Data Visualization

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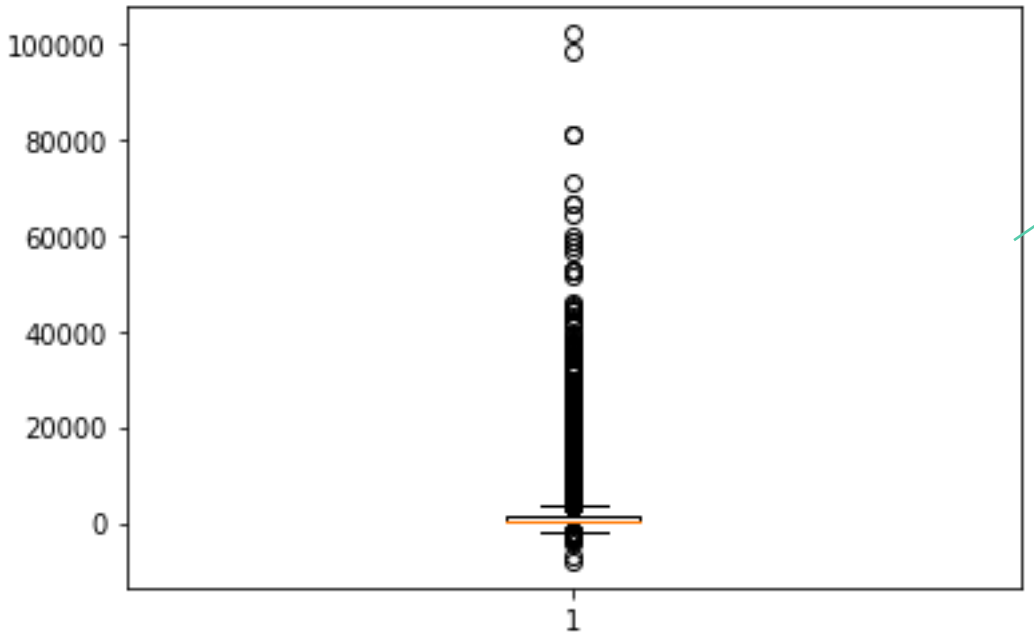
Data Visualizations

- Data Visualizations is NOT about beautiful charts and graphs
- It is about representing the data using right charts

Continuous variable distributions

Box-Plots

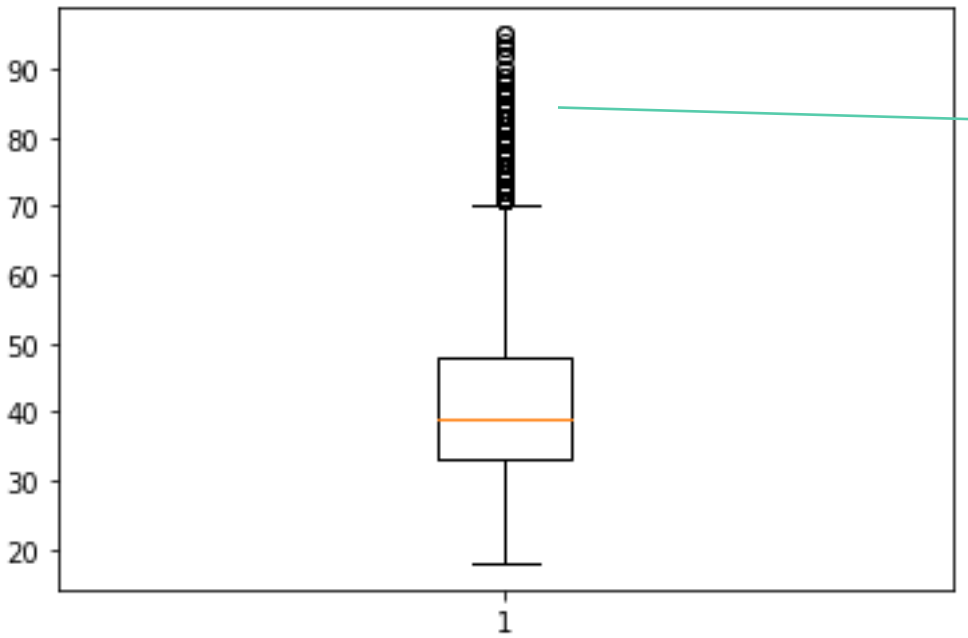
```
plt.boxplot(bank_data["balance"])
```



Talk about outliers and highlight them if any.

