```
[46]: import pandas as pd
      import matplotlib.pyplot as plt
      import seaborn as sns
      import mysql.connector
      import numpy as np


      db = mysql.connector.connect(host = "localhost",
                                   username = "root",
                                   password = "2004",
                                   database = "ecommerce")


      cur = db.cursor()
```

1. List all unique cities where customers are located.

```
[2]:

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

      cur.execute(query)

      data = cur.fetchall()

      data
      # df = pd.DataFrame(data)
      # df.head()
```

```
[2]: [('franca',),
      ('sao bernardo do campo',),
      ('sao paulo',),
      ('mogi das cruzes',),
      ('campinas',),
      ('jaragua do sul',),
      ('timoteo',),
      ('curitiba',),
      ('belo horizonte',),
      ('montes claros',),
      ('rio de janeiro',),
      ('lencois paulista',),
      ('caxias do sul',),
      ('piracicaba',),
      ('guarulhos',),
      ('pacaja',),
      ('florianopolis',),
      ('aparecida de goiania',),
      ('santo andre',),
```

2. Count the number of orders placed in 2017.

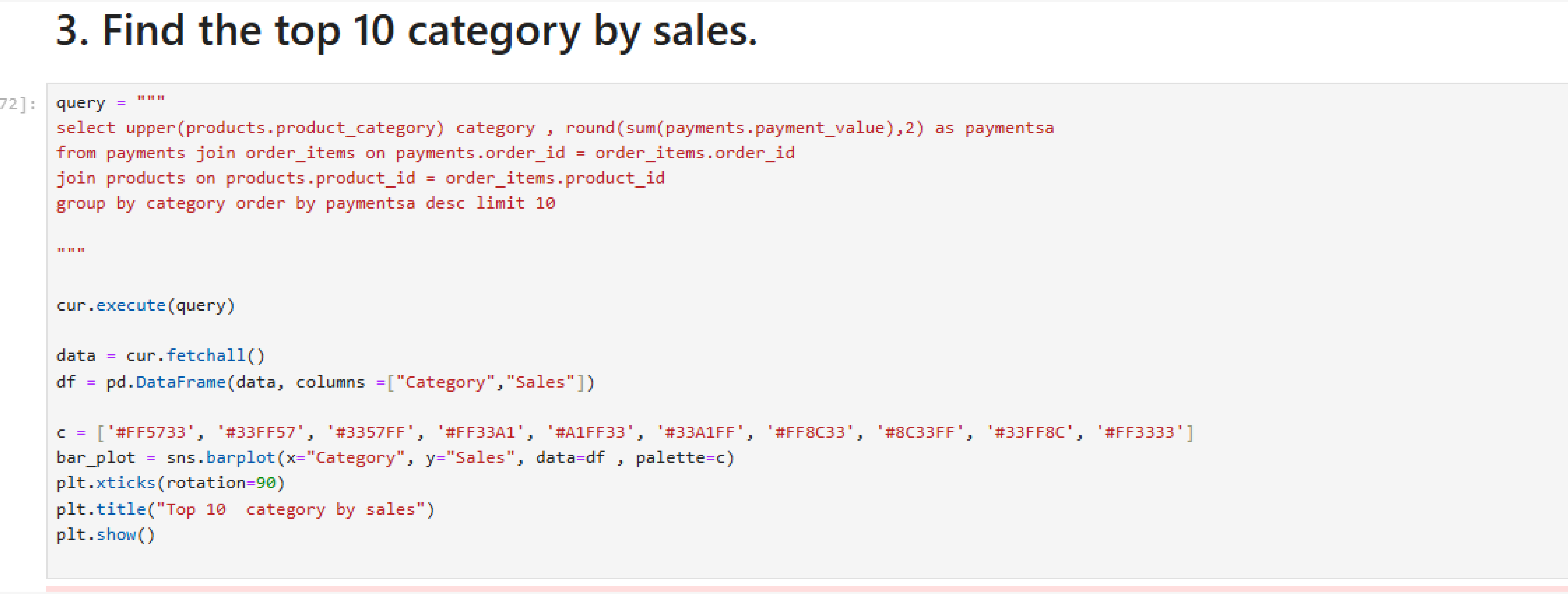
```
[12]: query = """ select count( order_id) from orders where year(order_purchase_timestamp) = 2017 """

      cur.execute(query)

      data = cur.fetchall()

      data[0][0]
```

```
[12]: 90202
```



