

CptS - 451 Introduction to Database Systems Spring 2018

Project Description

In your semester long CptS 451 course project you would develop a data search application for Yelp.com's business review data. The emphasis would be on the database infrastructure of the application.

Learner Objectives:

At the conclusion of this assignment you will gain experience in:

- ✓ Database modeling and design
- ✓ Populating the database with large datasets
- ✓ Querying large databases
- ✓ Optimizing query performance through indexes
- ✓ JSON parsing
- ✓ Database Application Development

Overview:

In 2013, Yelp.com has announced the “Yelp Dataset Challenge” and invited students to use this data in an innovative way and break ground in research. In your project you would query this dataset to extract useful information for local businesses and individual users.

The Yelp data is available in JSON format. The original Yelp dataset includes and **5.2M** reviews by **1.3M** users for **174K** businesses from United States, Canada, UK, and Germany. (<https://www.yelp.com/dataset>) In your project you will use a smaller dataset that your instructor created. This simplified dataset includes only **11,481** businesses, **192,999** users, and **416,490** reviews written for those businesses.

You will be given sample code (Python) to parse some of the Yelp JSON files (available on Blackboard). The Yelp JSON files that you will use in this project are available at the instructor's website at:

http://www.eecs.wsu.edu/~arslanay/CptS451/project/yelp_dataset/Yelp-CptS451-2018.zip

(Note: Please make sure to use the dataset available on the above link, not the one from the Yelp.com website)

See Appendix-B for an overview of the Yelp Academic Dataset.

Requirements:

You would develop a target application which runs queries on the Yelp data and extracts useful information. The primary users for this application will be potential customers seeking for businesses.

Using this application the users can gather information about:

- the businesses in a particular state, city, and/or zipcode,
- the businesses that belong to certain categories,
- detailed information about a business,
- ratings and popularity of businesses,
- etc.

You may design your application either as a standalone or a web-based application.

A detailed description of the application and example screenshots are available in Appendix-A. In evaluating your work instructor's primary focus will be primarily on how you design your database and how efficiently you

can search the database. However your GUI should provide the basic functionality for easy search of the business. Creativity is encouraged! Additional functionality will be considered for extra credit.

You will be given more detailed milestone descriptions when they are assigned.

Submission Instructions:

You will submit the deliverables for milestones on **Blackboard** (learn.wsu.edu). For each milestone you will create a .zip files that contains all deliverables for that milestone, name the .zip files as `<yourname>_milestoneX.zip`, and submit it to the corresponding milestone dropbox on Blackboard. Specific submission details for each milestone will be provided under milestone descriptions.

Project Milestones:

I. Milestone-0: (no submission required)

Download and install PostgreSQL Database Server. You may download the latest version from the link <https://www.postgresql.org/>

II. Milestone-1: (Deadline Feb 9, 2018 11:59pm)

1) Parse JSON Data:

Download the Yelp dataset from http://www.eecs.wsu.edu/~arslanay/CptS451/project/yelp_dataset/Yelp-CptS451-2018.zip. Look at each JSON file and understand what information the JSON objects provide. Pay attention to the data items in JSON objects that you will need for your application. The milestone-1 description will specify which data items you shouldn't parse in the *business*, *review*, *check-in*, *user* JSON objects.

Download the sample program from Blackboard (*Project/ Sample JSON Parsing Code*). You may either use the C# or the Python version of the sample parsing code. The sample code:

- reads JSON objects form a file and extracts certain key and value pairs from JSON objects, and
- writes the extracted data into a text file.

Please note that the sample code includes examples of extracting simple key values only. In a JSON object the key value can be an array or another JSON object (for example: categories and attributes), therefore you need to recursively parse those objects until you extract all data stored in JSON objects. You will write the code for parsing business, user, review, and checkin JSON objects.

2) Build a very simple database application:

Download the "Milestone1DB.csv" file from the link http://www.eecs.wsu.edu/~arslanay/CptS451/project/yelp_dataset/milestone1DB.csv. Create a database on PostgreSQL with name "milestone1DB" and create a table named "business". You will import the CSV file into this table. Detailed instructions are available in Milestone-1 specification. (Note that the schema of this table should comply with the columns of the CSV file.)

Write a simple application (either web or standalone) which connects to the milestone1DB database and runs simple queries on the business table. The goal of this exercise is to get you started in database programming early on. In Milestone3 you will develop a larger application with all required features.

The instructor will provide a video which explains how to establish connectivity with PostgreSQL in C# using Npgsql. Instructor will provide the queries you need to run on your table (see Milestone 1 specification).

