

```

import pandas as pd
import numpy as np

import matplotlib.pyplot as plt
import seaborn as sns
import mysql.connector

db = mysql.connector.connect(host='localhost',
                             username='root',
                             password='Sayan@0811',
                             database='ecommerce')

cur = db.cursor()

```

Basic Questions

List all unique cities where customers are located.

```

query = """ select distinct(customer_city) from customers """

cur.execute(query)

data = cur.fetchall()

data

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...]
```

Count the number of orders placed in 2017.

```
query = """select count(order_id) from ecommerce.orders
where year(order_purchase_timestamp) = 2017"""

cur.execute(query)

data = cur.fetchall()

data[0][0]

45101
```

Find the total sales per category.

```
query = """select upper(products.product_category) category,
round(sum(payments.payment_value),2) sales
from products join order_item
on products.product_id = order_item.product_id
join payments
on payments.order_id = order_item.order_id
group by category"""

cur.execute(query)

data = cur.fetchall()

data
df = pd.DataFrame(data,columns = ['Category','Sales'])
df
```

	Category	Sales
0	PERFUMERY	506738.66
1	FURNITURE DECORATION	1430176.39
2	TELEPHONY	486882.05
3	BED TABLE BATH	1712553.67
4	AUTOMOTIVE	852294.33
..
69	CDS MUSIC DVDS	1199.43
70	LA CUISINE	2913.53
71	FASHION CHILDREN'S CLOTHING	785.67
72	PC GAMER	2174.43
73	INSURANCE AND SERVICES	324.51

[74 rows x 2 columns]

Calculate the percentage of orders that were paid in installments.

```
query = """ select (sum(case when payment_installments >=1 then 1 else 0 end))/count(*)*100 from payments """

cur.execute(query)

data = cur.fetchall()

data

[(Decimal('99.9981'),)]
```

Count the number of customers from each state.

```
query = """select customer_state,count(customer_id) from
ecommerce.customers
group by customer_state"""

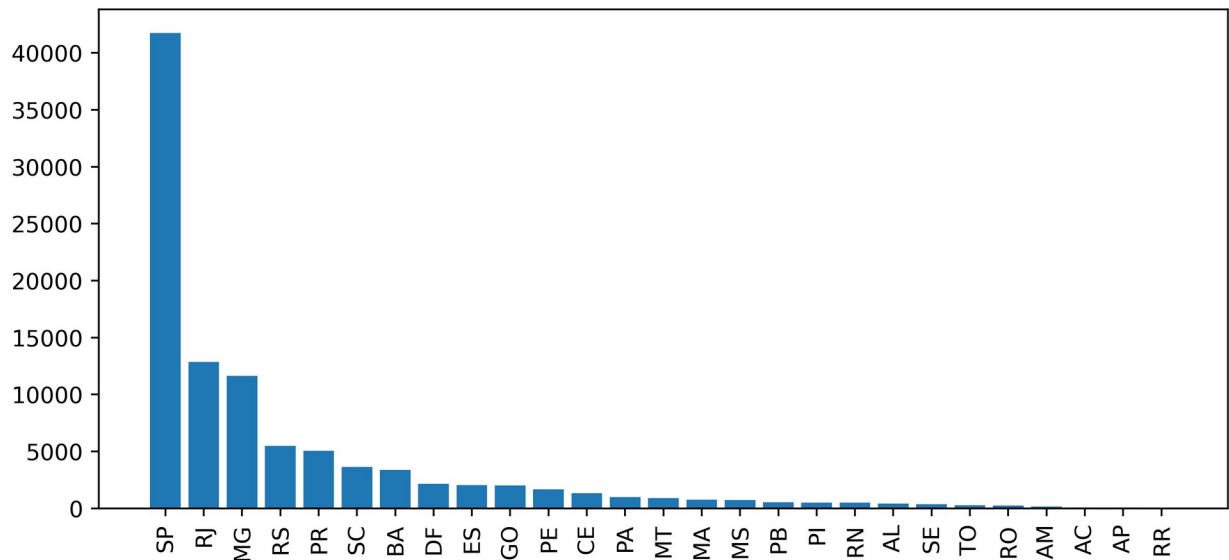
cur.execute(query)

data = cur.fetchall()

data

df = pd.DataFrame(data,columns = ['State','customer_count'])
df = df.sort_values(by = 'customer_count',ascending=False)

plt.figure(figsize=(9,4),dpi=500)
plt.bar(df['State'],df['customer_count'])
plt.xticks(rotation = 90)
plt.show()
```



Intermediate Queries

Calculate the number of orders per month in 2018.

