Double-click (or enter) to edit

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.graph_objects as go

df = pd.read_csv('/content/FINAL (1).csv')
```

```
df.describe()
```

	Unnamed: 0	price	payment_value	review_score
count	119143.000000	118310.000000	119140.000000	118146.000000
mean	59571.000000	120.646603	172.735135	4.015582
std	34393.765898	184.109691	267.776077	1.400436
min	0.000000	0.850000	0.000000	1.000000
25%	29785.500000	39.900000	60.850000	4.000000
50%	59571.000000	74.900000	108.160000	5.000000
75%	89356.500000	134.900000	189.240000	5.000000
max	119142.000000	6735.000000	13664.080000	5.000000

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 119143 entries, 0 to 119142
Data columns (total 15 columns):
 #   Column                         Non-Null Count   Dtype  
---  ------                         --------------   -----  
 0   Unnamed: 0                     119143 non-null  int64  
 1   customer_city                  119143 non-null  object 
 2   seller_city                    118310 non-null  object 
 3   seller_state                   118310 non-null  object 
 4   product_category_name_english  116576 non-null  object 
 5   price                          118310 non-null  float64
 6   payment_value                  119140 non-null  float64
 7   payment_type                   119140 non-null  object 
 8   order_status                   119143 non-null  object 
 9   order_purchase_timestamp       119143 non-null  object 
 10  order_delivered_customer_date  115722 non-null  object 
 11  review_score                   118146 non-null  float64
 12  review_comment_title           13886 non-null   object 
 13  review_comment_message         50081 non-null   object 
 14  review_creation_date           118146 non-null  object 
dtypes: float64(3), int64(1), object(11)
memory usage: 13.6+ MB
```

What is the effect of review length on customer sentiment and review scores in Brazilian e-commerce, and how can this relationship inform strategies to encourage more informative customer feedback?

```
df.describe()
```

	Unnamed: 0	price	payment_value	review_score
count	119143.000000	118310.000000	119140.000000	118146.000000
mean	59571.000000	120.646603	172.735135	4.015582
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min	0.000000	0.850000	0.000000	1.000000
25%	29785.500000	39.900000	60.850000	4.000000
50%	59571.000000	74.900000	108.160000	5.000000
75%	89356.500000	134.900000	189.240000	5.000000
max	119142.000000	6735.000000	13664.080000	5.000000

```
df.head()
```

	Unnamed: 0	customer_city	seller_city	seller_state	product_category_name_english	price	payment_va
0	0	São Paulo	maua	SP	housewares	29.99	18
1	1	São Paulo	maua	SP	housewares	29.99	2
2	2	São Paulo	maua	SP	housewares	29.99	18
3	3	barriers	belo horizonte	SP	perfumery	118.70	141
4	4	VIANOPOLIS	guariba	SP	auto	159.90	179

```
df.sample(5)
```

	Unnamed: 0	customer_city	seller_city	seller_state	product_category_name_english	price	payme
74582	74582	sao paulo	sao paulo	SP	furniture_decor	159.00	
31316	31316	santa luzia	ibitinga	SP	bed_bath_table	39.00	
80778	80778	aracaju	barra mansa	RJ	auto	21.99	
28720	28720	sao paulo	sao paulo	SP	sports_leisure	33.99	
106863	106863	salvador	sao paulo	SP	sports_leisure	59.99	

```
df.tail()
```

	Unnamed: 0	customer_city	seller_city	seller_state	product_category_name_english	price	payme
119138	119138	praia grande	tupa	SP	baby	174.90	
119139	119139	nova vicosa	sao paulo	SP	home_appliances_2	205.99	
119140	119140	japuiba	ilicinea	MG	computers_accessories	179.99	
119141	119141	japuiba	ilicinea	MG	computers_accessories	179.99	
119142	119142	lapa	franca	SP	health_beauty	68.50	

