



# DESIGNING DATABASE SYSTEMS

[Group 1]

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# Introducing the Team



Sara Hart



Angel Sheu



Lisa Rumao



Molly Li



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01

**CONTEXT,  
BACKGROUND INFO,  
META DATA**



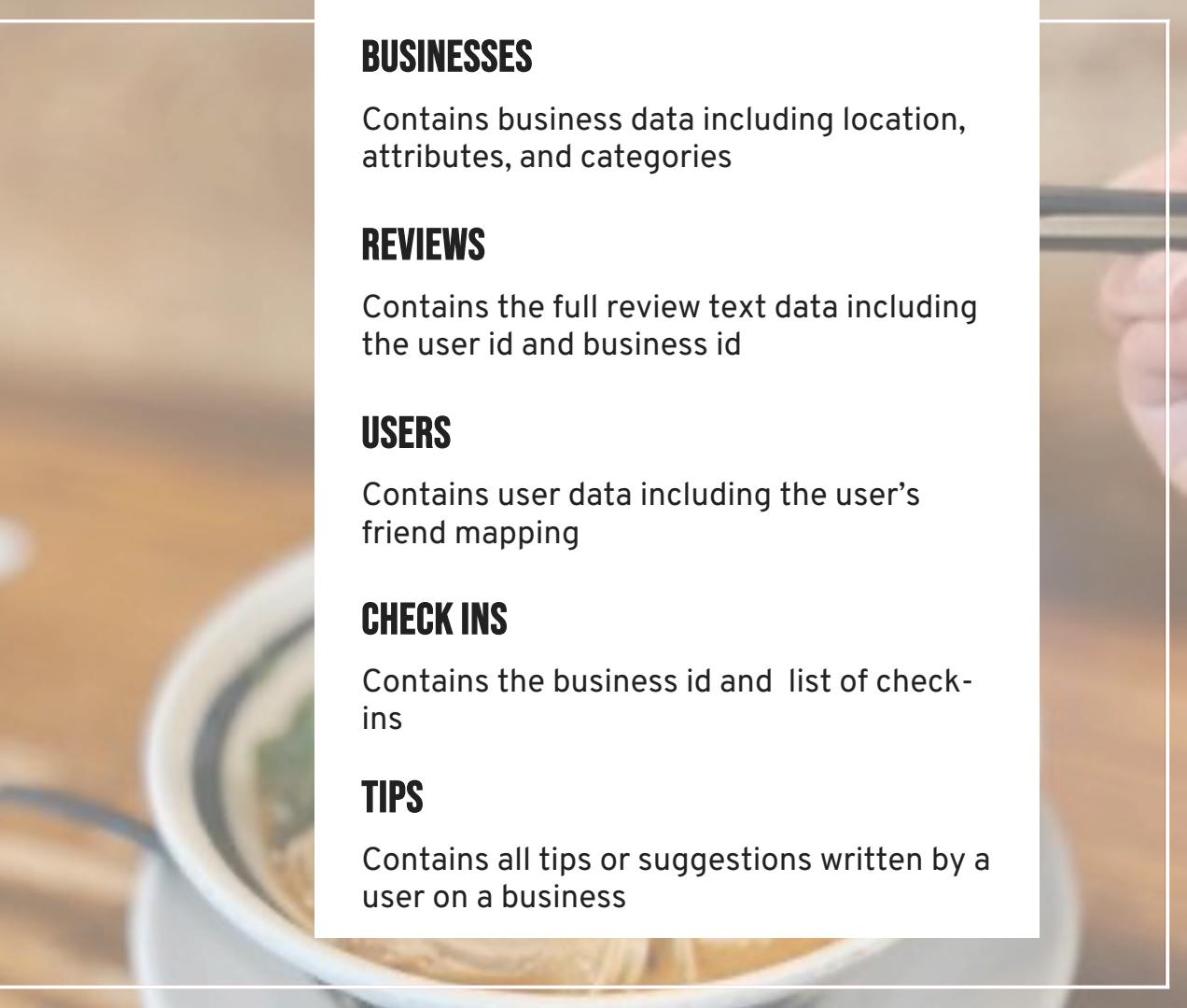
## WHAT'S YELP?

Yelp is a “crowd-sourced local business review and social networking site”.

## WHY YELP?

This company offers a vast amount of data that is open to the public for academic use.

# METADATA (ENTITIES)



## BUSINESSES

Contains business data including location, attributes, and categories

## REVIEWS

Contains the full review text data including the user id and business id

## USERS

Contains user data including the user's friend mapping

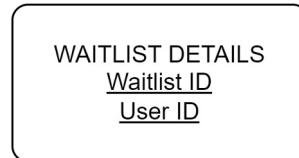
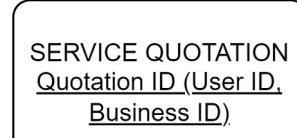
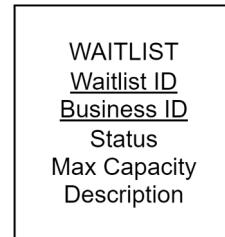
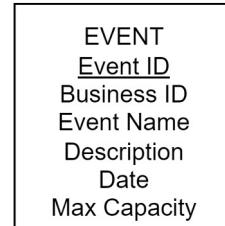
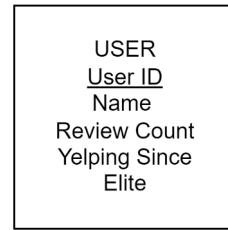
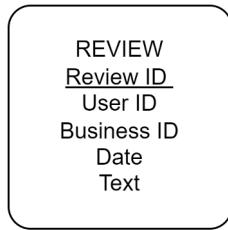
## CHECK INS