Box-Plots

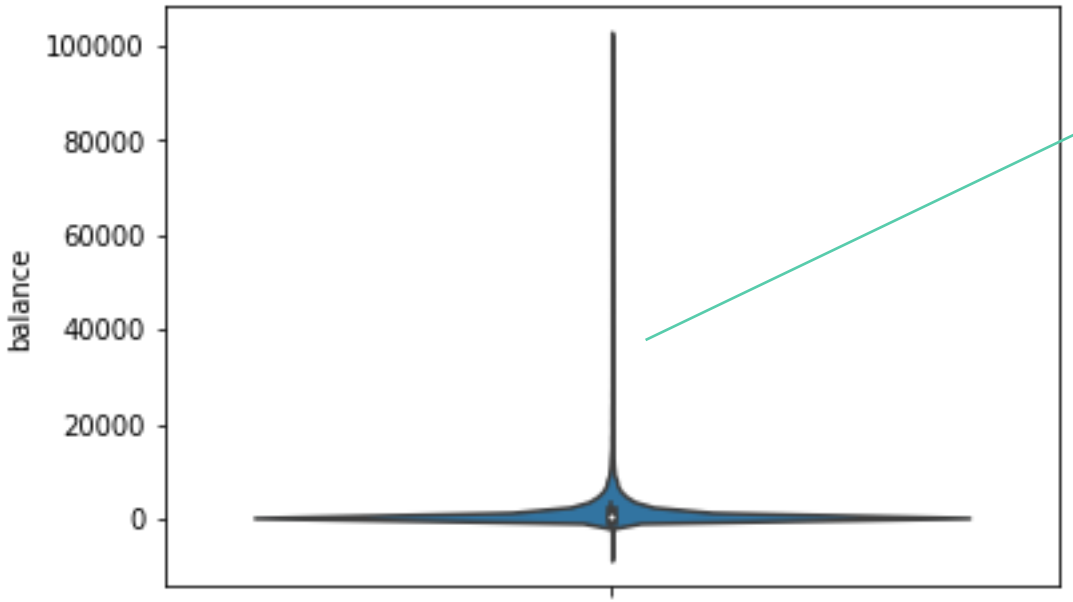
```
plt.boxplot(bank_data["age"])
```



Talk about outliers and highlight them if any.

Violin Plots

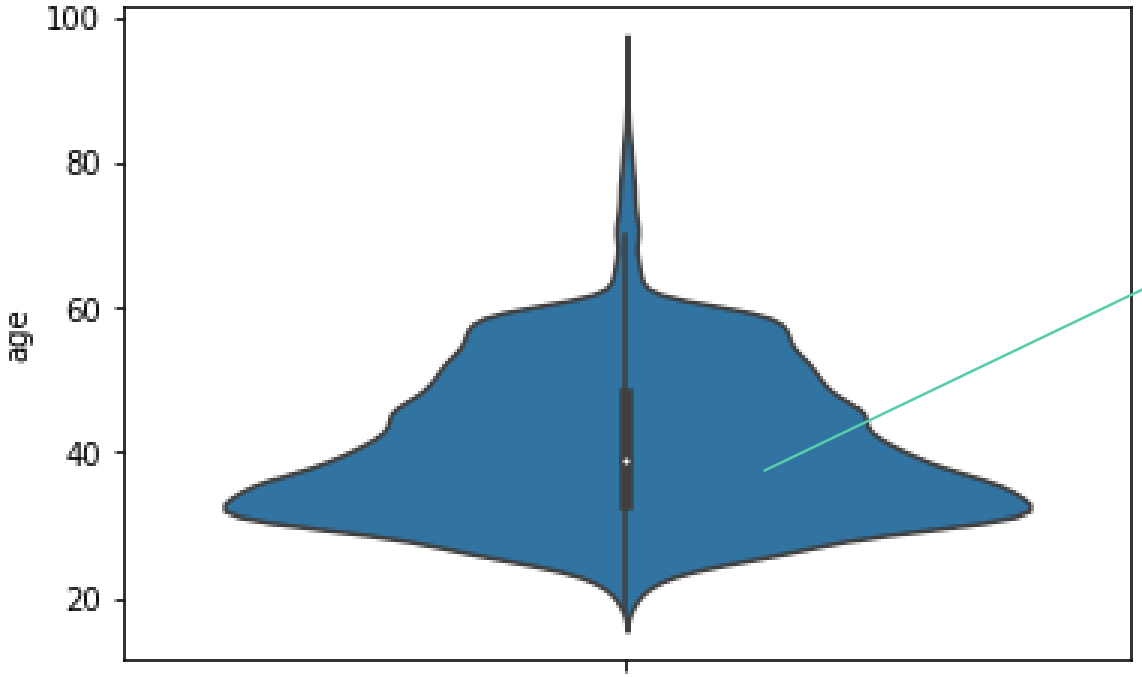
```
import seaborn as sns
sns.violinplot(y=bank_data["balance"])
```