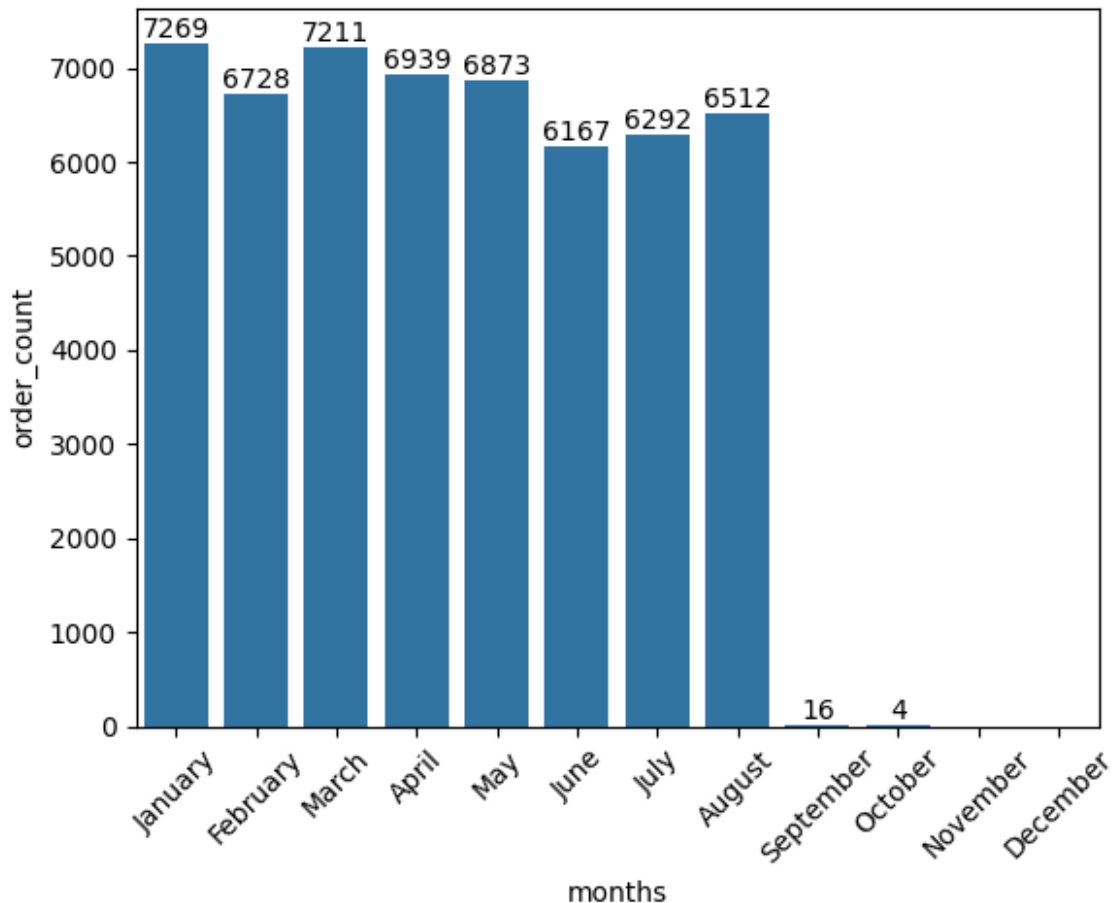
```
query = """select monthname(order_purchase_timestamp) months,
count(order_id)
from ecommerce.orders
where year(order_purchase_timestamp)=2018
group by months"""

cur.execute(query)

data = cur.fetchall()

data
df = pd.DataFrame(data, columns = ['months', 'order_count'])
o =
['January', 'February', 'March', 'April', 'May', 'June', 'July', 'August', 'September', 'October', 'November', 'December']

ax = sns.barplot(x = df['months'], y = df['order_count'], data=df,
order = o)
plt.xticks(rotation = 45)
ax.bar_label(ax.containers[0])
plt.show()
```