Contains the business id and list of check-ins

## TIPS

Contains all tips or suggestions written by a user on a business

# METADATA (ATTRIBUTES)



original entities

new entities

02

**RELATIONSHIPS,  
BUSINESS RULES,  
ERD**



# BUSINESS RULES

- Users can join a waitlist for a business only if the business is indicated as 'open'.
- Eligibility for 'elite' status requires users to meet a minimum review threshold and maintain high engagement (useful, funny, cool votes) annually.
- Only registered users with a unique identifier (UserID) are permitted to post reviews or tips.
- A verified email address is mandatory for users to publish reviews or tips on Yelp.



USERS

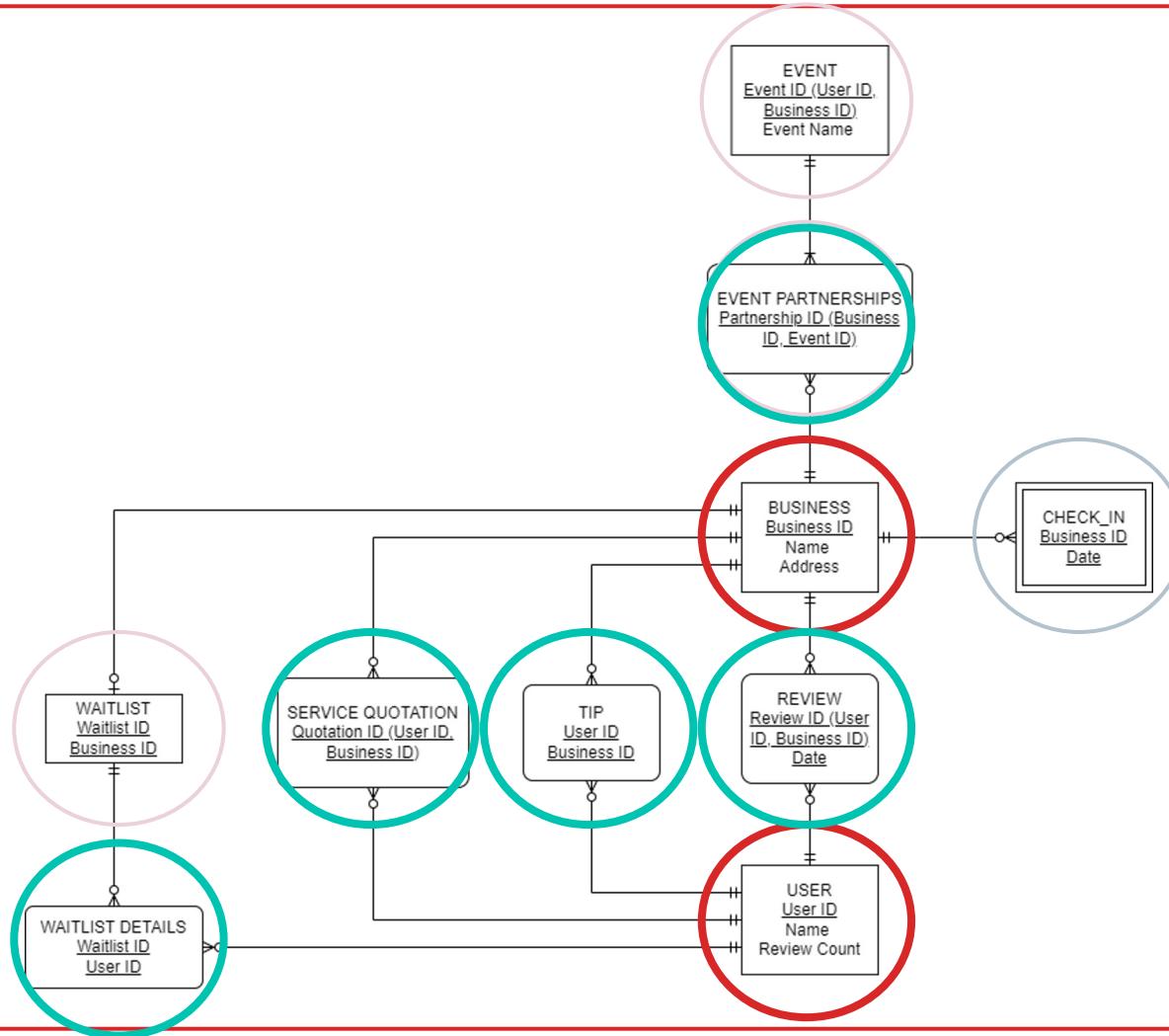
- Each business listed on the platform must provide a valid address, which includes the city, state, and postal code.
- A business may accumulate numerous reviews, tips, and check-ins, but each review, tip, or check-in must correspond to one unique business.