3. Find the top 10 category by sales.

72]:

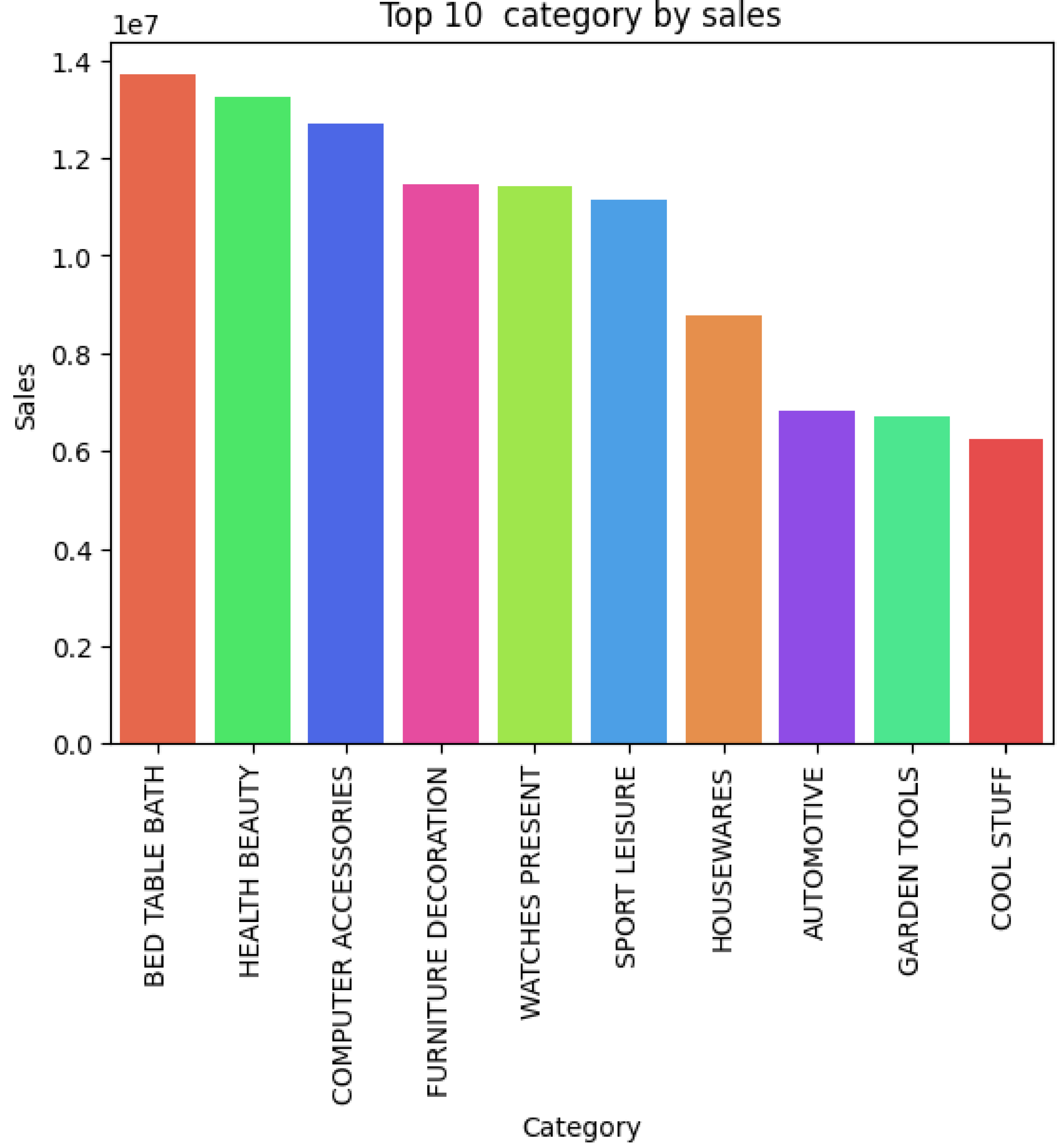
```
query = """
select upper(products.product_category) category , round(sum(payments.payment_value),2) as paymentsa
from payments join order_items on payments.order_id = order_items.order_id
join products on products.product_id = order_items.product_id
group by category order by paymentsa desc limit 10

"""


cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data, columns =["Category","Sales"])

c = ['#FF5733', '#33FF57', '#3357FF', '#FF33A1', '#A1FF33', '#33A1FF', '#FF8C33', '#8C33FF', '#33FF8C', '#FF3333']
bar_plot = sns.barplot(x="Category", y="Sales", data=df , palette=c)
plt.xticks(rotation=90)
plt.title("Top 10  category by sales")
plt.show()
```