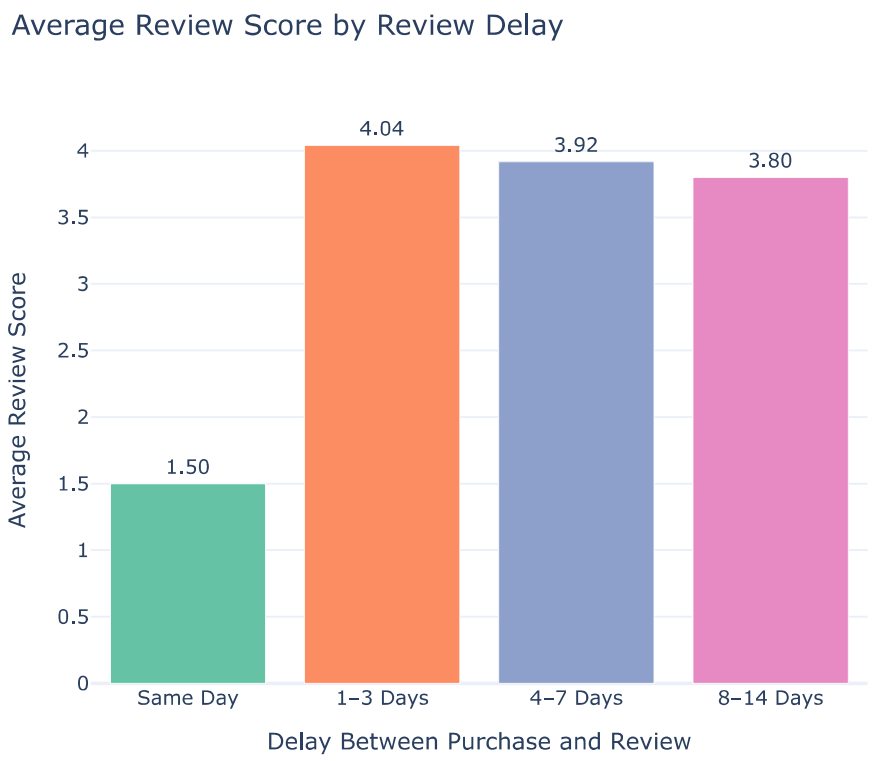
```
import pandas as pd
import plotly.express as px

review_col = 'review_comment_message'
rating_col = 'review_score'

df = df.dropna(subset=[review_col, rating_col])
df['review_length'] = df[review_col].apply(lambda x: len(str(x).split()))
df[rating_col] = df[rating_col].astype(str)

fig = px.box(
    df,
    x=rating_col,
    y='review_length',
    color=rating_col,
    color_discrete_sequence=px.colors.qualitative.Set2,
    title='Effect of Review Length on Customer Sentiment (Rating)',
    labels={
        rating_col: 'Rating Score',
        'review_length': 'Review Length (Number of Words)'
    },
    points="outliers"
)

fig.update_layout(
    xaxis_title='Rating Score',
    yaxis_title='Review Length (Number of Words)',
    showlegend=False,
    template='plotly_white'
)

fig.show()
```

How does the timing of review creation (e.g., delay between purchase and review) influence review scores and customer satisfaction in e-commerce, and what operational changes can mitigate negative impacts of delayed reviews?

```
import pandas as pd
import plotly.express as px

df = df.dropna(subset=['order_purchase_timestamp', 'review_creation_date', 'review_score'])
df['order_purchase_timestamp'] = pd.to_datetime(df['order_purchase_timestamp'])
df['review_creation_date'] = pd.to_datetime(df['review_creation_date'])
df['review_delay_days'] = (df['review_creation_date'] - df['order_purchase_timestamp']).dt.days
df = df[df['review_delay_days'] >= 0]

bins = [-1, 0, 3, 7, 14]
labels = ['Same Day', '1–3 Days', '4–7 Days', '8–14 Days']
df['delay_category'] = pd.cut(df['review_delay_days'], bins=bins, labels=labels)
df['review_score'] = pd.to_numeric(df['review_score'], errors='coerce')


grouped = df.groupby('delay_category', observed=True)['review_score'].mean().reset_index()

fig = px.bar(
    grouped,
    x='delay_category',
    y='review_score',
    text='review_score',
    color='delay_category',
    color_discrete_sequence=px.colors.qualitative.Set2,
    title='Average Review Score by Review Delay',
    labels={
        'delay_category': 'Delay Between Purchase and Review',
```

```
        'review_score': 'Average Review Score'
    }
)

fig.update_traces(texttemplate='%{text:.2f}', textposition='outside')
fig.update_layout(
    uniformtext_minsize=8,
    uniformtext_mode='hide',
    xaxis_title='Delay Between Purchase and Review',
    yaxis_title='Average Review Score',
    showlegend=False,
    template='plotly_white'
)

fig.show()
```