Milestone-1 Deliverables:

1. (40%) Source code for parsing all JSON data. Only submit your source code, not the data files.
2. (60%) Source code for your application. Only submit your source code, not the data files.

Create a zip archive “<your-last-name>_milestone1.zip” that includes your source code for JSON parsing and your sample application. Upload your milestone-1 submission on Blackboard until the deadline.

III. Milestone-2: (Deadline TBA)

- 1) Design a database schema that models the database for the described application scenario in Appendix-A and provide the ER diagram for your database design. Your database schema doesn't necessarily need to include all the data items provided in the JSON files. Your schema should be precise but yet complete. It should be designed in such a way that all queries/data retrievals on/from the database run efficiently and effectively. In Milestone3 you may revise your ER model.

Translate your ER model into relations and produce DDL SQL statements for creating the corresponding tables in a relational DBMS. Note the constraints, including key constraints, referential integrity constraints, not NULL constraints, etc. needed for the relational schema to capture and enforce the semantics of your ER design.

Populate your database with the Yelp data. Generate INSERT statements for your tables and run those to insert data into your DB. You will also write additional scripts to update the information stored in your database.

Write triggers and assertions to ensure the validity and consistency of the information stored in your database. Details will be available in Milestone2 specification.

Milestone-2 Deliverables:

(Weights of the deliverables are TBA)

1. The E-R diagram for your database design. To create your ER diagram, I suggest you to use Edraw Max (<https://www.edrawsoft.com/download-edrawmax.php>) . You may also use your favorite drawing tool (e.g., Visio, Word, PowerPoint). **Should be submitted in .pdf format.** Name this file “<your-last-name>_ER_v1.pdf”
2. SQL script file containing all SQL statements (i.e., CREATE TABLE statements, UPDATE statements, and TRIGGERS) . Name this file “<your-last-name>_SQL.sql”
3. SQL script files containing samples of SQL INSERT statements for populating the database (20 samples from each table). You don't need to submit the complete files. “<your-last-name>_Inserts.sql”

Create a zip archive “<your-last-name>_milestone2.zip” that includes your ER diagram and SQL script files.

Upload your milestone-2 submission on Blackboard until the deadline.

You will demonstrate your Milestone1 and Milestone-2 together.

IV. Milestone-3: (Deadline: TBA)

In this milestone you will implement an application (either web or standalone) where the users can search for information and statistic about local businesses. A detailed description of the application requirements is provided in Appendix-A.

Milestone-3 Deliverables:

(Weights of the deliverables are TBA.)

1. The source code of your application. **Please only upload your source code, not your DB files.**
2. SQL script file that contains:
 - a. your main SELECT query for searching businesses and reviews,
 - b. CREATE INDEX statements for the indexes you used.

Create a zip archive “<your-last-name>_milestone3.zip” that includes your source code and the SQL script file. Upload your milestone-3 submission on Blackboard until the deadline.

You will demonstrate your final project to the instructor. The demonstration schedule will be announced in mid-April.

References:

1. Yelp Dataset Challenge, <https://www.yelp.com/dataset>
2. Samples for users of the Yelp Academic Database, <https://github.com/Yelp/dataset-examples>
3. Yelp Challenge, University of Washington Student Paper 1
<http://courses.cs.washington.edu/courses/cse544/13sp/final-projects/p08-fants.pdf>
4. Yelp Challenge, University of Washington Student Paper 2,
<http://courses.cs.washington.edu/courses/cse544/13sp/final-projects/p10-michelmj.pdf>

Appendix-A

Application Specification

The primary users for this application will be potential customers seeking for businesses. Using this application the users can gather information about:

- the businesses in a particular state, city, and/or zipcode,
- the businesses that belong to certain categories,
- detailed information about businesses,
- ratings and popularity of businesses,
- the businesses that their friends visited and reviewed, etc.

You may design your application either as a standalone or a web-based application. Below you will find screenshots to help you visualize the required functionality.

The application will have 2 main windows:

A. User Information:

User can view the list of his/her friends and the latest tips each friend has provided.

Use Case:

1. The user enters his name and chooses his/her own user id (among the users who has the same name). The system retrieves user's profile information (including, his/her name, average stars, the date he/she joined yelp, number of fans, average stars, and count of votes) from the database and displays it on the screen. The list of the user's friends and the latest tip that each of those friends posted are displayed.