Top 10 category by sales
1e7
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Sales
BED TABLE BATH
HEALTH BEAUTY
COMPUTER ACCESSORIES
FURNITURE DECORATION
WATCHES PRESENT
SPORT LEISURE
HOUSEWARES
AUTOMOTIVE
GARDEN TOOLS
COOL STUFF
Category

4. Calculate the percentage of orders that were paid in installments.

•[5]:
```
query = """
select (sum(case when payment_installments then 1 else 0 end)/count(*))*100 from payments
"""


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

[5]:
```
[(Decimal('99.9981'),)]
```

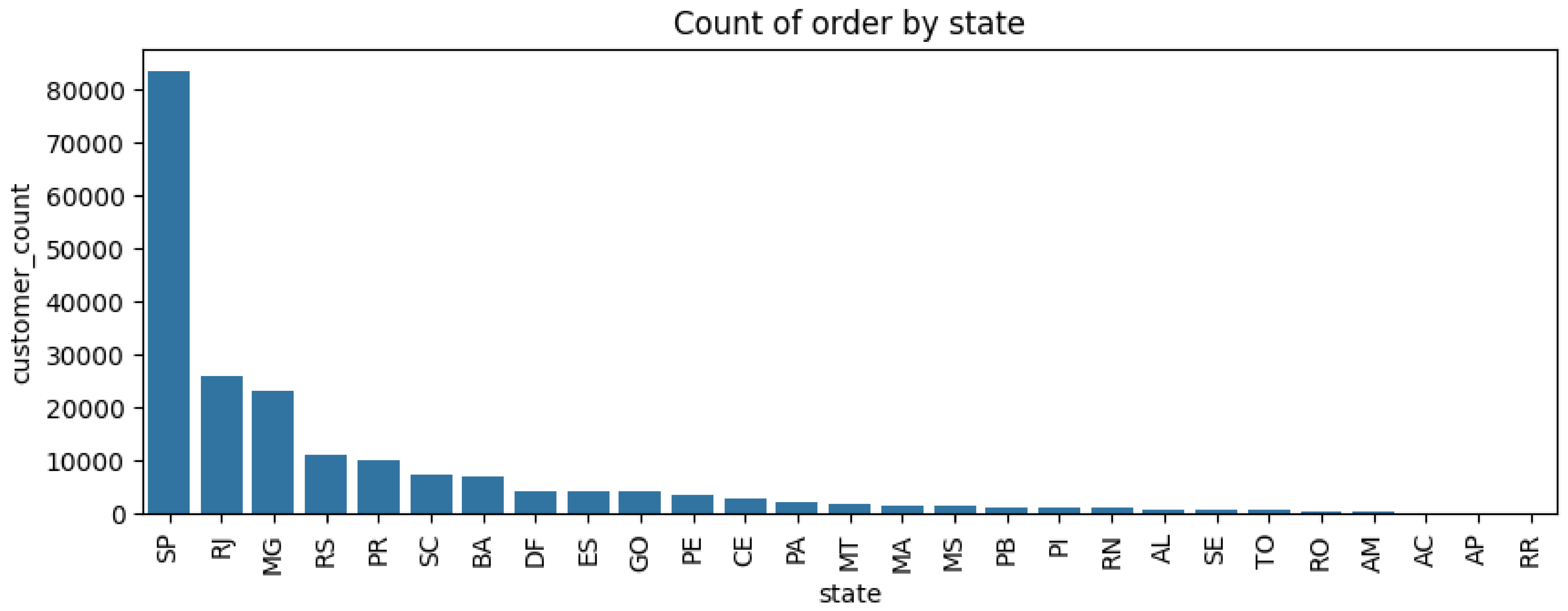
5. Count the number of customers from each state.

[71]:
```
query = """
SELECT customer_state , count(customer_id) as customer FROM customers group by customer_state order by customer desc;
"""


cur.execute(query)

data = cur.fetchall()
df = pd.DataFrame(data , columns =["state","customer_count"])
df = df.sort_values(by = "customer_count" , ascending = False)