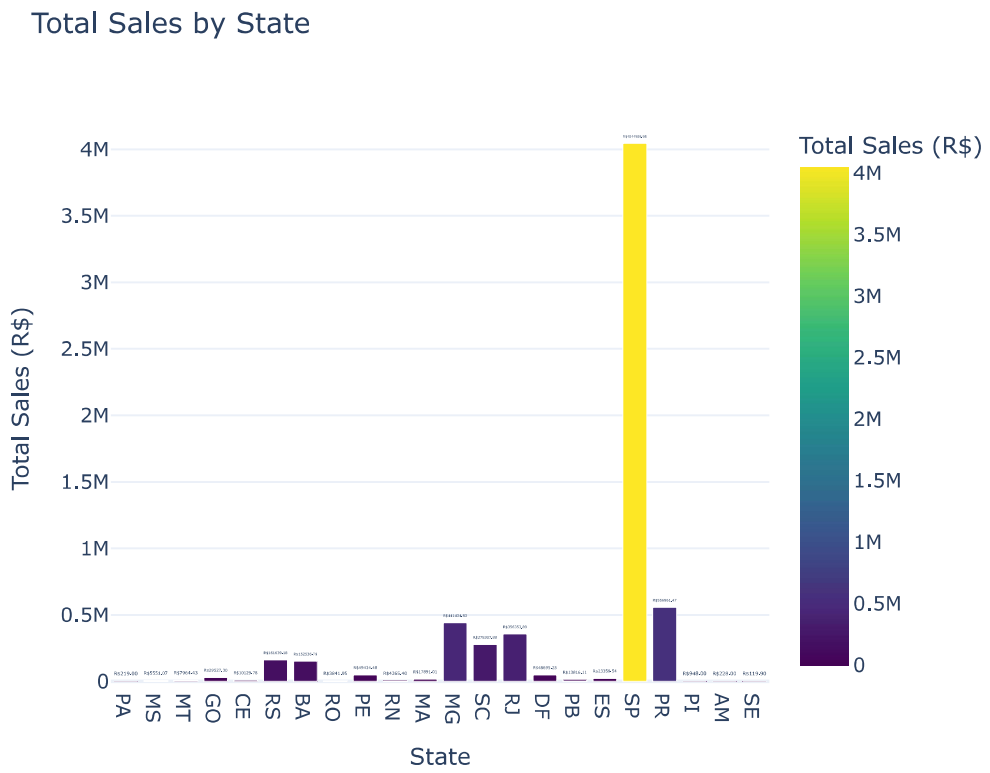
```
<ipython-input-39-e505b97bcd1d>:12: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.h
```




```
import pandas as pd
import plotly.express as px

df = df.dropna(subset=['seller_state', 'review_score', 'price'])
df['review_score'] = pd.to_numeric(df['review_score'], errors='coerce')
df['price'] = pd.to_numeric(df['price'], errors='coerce')

state_grouped = df.groupby('seller_state').agg({
```

