Filtering Data in SQL

Please note that any topics that are not covered in today's lecture will be covered in the next lecture.

Problem Statement:

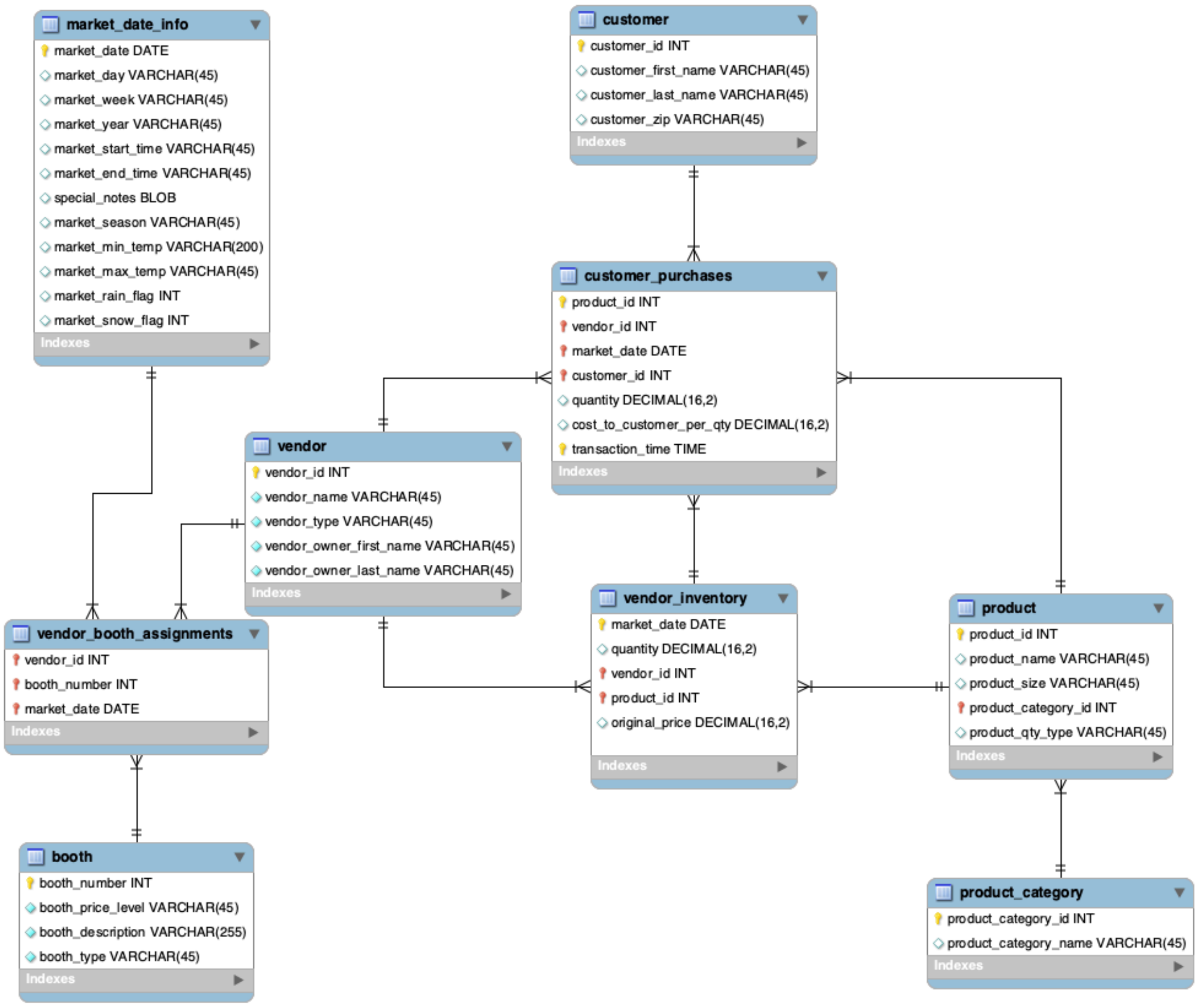
- Amazon Farmers Market (AFM), a beloved community market, faces a growing threat from large grocery chains that are expanding their local produce offerings. To maintain its customer base and thrive in this competitive environment, AFM needs to leverage data analytics for a deeper understanding of:

    - **Customer Behavior**: Analyze purchase history, spending habits, and visit frequency to identify customer segments, preferences, and potential churn risks.
    - **Vendor Performance:** Analyze sales data and customer attraction metrics to identify top-performing vendors, evaluate product popularity, and optimize vendor selection.