The user may remove a friend from his friend list. (See Figure-1)

The screenshot shows a web application window titled 'Yelp'. It has two tabs: 'User Information' (selected) and 'Business Search'. The 'User Information' tab displays the following details for a user named 'Tyler':

- Set Current User:** A dropdown menu showing 'Tyler' and a list of other users with IDs like '_28VdchP8snwHzW-WEAJ6A'.
- User Information:**
 - Name: Tyler
 - Stars: 5
 - Fans: 0
 - Yelping Since: 2016-07-03
 - Votes: funny: 1, cool: 0, useful: 0
- Set User Location:**
 - Latitude: 33.3187306943
 - Longitude: -111.943387985
 - Set Location button

Below the user information, there are two main sections:

- Friends:** A table listing friends with columns 'Name', 'Avg Stars', and 'Yelping Since'. The list includes names like Emily, Ali, Nicole, Laura, Omar, Benjamin, Heather, Sarah, Megan, Taylor, Kassie, Christie, Brittany, Larissa, Jennifer, Karolina, Arianna, Stephanie, Elizabeth, Clayton, Cassandra, and Lauren.
- Tips by Friends:** A table titled 'Latest tips posted by the user's friends:' with columns 'User Name', 'Business', 'City', and 'Text'. It shows various reviews from friends, such as 'Emily' at 'El Pollo Loco' and 'Ali' at 'Grimaldi's Pizzeria'.

At the bottom left of the 'Friends' section, there is a 'Remove Friend' button.

Figure 1 – User information window

B. Business Search:

Users can search for businesses which are within a certain state, city, and zip and which belong to the selected categories. The application allows users to display some statistics about the businesses in the search results and to retrieve various information about a selected business

Use Cases:

1. User selects a state, city, and zipcode. When search button is pressed, the businesses in that state/city/zipcode are displayed (see Figure-2). The following information is provided for each business:

- Business name
- Address, city, state
- Distance to user's location
- Business rating (stars)
- # of reviews provided for the business
- Average rating (stars) of the reviews provided for the business
- Total number of check-ins

(Note: You should query (i) the review table to calculate the number of reviews and avg review rating and (ii) the check-in table to calculate the number of check-ins for each business and update those attributes in the business table.)

The screenshot shows the Yelp application interface. On the left, there are filters for 'Select Location' (State: AZ, City: Chandler, Zipcode: 85226) and 'Business Category'. The main area displays 'SEARCH RESULTS' for Chandler, AZ, 85226, with 210 businesses found. A table lists the top results with columns: BusinessName, Address, City, State, Distance (miles), Stars, # of Reviews, Avg Review Rating, and Total Check. On the right, there are filters for 'Filter by Price' (\$, \$\$, \$\$\$, \$\$\$\$), 'Filter by Attributes' (Accepts Credit Cards, Takes Reservations, Wheelchair Accessible, Outdoor Seating, Good for Kids, Good for Groups, Delivery, Take Out, Free Wi-Fi, Bike Parking), 'Filter by Meal' (Breakfast, Brunch, Lunch, Dinner, Dessert, Late Night), and 'Sort Results By' (Name (default)). At the bottom, there are buttons for 'Show Checkins', 'Show Reviews', and '#of Business per Zipcode'.

BusinessName	Address	City	State	Distance (miles)	Stars	# of Reviews	Avg Review Rating	Total Check
1st Nails II	6245 W Chandler Blvd	Chandler	AZ	1.01	4	21	4	34
4T Nail&Spa	4929 W Chandler Blvd	Chandler	AZ	1.34	4.5	6	5	28
9-Party Nails	3875 W Ray Rd, Ste 14	Chandler	AZ	1.99	3	17	3.12	12
Aldo Shoes	3111 W Chandler Blvd	Chandler	AZ	2.88	4	8	3.88	47
Arizona Dyno Chip	513 N 54th St, Ste 5	Chandler	AZ	1.45	4.5	4	3.75	2
Arizona Hair Co	6045 W Chandler Blvd, A12	Chandler	AZ	1	4.5	9	4.89	8
Audi Chandler	7460 West Orchid Lane	Chandler	AZ	1.64	4.5	64	4.61	101
AutoZone	3920 W Ray Rd	Chandler	AZ	1.97	4	12	4	27
AZ Admire Nails &	5865 W Ray Rd, Ste 4	Chandler	AZ	0.02	4	13	4.08	4
Az Family Dentistry	5690 W Chandler Blvd, Ste 1	Chandler	AZ	0.93	5	5	5	4
Baja Fresh	3450 W Chandler Blvd	Chandler	AZ	2.68	2	8	2	89
Bare Escentuals	3111 W Chandler Blvd	Chandler	AZ	2.88	5	5	5	44
Bath & Body Works	7131 W Ray Rd, Ste 28	Chandler	AZ	1.3	3.5	8	3.63	91
Bath & Body Works	3111 W Chandler Blvd	Chandler	AZ	2.79	3.5	5	4.4	22
Bed Bath & Beyond	850 N 54th St	Chandler	AZ	1.59	4	12	4.17	200
Benihana	3025 W Chandler Blvd	Chandler	AZ	2.96	3	220	3.2	1164
Best Western Plus C	7101 W Sundust Rd	Chandler	AZ	2.76	4	3	5	0
Betillos Mexican Fo	6045 W Chandler Blvd, Ste 11	Chandler	AZ	1	4	19	4.11	81
Beyer Motor Works	300 S 79th St	Chandler	AZ	2.26	4.5	8	5	14
Brighton Collectible	3111 W Chandler Blvd	Chandler	AZ	2.88	2.5	7	2.57	5

