Unit economics

ANALYZING BUSINESS DATA IN SQL

SQL

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Unit economics

- **Unit economics:** Measures performance per unit, as opposed to overall performance
- **Example:** Average Revenue Per User (ARPU)
  - **Formula:** $\frac{Revenue}{Count\ of\ users}$
  - **Use:** Measures a company's success in scaling its business model

ARPU - query (I)

```
WITH kpis AS (
  SELECT
    SUM(meal_price * order_quantity) AS revenue,
    COUNT(DISTINCT user_id) AS users
  FROM meals
  JOIN orders ON meals.meal_id = orders.meal_id)

SELECT
  ROUND(
    revenue :: NUMERIC / GREATEST(users, 1),
  2) AS arpu
FROM kpis;
```

ARPU - query (I) by month

```sql
WITH kpis AS (
  SELECT
    DATE_TRUNC('month', order_date) AS delivr_month,
    SUM(meal_price * order_quantity) AS revenue,
    COUNT(DISTINCT user_id) AS users
  FROM meals
  JOIN orders ON m.meal_id = o.meal_id
  GROUP BY delivr_month)

SELECT
  delivr_month,
  ROUND(
    revenue :: NUMERIC / GREATEST(users, 1),
  2) AS arpu
FROM kpis
ORDER BY delivr_month ASC;
```

ARPU - query (II)

```
WITH user_revenues AS (
  SELECT
    user_id,
    SUM(meal_price * order_quantity) AS revenue
  FROM meals
  JOIN orders ON meals.meal_id = orders.meal_id
  GROUP BY user_id)

SELECT
  ROUND(AVG(revenue) :: NUMERIC, 2) AS arpu
FROM user_revenues;
```

Comparing the two ways

First way

```
revenue    users
---------  -----
260226.75  1304
```

Second way

```
user_id  revenue
-------  -------
0        262.75
1        160.5
2        255.25
```

ARPU - result

```
arpu
------
199.56
```

Unit economics

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Histograms

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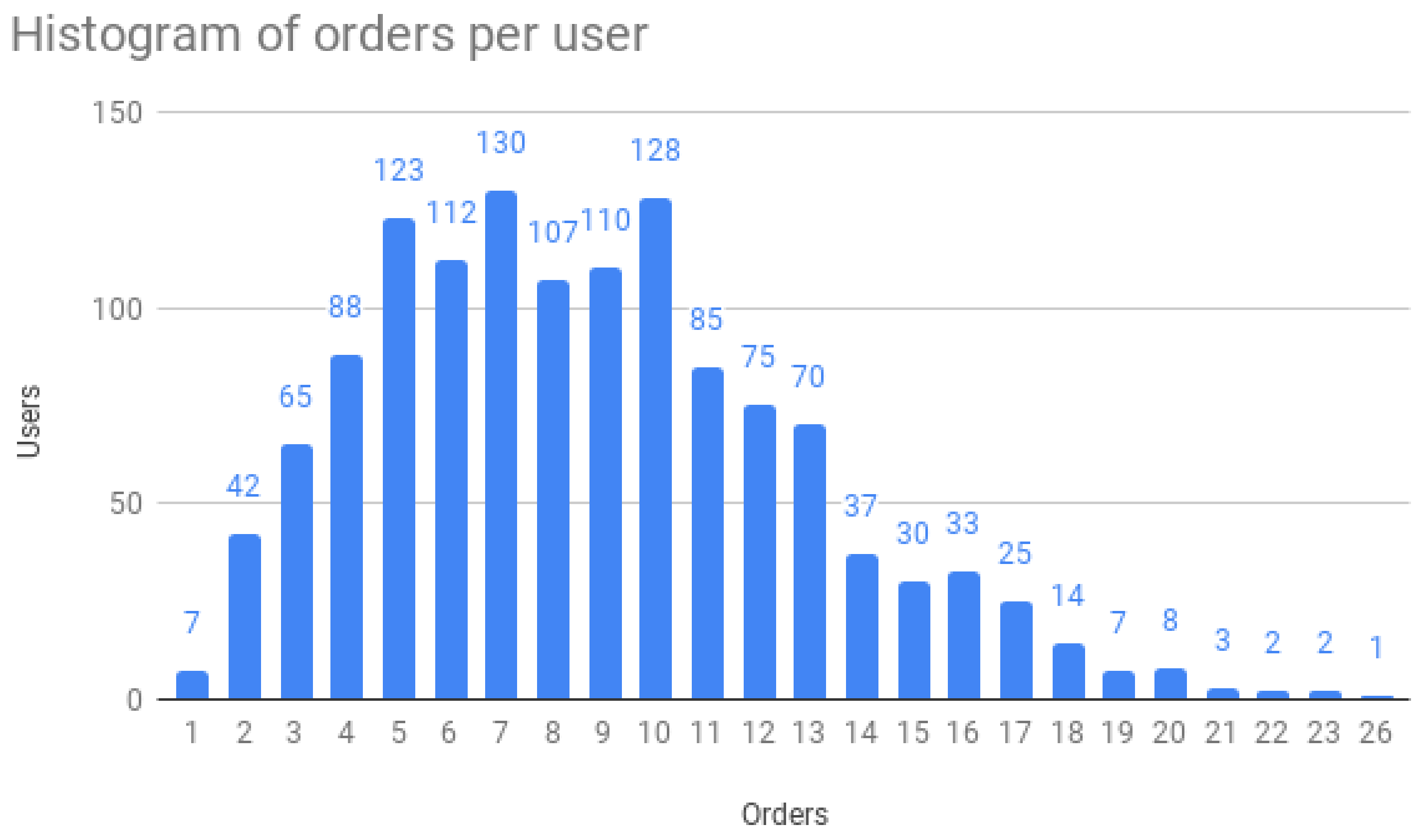
datacamp