- Treat like an alternative to box plots

Violin Plots

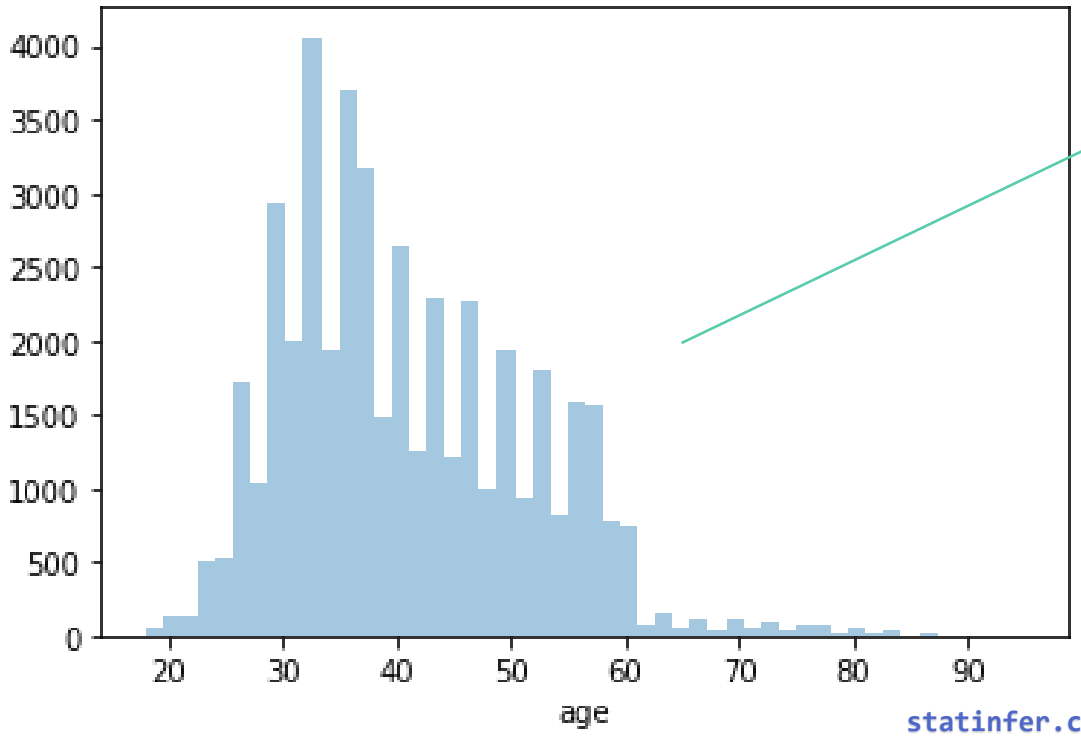
```
sns.violinplot(y=bank_data["age"])
```



- Treat like an alternative to box plots
- Talk about the ranges where maximum data is present

Histograms

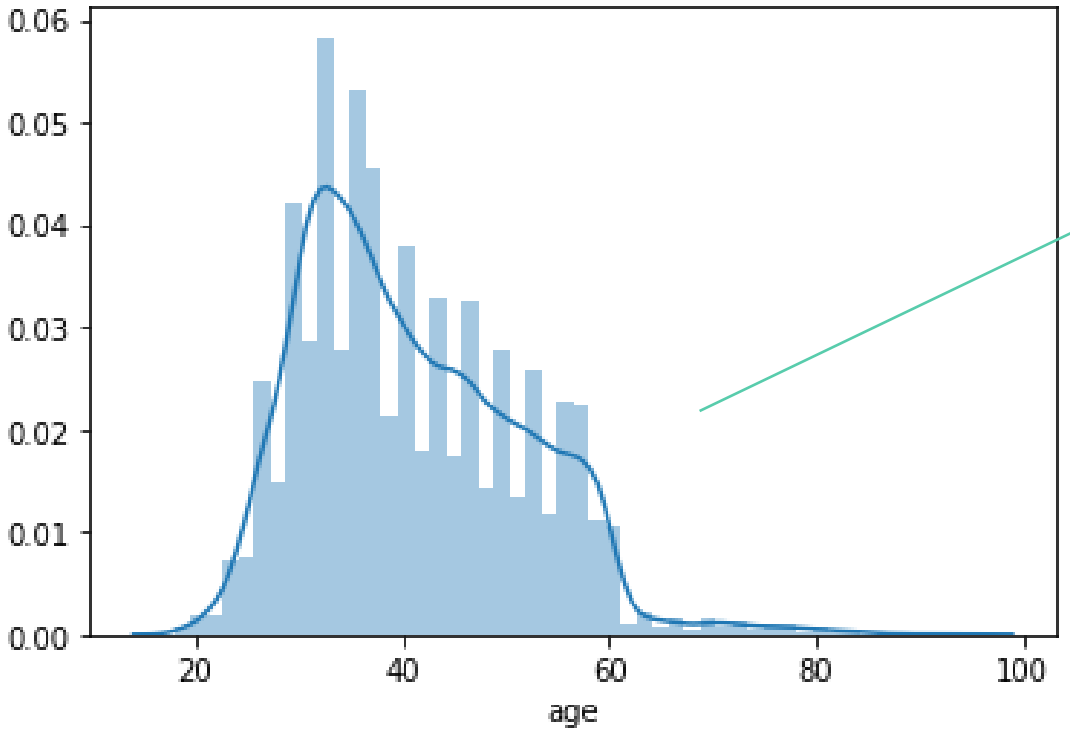
- Represents the frequency distribution of a numerical variable
- On X-axis, we have class intervals of the variable and on Y-axis we have corresponding frequencies.
- Gives an idea on the overall distribution of the variable.