Figure 2 – Searching for the businesses in a Chandler, AZ, 85226

2. The user might refine the results by specifying one or more business categories. The search will return the businesses which belong **to ALL categories** specified by the user (i.e., AND condition) (see Figure-3 and -4).

User Information **Business Search**

Select Location
 State: AZ
 City: Chandler
 Zipcode: 85226

Open Businesses
 Day of Week:
 From:
 To:

SEARCH RESULTS # of businesses: 20

BusinessName	Address	City	State	Distance (miles)	Stars	# of Reviews	Avg Review Rating	Total Checks
Cafe 24/7	5040 Wild Horse Pass Blvd	Chandler	AZ	2.97	2	31	2.26	117
California Pizza Kitch	3163 W Chandler Blvd, Ste 4	Chandler	AZ	2.89	3	65	3.45	506
Charleston's	1040 N 54th St	Chandler	AZ	1.59	4	143	4.14	595
Culver's	3155 W Ray Rd	Chandler	AZ	2.74	3.5	80	3.67	734
Dessie's Cafe	4050 W Ray Rd	Chandler	AZ	1.78	3.5	49	3.57	129
Dirty Blonde Tavern	4929 W Chandler Blvd	Chandler	AZ	1.35	4	48	3.94	218
Duke's Tavern	4910 W Ray Rd	Chandler	AZ	0.99	4	29	4.03	65
Fatburger	5040 Wild Horse Pass	Chandler	AZ	3.28	2	19	1.84	95
Fired Up Grill	7131 W Ray Rd, Ste 45	Chandler	AZ	1.18	3	70	3.29	164
Freddy's Frozen Custard	3476 W Frye Rd	Chandler	AZ	2.84	3.5	68	3.87	424
Johnny Rockets	3157 W. Chandler, Sp #2, Chandler	Chandler	AZ	2.8	3	12	3.17	37
Lucky Lou's American	3245 W Ray Rd	Chandler	AZ	2.64	3.5	80	3.58	811
Marie's Restaurant	7455 W Chandler Blvd	Chandler	AZ	1.79	2.5	11	2.64	5
McCool's Bar & Grill	4910 W Ray Rd	Chandler	AZ	0.98	4.5	7	4.57	213
Red Lobster	7240 W Ray Rd	Chandler	AZ	1.42	3	72	3.22	413
Red Robin Gourmet	3420 W. Chandler Blvd.	Chandler	AZ	2.65	3	82	3.22	748
Sandstone Cafe	4959 W Ray Rd	Chandler	AZ	0.91	3	6	3.67	9
Shula's Steak House	5040 West Wild Horse Pass Blvd	Chandler	AZ	3.18	3.5	101	3.61	274
Speakeasy Saloon	7450 W Chandler Blvd	Chandler	AZ	1.75	2.5	16	2.63	37
Whataburger	7375 W Chandler Blvd	Chandler	AZ	1.73	3	31	3.13	190

Selected Business
 Business Name:
 < <review text > >
 Rating:
 Add Review

Filter by Price:
☐ \$ ☐ \$\$\$
☐ \$\$ ☐ \$\$\$\$

Filter by Attributes:
☐ Accepts Credit Cards
☐ Takes Reservations
☐ Wheelchair Accessible
☐ Outdoor Seating
☐ Good for Kids
☐ Good for Groups
☐ Delivery
☐ Take Out
☐ Free Wi-Fi
☐ Bike Parking