Histograms - overview

Histogram: Visualizes the frequencies of each value in a dataset

Frequency table

```
orders  users
------  -----
1       7
2       42
3       65
...     ...
```



Histograms - query (I)

```
WITH user_orders AS (
  SELECT
    user_id,
    COUNT(DISTINCT order_id) AS orders
  FROM meals
  JOIN orders ON meals.meal_id = orders.meal_id
  GROUP BY user_id)

SELECT
  orders,
  COUNT(DISTINCT user_id) AS users
FROM user_orders
GROUP BY orders
ORDER BY orders ASC;
```

Histograms - query (II)

```
WITH user_revenues AS (
  SELECT
    user_id,
    SUM(meal_price * order_quantity) AS revenue
  FROM meals
  JOIN orders ON meals.meal_id = orders.meal_id
  GROUP BY user_id)

SELECT
  ROUND(revenue :: NUMERIC, -2) AS revenue_100,
  COUNT(DISTINCT user_id) AS users
FROM user_revenues
GROUP BY revenue_100
ORDER BY revenue_100 ASC;
```

Plotting histograms

Excel

Google Sheets

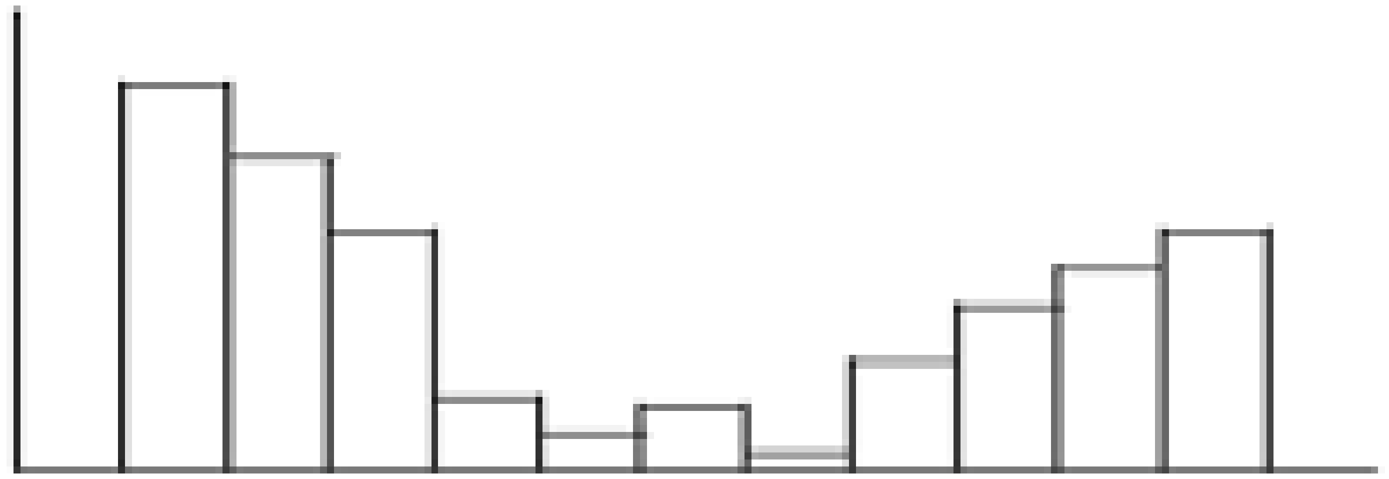
matplotlib

ggplot2

www.rstudio.com