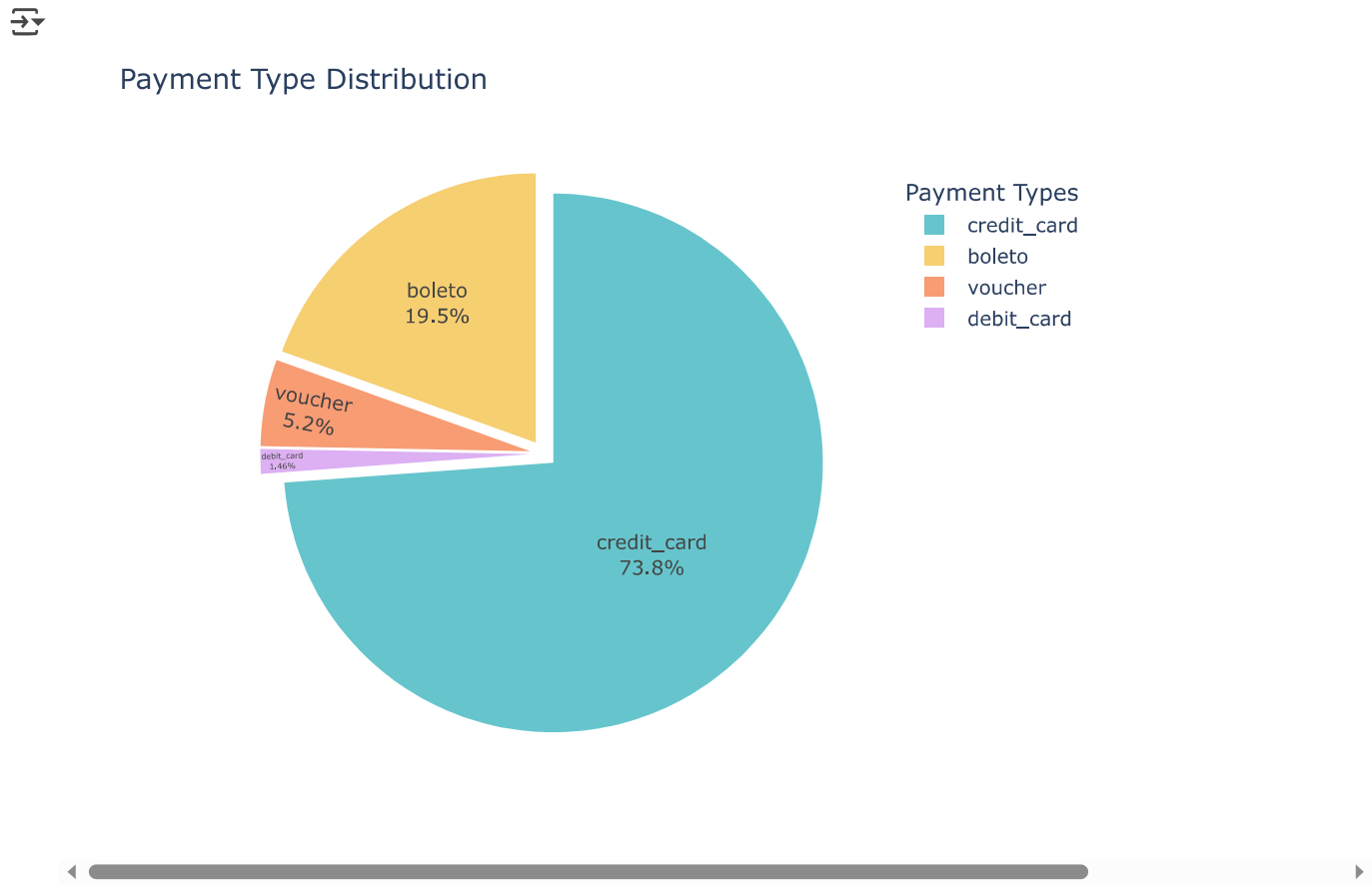
```
        'review_score': 'mean',
        'price': 'sum',
        'Unnamed: 0': 'count'
    }).reset_index().rename(columns={'Unnamed: 0': 'order_count'})

    state_grouped = state_grouped.sort_values(by='review_score', ascending=False)

    fig = px.bar(
        state_grouped,
        x='seller_state',
        y='price',
        color='price',
        text='price',
        title='Total Sales by State',
        labels={
            'seller_state': 'State',
            'price': 'Total Sales (R$)'
        },
        color_continuous_scale='viridis'
    )

    fig.update_traces(texttemplate='R$%{text:.2f}', textposition='outside')
    fig.update_layout(
        xaxis_title='State',
        yaxis_title='Total Sales (R$)',
        template='plotly_white'
    )

    fig.show()
```

```
<ipython-input-40-c853d9904234>:5: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.h

<ipython-input-40-c853d9904234>:6: SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.h
```