BUSINESS

# ER DIAGRAM

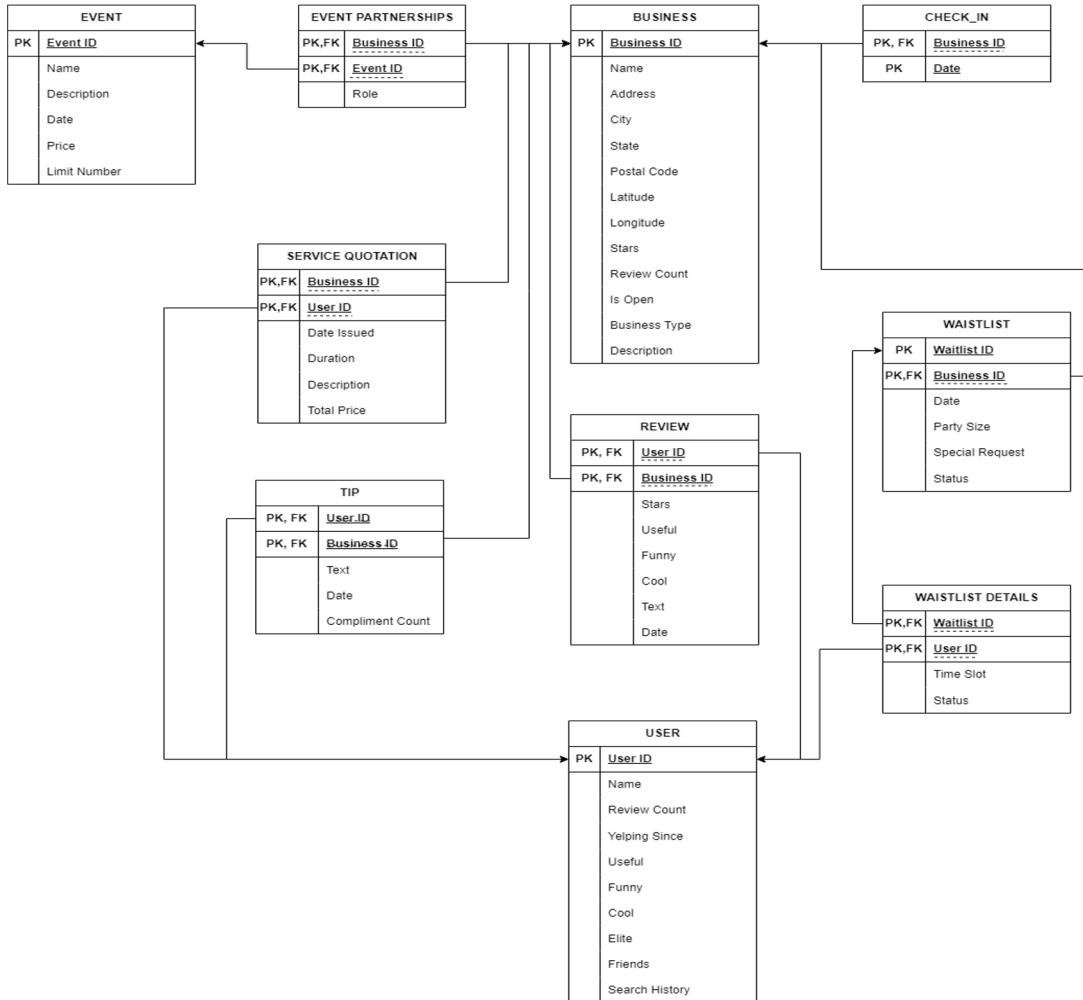
Legend	
	Original
	New



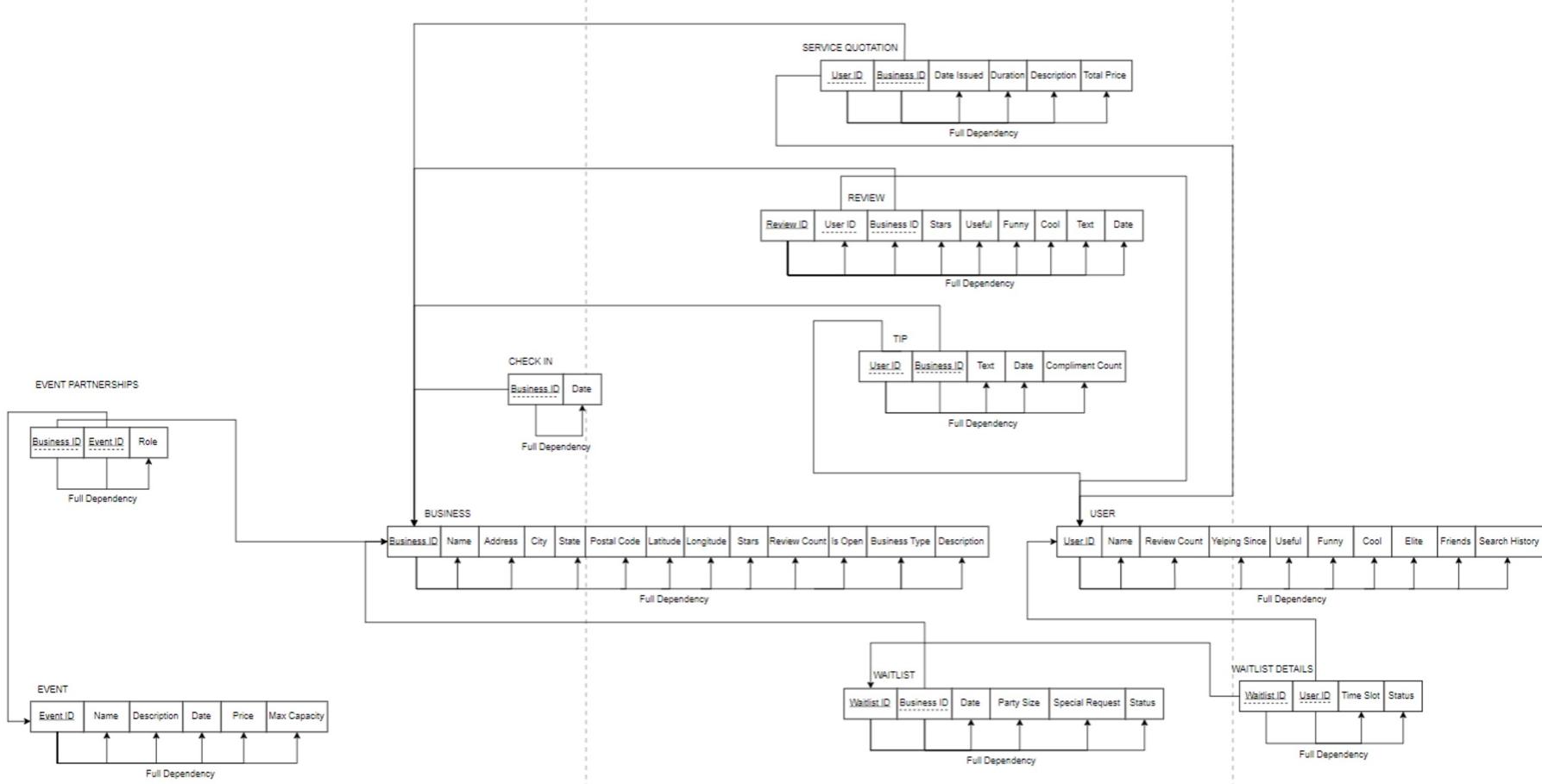
**03**

**RELATIONAL  
DATA MODELING,  
AS-IS DEPENDENCIES**

# RELATIONAL DATA MODELING



# AS - IS DEPENDENCIES



# 04

## NORMALIZATION (3RD NORMAL FORM)

# ALL TABLES IN 3RD NORMAL FORM!

## ★ Business Entity table

index	business_id	name	address	city	state	postal_code	latitude	longitude	stars	review_count	is_open	attributes	categories	hours
0	Pns2I4eNsfO8kk83dixA6A	Abby Rappoport, LAC, CMQ	1616 Chapala St, Ste 2	Santa Barbara	CA	93101	34.4266787	-119.7111968	5.0	7	0	{"ByAppointmentOnly": "True"}	Doctors, Traditional Chinese Medicine, Naturopathic/Holistic, Acupuncture, Health & Medical, Nutritionists	
1	mpf3x-BjTdTEA3yCzrAYPw	The UPS Store	87 Grasso Plaza Shopping Center	Afton	MO	63123	38.551126	-90.335695	3.0	15	1	{"BusinessAcceptsCreditCards": "True"}	Shipping Centers, Local Services, Notaries, Mailbox Centers, Printing Services	{"Monday": "0:0-0:0", "Tuesday": "8:0-18:30", "Wednesday": "8:0-18:30", "Thursday": "8:0-18:30", "Friday": "8:0-18:30", "Saturday": "8:0-14:0"}
2	tUFrWirKiKi_TAnsVWINQQ	Target	5255 E Broadway Blvd	Tucson	AZ	85711	32.223236	-110.880452	3.5	22	0	