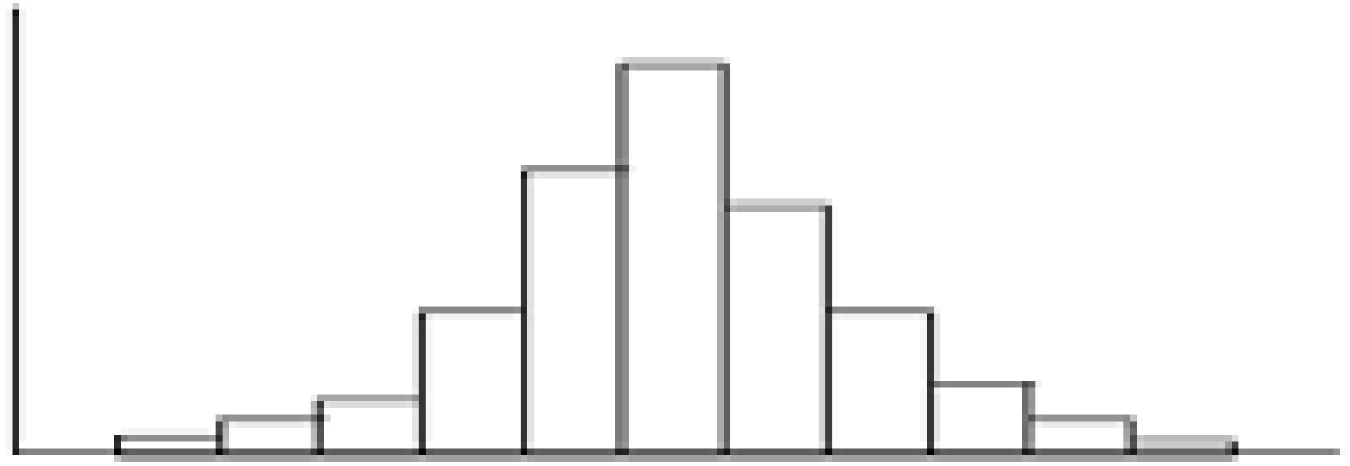
What do histograms tell you?

U-shaped histogram



- Many users who generate low and high levels of revenue; few who generate median level of revenue

Normal histogram



- Many users who generate median level of revenue; few who generate low or high levels of revenue

Histograms

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Bucketing

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Histograms - recap

```
WITH user_orders AS (
  SELECT
    user_id,
    COUNT(DISTINCT order_id) AS orders
  FROM meals
  JOIN orders ON meals.meal_id = orders.meal_id
  GROUP BY user_id)

SELECT
  orders,
  COUNT(DISTINCT user_id) AS users
FROM user_orders
GROUP BY orders
ORDER BY orders ASC
LIMIT 5;
```

CASE expression

Query

```
SELECT
  CASE
    WHEN meal_price < 4 THEN 'Low-price meal'
    WHEN meal_price < 6 THEN 'Mid-price meal'
    ELSE 'High-price meal'
  END AS price_category,
  COUNT(DISTINCT meal_id)
FROM meals
GROUP BY price_category;
```

