Yelp Project Report

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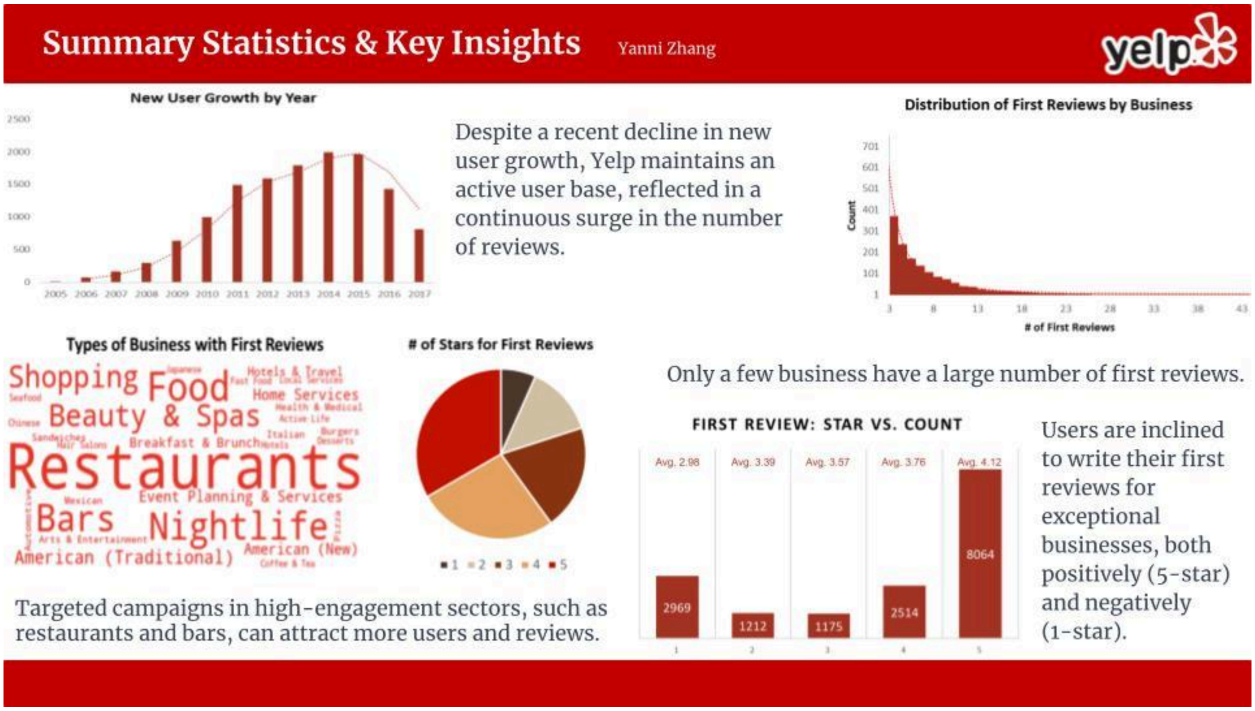

Summary Statistics & Key Insights

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Despite a recent decline in new user growth, Yelp maintains an active user base, reflected in a continuous surge in the number of reviews.

Only a few business have a large number of first reviews.

Users are inclined to write their first reviews for exceptional businesses, both positively (5-star) and negatively (1-star).

Targeted campaigns in high-engagement sectors, such as restaurants and bars, can attract more users and reviews.

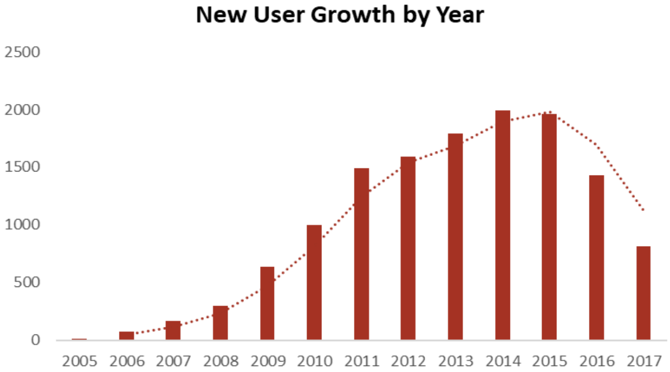
Yelp, an online platform for consumers to share their experiences with businesses, has been one of the most widely used business review applications since its launch in 2004. Users rely on Yelp to make informed decisions about where to eat, shop, or entertain. Engaging with local businesses, Yelp has become a valuable source of information for both consumers and businesses. To gain insights from Yelp's vast collection of user-generated data, I have obtained a subset of the Yelp dataset and plan to conduct a thorough analysis to study consumer behavior, preferences, and trends. I hope this could inform and improve Yelp's user acquisition strategy.