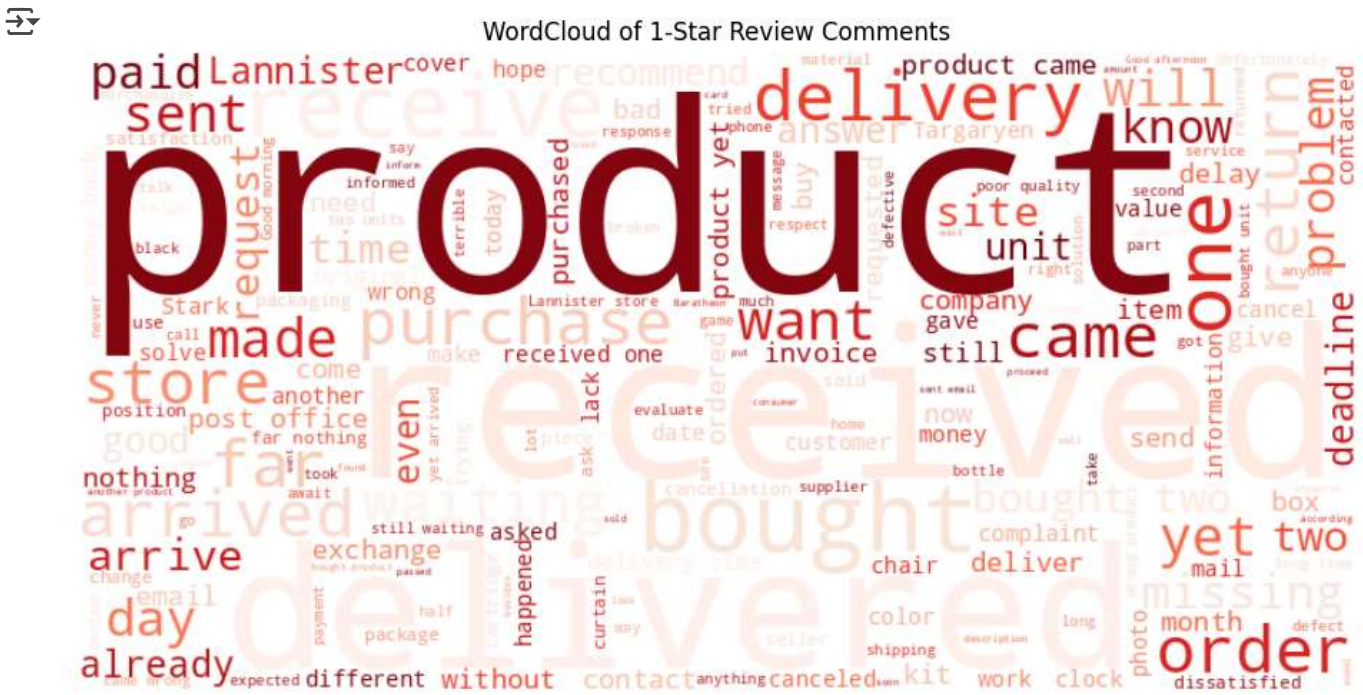

```
import pandas as pd
import plotly.express as px

df = df.dropna(subset=['payment_type'])
payment_counts = df['payment_type'].value_counts().reset_index()
payment_counts.columns = ['payment_type', 'count']

fig = px.pie(
    payment_counts,
    names='payment_type',
    values='count',
    title='Payment Type Distribution',
    color_discrete_sequence=px.colors.qualitative.Pastel
)

fig.update_traces(
    textposition='inside',
```

```
    textinfo='percent+label',
    pull=[0.05] * len(payment_counts)
)

fig.update_layout(
    showlegend=True,
    legend_title='Payment Types',
    template='plotly_white'
)

fig.show()
```




```
from wordcloud import WordCloud, STOPWORDS
import matplotlib.pyplot as plt

df = df.dropna(subset=['review_score', 'review_comment_message'])
df_1star = df[df['review_score'] == 1]

text = " ".join(review for review in df_1star['review_comment_message'])
stopwords = set(STOPWORDS)

wordcloud = WordCloud(
    width=800,
    height=400,
    background_color='white',
    stopwords=stopwords,
    colormap='Reds',
    max_words=200
).generate(text)

plt.figure(figsize=(10, 5))
plt.imshow(wordcloud, interpolation='bilinear')
```