{"BikeParking": "True", "BusinessAcceptsCreditCards": "True", "RestaurantsPriceRange2": "2", "CoatCheck": "False", "RestaurantsTakeOut": "False", "RestaurantsDelivery": "False", "Caters": "False", "WiFi": "u'no'", "BusinessParking": "garage: False, street: False, validated: False, lot: True, valet: False", "WheelchairAccessible": "True", "HappyHour": "False", "OutdoorSeating": "False", "HasTV": "False", "RestaurantsReservations": "False", "DogsAllowed": "False", "ByAppointmentOnly": "False"}	Department Stores, Shopping, Fashion, Home & Garden, Electronics, Furniture Stores	{"Monday": "9:0-22:0", "Tuesday": "9:0-22:0", "Wednesday": "8:0-22:0", "Thursday": "8:0-22:0", "Friday": "8:0-23:0", "Saturday": "8:0-23:0", "Sunday": "8:0-22:0"}
3	MTSW4McQd7CbVtyjqoe9mw	St Honore Pastries	935 Race St	Philadelphia	PA	19107	39.9555052	-75.1555641	4.0	80	1	{"RestaurantsDelivery": "False", "OutdoorSeating": "False", "BusinessAcceptsCreditCards": "False", "BusinessParking": "garage: False, street: True, validated: False, lot: False, valet: False", "BikeParking": "True", "RestaurantsPriceRange2": "1", "RestaurantsTakeOut": "True", "ByAppointmentOnly": "False", "WiFi": "u'free'", "Alcohol": "u'none'", "Caters": "True"}	Restaurants, Food, Bubble Tea, Coffee & Tea, Bakeries	{"Monday": "7:0-20:0", "Tuesday": "7:0-20:0", "Wednesday": "7:0-20:0", "Thursday": "7:0-20:0", "Friday": "7:0-21:0", "Saturday": "7:0-21:0", "Sunday": "7:0-21:0"}