- Talk about the range and maximum spread

Code - Histogram Example

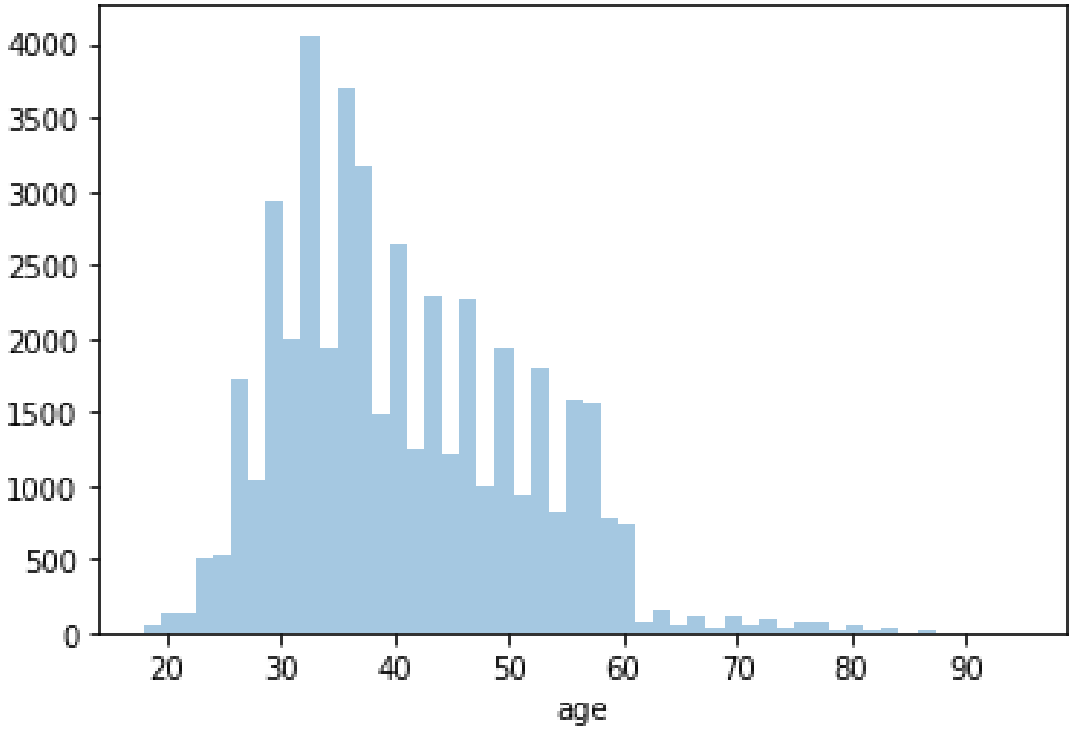
```
#Bank Marketing data
import seaborn as sns
sns.distplot(bank_data["age"])
```