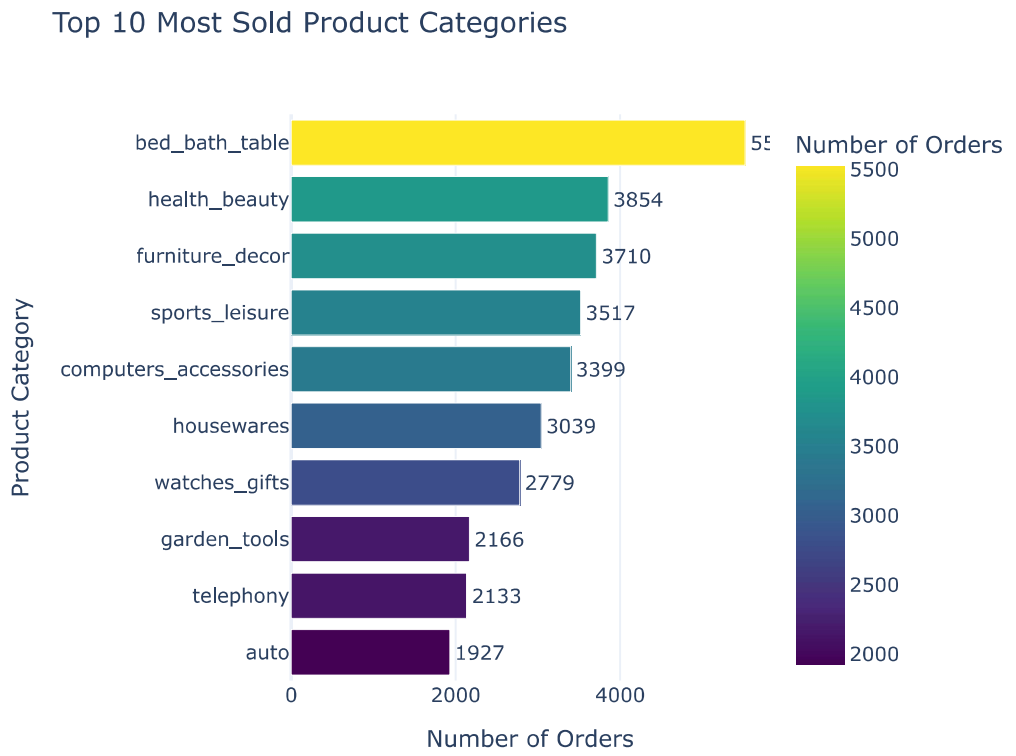
```
plt.axis("off")
plt.title("WordCloud of 1-Star Review Comments")
plt.tight_layout()
plt.show()
```



World Cloud does not support plotly library

```
import pandas as pd
import plotly.express as px

top_categories = df["product_category_name_english"].value_counts().nlargest(10)
top_df = top_categories.reset_index()
top_df.columns = ['product_category', 'order_count']

fig = px.bar(
    top_df,
    x='order_count',
    y='product_category',
    orientation='h',
    text='order_count',
    title='Top 10 Most Sold Product Categories',
    labels={
        'order_count': 'Number of Orders',
        'product_category': 'Product Category'
    },
    color='order_count',
    color_continuous_scale='viridis'
)

fig.update_traces(textposition='outside')
fig.update_layout(
    yaxis=dict(autorange='reversed'),  # To match Seaborn's descending order
    template='plotly_white'
)
```