As a starting point, it is important to establish some summary statistics about the dataset. The data I am working with covers the period from 2005 to 2017, with a primary concentration of businesses in several locations, including Las Vegas, Phoenix, and Toronto.[1] In the dataset, I have identified 28,450 distinct businesses, 13,261 distinct users, and 48,862 distinct reviews. On average, each business has around 1.7 reviews, with the highest receiving 77 reviews and the

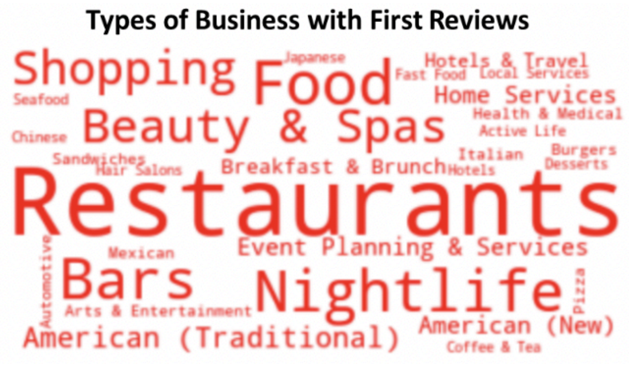
[1] Appendix: Table 1 shows the top five cities with the highest number of businesses.

lowest receiving just one. I also found 4,743 active users who have posted at least one review in the past year, that is, in 2017.

My analysis then looks at Yelp's user growth by examining the number of new users in each year. It can be found that Yelp has experienced increasing user growth since 2005, peaking in 2014 and 2015 when Yelp attracted nearly 2,000 new users each year. Despite the declining trend in new user growth in the last 3 years, the number of reviews on Yelp continues to surge each year, indicating a highly active and engaged existing user base. For instance, in 2006, Yelp had only 40 reviews, but by 2017, it received a staggering 11,036 reviews in total.[2]



To unravel the driving force behind the first reviews by each user, I begin by filtering the dataset to obtain the 15,934 first reviews and subsequently search for commonalities among them. My findings indicate that exceptional businesses, both positively and negatively, tend to elicit commentary from customers. Specifically, out of the 15,934 first reviews, over 8,000 are 5-star reviews, while almost 3,000 are 1-star reviews.[3] I then delved into the business categories of the first reviews. As each business id may belong to multiple categories, I utilized a visually-appealing word cloud to showcase the most commonly mentioned categories.[4] My analysis revealed that users predominantly write their first reviews for businesses in the restaurant, bar, beauty and spas, and shopping sectors, among others. This suggests that the service industry is likely to receive more feedback from customers.[5] I also count the number of businesses by the number of first reviews they have received, and I noticed that only a few restaurants have a relatively large number of



[2] Appendix: Table 2 shows the number of new users and reviews each year.
[3] Appendix: Table 3 shows the number of first reviews according to the number of stars awarded.
[4] Appendix: Table 4 shows the top 30 business categories for business receiving first reviews.
[5] Appendix: Table 5 shows the number of occurrences of some business keywords in the first reviews.

first reviews. Most businesses have received less than 10 first reviews, while the business with the most first reviews has received more than 40. Therefore, I can conclude that the distribution of first reviews among businesses is heavily skewed to the right.