- Talk about the range and maximum spread

Code - Histogram Example

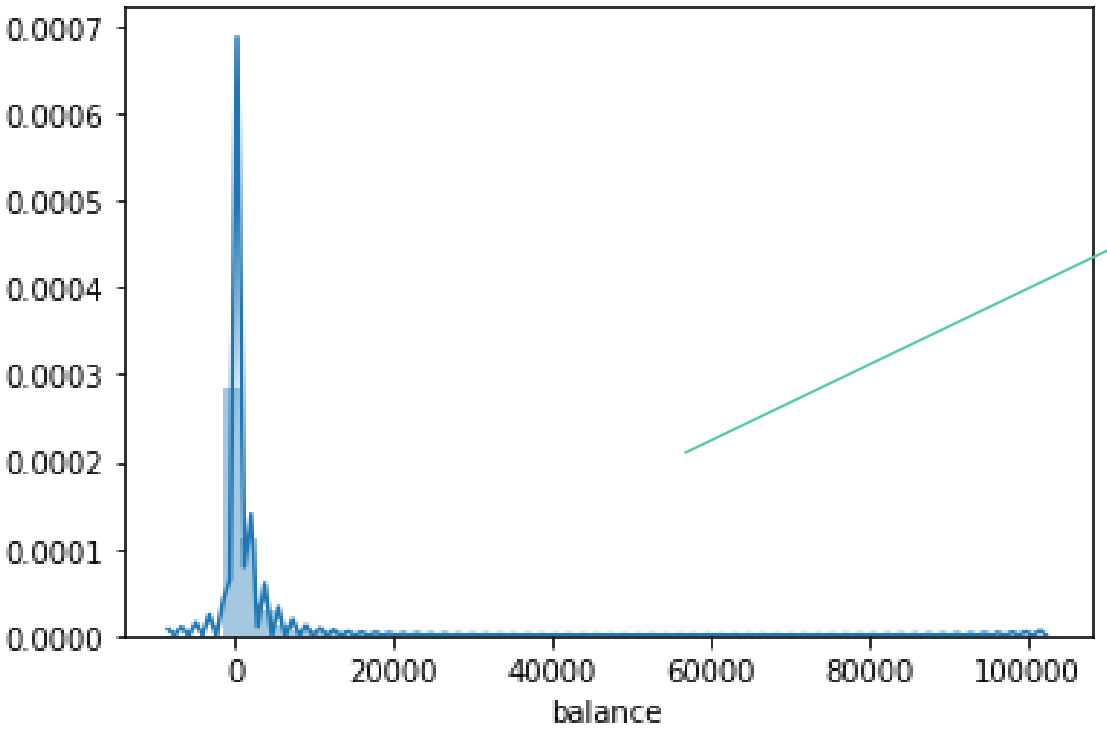
```
#Bank Marketing data
import seaborn as sns
sns.distplot(bank_data["age"] ,kde=False)
```



- `kde=False` Removes the smooth line from the diagram
- Removes the kernel density estimate.

Code - Histogram Example

```
import seaborn as sns
sns.distplot(bank_data["balance"])
```