    - **Market Operations**: Analyze traffic trends and seasonal sales patterns to optimize inventory management, staffing levels, and marketing campaigns.
    - **Inventory management:** Analyze future demand for specific products based on historical sales data to optimize the right amount of inventory to meet customer needs while minimizing waste and storage costs.

- After gaining a basic understanding of SQL commands and data extraction techniques, you have been delving deeper into the Farmer's Market database to understand all of these mentioned parameters.
    - Your recent exploration has revealed the need for more advanced data manipulation techniques, especially around handling text data and complex filtering.
- As an intern, you are not sure how to proceed, and you have several questions:
    - How to combine two columns into a single column?
    - The formatting of some records is inconsistent, with some being in lowercase, others in uppercase, or a mix. So how to Standardize those records?
    - If you want to extract only specific parts of text data, such as the initial character of a field, how to do it?
    - If you want to filter the data based on different criteria, how to do it?
- To address these doubts, your manager advises you to:
    - Explore String Manipulation Functions to manipulate strings in SQL and how to do proper formatting.
    - Understand Advanced Filtering Techniques.
    - And apply these techniques to extract the insights.
- By mastering these advanced string manipulation and filtering techniques, you will be better equipped to optimize inventory management, tailor marketing efforts, improve the customer experience for long-term success and solidify AFM's position as a vital community hub for fresh, local produce.

Dataset: Farmer’s Market database



<u>Formulating questions to be explored based on the data provided</u>:

- **Customer Behavior:**
  - We want to merge each customer’s name into a single column that contains the first name, then a space, and then the last name.

    - We have a customer with first_name “john” and last_name “doe”. How can we properly format his name by capitalizing the first letter of the first & last name while keeping all other letters in lowercase?
    - Print a report of everything the customer_id 4 has ever purchased at the market, sorted by date. Add the total_amt column as well for each purchase.
    - Return a list of customers with the following last names: [Diaz, Edwards, Wilson]
    - You want to get data about a customer you know as Jerry but you are not sure if they are listed as Jeremy or Jeremiah or Jerry. Get all customers whose name starts with “jer”.
    - Your manager wants to see all the unique customer IDs present in the `customer_purchases` table. How would you get this data?

- **Vendor Performance:**
    - Find the booth assignments for vendor_id 7 for all dates between April 3, 2019 and May 16, 2019, including the 2 dates.
    - Find out which vendors primarily sell fresh products and which don’t.
    - What if we want to add 1 for vendors who sell fresh products and 0 for those who don’t?

- **Market Operations**:
    - Analyze purchases made at the market on days when it rained.
    - Put the total cost of customer purchases into different bins.
        - under $5.00,
        - $5.00–$9.99,
        - $10.00–$19.99, or
        - $20.00 and over.

- **Inventory management:**
    - Get all the product info for products with ID between 3 and 8 (not inclusive) and for products with ID 10.

- Extract all the product names that are part of product category 1
- Find all of the products from the `product` table that don't have their sizes mentioned.
- What if you're asked to fetch all the product IDs from the `products` table and set a default value "medium" in rows where the product size is NULL?
- List down all the product details where product_category_name contains "Fresh" in it.

Up until now, we have manipulated just numbers, what about strings?

Concatenating Strings: How to work with strings in SQL?

There are also **inline functions** that can be used to modify string values in SQL, as well.

Notice that our customer table has separate columns for each customer's first and last names.

Let's quickly look at the customer table.

```
SELECT *
FROM farmers_market.customer
LIMIT 5
```

Question: We want to merge each customer's name into a single column that contains the first name, then a space, and then the last name.

CONCAT()

- We can accomplish that by using the CONCAT() function.