plt.figure(figsize = (10,3.3))
sns.barplot(x = "state" ,y = "customer_count"  ,data = df)
plt.xticks(rotation = 90)
plt.title("Count of order by state")
plt.show()
df
```



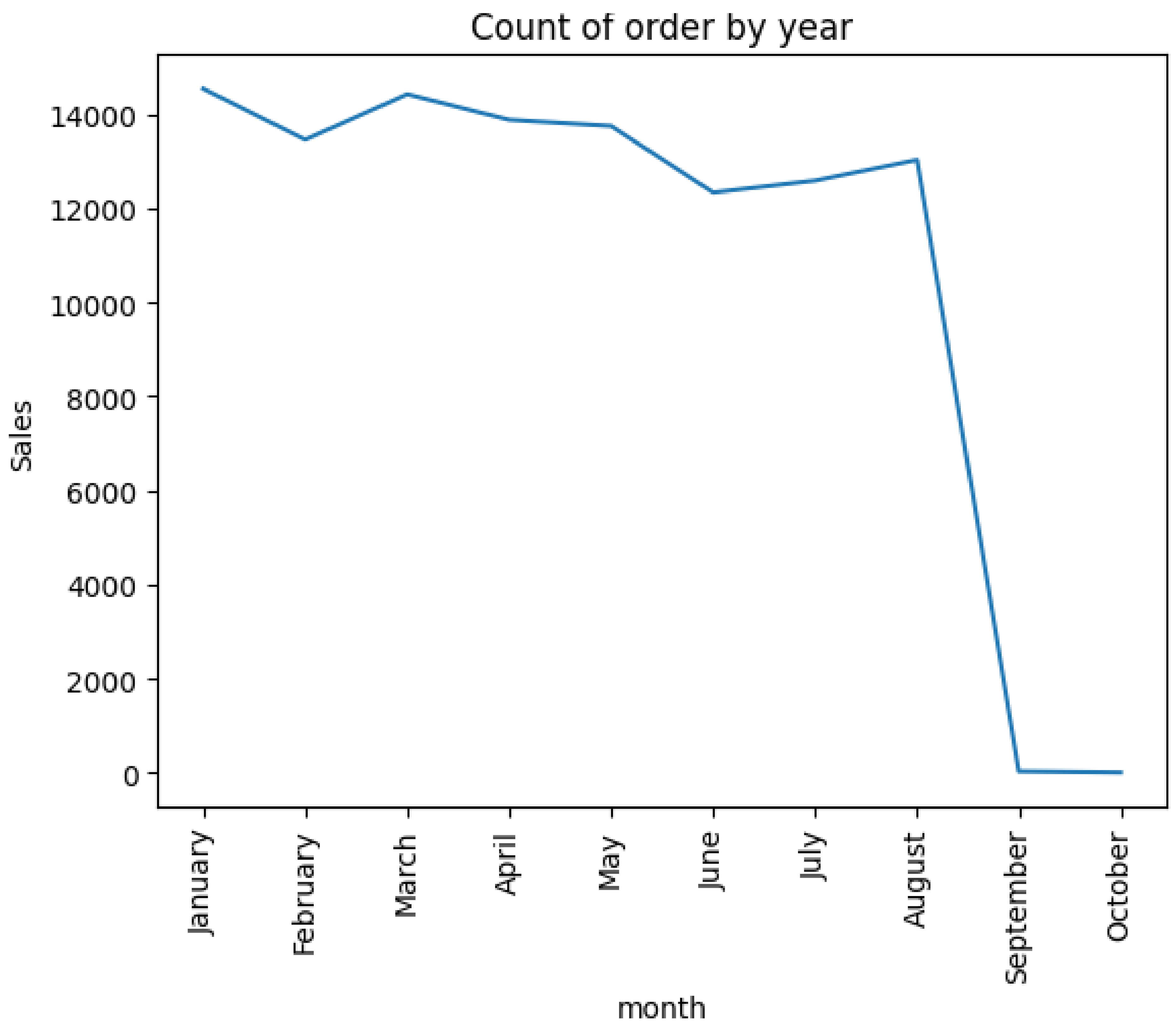
[71]:

	state	customer_count
0	SP	83492
1	RJ	25704
2	MG	23270
3	RS	10932
4	PR	10090
5	SC	7274
6	BA	6760

6 Calculate the number of orders per month in 2018.

[73]:

```
query = """
SELECT
    months,
    order_count
FROM (
    SELECT
        MONTHNAME(order_purchase_timestamp) AS months,
        COUNT(order_id) AS order_count,
        MONTH(order_purchase_timestamp) AS monthnum
    FROM
        orders
    WHERE
        YEAR(order_purchase_timestamp) = 2018
    GROUP BY
        months, monthnum
) AS monthly_orders
ORDER BY
    monthnum;
"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data ,  columns =["month","Sales"])
sns.lineplot(data= df, x = "month", y = "Sales" )
plt.xticks(rotation=90)
plt.title("Count of order by year")
plt.show()
df
```



[73]:

	month	Sales
0	January	14538
1	February	13456
2	March	14422

3	April	13878
4	May	13746
5	June	12334
6	July	12584
7	August	13024
8	September	32
9	October	8

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

[7]:

```
query = """
with a as(select orders.order_id , orders.customer_id,  count(order_items.order_item_id) as nikhil from order_items join orders on  orders.order_id = or
group by orders.order_id , orders.customer_id)
select customers.customer_city ,round(avg(a.nikhil),2) from a join customers on a.customer_id = customers.customer_id group by customers.customer_city

"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data)
df
```

[7]:

	0	1

[7]:

	0	1
0	sao jose dos campos	4.55
1	indaial	4.46
2	treze tilias	5.09
3	sao paulo	4.62
4	rio de janeiro	4.59
...	...	...
4105	aurora do para	4.00
4106	nova america	4.00
4107	tibau do sul	4.00
4108	lagoa da canoa	4.00
4109	buriti	12.00

4110 rows × 2 columns

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

[8]:
```python
query = """

select upper(products.product_category) , round((round(sum(payments.payment_value),2) / (select sum(payment_value) from payments))*100,2)  from products
payments.order_id = order_items.order_id group by products.product_category

"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data)
df
```

[8]:
```
                                0      1
 0                      PERFUMERY  12.66
 1           FURNITURE DECORATION  35.73
 2                      TELEPHONY  12.17
 3  FASHION BAGS AND ACCESSORIES   5.45
 4                 BED TABLE BATH  42.79
...                           ...    ...
69                 CDS MUSIC DVDS   0.03
70                     LA CUISINE   0.07
71    FASHION CHILDREN'S CLOTHING   0.02
72                       PC GAMER   0.05
73        INSURANCE AND SERVICES   0.01
```

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

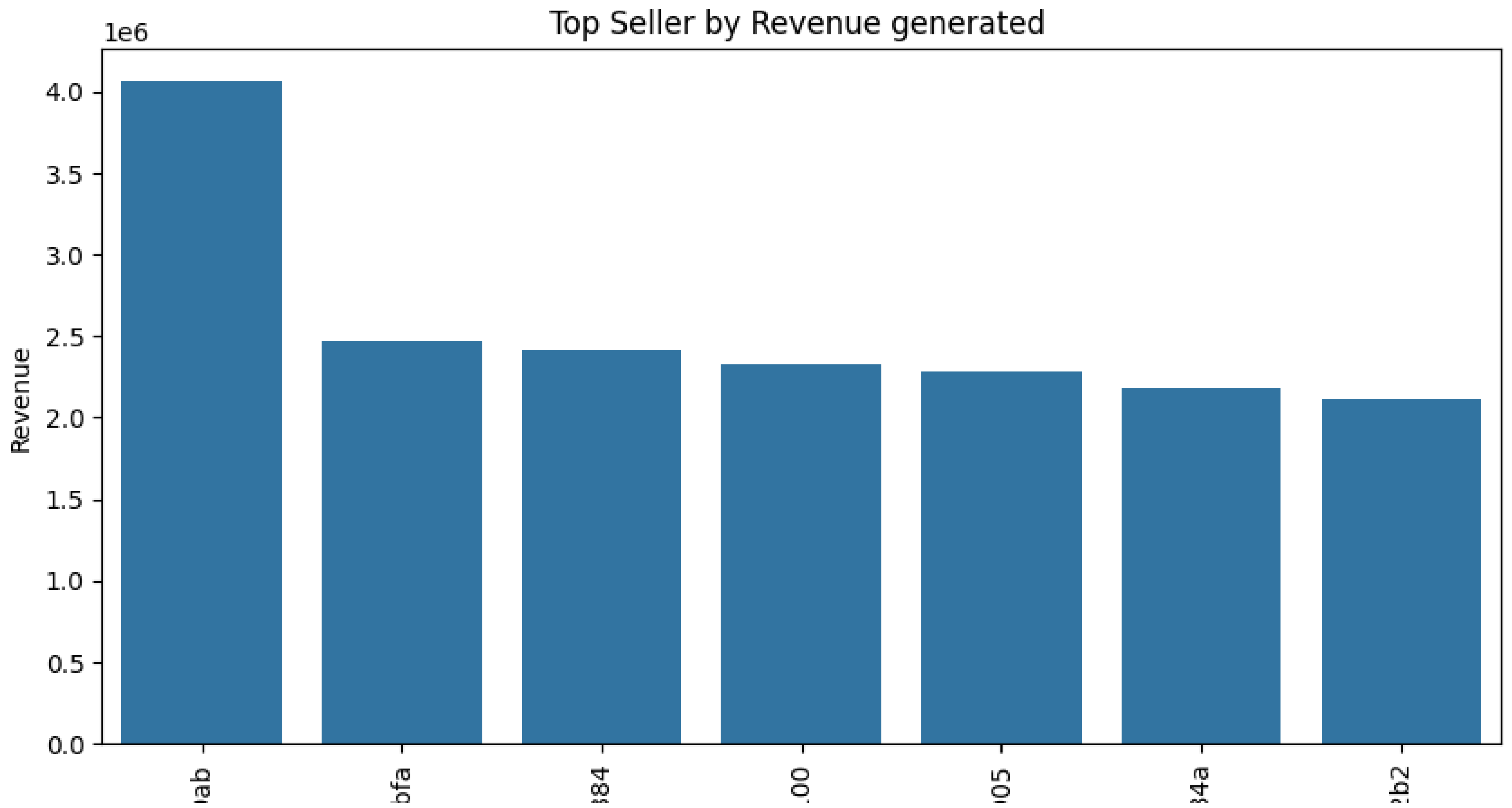
[9]:
```
query = """
select products.product_category , count(order_items.product_id) sellTime , round(avg(order_items.price),2) price
from products join order_items on products.product_id = order_items.product_id group by products.product_category
"""