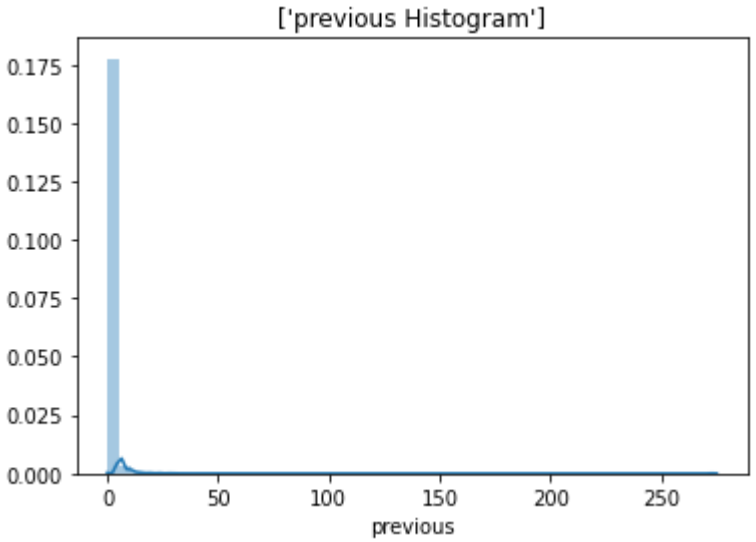


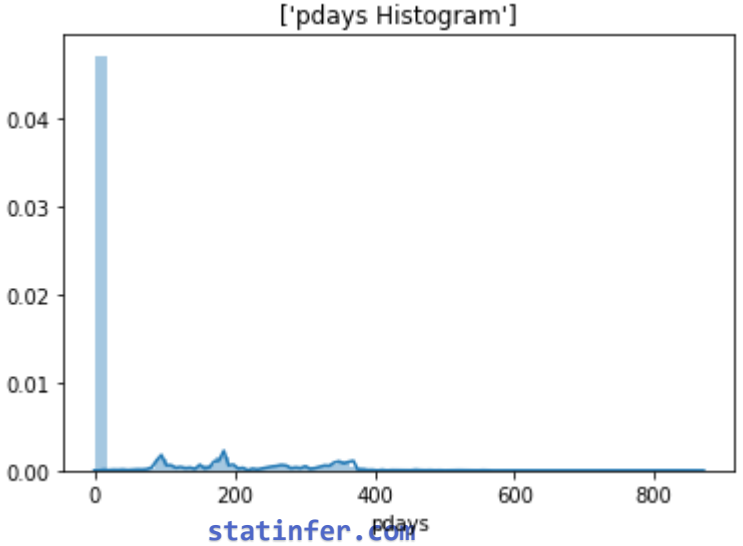
- Talk about the range and maximum spread

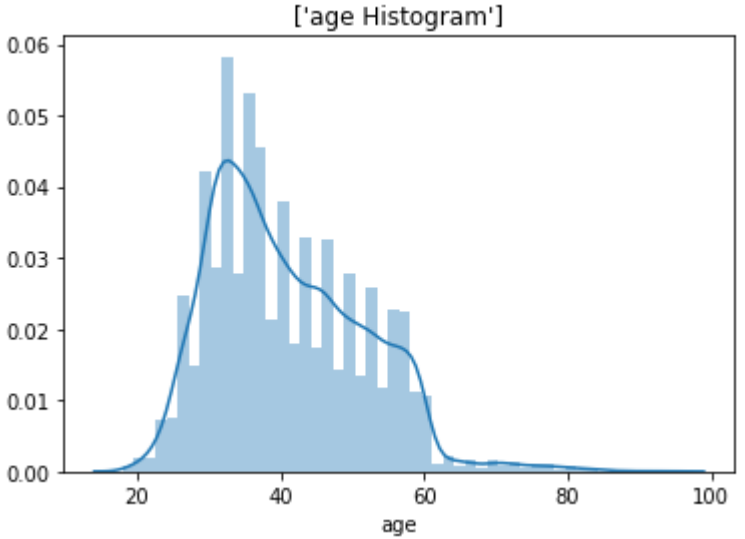
Histograms for all the numerical columns

```
numeric_cols=[col for col in bank_data.columns if bank_data[col].dtypes in
 ["int64","float64"]]
print(numeric_cols)

plt.figure()
for col in numeric_cols:
  sns.distplot(bank_data[col])
  plt.title([col + " Histogram"])
  plt.show()
```







LAB: Rossman Store Sales Data

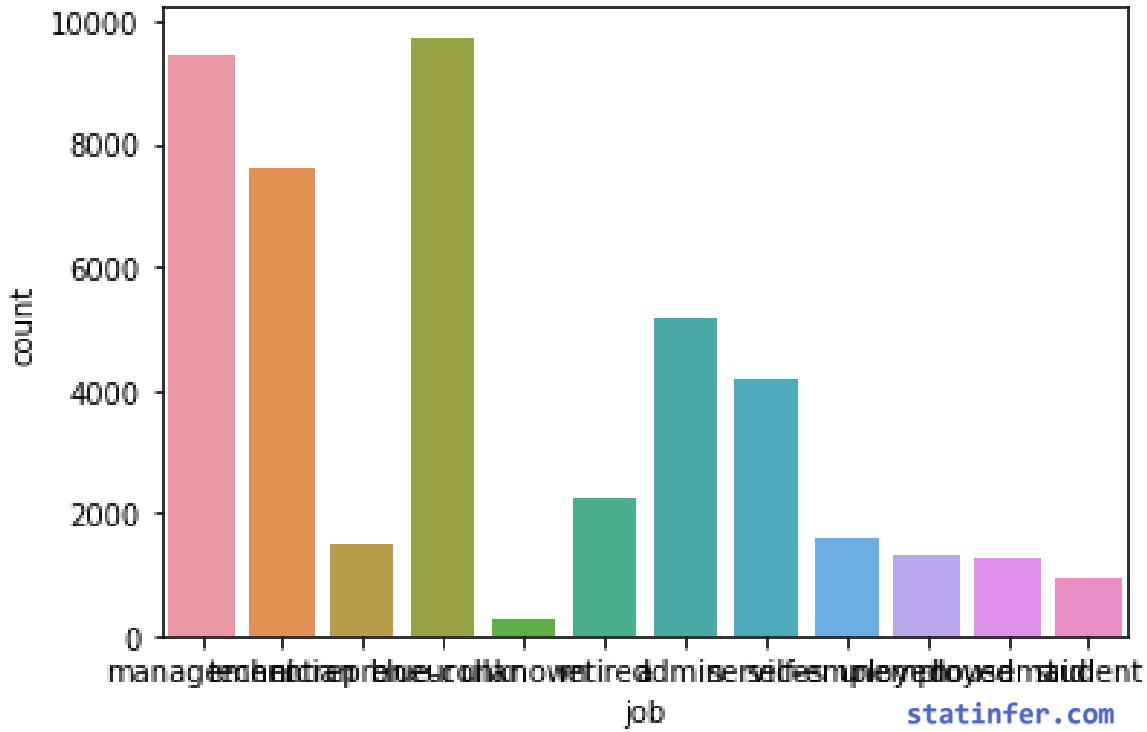
- What is the usual range of “Sales” on most of the days? – Are there any outliers in sales?
- What is the usual range of “Customers” on most of the days? – Are there any outliers in number of customers?