Find the average number of products per order, grouped by customer city.

```
query = """with count_per_order as
(select orders.order_id, orders.customer_id,
count(order_item.order_id) as oc
from orders join order_item
on orders.order_id = order_item.order_id
group by orders.order_id, orders.customer_id)

select customers.customer_city, round(avg(count_per_order.oc),2)
average_orders
from customers join count_per_order
on customers.customer_id = count_per_order.customer_id
group by customers.customer_city"""

cur.execute(query)

data = cur.fetchall()

data
```

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( 'itaporanga', Decimal('1.29')),
( 'posse', Decimal('1.13')),
( 'erechim', Decimal('1.09')),
...]
```

Calculate the percentage of total revenue contributed by each product category.

```
query = """select upper(products.product_category)
category,round((sum(payments.payment_value)/(select sum(payment_value)
from payments))*100,2) sales_percentage
from products join order_item
on products.product_id = order_item.product_id
join payments
on payments.order_id = order_item.order_id
group by category
order by sales_percentage desc"""
```

```
cur.execute(query)
```

```
data = cur.fetchall()
```

```
data
```

```
[('BED TABLE BATH', 10.7),
('HEALTH BEAUTY', 10.35),
('COMPUTER ACCESSORIES', 9.9),
('FURNITURE DECORATION', 8.93),
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('HOUSEWARES', 6.84),
('AUTOMOTIVE', 5.32),
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('COOL STUFF', 4.87),
('FURNITURE OFFICE', 4.04),
('TOYS', 3.87),
('BABIES', 3.37),
('PERFUMERY', 3.17),
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('BLU RAY DVDS', 0.05),
('PARTY ARTICLES', 0.04),
('SONG', 0.04),
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('CITTE AND UPHACK FURNITURE', 0.04),
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('HYGIENE DIAPERS', 0.03),
('KITCHEN PORTABLE AND FOOD COACH', 0.03),
('FASHION SPORT', 0.02),
('LA CUISINE', 0.02),
('ARTS AND CRAFTS', 0.01),

```
( 'FLOWERS', 0.01),
( 'HOUSE COMFORT 2', 0.01),
( 'CDS MUSIC DVDS', 0.01),
( 'PC GAMER', 0.01),
( "FASHION CHILDREN'S CLOTHING", 0.0),
( 'INSURANCE AND SERVICES', 0.0)]
```

Identify the correlation between product price and the number of times a product has been purchased.

```
query = """select products.product_category,
count(order_item.product_id),round(avg(order_item.price),2) from
products
join order_item
on products.product_id = order_item.product_id
group by products.product_category"""

cur.execute(query)

data = cur.fetchall()
data
df = pd.DataFrame(data,columns=['Category','order_count','price'])

arr1 = df['order_count']
arr2 = df['price']

np.corrcoef([arr1,arr2])

array([[ 1.          , -0.10631514],
       [-0.10631514,  1.          ]])

print("Neutral Relationship")

Neutral Relationship
```

Calculate the total revenue generated by each seller, and rank them by revenue.