Above all, I have identified several key insights that can inform Yelp's business strategy. Firstly, I find that exceptional businesses tend to elicit commentary from customers, which presents an opportunity for Yelp to encourage more users to share their experiences by offering incentives or rewards for writing a review. Additionally, my analysis shows that users predominantly write their first reviews for businesses in the restaurant, bar, beauty and spas, and shopping sectors. Yelp can focus on these industries and create targeted campaigns to attract more users and reviews from these sectors. Moreover, Yelp can leverage data insights to improve its recommendation engine and provide more personalized recommendations to users, thereby promoting a thriving online community. By implementing these strategies, Yelp can enhance user experience and attract more new users, ultimately leading to sustainable growth for the platform.

Appendix 1. Tables

Table 1. Top five cities with the highest number of businesses

City	Number of Business
Las Vegas	6120
Phoenix	3044
Toronto	2565
Scottsdale	1595
Charlotte	1310

Table 2. Number of new users and reviews in each year

Year	Number of New Users	Number of Reviews
2005	13	/
2006	75	40
2007	164	139
2008	299	483
2009	636	661
2010	999	1400
2011	1490	2462
2012	1591	3002
2013	1792	4223
2014	1995	6106
2015	1963	8878
2016	1432	10432
2017	812	11036

Table 3. Number of first reviews according to the number of stars awarded

Stars	Number of First Review	Average Business Stars
1	2969	2.98
2	1212	3.39
3	1175	3.57
4	2514	3.76
5	8064	4.12

Table 4. Top 30 business categories for business receiving first reviews

Business Categories	Frequency
Restaurants	5997
Food	1895
Nightlife	1695
Bars	1566
Beauty & Spas	1015
Shopping	982
American (Traditional)	944
Event Planning & Services	871
Home Services	827
American (New)	827
Breakfast & Brunch	748
Hotels & Travel	646
Health & Medical	584
Mexican	581
Sandwiches	574
Automotive	563
Italian	561
Pizza	560

Burgers	513
Arts & Entertainment	494
Local Services	486
Coffee & Tea	480
Seafood	434
Active Life	406
Hotels	386
Chinese	386
Japanese	367
Hair Salons	364
Fast Food	355
Desserts	352

Table 5. Number of occurrences of some business keywords in the first reviews

Business Keyword	Number of occurrences in First Review
restaurants	9063
services	3335
bars	3191
hotels	1302