## ★ Check-in Entity table

index	business_id	date
0	--kPU91CF4Lq2-WIRu9Lw	2020-03-13 21:10:56, 2020-06-02 22:18:06, 2020-07-24 22:42:27, 2020-10-24 21:36:13, 2020-12-09 21:23:33, 2021-01-20 17:34:57, 2021-04-30 2
1	--0iUa4sNDFiZFrAdlWhZQ	2010-09-13 21:43:09, 2011-05-04 23:08:15, 2011-07-18 22:30:31, 2012-09-07 20:28:50, 2013-03-27 15:57:36, 2013-08-13 00:31:34, 2013-08-13 01
2	-30_8lhuyMHbSOcNWd6DQ	2013-06-14 23:29:17, 2014-08-13 23:20:22
3	--7PUidqRWpRSpXebiyxTg	2011-02-15 17:12:00, 2011-07-28 02:46:10, 2012-03-11 10:30:02, 2012-04-24 07:07:59, 2012-04-24 07:43:31, 2013-05-25 16:41:10, 2014-05-02 1
4	--7jw19RH9JKXgFohspgQw	2014-04-21 20:42:11, 2014-04-28 21:04:46, 2014-09-30 14:41:47, 2014-10-23 18:22:28, 2015-04-27 19:55:00, 2015-09-21 12:52:09, 2015-10-01 11 13:11:34, 2016-05-25 12:44:11, 2016-06-27 15:46:11, 2016-06-30 15:14:28, 2016-07-28 14:15:59, 2016-09-22 20:05:06, 2016-11-16 19:00:11, 2017-01-14 17:39, 2021-06-21 19:59:50

# ALL TABLES IN 3RD NORMAL FORM!

## ★ Review Entity table

	user_id	business_id	text	date	compliment_count
0	AGNUgVwnZUey3gcPCJ76iw	3uLgwr0qeCNMjKenHJwPGQ	Avengers time with the ladies.	2012-05-18 02:17:21	0
1	NBN4MgHP9D3cw--SnauTkA	QoezRbYQncpRqyrLH6lqjg	They have lots of good deserts and tasty cuban...	2013-02-05 18:35:10	0
2	-copOvldyKh1qr-vzkDEvw	MYoRNlb5chwjQe3c_k37Gg	It's open even when you think it isn't	2013-08-18 00:56:08	0
3	FjMQVZjSqY8syIO-53KFKw	hV-bABTK-glh5wj31ps_Jw	Very decent fried chicken	2017-06-27 23:05:38	0
4	Id0AperBXk1h6UbqmM80zw	_uN0OudeJ3ZI_tf6nxg5ww	Appetizers.. platter special for lunch	2012-10-06 19:43:09	0

## ★ Tips Entity table

index	review_id	user_id	business_id	stars	useful	funny	cool	text	date
0	KU_05udG6zpxOg-VcAEodg	mh_eMz6K5RLWhZylSBhwA	XQfwVwDr-v0ZS3_CbbE5Xw	3	0	0	0	If you decide to eat here, just be aware it is going to take about 2 hours from beginning to end. We have tried it multiple times, because I want to like it! I have been to it's other locations in NJ and never had a bad experience. The food is good, but it takes a very long time to come out. The waitstaff is very young, but usually pleasant. We have just had too many experiences where we spent way too long waiting. We usually opt for another diner or restaurant on the weekends, in order to be done quicker.	2018-07-07 22:09:11
1	BiTunyQ73aT9WBnpR9DZGw	OyoGAe7OKpv6SyGZT5g77Q	7ATYjTlgM3jUlt4UM3lypQ	5	1	0	1	I've taken a lot of spin classes over the years, and nothing compares to the classes at Body Cycle. From the nice, clean space and amazing bikes, to the welcoming and motivating instructors, every class is a top notch work out. For anyone who struggles to fit workouts in, the online scheduling system makes it easy to plan ahead (and there's no need to line up way in advanced like many gyms make you do). There is no way I can write this review without giving Russell, the owner of Body Cycle, a shout out. Russell's passion for fitness and cycling is so evident, as is his desire for all of his clients to succeed. He is always dropping in to classes to check in/provide encouragement, and is open to ideas and recommendations from anyone. Russell always wears a smile on his face, even when he's kicking your butt in class!	2012-01-03 15:28:18
2	saUsX_uimxRiCVr67Z4Jig	8g_iMtSiwikVnbP2etR0A	YjUWPrpI6HXG530lwP-fb2A	3	0	0	0	Family diner. Had the buffet. Eclectic assortment: a large chicken leg, fried jalapeño, tamale, two rolled grape leaves, fresh melon. All good. Lots of Mexican choices there. Also has a menu with breakfast served all day long. Friendly, attentive staff. Good place for a casual relaxed meal with no expectations. Next to the Clarion Hotel.	2014-02-05 20:30:30
3	AqPFMieE6RsU23_auEsxA	_7bHUI9Uuf5__Hhc_Q8guQ	kxX2SOes4o-D3ZQBkiMRfA	5	1	0	1	Wow! Yummy, different, delicious. Our favorite is the lamb curry and korma. With 10 different kinds of naan!!! Don't let the outside deter you (because we almost changed our minds)...go in and try something new! You'll be glad you did!	2015-01-04 00:01:03
4	Sx8TMOWLNUJBWer-OpcmoA	bqjbaE6dDog4jkNY91nclQ	e4Vwtrqf-wpJfwesvgvdgxQ	4	1	0	1	Cute interior and owner (?) gave us tour of upcoming patio/rooftop area which will be great on beautiful days like today. Cheese curds were very good and very filling. Really like that sandwiches come w salad, esp after eating too many curds! Had the onion, gruyere, tomato sandwich. Wasn't too much cheese which I liked. Needed something else...pepper jelly maybe. Would like to see more menu options added such as salads w fun cheeses. Lots of beer and wine as well as limited cocktails. Next time I will try one of the draft wines.	2017-01-14 20:54:15