Filter by Meal:
☐ Breakfast ☐ Dinner
☐ Brunch ☐ Dessert
☐ Lunch ☐ Late Night

Sort Results By:
 Name (default)

Show Checkins
Show Reviews
of Business per Zipcode

Figure 3 – Searching for the businesses with category ‘American (Traditional)’ in Chandler, AZ, 85226

User Information **Business Search**

Select Location
 State: AZ
 City: Chandler
 Zipcode: 85226

Open Businesses
 Day of Week:
 From:
 To:

SEARCH RESULTS # of businesses: 4

BusinessName	Address	City	State	Distance (miles)	Stars	# of Reviews	Avg Review Rating	Total Checks
Culver's	3155 W Ray Rd	Chandler	AZ	2.74	3.5	80	3.67	734
Fatburger	5040 Wild Horse Pass	Chandler	AZ	3.28	2	19	1.84	95
Johnny Rockets	3157 W. Chandler, Sp #2, Chandler	Chandler	AZ	2.8	3	12	3.17	37
Whataburger	7375 W Chandler Blvd	Chandler	AZ	1.73	3	31	3.13	190

Selected Business
 Business Name:
 < <review text > >
 Rating:
 Add Review

Filter by Price:
☐ \$ ☐ \$\$\$
☐ \$\$ ☐ \$\$\$\$

Filter by Attributes:
☐ Accepts Credit Cards
☐ Takes Reservations
☐ Wheelchair Accessible
☐ Outdoor Seating
☐ Good for Kids
☐ Good for Groups
☐ Delivery
☐ Take Out
☐ Free Wi-Fi
☐ Bike Parking

Filter by Meal:
☐ Breakfast ☐ Dinner
☐ Brunch ☐ Dessert
☐ Lunch ☐ Late Night

Sort Results By:
 Name (default)

Show Checkins
Show Reviews
of Business per Zipcode

Figure 4 – Searching for the businesses with categories ‘American (Traditional)’, ‘Burgers’, and ‘Fast Food’ in Chandler, AZ, 85226

- The user might refine the results according to the times the business is open/closed on a certain day of the week. User specifies a day-of-week and a start and end time. All businesses that are closed during the given time-slot are excluded from the results. Please note that if a business is closed during part of the slot (but open during the rest), it should be excluded from the result. All filtering

on the results need to be implemented in SQL queries. No points will be given if you filter results in the GUI when you display them in the list-view.

If no time-slot is given, no filtering should be done.

The screenshot shows the Yelp Business Search interface. The 'User Information' tab is active, displaying search filters. The 'Select Location' section shows 'State: AZ', 'City: Chandler', and 'Zipcode: 85226'. The 'Business Category' section shows 'Department Stores', 'Event Planning & Service', 'Fashion', 'Fast Food', 'Food', 'Furniture Stores', 'General Dentistry', 'Hair Removal', and 'Hair Salons'. The 'Open Businesses' section shows 'Day of Week: Saturday', 'From: 19:00', and 'To: 23:00'. The 'Filter by Price' section shows '\$', '\$\$', '\$\$\$', and '\$\$\$\$'. The 'Filter by Attributes' section shows checkboxes for 'Accepts Credit Cards', 'Takes Reservations', 'Wheelchair Accessible', 'Outdoor Seating', 'Good for Kids', 'Good for Groups', 'Delivery', 'Take Out', 'Free Wi-Fi', and 'Bike Parking'. The 'Filter by Meal' section shows checkboxes for 'Breakfast', 'Brunch', 'Lunch', 'Dinner', 'Dessert', and 'Late Night'. The 'Sort Results By' section shows 'Name (default)'. The 'SEARCH RESULTS' table shows 10 businesses. The 'Selected Business' section shows 'Business Name' and 'Rating:'. The 'Add Review' button is visible.