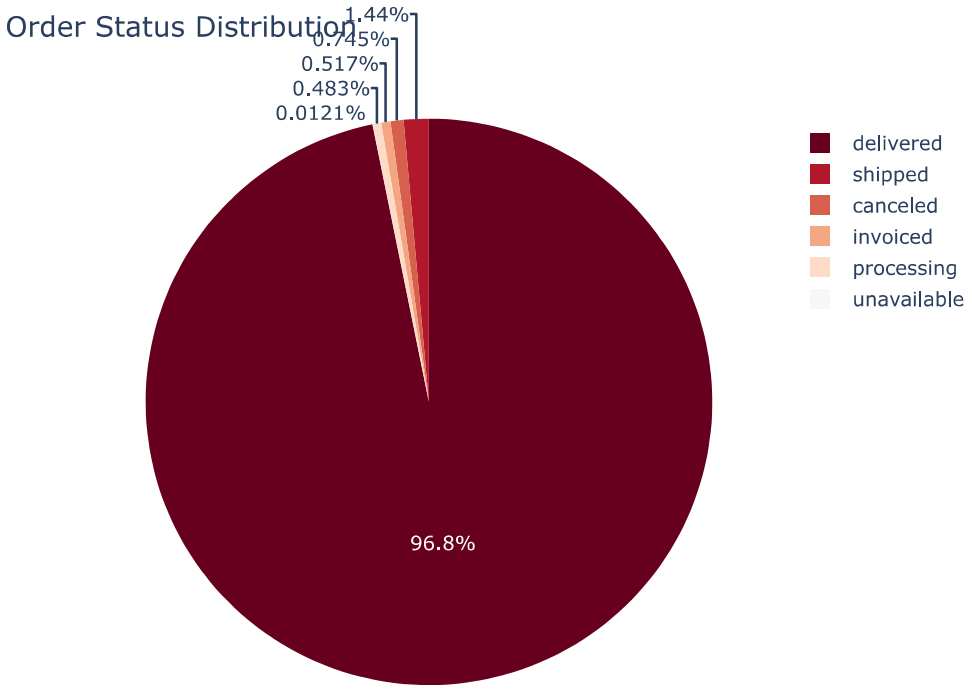
```
fig.show()
```



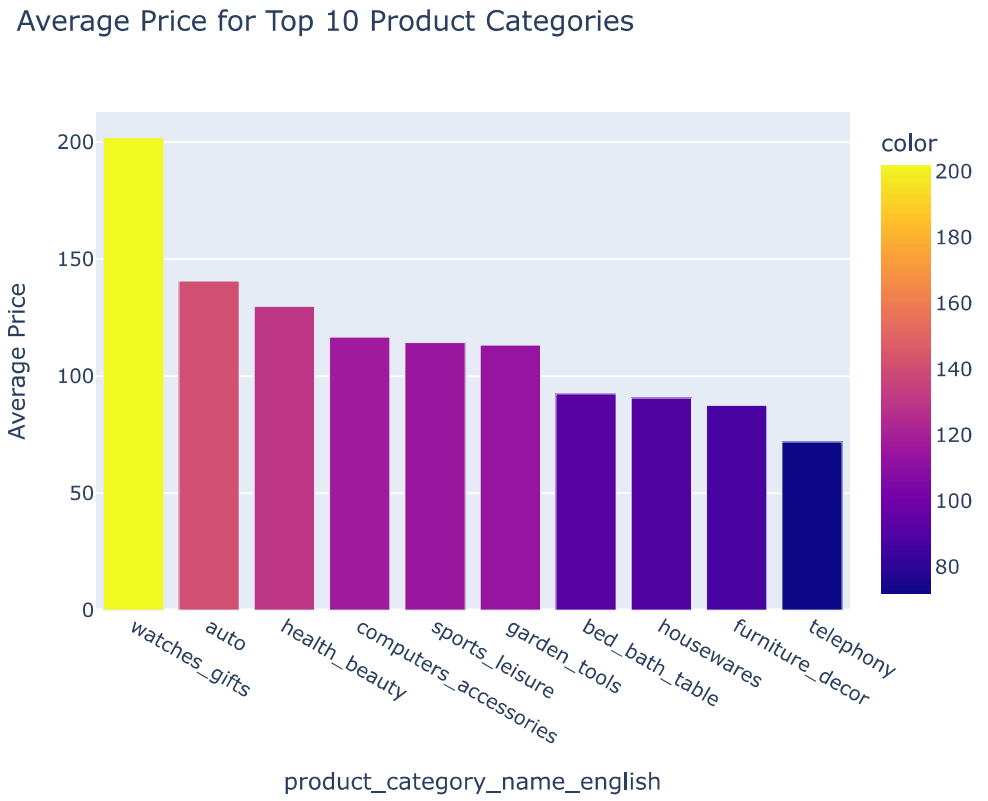

```
import plotly.express as px

review_counts = df["review_score"].dropna().value_counts().sort_index()

fig = px.bar(
    x=review_counts.index,
    y=review_counts.values,
    labels={'x': 'Review Score', 'y': 'Count'},
    title='Review Score Distribution',
    color=review_counts.values,
    color_continuous_scale='magma'
)

fig.show()
```


```
df['order_purchase_timestamp'] = pd.to_datetime(df['order_purchase_timestamp'], errors='coerce')
df['order_delivered_customer_date'] = pd.to_datetime(df['order_delivered_customer_date'], errors='coerce')
df['review_creation_date'] = pd.to_datetime(df['review_creation_date'], errors='coerce')
```