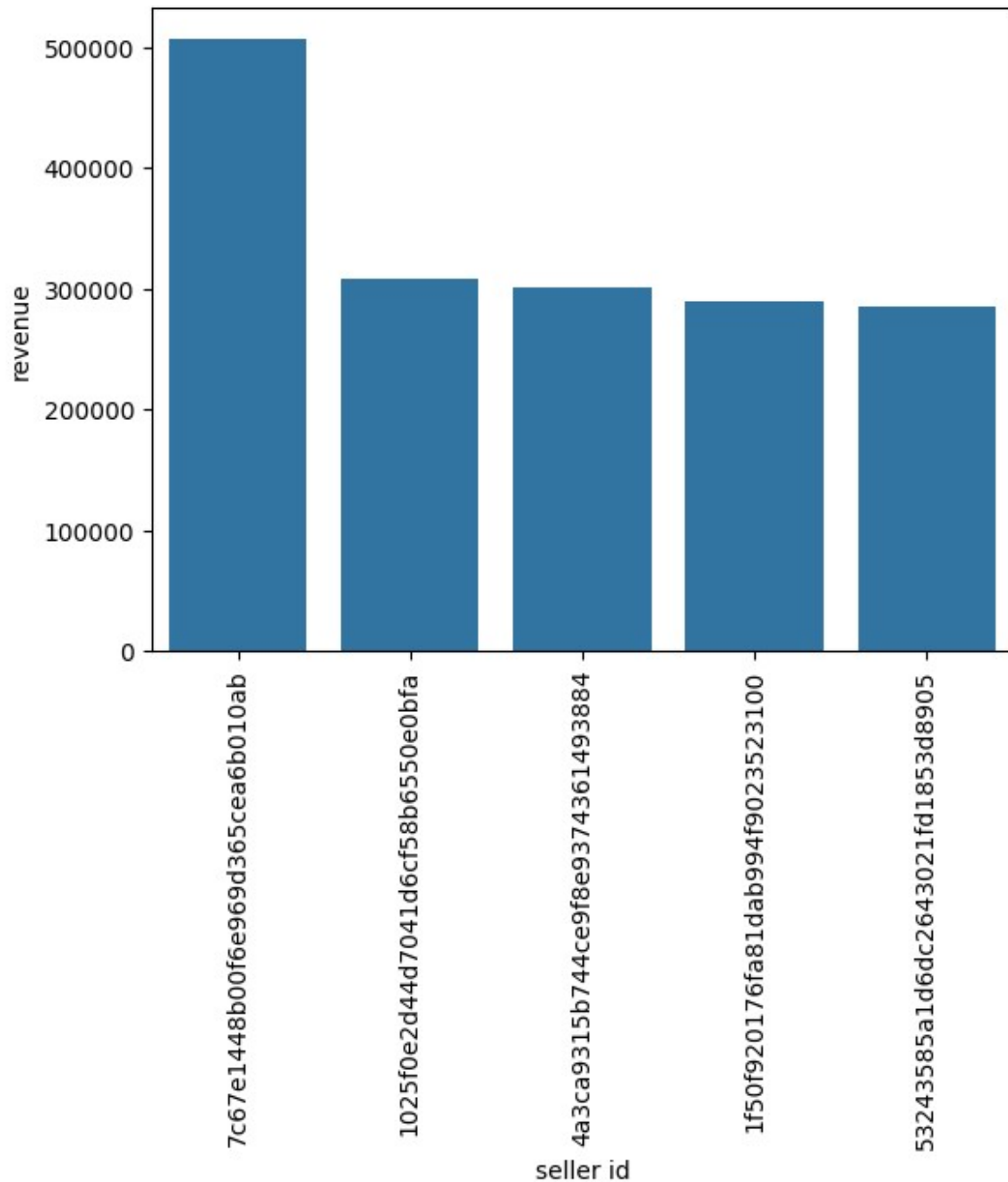
```
query = """select *,dense_rank() over(order by revenue desc) as rn
from (select order_item.seller_id,
round(sum(payments.payment_value),2)
revenue from order_item join payments
on order_item.order_id = payments.order_id
group by order_item.seller_id) as a"""

cur.execute(query)

data = cur.fetchall()
data
```



```
df = pd.DataFrame(data, columns = ['seller id', 'revenue', 'rank'])
df.head()
sns.barplot(x='seller id',y='revenue', data=df.head())
plt.xticks(rotation=90)
plt.show()
```