## ★ User Entity table

user_id	name	review_count	yelping_since	useful	funny	cool	elite	friends	fans	...	compliment_more	compliment_profile	compliment_cute	compliment_list	compliment_note	compliment_plain	compliment_cool	compliment_funny	compliment_writer	compliment_photos	
0	qVd0DYU55jXVbgXdf7w	Walker	585	2007-01-25 16:47:26	7217	1259	5994	2007	NSCj54eVehBjyZ0g2E4w, pe4277DcH2Qm81Nx-SqA...	267	...	65	55	56	18	232	844	467	467	239	180
1	j14WgRoU_-22E1av1dXrJg	Daniel	4333	2009-01-25 04:35:42	43091	13066	27281	2009,2010,2011,2012,2013,2014,2015,2016,2017...	uREPECX75ePMqOFyjQ, 52d4HdRvzz1w85UxUA...	3138	...	264	184	157	251	1847	7054	3131	3131	1521	1946
2	ZWnXYQFK0hExoTxPIV2zvg	Steph	665	2008-07-25 10:41:00	2086	1010	1003	2009,2010,2011,2012,2013	Lu3Q36n3bdhyHahITRA, j9B4khUhDTKvecyWogj...	52	...	13	10	17	3	66	96	119	119	35	18
3	SZDeASXg7o5mNLshsdA	Gwen	224	2005-11-29 04:38:33	512	330	299	2009,2010,2011	env1VPhsfUdPhs6PH...g, 4v0cMILU69slsgq/4vg...	28	...	4	1	6	2	12	16	26	26	10	9
4	hASIMy-EnncsH4JoR-hFGQ	Karen	79	2007-01-05 19:40:59	29	15	7		PBK4q9KEEBHhvF5XUirlw, 3FWPpM7K1gXeOM_2ByMba...	1	...	1	0	0	1	1	0	0	0	0	0

# 05

## SQL QUERIES, DATA ANALYSIS, FINDINGS

# BUSINESS QUESTIONS

1. Which types of businesses are most frequently reviewed by users with a high review count ( $>600$ ), what are their average star ratings?
2. Who are the elite users? How many reviews do they have?
3. What are the top three businesses that have received the most reviews from users with a large fan base( $>=100$ ) on the platform?
4. What business locations have the highest check-in frequency?
5. What kind of business category are the top 5 check-in?
6. Do businesses with higher review counts tend to receive more tips?

1. Which types of businesses are most frequently reviewed by users with a high review count (>600), what are their average star ratings?

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3. What are the top three businesses that have received the most reviews from users with a large fan base(>=100) on the platform?