Categorical Variable Visualization

Bar charts

- Bar charts used to summarize the categorical variables

```
plt.figure()
sns.countplot(x="job",  data=bank_data)
```

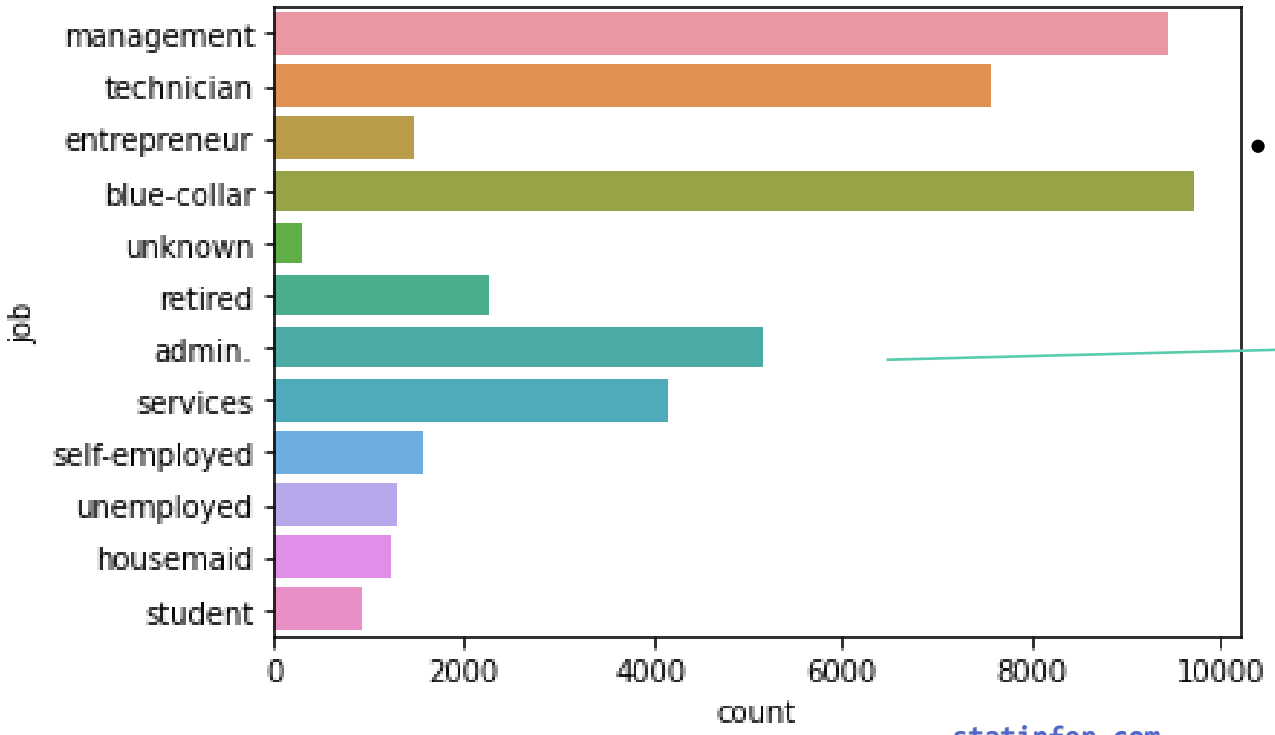


- Countplot() function is used to create box plots

Bar chart - Horizontal

- All the categories are shown in the chart

```
plt.figure()
sns.countplot(y="job",  data=bank_data)
```