- The list of string values you want to merge together are entered into the CONCAT() function as parameters.
- A space can be included by surrounding it with quotes.

```
SELECT
customer_id,
CONCAT(first_name, " ", last_name) AS full_name
FROM farmers_market.customer
LIMIT 5
```

Now we want the formatting to be good and precise. Let's see how we can achieve this.

Question: In a customer's full_name, we want the **first_name to be in upper case** followed by the last_name as it is.

UPPER() is a function that capitalizes string values.

- It's also possible to nest functions inside other functions, which the SQL interpreter executes **from the "inside" to the "outside."**
- We can enclose the UPPER() function inside the CONCAT() function to uppercase the full name.

```
SELECT
customer_id,
CONCAT(UPPER(first_name), " ", last_name) AS full_name
FROM farmers_market.customer
LIMIT 5
```

Similar to the UPPER() function, we also have a **LOWER()** function in case we want to turn some string value into lowercase.

Question: What if we only want to display a subset of a string?

For that, we can use a function called **SUBSTR()**.

Syntax: SUBSTR(value, position, length)

- **position** tells us which character to start from.
- **length** tells us up to which character we should include.

Say we want to display only the first character of someone's last_name?

```
SELECT
customer_id,
CONCAT(UPPER(first_name), " ", SUBSTR(last_name, 1, 1) AS full_name
FROM farmers_market.customer
LIMIT 5
```

Question: We have a customer with first_name "**john**" and last_name "**doe**". How can we properly format his name by capitalizing the first letter of the first & last name while keeping all other letters in lowercase?

```
SELECT
CONCAT(UPPER(SUBSTR("john", 1, 1)),
LOWER(SUBSTR("john", 2)), " ",
UPPER(SUBSTR("doe", 1, 1)),
LOWER(SUBSTR("doe", 2))) AS full_name;
```

In BigQuery, we also have the **INITCAP()** function that we can use.

It takes a STRING and returns it with the first character in each word in uppercase and all other characters in lowercase.

```
SELECT
CONCAT(INITCAP("john")," ", INITCAP("doe")) AS full_name;
```

As we have seen how we can manipulate strings in SQL, now let’s explore how we can filter the data based on the different criteria and requirements.

Let’s say your manager comes up with some requirements:

Question: Extract all the product names that are part of product category 1

Filtering data - The **WHERE** Clause

- The WHERE clause is the part of the SELECT statement in which you list conditions that are used to determine which rows in the table should be included in the results set.
- In other words, the WHERE clause is used for filtering of records.

```
SELECT
product_id, product_name, product_category_id
FROM farmers_market.product
WHERE product_category_id = 1
LIMIT 5
```

Similarly, what if we want all the product names that are part of any other product category except 1?

We can do this using the != or <> (Not equal to)operator.

```
SELECT
product_id, product_name, product_category_id
FROM farmers_market.product
WHERE product_category_id <> 1
LIMIT 5
```

Order of Execution of a SQL query:

- **FROM** - The database gets the data from tables in the FROM clause.
- **WHERE** - The data is filtered based on the conditions specified in the WHERE clause. Rows that do not meet the criteria are excluded.
- **SELECT** - It determines which columns to include in the final result set.
- **ORDER BY** - It allows you to sort the result set based on one or more columns, either in ascending or descending order.
- **OFFSET** - The specified number of rows are skipped from the beginning of the result set.
- **LIMIT** - After skipping the rows, the LIMIT clause is applied to restrict the number of rows returned.

Let's look into several examples:

Question: Print a report of everything the customer_id 4 has ever purchased at the market, sorted by date. Add the total_amt column as well for each purchase.

```
SELECT
customer_id, market_date, quantity,
cost_to_customer_per_qty,
ROUND(quantity * cost_to_customer_per_qty, 2) AS total_amt
FROM `farmers_market.customer_purchases`
WHERE customer_id = 4
ORDER BY market_date ASC
```

Quiz - 3

Q. Which is the right query to get all info about a customer named "Rajesh"?

a) Select * from DB.table where customer_name == "Rajesh"
b) Select customer_name from DB.table where customer_name = "Rajesh"
c) Select * from DB.table where customer_name = "rajesh"
d) Select * from DB.table where customer_name = "Rajesh" - correct

---

Question: Get all the product info for products with ID between 3 and 8 (not inclusive) and for products with ID 10.