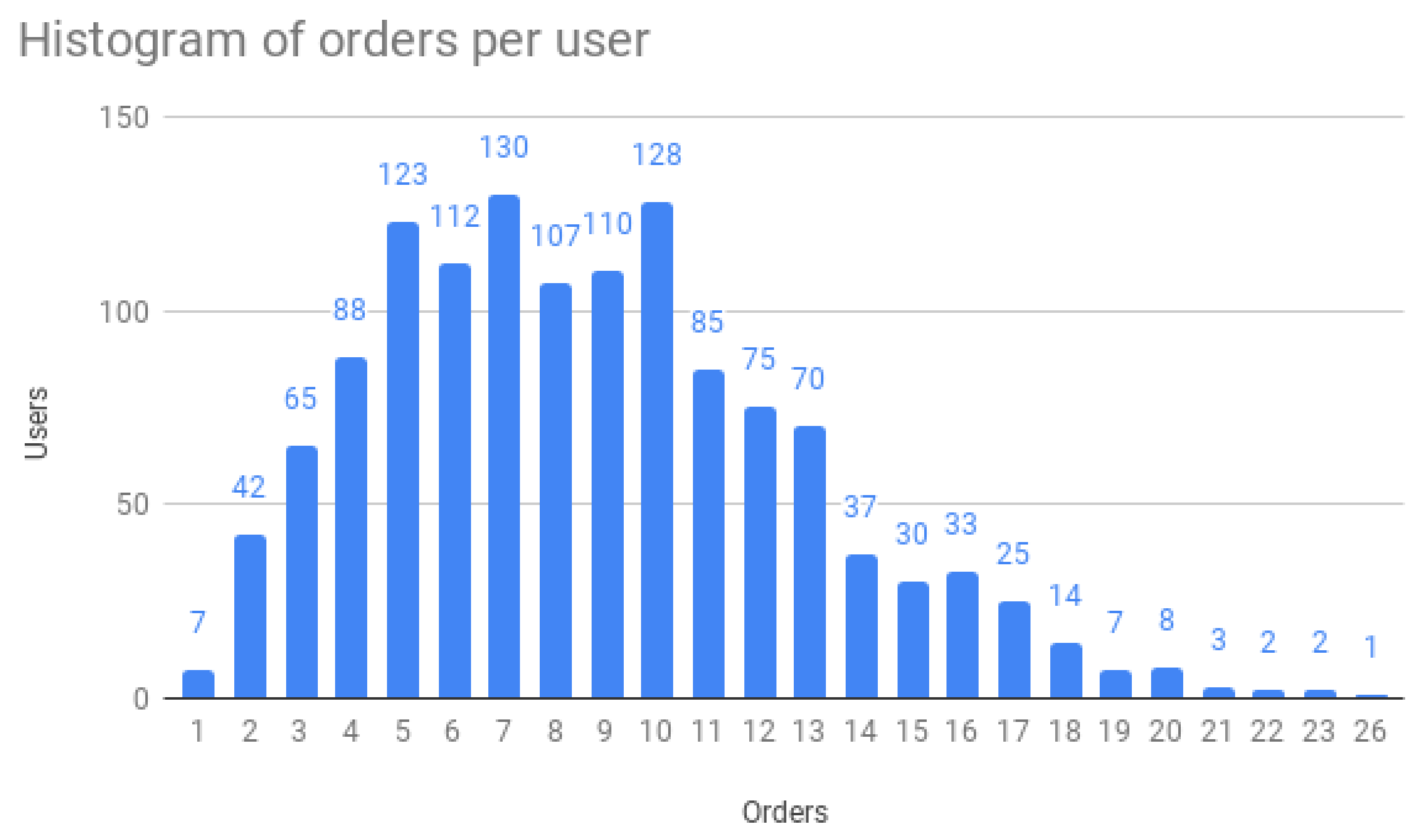
Bucketing - query

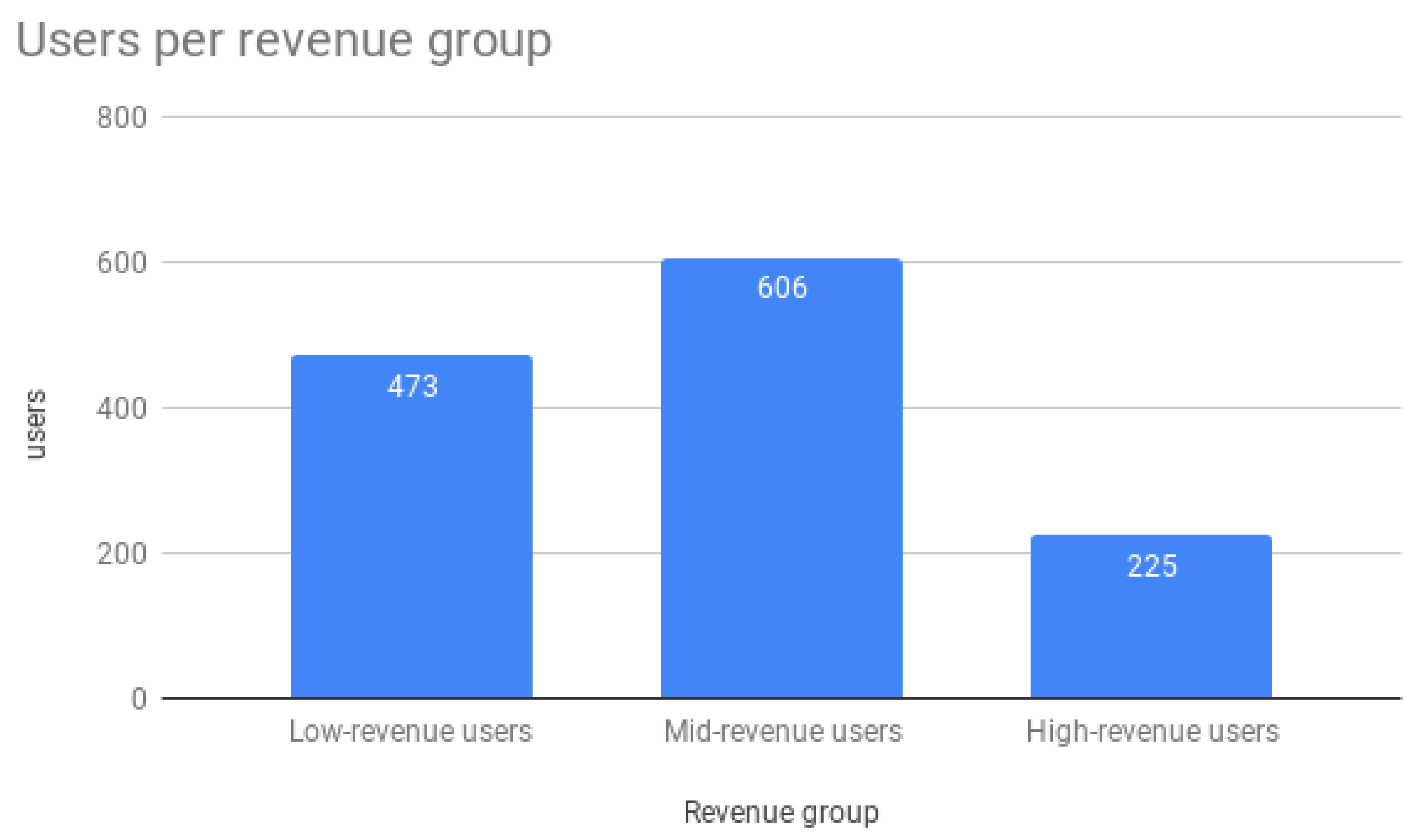
```sql
WITH user_revenues AS (
  SELECT
    user_id,
    SUM(meal_price * order_quantity) AS revenue
  FROM meals
  JOIN orders ON meals.meal_id = orders.meal_id
  GROUP BY user_id)

SELECT
  CASE
    WHEN revenue < 150 THEN 'Low-revenue users'
    WHEN revenue < 300 THEN 'Mid-revenue users'
    ELSE 'High-revenue users'
  END AS revenue_group,
  COUNT(DISTINCT user_id) AS users
FROM user_revenues
GROUP BY revenue_group;
```

Bucketing - result

```
revenue_group       users
------------------  -----
Low-revenue users   473
Mid-revenue users   606
High-revenue users  225
```