BusinessName	Address	City	State	Distance (miles)	Stars	# of Reviews	Avg Review Rating	Total Checkins	Business
Cafe 24/7	5040 Wild Horse Pass Blvd	Chandler	AZ	2.97	2	31	2.26	117	Ev
California Pizza Kite	3163 W Chandler Blvd. Ste 4	Chandler	AZ	2.89	3	65	3.45	506	Al
Fatburger	5040 Wild Horse Pass	Chandler	AZ	3.28	2	19	1.84	95	Ez
Freddy's Frozen Cur	3476 W Frye Rd	Chandler	AZ	2.84	3.5	68	3.87	424	o5
Johnny Rockets	3157 W. Chandler, Sp #2, Chanc	Chandler	AZ	2.8	3	12	3.17	37	36
Marie's Restaurant	7455 W Chandler Blvd	Chandler	AZ	1.79	2.5	11	2.64	5	S6
Red Lobster	7240 W Ray Rd	Chandler	AZ	1.42	3	72	3.22	413	74
Red Robin Gourmet	3420 W. Chandler Blvd.	Chandler	AZ	2.65	3	82	3.22	748	Ex
Shula's Steak House	5040 West Wild Horse Pass Blvd	Chandler	AZ	3.18	3.5	101	3.61	274	Kv
Whataburger	7375 W Chandler Blvd	Chandler	AZ	1.73	3	31	3.13	190	xN

Figure 5 – Searching for the businesses with category ‘American (Traditional)’ in Chandler, AZ, 85226 which are open on Saturdays from 19pm to 23pm.

3. The user may also refine results by specifying various attributes including:
 - a. Price range (1 to 4) – (see RestaurantsPriceRange2 attribute)
 - b. Accepts credit cards (see BusinessAcceptsCreditCards attribute)
 - c. Takes reservations (see RestaurantsReservations attribute)
 - d. Wheelchair accessible (see WheelchairAccessible attribute)
 - e. Outdoor seating (see OutdoorSeating attribute)
 - f. Good for kids (see GoodForKids attribute)
 - g. Good for groups (see RestaurantsGoodForGroups attribute)
 - h. Delivery (see RestaurantsDelivery attribute)
 - i. Take out (see RestaurantsTakeOut attribute)
 - j. Wifi (free Wifi only) – (see WiFi attribute)
 - k. Bike parking (see BikeParking attribute)
 - l. Meals (breakfast, brunch, lunch, dinner, desert, latenight attributes)

The screenshot shows the Yelp Business Search interface. The 'Business Search' tab is active. The search criteria are: State: AZ, City: Chandler, Zipcode: 85226, Business Category: American (Traditional), Open Businesses: Saturday, From: 19:00, To: 23:00. The search results table shows 5 businesses.

BusinessName	Address	City	State	Distance (miles)	Stars	# of Reviews	Avg Review Rating	Total Checkins
California Pizza Kitch	3163 W Chandler Blvd, Ste 4	Chandler	AZ	2.89	3	65	3.45	506
Fatburger	5040 Wild Horse Pass	Chandler	AZ	3.28	2	19	1.84	95
Marie's Restaurant	7455 W Chandler Blvd	Chandler	AZ	1.79	2.5	11	2.64	5
Red Lobster	7240 W Ray Rd	Chandler	AZ	1.42	3	72	3.22	413
Red Robin Gourmet	3420 W. Chandler Blvd.	Chandler	AZ	2.65	3	82	3.22	748

The interface also includes filters for Price (Filter by Price: \$, \$\$, \$\$\$, \$\$\$\$), Attributes (Accepts Credit Cards, Takes Reservations, Wheelchair Accessible, Outdoor Seating, Good for Kids, Good for Groups, Delivery, Take Out, Free Wi-Fi, Bike Parking), and Meal (Breakfast, Brunch, Lunch, Dinner, Dessert, Late Night). The 'Selected Business' section shows 'American (Traditional)' with a 'Checkin' button and a 'Rating' dropdown. The 'Add Review' button is also visible.

Figure 6 – Searching for the businesses with category ‘American (Traditional)’ in Chandler, AZ, 85226 which are open on Saturdays from 19pm to 23pm and which has ‘price range 2’, accepts credit cards, is good for kids, and has takeout service.

- The user may check-in to a selected business. The number of check-ins for that business should be incremented automatically after the check-in.
- The user may provide a review for the selected business and assign a rating. The new review should appear when the reviews for that business is displayed and the business’s review rating should be updated. (Note: Assume the review is posted by the user selected in the ‘User Information’ tab) (See Figure-7)

The screenshot shows a web application for searching businesses. It includes filters for location (State: AZ, City: Chandler), open businesses (Day of Week: Saturday, From: 17:00, To: 23:00), and price (\$ to \$\$\$\$). The search results are sorted by 'Total Checkins' in descending order. Below the results, there is a section for a selected business with a 'Checkin' button, a rating input (set to 4), and an 'Add Review' button. On the right, there are filters for attributes (e.g., Accepts Credit Cards, Takes Reservations) and meal types (e.g., Breakfast, Brunch, Lunch). Buttons for 'Show Checkins', 'Show Reviews', and '#of Business per Zipcode' are also present.