Filtering on multiple conditions - using operators - **"AND"**, **"OR"**, **"NOT"**

- Conditions with OR between them will jointly evaluate to TRUE, meaning the row will be returned, if any of the clauses are TRUE.
- Conditions with AND between them will only evaluate to TRUE in combination if all of the clauses evaluate to TRUE. Otherwise, the row will not be returned.
- **Remember that NOT flips the following boolean value to its opposite (TRUE becomes FALSE, and vice versa).**

According to the question, we need ">3 and <8" → 4, 5, 6, 7, 10
1. Product_id > 3
2. Product_id < 8
3. Product_id = 10

```
SELECT *
FROM `farmers_market.product`
WHERE (product_id > 3 AND product_id < 8) OR product_id =10
```

Question: Find the booth assignments for vendor_id 7 for all dates between April 3, 2019 and May 16, 2019, including the 2 dates.

```
SELECT *
FROM `farmers_market.vba`
WHERE vendor_id = 7 AND
(market_date >= "2019-04-03" AND market_date <= "2019-05-18")
```

Whenever you have such range-based questions, you can use the **BETWEEN** keyword.

```
SELECT *
FROM `farmers_market.vba`
WHERE vendor_id = 7 AND
(market_date BETWEEN "2019-04-03" AND "2019-05-18")
```

NOTE:
Between is inclusive of the upper & lower limit of the range specified.

Question: Return a list of customers with the following last names: [Diaz, Edwards, Wilson]

To solve this question.. we could use a long list of OR comparisons.

```
SELECT
    customer_id,
    customer_first_name,
    customer_last_name
```

```
 FROM farmers_market.customer
 WHERE
    customer_last_name = 'Diaz'
    OR customer_last_name = 'Edwards'
    OR customer_last_name = 'Wilson'
```

Alternative approach -

Whenever we have a list of values to filter from, we can use the **IN** keyword and provide a comma-separated list of values to compare against.

```
SELECT
    customer_id,
    customer_first_name,
    customer_last_name
 FROM farmers_market.customer
 WHERE
    customer_last_name IN ('Diaz' , 'Edwards', 'Wilson')
```

In this case, the **IN** keyword will return TRUE for any row with a customer_last_name that is in the provided list.

Question: What if we want a list of all customers except those with the last names: [Diaz, Edwards, Wilson]

In such a case, we can use the **NOT** operator along with the IN keyword to exclude the customers having last names as 'Diaz' , 'Edwards' or 'Wilson'.

```
SELECT
```

```
    customer_id,
    customer_first_name,
    customer_last_name
 FROM farmers_market.customer
 WHERE
    customer_last_name NOT IN ('Diaz' , 'Edwards', 'Wilson')
```

Please note that the last names inside the IN clause are case sensitive.

So for words like diaz, EDWARDS, and WiLSoN, the IN clause will return False.
If we want to include the last names despite their case, we can do...

```
SELECT
    customer_id,
    customer_first_name,
    customer_last_name
 FROM farmers_market.customer
 WHERE
    LOWER(customer_last_name) IN ('diaz' , 'edwards', 'wilson')
```

