQL:

```
SELECT brand.name, COUNT(medicine.medicine_id) AS amount

FROM brand  JOIN medicine ON brand.brand_id = medicine.brand_id

GROUP BY brand.name ORDER BY amount DESC LIMIT 10;
```

7) Top factories: return factories that produce most kinds of medicine.

   SQL:

```
SELECT factory.name, COUNT(medicine.medicine_id) AS amount

FROM factory JOIN brand ON brand.factory_id = factory.factory_id

 JOIN medicine ON brand.brand_id = medicine.brand_id

GROUP BY factory.name ORDER BY amount DESC LIMIT 10;
```

5. Limitation

1. Most data in the junction table were generated randomly, hence it might happen that a retailer only sells one medicine, which in the real world is very rare.
2. Security issue: although we have created a login page, but one can actually access the admin mode by directly visit the admin page using correct url.
3. Only the medicine table could be modified at the front-end. In the future, we can add more features so that administrators could modify other tables as well.

6. DDL STATEMENTS

```
1)  CREATE DATABASE pharmaSeek;
2)  CREATE TABLE medicine (

    medicine_id INT(22) PRIMARY KEY NOT NULL,

    name VARCHAR(30) NOT NULL,

    type_id INT(22),

    brand_id INT(22) NOT NULL,

    chemical_id INT(22),

    reg_date TIMESTAMP,

    prescription tinyint(1),

    in_market tinyint(1)

    );

3)  CREATE TABLE drug_type (

    type_id INT(22) AUTO_INCREMENT PRIMARY KEY NOT NULL,

    name VARCHAR(30) NOT NULL,

    targets VARCHAR(255)
    );

4)  CREATE TABLE drug_type (

    type_id INT(22) AUTO_INCREMENT PRIMARY KEY NOT NULL,

    name VARCHAR(30) NOT NULL,

    targets VARCHAR(255)

    );

5)  CREATE TABLE factory (

    factory_id INT(22) AUTO_INCREMENT PRIMARY KEY NOT NULL,

    name VARCHAR(50) NOT NULL,

    address VARCHAR(255),

    ranking INT(22),

    is_open tinyint(1)

    );

6)  CREATE TABLE brand (

    brand_id INT(22) AUTO_INCREMENT PRIMARY KEY NOT NULL,

    name VARCHAR(30) NOT NULL,

    factory_id INT(22),

    reg_date TIMESTAMP,

    in_business tinyint(1)

    );

7)  CREATE TABLE brand (
    brand_id INT(22) AUTO_INCREMENT PRIMARY KEY NOT NULL,
    name VARCHAR(30) NOT NULL,
    factory_id INT(22),
    reg_date TIMESTAMP,
    in_business tinyint(1)
    );
8)  CREATE TABLE chemical (
    retailer_id INT(22) AUTO_INCREMENT PRIMARY KEY NOT NULL,
    name VARCHAR(30) NOT NULL,
    use_with_caution tinyint(1),
    );
9)  CREATE TABLE medicine_illness (
    medicine_id INT(22) NOT NULL,
    illness_id INT(22) NOT NULL,
    effectiveness tinyint(1)
    );
10) ALTER TABLE brand
    ADD FOREIGN KEY (factory_id)
    REFERENCES factory(factory_id)
    ON DELETE CASCADE
    ON UPDATE CASCADE;
```

```
11) ALTER TABLE medicine
    ADD FOREIGN KEY (brand_id)
    REFERENCES brand(brand_id)
    ON DELETE CASCADE
    ON UPDATE CASCADE;
12) ALTER TABLE medicine
    ADD FOREIGN KEY (illness_id)
    REFERENCES illness(illness_id)
    ON DELETE CASCADE
    ON UPDATE CASCADE;
13) ALTER TABLE medicine
    ADD FOREIGN KEY (chemical_id)
    REFERENCES chemical(chemical_id)
    ON DELETE CASCADE
    ON UPDATE CASCADE;
14) ALTER TABLE medicine_retailer
    ADD FOREIGN KEY (medicine_id)
    REFERENCES medicine(medicine_id)
    ON DELETE CASCADE
    ON UPDATE CASCADE
15) ALTER TABLE medicine_retailer
```

```
ADD FOREIGN KEY (retailer_id)

REFERENCES retailer(retailer_id)

ON DELETE CASCADE

ON UPDATE CASCADE
```

16) CREATE TABLE admin_info(

```
CREATE TABLE admin_info(

uesr_id int(11) not null PRIMARY key AUTO_INCREMENT,

name varchar(55) not null,

password int(55) not null)
```