cur.execute(query)
data =  cur.fetchall()
df = pd.DataFrame(data , columns= ["Category","Order_count","price"])
# df
arr1 = df["Order_count"]
arr2 = df["price"]
a = np.corrcoef([arr1,arr2])
print(a[0],a[1])
```

```
[ 1.         -0.10631514] [-0.10631514  1.        ]
```

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

[81]:
```
query = """
select *  , rank() over(order by income desc) as ranks from
(
select sellers.seller_id , round(sum(payments.payment_value),2) as income  from sellers join order_items on order_items.seller_id = sellers.seller_id
join payments on order_items.order_id = payments.order_id group by sellers.seller_id
) as a
"""
cur.execute(query)
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns = ["Seller" , "Revenue" , "Renk"])
df = df.head(7)
plt.figure(figsize = (10,5))
sns.barplot(x = "Seller", y = "Revenue" , data = df)
plt.title(" Top Seller by Revenue generated  ")
plt.xticks(rotation = 90)
plt.show()
```



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

[61]:
```
query = """
select customer_id , order_purchase_timestamp , avg(payment_value) over(partition by customer_id order by order_purchase_timestamp  rows between 2 preced
(select orders.customer_id , orders.order_purchase_timestamp , payments.payment_value
from orders join payments on orders.order_id = payments.order_id) as a
"""
cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns = ["customer" ,"time" ,"moving_avg"])
df
```

[61]:

	customer	time	moving_avg
0	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.739998
1	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.739998
2	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.739998
3	00012a2ce6f8dcda20d059ce98491703	2017-11-14 16:08:26	114.739998
4	000161a058600d5901f007fab4c27140	2017-07-16 09:40:32	67.410004
...	...	...	...
415539	ffffa3172527f765de70084a7e53aae8	2017-09-02 11:53:32	45.500000
415540	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.370001
415541	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.370001
415542	ffffe8b65bbe3087b653a978c870db99	2017-09-29 14:07:03	18.370001

12 Calculate the cumulative sales per month for each year.

[60]:
```
query = """
select years , months , payment , sum(payment) over(order by years , months) as comunative_sales from
(select year(orders.order_purchase_timestamp) as years , month(orders.order_purchase_timestamp) as months, round(sum(payments.payment_value),2)  as payme
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","avg" ,"moving_avg"])
df
```

[60]:

	year	month	avg	moving_avg
0	2016	9	1008.96	1008.96
1	2016	10	236361.92	237370.88
2	2016	12	78.48	237449.36
3	2017	1	553952.16	791401.52
4	2017	2	1167632.04	1959033.56
5	2017	3	1799454.40	3758487.96
6	2017	4	1671152.12	5429640.08
7	2017	5	2371675.28	7801315.36
8	2017	6	2045105.52	9846420.88
9	2017	7	2369531.68	12215952.56

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

[12]:

```
query = """
with a as(
select year(orders.order_purchase_timestamp) as years ,
round(sum(payments.payment_value),2) revenue
from orders join payments
on payments.order_id = orders.order_id  group by years order by years)
select years , round((revenue-back)/back,6) * 100 from
(select years ,revenue , lag(revenue ,1) over(order by years) back  from a)  as b
"""


cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data, columns = ["year", "yoy"])
df
```

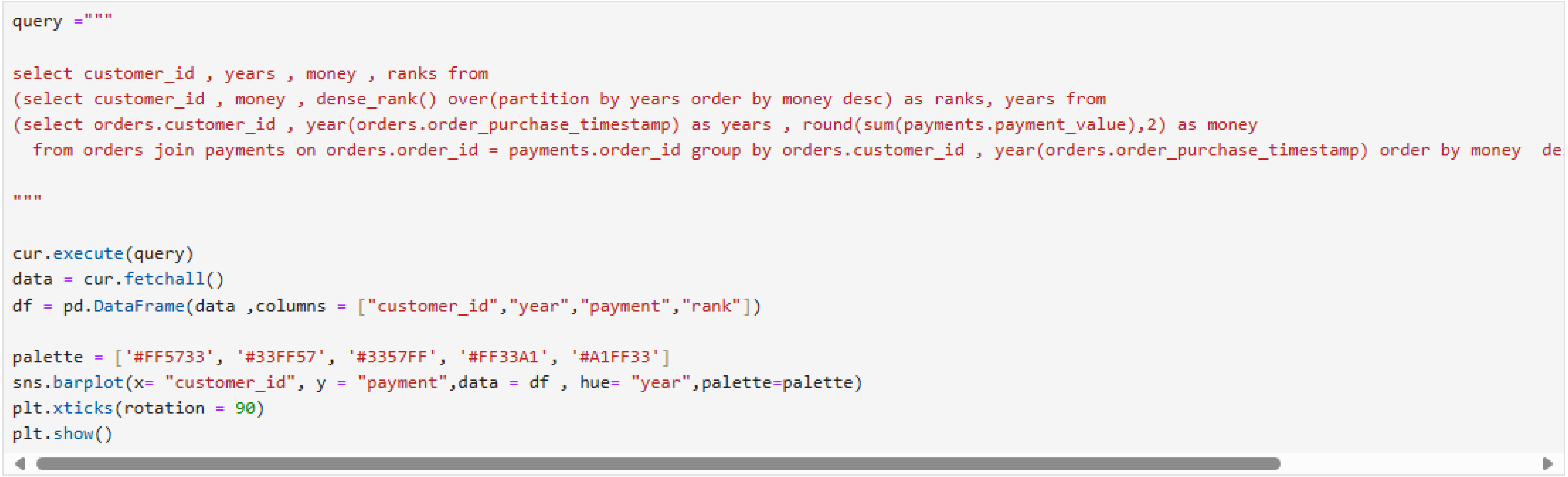
[12]:

```
   year         yoy
0  2016         NaN
1  2017  12112.7038
2  2018     20.0009
```

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

[83]:

```
query ="""
```



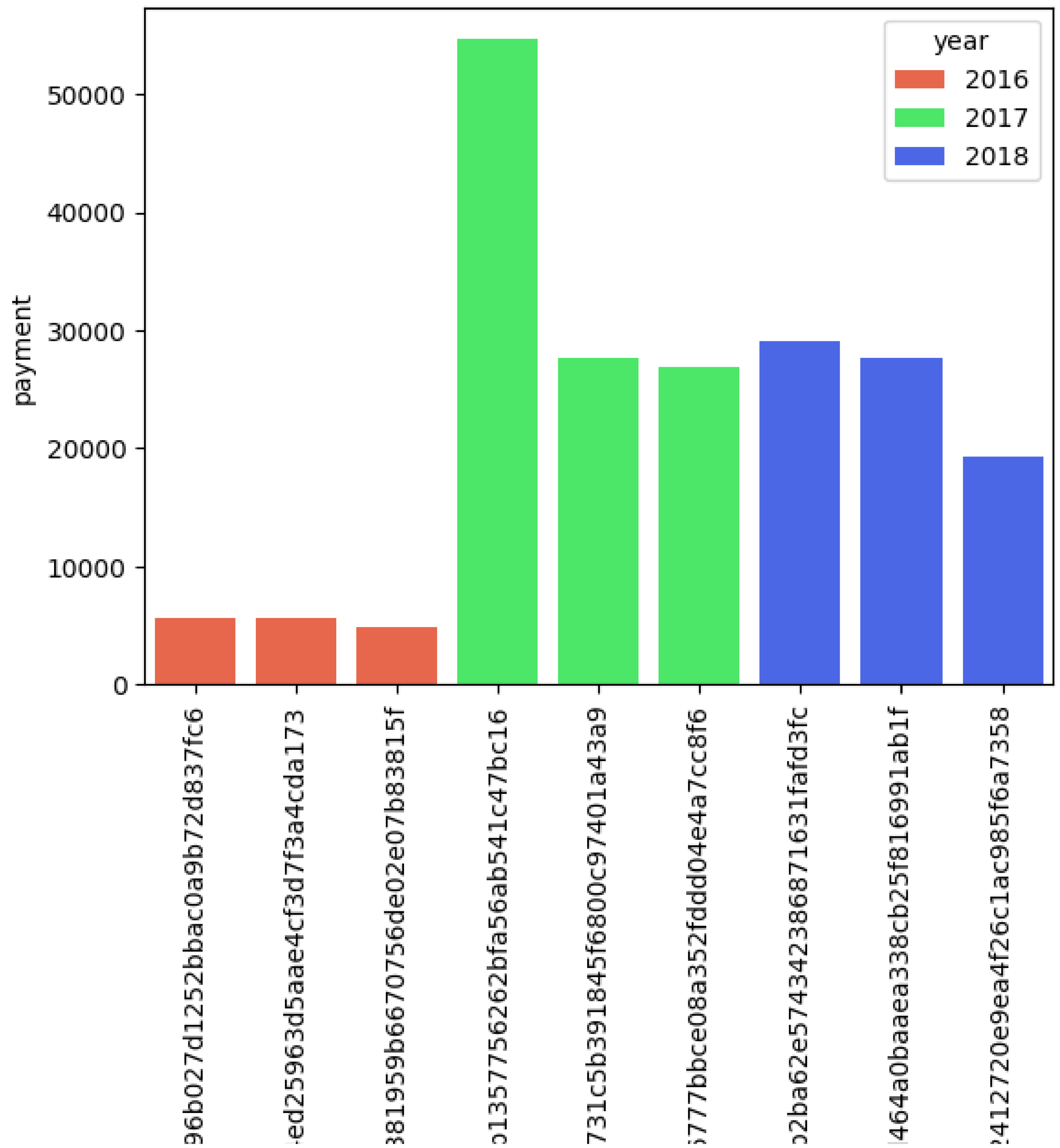
```
query ="""

select customer_id , years , money , ranks from
(select customer_id , money , dense_rank() over(partition by years order by money desc) as ranks, years from
(select orders.customer_id , year(orders.order_purchase_timestamp) as years , round(sum(payments.payment_value),2) as money
  from orders join payments on orders.order_id = payments.order_id group by orders.customer_id , year(orders.order_purchase_timestamp) order by money  de

"""


cur.execute(query)
data = cur.fetchall()
df = pd.DataFrame(data ,columns = ["customer_id","year","payment","rank"])

palette = ['#FF5733', '#33FF57', '#3357FF', '#FF33A1', '#A1FF33']
sns.barplot(x= "customer_id", y = "payment",data = df , hue= "year",palette=palette)
plt.xticks(rotation = 90)
plt.show()
```


year
2016
2017
2018
payment
50000
40000
30000
20000
10000
0
96b027d1252bbac0a9b72d837fc6
ed25963d5aae4cf3d7f3a4cda173
381959b6670756de02e07b83815f
01357756262bfa56ab541c47bc16
731c5b391845f6800c97401a43a9
5777bbce08a352fddd04e4a7cc8f6
02ba62e5743423868716 31fafd3fc
464a0baaea338cb25f816991ab1f
2412720e9ea4f26c1ac985f6a7358