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```
SELECT B.categories, AVG(R.stars) AS average_star_rating  
FROM User U  
INNER JOIN Review R ON U.User_id = R.User_id  
INNER JOIN yelp_academic_dataset_business B ON  
R.Business_id = B.Business_id  
WHERE U.Review_count > 600  
GROUP BY B.categories  
ORDER BY average_star_rating DESC;
```

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categories	average_star_rating
Cupcakes, Caribbean, Restaurants, Trinidadian, Food, Bakeries, Cafes	5
Orthodontists, Health & Medical, Oral Surgeons, General Dentistry, Dentists, Cosmetic Dentists	5
Food, Delis, Italian, Bakeries, Restaurants	5
Painters, Home Services, Decks & Railing, Contractors, Pressure Washers	5
Vietnamese, Food, Restaurants, Food Trucks	5
Theatre, Stage & Studio, Dance Wear, Performing Arts	5
Dance Wear, Sports Wear, Children's Clothing, Arts & Entertainment, Social Clubs, Performing Arts, Sporti...	5
Hawaiian Food, Food Trucks, Street Vendors, Restaurants	5
Shopping, Books, Mags, Music & Video, Toy Stores, Hobby Shops, Comic Books	5
Italian, Mexican, American, Indian, Burgers, Fast Food, Steakhouses	5
Seafood, Restaurants, Sushi Bars, Japanese	5
Hotels, Motels, Bed & Breakfast, Bed & Breakfasts, Lodging Services, Mailbox Centers	4.5
Local Services, Shopping Centers, Nurseries, Printing Services, Mailbox Centers	4.75
Salad, Restaurants, Burgers, Soul Food	4.6666666666666667
Active Life, Playgrounds, Parks, Swimming Pools	4.5
Food, Coffee, Tea	4.5
Streetwear, Restaurants, Sushi Bars, Japanese	4.5
Entertainment, Arts & Entertainment, Brewpubs, American (Traditional), Bakeries, Breweries, Food, Restau...	4.5
Bars, Beer Gardens, Food, Breweries, Nightlife, Tours, Pubs, Wine Tours, Beer Tours, Hotels & Travel	4.5
Restaurants, Breakfast & Brunch, Vegan, Bagels, Food, Coffee & Tea	4.5
Food, Beer, Wine & Spirits, Breweries	4.25
Home Decor, Shopping, Antiques, Books, Mags, Music & Video, Home & Garden	4.25
Shops, Boutiques, Apparel, Video, Bookstores, Venues & Event Spaces, Performing Arts & Entertainment, Hotels & Travel, Food, Convenience Store...	4.125
Irish Pub, Bars, Restaurants, Irish, Nightlife	4
Dog Parks, Active Life, Parks	4
Other Businesses, Cupcakes, Ice Cream & Frozen Yogurt	4
Professional Sports Teams, Arts & Entertainment	4
Food, Ice Cream & Frozen Yogurt, Desserts, Shaved Ice	4

- ★ Businesses with perfect ratings often specialize in a specific niche
- ★ Focusing on high-quality service leads to excellent reviews

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```
SELECT u.user_id, u.name, u.review_count, date_joined.joined  
as joined, u.useful, u.funny, u.cool, u.fans, round(avg(stars),1)  
as avg_stars
```

```
FROM user u
```

```
INNER JOIN (
```

```
SELECT user_id, str_to_date(yelping_since,  
'%m/%d/%Y') as joined
```

```
FROM user
```

```
WHERE elite <> ""
```

```
) as date_joined
```

```
ON u.user_id = date_joined.user_id
```

```
INNER JOIN review r ON u.user_id = r.user_id
```

```
GROUP BY u.user_id, u.name, u.review_count,  
date_joined.joined, u.useful, u.funny, u.cool, u.fans
```

```
ORDER BY review_count desc;
```

**1. Which types of businesses are most frequently reviewed by users with a high review count (>600), what are their average star ratings?**

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user_id	name	review_count	joined	useful	funny	cool	fans	avg_stars
Hi10sGSZNxQH3NLyWSZ1oA	Fox	17473	2009-05-26	206296	185823	195814	3493	4.2
hWDybukVvLSDefzGmTw	Bruce	16567	2009-03-08	173089	98459	144849	867	3.9
bQCHF5rn5M19c5kEwCaNA	Vincent	8354	2012-03-18	42959	21176	36600	362	4.2
8RcEwGrFIgk7WQ35E6SnQ	George	7738	2009-11-06	8110	3868	3165	288	3.6
CxDODnhI8gp9KXzpBHJYXw	Jennifer	6679	2009-11-09	23254	9326	14773	828	3.3
HFECrzyDpgbS5EmTBtj2zQ	Eric	5887	2007-03-28	41470	22226	33884	444	3.9
m07sy7eLtOjVdZ8oN9JKag	Ed	5800	2006-07-22	73528	52593	62742	2251	3.8
ks1MQHwIfD0462PE61Bw	Rob	5511	2007-08-25	13351	4766	8994	445	3.6
IIGYj_XAMG3v75rmtBs_Q	Dominik	5434	2015-05-16	3267	904	2146	95	4.4
U4INQZOPSUaj8hMjlZ3KA	Michael	5061	2008-01-31	31803	14807	23493	1238	3.9

user_id	name	review_count	joined	useful	funny	cool	fans	avg_stars
hId6tb158sFw9HgyfrXYHw	Shelly	17	2017-02-13	12	0	4	1	5.0
CtuHCVmGe0ZdvMoHoTDouQ	Kitty	15	2020-09-08	19	1	9	2	5.0
1q6h738HLWdmIX4pFv4olsA	Amy	14	2016-10-02	6	2	2	0	5.0
GvMyZ4OaShwnBZA4A1Rnw	Brandon	14	2019-10-14	7	1	4	1	5.0
ehUOcpRgLU0Qh_5F5BHTyg	Diana	13	2014-03-31	26	15	19	9	5.0

- ★ Some elite users, with a presence on the site for over 10 years, boast a large number of reviews and receive numerous "reactions" (useful, funny, cool).
- ★ Other elite users, have a limited number of reviews, yet consistently give 5-star ratings.

1. Which types of businesses are most frequently reviewed by users with a high review count (>600), what are their average star ratings?

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```
SELECT b.business_id, b.name as business_name,  
count(*) as Amount_Of_Popular_Users,  
sum(b.review_count) as Total_Review  
  
FROM user as u  
  
RIGHT JOIN review r ON u.user_id = r.user_id  
  
JOIN business b ON b.business_id = r.business_id  
  
WHERE fans >= 100  
  
GROUP BY b.business_id, b.name  
  
ORDER BY Total_Review DESC  
  
LIMIT 3;
```

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business_id	business_name	Amount_Of_Popular_Users	Total_Review
ORL4JE6tz3rJxVqkdKfegA	Gaylord Opryland Resort & Convention Center	11	18029
oaboaRBUsGjbo2kfUIKDLQ	Mike's Ice Cream	8	4744
sB45WFgysT617bKWP_WJwA	Budweiser Brewery Experience	7	4235

- ★ Identifying businesses that engage with popular users
- ★ Provides insights into community dynamics and preferences

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```
SELECT postal_code, sum(date_count) as sum_checkin  
FROM business b  
INNER JOIN checkin c  
ON b.business_id = c.business_id  
GROUP BY postal_code  
ORDER BY sum_checkin desc  
LIMIT 5;
```

1. Which types of businesses are most frequently reviewed by users with a high review count (>600), what are their average star ratings?