Appendix 2. SQLite Code

```
-- total distinct user count
SELECT COUNT(DISTINCT user_id)
FROM user;

-- total distinct business count
SELECT COUNT(DISTINCT business_id)
FROM business;

-- total distinct review count
SELECT COUNT(DISTINCT review_id)
FROM review;

-- total distinct reviewer count
SELECT COUNT(DISTINCT user_id)
 FROM review;

-- active user count (users who have posted reviews in 2017)
SELECT COUNT(DISTINCT user_id)
FROM review
WHERE substr(date, 1, 4) = '2017';

-- calculate review per business
CREATE TEMPORARY TABLE review_business AS SELECT business_id,
                                   count( * ) AS freq
                                FROM review
                               GROUP BY business_id;

SELECT MAX(freq),
    MIN(freq),
    AVG(freq)
 FROM review_business;

-- top five city with the highest number of businesses
SELECT city,
    count( * ) AS cout_of_business
 FROM business
GROUP BY city
ORDER BY cout_of_business DESC
LIMIT 5;

-- how many new user we have each year
SELECT substr(yelping_since, 1, 4) AS year, count(*) AS NumNewUser
```

```
FROM user
GROUP BY year;

-- how many reviews we have each year
SELECT substr(date, 1, 4) AS year, count(*) AS NumReview
FROM review
GROUP BY year;

-- presenting the above two in one table
SELECT *
FROM
   (SELECT substr(yelping_since, 1, 4) as year
   FROM user
   UNION
   SELECT substr(date, 1, 4)
   FROM review)
   LEFT JOIN
   (SELECT substr(yelping_since, 1, 4) AS year, count(*) AS NumNewUser
   FROM user
   GROUP BY year) AS T1
   USING ('year')
   LEFT JOIN
   (SELECT substr(date, 1, 4) AS year, count(*) AS NumReview
   FROM review
   GROUP BY year) AS T2
   USING ('year');

-- first review from each user
SELECT *
FROM review
INNER JOIN
   (SELECT user_id, MAX(date) AS first_date
   FROM review
   GROUP BY user_id) AS A
ON review.user_id = A.user_id
AND review.date = A.first_date;

-- first review from each user joining business information
SELECT *
FROM (SELECT *
   FROM review
   INNER JOIN
       (SELECT user_id, MAX(date) AS first_date
        FROM review
```

```
      GROUP BY user_id) AS A
  ON review.user_id = A.user_id
  AND review.date = A.first_date)
  LEFT JOIN business USING ("business_id");

-- what rating (star) does the first review give? What are the average stars for the business receiving the new comments?
SELECT FR.stars, count(*) AS frequency, ROUND(AVG(business.stars), 2) AS avg_business_stars
FROM (SELECT *
  FROM review
  INNER JOIN
     (SELECT user_id, MAX(date) AS first_date
      FROM review
      GROUP BY user_id) AS A
  ON review.user_id = A.user_id
  AND review.date = A.first_date) AS FR
  LEFT JOIN business USING ("business_id")
GROUP BY FR.stars
ORDER BY FR.stars;

-- which business attracts more new users to leave the first comment?
SELECT FR.business_id, count(*) AS frequency, B.stars, B.categories
FROM (SELECT *
  FROM review
  INNER JOIN
     (SELECT user_id, MAX(date) AS first_date
      FROM review
      GROUP BY user_id) AS A
  ON review.user_id = A.user_id
  AND review.date = A.first_date) AS FR
  LEFT JOIN business AS B USING ("business_id")
GROUP BY FR.business_id
ORDER BY frequency DESC;

-- number of occurrences of some business keyword in the first reviews
CREATE TEMPORARY TABLE T1 AS SELECT FR.business_id,
                          count( * ) AS frequency,
                          B.stars,
                          B.categories
                      FROM (
                             SELECT *
                               FROM review
                                   INNER JOIN
                                   (
                                      SELECT user_id,
                                           MAX(date) AS first_date
                                       FROM review
                                      GROUP BY user_id
                                   )
                                   AS A ON review.user_id = A.user_id AND
                                         review.date = A.first_date
                          )
                          AS FR
                          LEFT JOIN
                          business AS B USING (
                             business_id
                          )
                      GROUP BY FR.business_id
                      ORDER BY frequency DESC;

SELECT sum(frequency) AS occur_restaurants
 FROM T1
WHERE categories LIKE '%restaurants%';

SELECT sum(frequency) AS occur_services
 FROM T1
WHERE categories LIKE '%services%';

SELECT sum(frequency) AS occur_bars
 FROM T1
WHERE categories LIKE '%bars%';

SELECT sum(frequency) AS occur_hotels
 FROM T1
WHERE categories LIKE '%hotels%';



-- business category keyword occurrence
SELECT word, COUNT(*) AS frequency
FROM(WITH split(word, csv) AS
  (
  SELECT
  -- in final WHERE, we filter raw csv (1st row) and terminal ',' (last row)
  '',
  -- here you can SELECT FROM e.g. another table: col_name||',' FROM X
  (SELECT GROUP_CONCAT(categories, ',')
     FROM
     (SELECT FR.business_id, count(*) AS frequency, B.categories
     FROM (SELECT *
            FROM review
            INNER JOIN (SELECT user_id, MAX(date) AS first_date
                   FROM review
                   GROUP BY user_id) AS A
            ON review.user_id = A.user_id AND review.date = A.first_date) AS FR
            LEFT JOIN business AS B USING ("business_id")
            GROUP BY FR.business_id)
  )||',' -- terminate with ',' indicating csv ending
 -- 'recursive query'
 UNION ALL SELECT
  substr(csv, 0, instr(csv, ',')), -- each word contains text up to next ','
  substr(csv, instr(csv, ',') + 1) -- next recursion parses csv after this ','
 FROM split -- recurse
 WHERE csv != '' -- break recursion once no more csv words exist
) SELECT word FROM split
WHERE word!='')
GROUP BY word
ORDER BY frequency DESC;
```