Histograms versus bar graphs





Bucketing

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Percentiles

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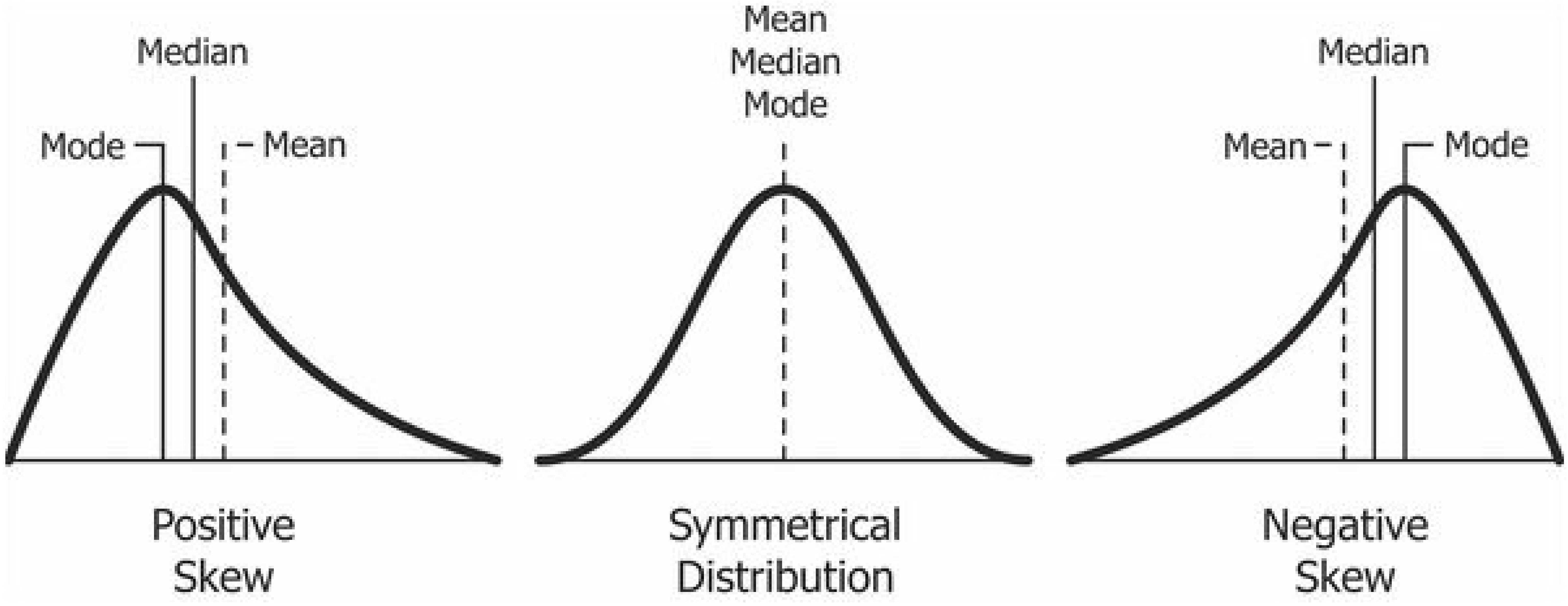
Percentiles - overview

- **Percentile:** nth percentile is the value for which $n\%$ of a dataset's values are beneath this value
  - Lowest value is the 0th percentile
  - Highest value is the 99th percentile

Quartiles

- **Example:** 25th percentile of user orders is 17, then 25% have ordered 17 times or less
- **First quartile**: 25th percentile
- **Third quartile**: 75th percentile
- **Interquartile range (IQR)**: All data between the first and third quartiles
- **Second quartile**: 50th percentile, median
  - Different from the mean!

Skewed data


Median
Mode
Mean
Positive Skew
Mean
Median
Mode
Symmetrical Distribution
Median
Mean
Mode
Negative Skew

Quartiles - query

```
WITH user_orders AS (
  SELECT
    user_id,
    COUNT(DISTINCT order_id) AS orders
  FROM orders
  GROUP BY user_id)

SELECT
  ROUND(
    PERCENTILE_CONT(0.25) WITHIN GROUP (ORDER BY orders ASC) :: NUMERIC,
  2) AS orders_p25,
  ROUND(
    PERCENTILE_CONT(0.5) WITHIN GROUP (ORDER BY orders ASC) :: NUMERIC,
  2) AS orders_p50,
  ROUND(
    PERCENTILE_CONT(0.75) WITHIN GROUP (ORDER BY orders ASC) :: NUMERIC,
  2) AS orders_p75,
  ROUND(AVG(orders) :: NUMERIC, 2) AS avg_orders
FROM user_orders;
```

Quartiles - result

```
orders_p25  orders_p50  orders_p75  avg_orders
----------  ----------  ----------  ----------
6.00        8.00        11.00       8.70
```

Percentiles

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