BusinessName	Address	City	State	Distance (miles)	Stars	# of Reviews	Avg Review Rating	Total Checkins
Red Robin Gourmet	3420 W. Chandler Blvd.	Chandler	AZ	2.65	3	82	3.22	748
California Pizza Kitch	3163 W Chandler Blvd, Ste 4	Chandler	AZ	2.89	3	65	3.45	506
Freddy's Frozen Cui	3476 W Frye Rd	Chandler	AZ	2.84	3.5	68	3.87	424
Red Lobster	7240 W Ray Rd	Chandler	AZ	1.42	3	72	3.22	413
Shula's Steak House	5040 West Wild Horse Pass Blvd	Chandler	AZ	3.18	3.5	101	3.61	274
Whataburger	7375 W Chandler Blvd	Chandler	AZ	1.73	3	31	3.13	190
Cafe 24/7	5040 Wild Horse Pass Blvd	Chandler	AZ	2.97	2	31	2.26	117
Fatburger	5040 Wild Horse Pass	Chandler	AZ	3.28	2	19	1.84	95
Johnny Rockets	3157 W. Chandler, Sp #2, Chanc	Chandler	AZ	2.8	3	12	3.17	37
Marie's Restaurant	7455 W Chandler Blvd	Chandler	AZ	1.79	2.5	11	2.64	5

Figure 7 – Business search results are sorted based on the number of check-ins (in descending order). User may provide a review for a selected business and rate it.

6. The user may sort the results based on the following. In Figure-7 the business search results are sorted by number of check-ins (in descending order). All sorting should be done in the SQL query (you can't use the sorting features of the data-grid.)
 - a. Business name (default sort order)
 - b. Highest rating (stars)
 - c. Most reviewed
 - d. Best review rating (highest avg review rating)
 - e. Most check-ins
 - f. Nearest
7. The user may select a certain business in the search results (by simply clicking on a business) and display various information about the business, including:
 - a. *Show Check-ins*: All check-ins for the business which are grouped by the day-of-the-week and the time-of-the-day. For simplicity, you are asked to aggregate the check-in information into morning (6am-12noon), afternoon (12noon-5pm), and evening (5pm-11pm), night (11pm-6am) intervals. (Assume start time of each interval is inclusive and end time is exclusive.) Your application should visualize the number of check-ins for each day-of-the-week and time-of-the-day as a chart. Please see Figure-8 for an example.

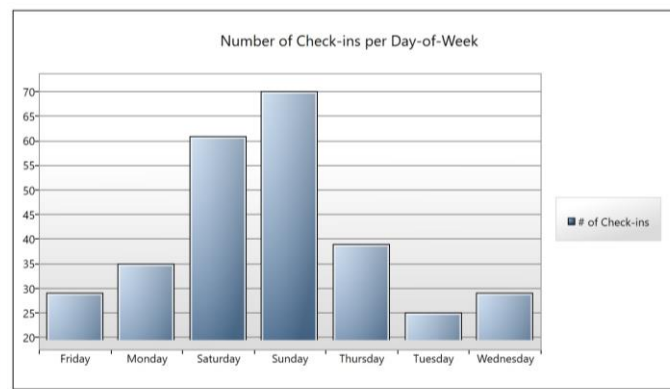


Figure 8 – Number of check-ins for the business ‘Shula’s Steak House’

- b. *Show Reviews*: The reviews provided for the selected business. For each review, you should display the name of the user who provided the review, the date tip is provided, the rating(stars) for the review and the review text. You should display this information as a list (or table) (see Figure-9)