OR use `UPPER(customer_last_name) IN ('DIAZ' , 'EDWARDS', 'WILSON')`

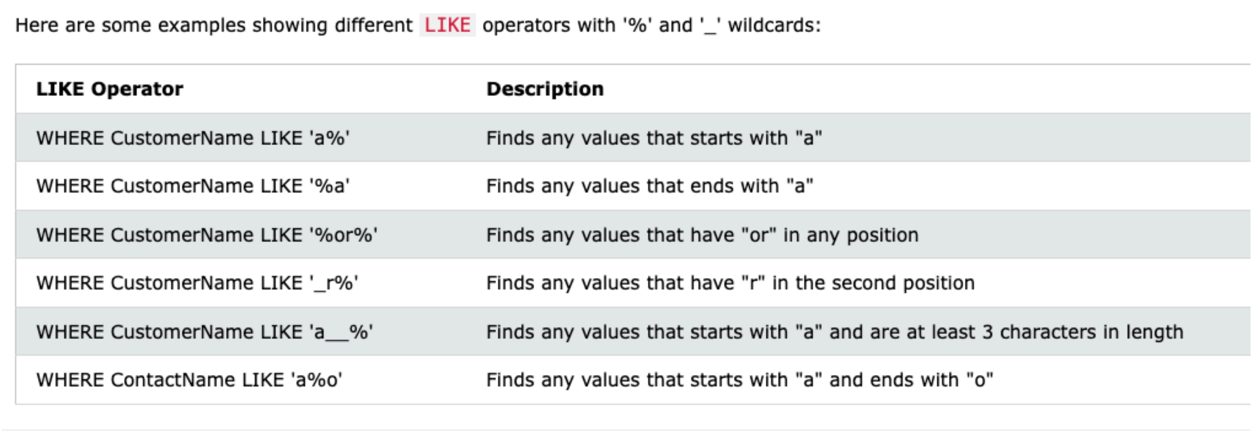
Question: You want to get data about a customer you knew as Jerry but you are not sure if they are listed as Jeremy or Jeremiah or Jerry. Get all customers whose name starts with “jer”.

In SQL, you can search for **partially matched strings** using a **comparison operator** called **LIKE**, and **wildcard characters**, which serve as a placeholder for unknown characters in a string.

Wildcards :

- **%** - a stand-in for 0 or more characters.
- **_** (underscore) - stand-in for one and only one character

```
SELECT *
FROM `farmers_market.customer`
WHERE lower(customer_first_name) LIKE "jer%"
```



Here are some examples showing different LIKE operators with '%' and '_' wildcards:

LIKE Operator	Description
WHERE CustomerName LIKE 'a%'	Finds any values that starts with "a"
WHERE CustomerName LIKE '%a'	Finds any values that ends with "a"
WHERE CustomerName LIKE '%or%'	Finds any values that have "or" in any position
WHERE CustomerName LIKE '_r%'	Finds any values that have "r" in the second position
WHERE CustomerName LIKE 'a__%'	Finds any values that starts with "a" and are at least 3 characters in length
WHERE ContactName LIKE 'a%o'	Finds any values that starts with "a" and ends with "o"

Insights and Recommendations:

1. **Effect of Proper Formatting:**

   Properly formatted customer names enhance personalized marketing and customer relationship management.

   - Recommendation: Ensure consistent data formatting practices to maintain professionalism and customer satisfaction.

2. **Customer purchase analysis:**

Analyzing individual customer purchase history provides insights into preferences and loyalty.

- Recommendation: Offer personalized promotions and recommendations based on past purchases to enhance customer retention and satisfaction.

3. **Last Name Targeting:**

   Targeting customers by last name facilitates personalized marketing efforts.

   - Recommendation: Develop targeted campaigns or loyalty programs for customers with these last names to increase engagement and loyalty.

4. **Flexible Search Capabilities:**

   Flexible search capabilities ensure accurate customer data retrieval.

   - Recommendation: Implement robust search functionalities in customer databases to facilitate efficient customer service and marketing outreach.

5. **Booth Assignment Optimization:**

   Booth assignments impact vendor visibility and sales potential.

   - Recommendation: Optimize vendor placement based on historical sales data and foot traffic patterns to maximize vendor performance during specific dates and events.

6. **Product-Specific Analysis**:

This query helps identify specific products for detailed analysis or promotion efforts.

- Recommendation: Analyze the sales performance of these products to determine if they need adjustments in pricing, marketing, or placement to boost sales.

7. **Product Category Preference Analysis:**

   Understanding product category preferences helps in targeted marketing and inventory management.

   - Recommendation: Focus on expanding product offerings in Category 1 based on popularity to attract more customers interested in these products.

Overall Summary:

Utilizing these data insights on customer behaviour, vendor performance, and market operations helps Amazon Fresh to optimize their operations further, enrich customer experiences, enhance inventory management and maintain competitiveness in the local produce market.