Advance Queries

Calculate the moving average of order values for each customer over their order history.

```
query = """ select customer_id,
order_purchase_timestamp,payment,avg(payment)
over(partition by customer_id order by order_purchase_timestamp
rows between 2 preceding and current row) as mov_avg
from
(select orders.customer_id,
orders.order_purchase_timestamp,payments.payment_value as payment
from payments join orders
on payments.order_id = orders.order_id) as a;
"""

cur.execute(query)

data = cur.fetchall()
df =
pd.DataFrame(data,columns=['customer_id','order_purchase_timestamp','p
ayment','mov_avg'])
df.head()
```

	customer_id	order_purchase_timestamp	payment
0	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.74
1	000161a058600d5901f007fab4c27140	2017-07-16 09:40:32	67.41
2	0001fd6190edaaf884bcaf3d49edf079	2017-02-28 11:06:43	195.42
3	0002414f95344307404f0ace7a26f1d5	2017-08-16 13:09:20	179.35
4	000379cdec625522490c315e70c7a9fb	2018-04-02 13:42:17	107.01

	mov_avg
0	114.739998
1	67.410004
2	195.419998
3	179.350006
4	107.010002

Calculate the cumulative sales per month for each year.

```
query = """ select years, months, payment, sum(payment)
over(order by years,months) cumulative_sales from
(select year(orders.order_purchase_timestamp) as years,
```

```

month(orders.order_purchase_timestamp) as months,
round(sum(payments.payment_value),2) as payment
from orders join payments
on orders.order_id = payments.order_id
group by years, months
order by years, months) as a;
"""

```

```
cur.execute(query)
```

```

data = cur.fetchall()
df = pd.DataFrame(data, columns =
['year', 'month', 'payment', 'cumalative_sum'])
df.head()

```

	year	month	payment	cumalative_sum
0	2016	9	252.24	252.24
1	2016	10	59090.48	59342.72
2	2016	12	19.62	59362.34
3	2017	1	138488.04	197850.38
4	2017	2	291908.01	489758.39

Calculate the year-over-year growth rate of total sales.

```

query = """ with a as (select year(orders.order_purchase_timestamp) as
years,
round(sum(payments.payment_value),2) as payment
from orders join payments
on orders.order_id = payments.order_id
group by years order by years)

```

```

select years, ((payment-lag(payment,1) over(order by years))/
lag(payment,1) over(order by years))*100 from a;
"""

```

```
cur.execute(query)
```

```
data = cur.fetchall()
```

```

df = pd.DataFrame(data, columns=['years', 'yoy % growth'])
df

```

	years	yoy % growth
0	2016	NaN
1	2017	12112.703761
2	2018	20.000924

Calculate the retention rate of customers, defined as the percentage of customers who make another purchase within 6 months of their first purchase.

```
query = """with a as (select customers.customer_id,
min(orders.order_purchase_timestamp) first_order
from customers join orders
on customers.customer_id = orders.customer_id
group by customers.customer_id),

b as (select a.customer_id,count(distinct order_purchase_timestamp)
next_order
from a join orders
on orders.customer_id = a.customer_id
and orders.order_purchase_timestamp > first_order
and orders.order_purchase_timestamp < date_add(first_order,interval 6
month)
group by a.customer_id)

select 100 * (count(distinct a.customer_id)/count(distinct
b.customer_id))
from a left join b
on a.customer_id = b.customer_id
"""

cur.execute(query)

data = cur.fetchall()
print(data)
print("No customer")

[(None,)]
No customer
```

Identify the top 3 customers who spent the most money in each year.

```
query = """select years, customer_id, payment, d_rank
from
(select year(orders.order_purchase_timestamp) years,
orders.customer_id,
sum(payments.payment_value) payment,
dense_rank() over(partition by year(orders.order_purchase_timestamp)
order by sum(payments.payment_value) desc) d_rank
from orders join payments
on payments.order_id = orders.order_id
group by year(orders.order_purchase_timestamp),orders.customer_id) as
a
```

```
where d_rank<=3;
"""

cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns = ['years','id','payment','rank'])
sns.barplot(x =
'id',y='payment',data=df,hue='years',palette='viridis')
plt.xticks(rotation= 90)
plt.show()
```