2. Who are the elite users? How many reviews do they have?

3. What are the top three businesses that have received the most reviews from users with a large fan base(>=100) on the platform?

4. What business locations have the highest check-in frequency?

5. What kind of business category are the top 5 check-in?

6. Do businesses with higher review counts tend to receive more tips?

postal_code	sum_checkin
93101	12681
70130	9461
19107	7000
70002	5667
89502	5651

93101 - Santa Barbara, California  
70130 - New Orleans, Louisiana  
19107 - Philadelphia, Pennsylvania  
70002 - Metairie, Louisiana  
89502 - Reno, Nevada

- ★ Frequent check-ins from Santa Barbara to Reno highlight the universal appeal of cultural and recreational spots
- ★ Preference for vibrant, activity-rich environments in both urban and suburban areas

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```
SELECT categories,sum(date_count) as sum_checkin  
FROM business b  
INNER JOIN checkin c  
GROUP BY categories  
ORDER BY sum_checkin desc  
LIMIT 5;
```

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categories	sum_checkin
Education, Colleges & Universities	4397
Food, Coffee & Tea	3642
Zoos, Arts & Entertainment, Performing Arts, Act...	3591
Food, Grocery, Organic Stores, Specialty Food,...	3096
Gyms, Trainers, Active Life, Fitness & Instruction	2640

- ★ Rising consumer interest in educational, social, and health-focused experiences.
- ★ Businesses in these sectors can leverage this trend by providing enriching experiences to their customers.

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```
SELECT name, review_count, tips_count  
FROM business_data  
JOIN tips_data  
ON business_data.business_id = tips_data.business_id  
ORDER BY tips_count DESC;
```

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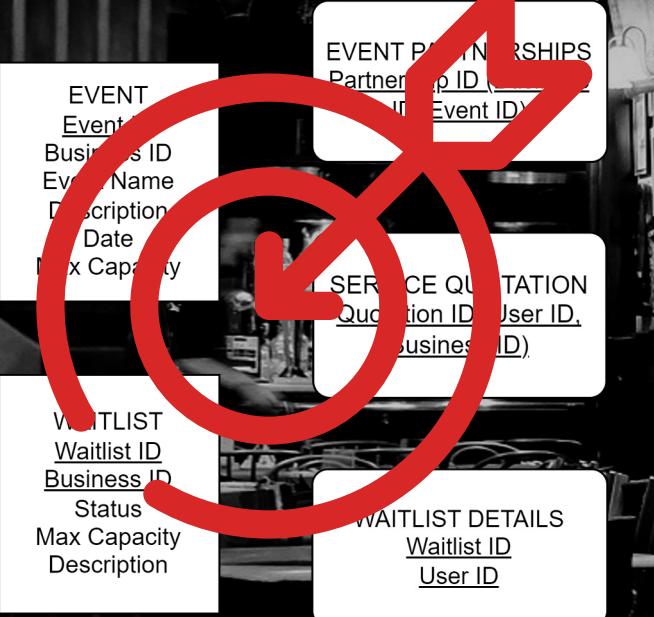
6. Do businesses with higher review counts tend to receive more tips?

	name	review_count	tips_count
▶	CafÃƒÂ© Du Monde	1880	2571
	Tap & Bottle	246	1011
	Gran Caffe L'Aquila	1138	1011
	AJ's Fine Foods	258	1011
	Atlantis Casino Resort Spa	1218	1011
	Philadelphia International Airport - PHL	2149	1011
	Beachside Bar-Cafe	640	1011
▶	Acme Oyster House	7568	932
	Oceana Grill	7400	613
	Hattie BÃ¢-â¢s Hot Chicken - Nashville	6093	579
	Reading Terminal Market	5721	827
	Ruby Slipper - New Orleans	5193	541

- ★ It is not always that businesses that have a higher review count tend to receive higher tips.
- ★ Tips are given purely by reviewers for informing new visitors about something special about the business.
- ★ This may happen if the business is famous, reducing the need for unique comments.

**06**

**PROJECT  
EXTENSION**



We've discovered intriguing Yelp services like waitlist and service quotes and aim to explore these further for deeper business insights.



# MEMBERS' CONTRIBUTION

	SARA	ANGEL	LISA	TING	MOLLY
STAGE 1	Create a metadata document	Create two more entities and five attributes for each.	Draw an ER Diagram	Define specific business rules	Create 5 business questions
STAGE 2	as-is dependency diagram	as-is dependency diagram	Graphical relational schema and as-is dependency diagram	as-is dependency diagram	as-is dependency diagram
STAGE 3	Data Analysis using SQL	Data Analysis using SQL	Data Analysis using SQL	Data Analysis using SQL	Data Analysis using SQL

# **THANK YOU FOR LISTENING**