Reviews by Users									
Date	User Name	Stars	Text	Funny	Useful	Cool			
2018-01-30	Tyler	4	Everything is awesome!	0	0	0			
2016-08-13	Monique	5	If your looking for elegance and pristine dining Shula's is the place to go. The lobster is amazing in fact everything is including Brian the water. It's definitely upscale and really good from the time you walk in until you leave your treated like royalty. It's truly delicious I've eaten there many times , just had a party of ten in honor of my sons birthday and everyone totally enjoyed everything	0	0	0			
2015-01-12	Mike	1	I was not impressed with Shula's. They are a steakhouse and should know how to cook steak. I ordered the cowboy Ribeye Medium rare. When the steak is served they cut into the steak to check the temperature. The Steak was blue rare, not even close to medium rare. The mashed potatoes were dry and not very good. This place is over priced and survives on the name alone. I will never go back.	0	0	0			
2013-09-21	Brian	3	The steaks at Shula's are delicious. I had the filet with a blue cheese crust, and for the thickness, it was done perfectly medium-rare. The cut and flavor were excellent, and I liked that they have you cut in and verify that it's done to your liking. The sides were standard steakhouse fare, and were just fine. The dessert was the same. The reason for 3 stars is the service. Speed is not a virtue at Shula's, and, while you don't want to be rushed, taking 3 hours for dinner leaves long gaps where you start losing your appetite and getting tired. This is compounded by the fact that the waiters disappear for long periods, and you're left with no drink. I spent the majority of the dinner with an empty glass.	0	0	0			
2010-01-31	Jason	5	My wife & I ate here Jan 30th, 2010. WHOA this place rocks.. We sat down and they came right over to ask us for drinks. She ordered a sangria martini and I a vanilla vodka screwdriver. They bring a cart around showing you the different cuts & sizes of the meats. We asked about the "Coaches 80th Bday special" 2 fillets, king crab legs, asparagus & mashed taters for both.. Plus a salad & a desert! And all for only \$80.. The fillet was cooked perfectly, the asparagus had balsamic on it as well.. There was NOTHING wrong with the service or the meal. For our desert we shared a piece of 7 layer choco cake.. The service was A++ the food was top notch.. We will not hesitate to dine there again or recommend this place to anyone. Thank you for a wonderful 1st time visit!	0	0	0			
2016-10-01	Danielle	5	Absolutely amazing food! Stellar service and awesome drinks. Our server Brian made the experience a great one, he took the time to explain and show us each cut and made suggestions on sides. By far some of the best service and Steaks I've had hands down... Oh and the bread... Nom Nom Nom	0	0	0			

Figure 9 – The reviews for the business ‘Shula’s Steak House’

- c. *#of Business per Zipcode*: Number of business per zipcode in the currently selected city. You should display this information as a chart. See Figure-10 for an example chart showing the number of businesses per zipcode in Chandler, AZ.

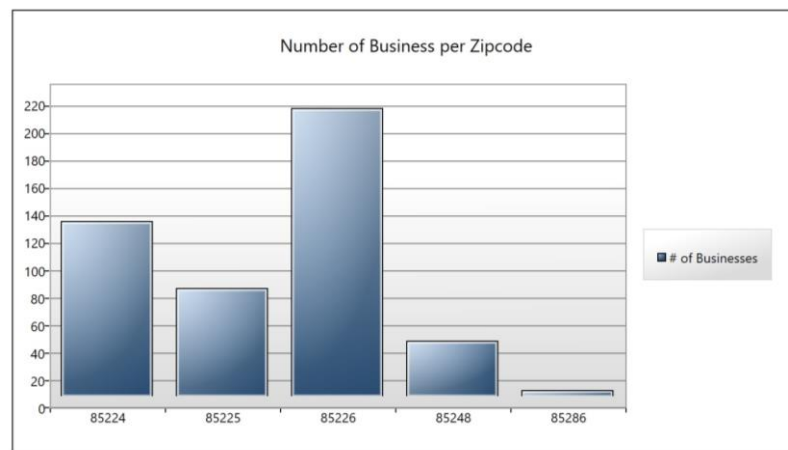


Figure 10 – Number of businesses per zipcode in Chandler, AZ.

Please note that all data displayed on the GUI should be kept in the database and should be retrieved from it when needed. You are not allowed to create internal data structures to store data.

You may design your application either as a standalone or a web-based application.

Appendix-B

Yelp's Academic Dataset

Yelp has made available a dataset which contains user reviews for **174K** businesses from United States, Canada, UK, and Germany. The purpose was to provide a real-world data set to promote research in various areas of research. The dataset includes 6 types of data objects: *business*, *review*, *user*, *tip*, *check-in*, and *photos*. Every object contains a 'type' field, which tells whether it is a *business*, a *user*, or a *review*. *Business* objects contain basic information about local businesses. *Review* objects contain the details of the reviews by users for the businesses. *Review*'s *user_id* associates the reviews with the *user* objects. Similarly, *review*'s *business_id* associates each review with the *businesses*.

Detailed description of the data objects is available at:

<https://www.yelp.com/dataset/documentation/json>

In your project, you will only parse *business*, *user*, *review*, and *check-in* objects. **In the review objects, you don't need to parse/extract the 'elite' and 'compliments' information.**

Usage of this dataset is governed by the Academic Dataset Terms of Use.