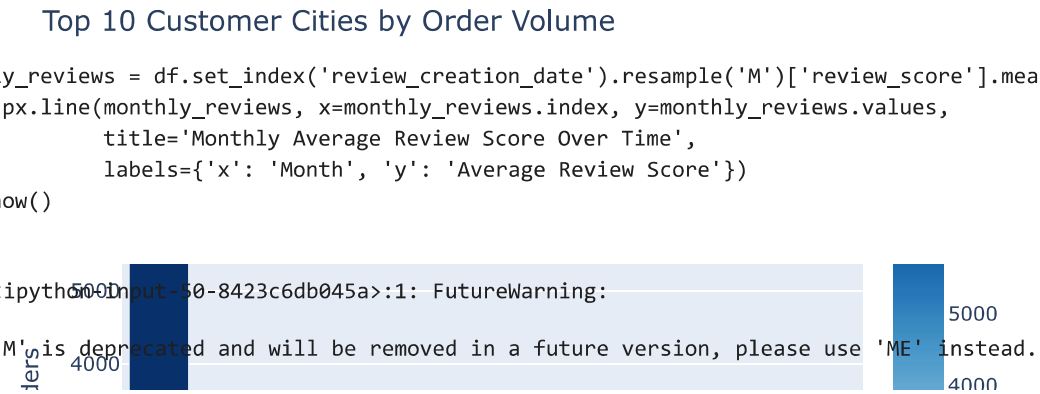
```
fig = px.pie(df, names='order_status', title='Order Status Distribution',
             color_discrete_sequence=px.colors.sequential.RdBu)
fig.show()
```




```
avg_price = df.groupby('product_category_name_english')['price'].mean().dropna()
top_categories = df['product_category_name_english'].value_counts().nlargest(10).index
avg_price_top = avg_price[top_categories].sort_values(ascending=False)
fig = px.bar(avg_price_top, x=avg_price_top.index, y=avg_price_top.values,
             labels={'x': 'Product Category', 'y': 'Average Price'},
             title='Average Price for Top 10 Product Categories',
             color=avg_price_top.values, color_continuous_scale='Plasma')
fig.show()
```




```
top_customer_cities = df['customer_city'].value_counts().nlargest(10).reset_index()
top_customer_cities.columns = ['customer_city', 'orders']
fig = px.bar(top_customer_cities, x='customer_city', y='orders',
             title='Top 10 Customer Cities by Order Volume',
             color='orders', color_continuous_scale='Blues')
fig.show()
```




```
monthly_reviews = df.set_index('review_creation_date').resample('M')['review_score'].mean().dropna()
fig = px.line(monthly_reviews, x=monthly_reviews.index, y=monthly_reviews.values,
              title='Monthly Average Review Score Over Time',
              labels={'x': 'Month', 'y': 'Average Review Score'})
fig.show()
```

```
<ipython-input-50-8423c6db045a>:1: FutureWarning:

'M' is deprecated and will be removed in a future version, please use 'ME' instead.
```


```
fig = px.box(df[df['price'] < 500], x='review_score', y='price',
             title='Price vs. Review Score (Under $500)',
             labels={'price': 'Product Price', 'review_score': 'Review Score'},
             color='review_score')
fig.show()
```