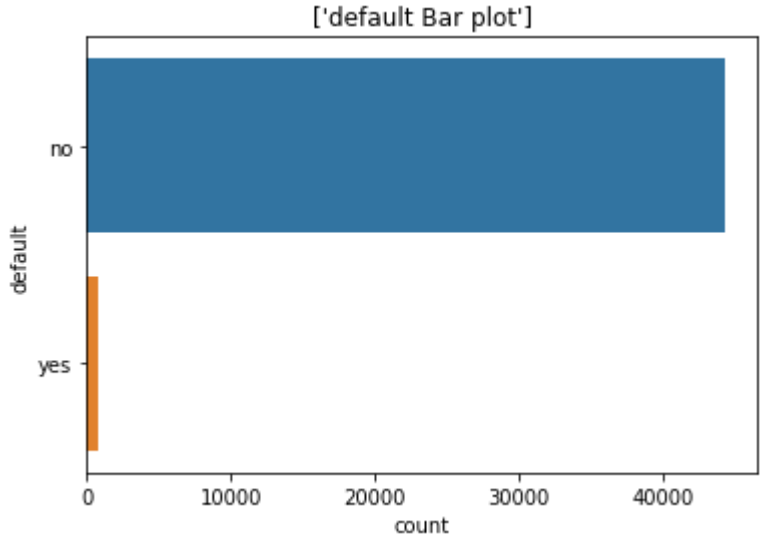
- Change the axis to display the category names

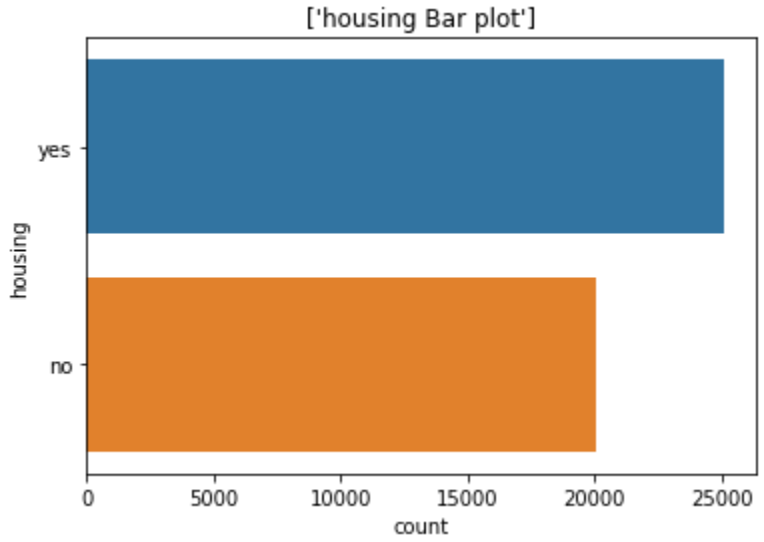
- Make a comment on top3 or top5 maximum frequency items.

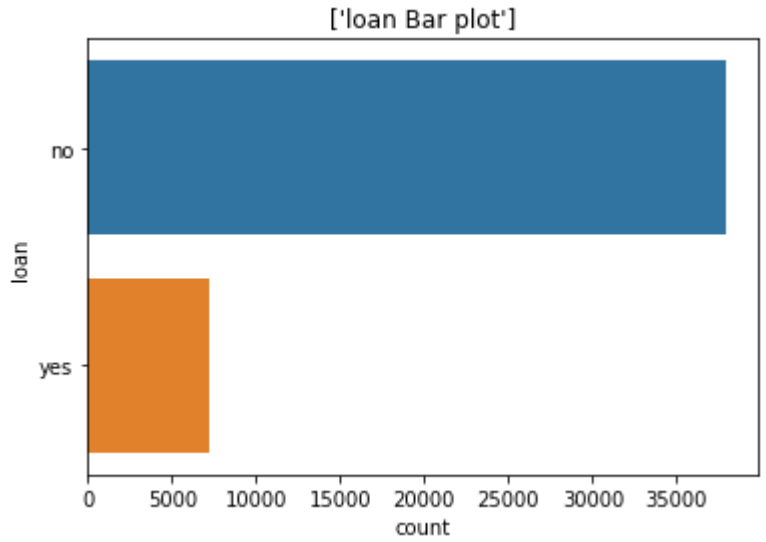
Bar chart for all the variables

```
categorical_cols=[col for col in bank_data.columns if bank_data[col].dtypes
 in ["object"]]
print(categorical_cols)

plt.figure()
for col in categorical_cols:
  sns.countplot(y=col,  data=bank_data)
  plt.title([col + " Bar plot"])
  plt.show()
```







LAB: Rossman Store Sales Data

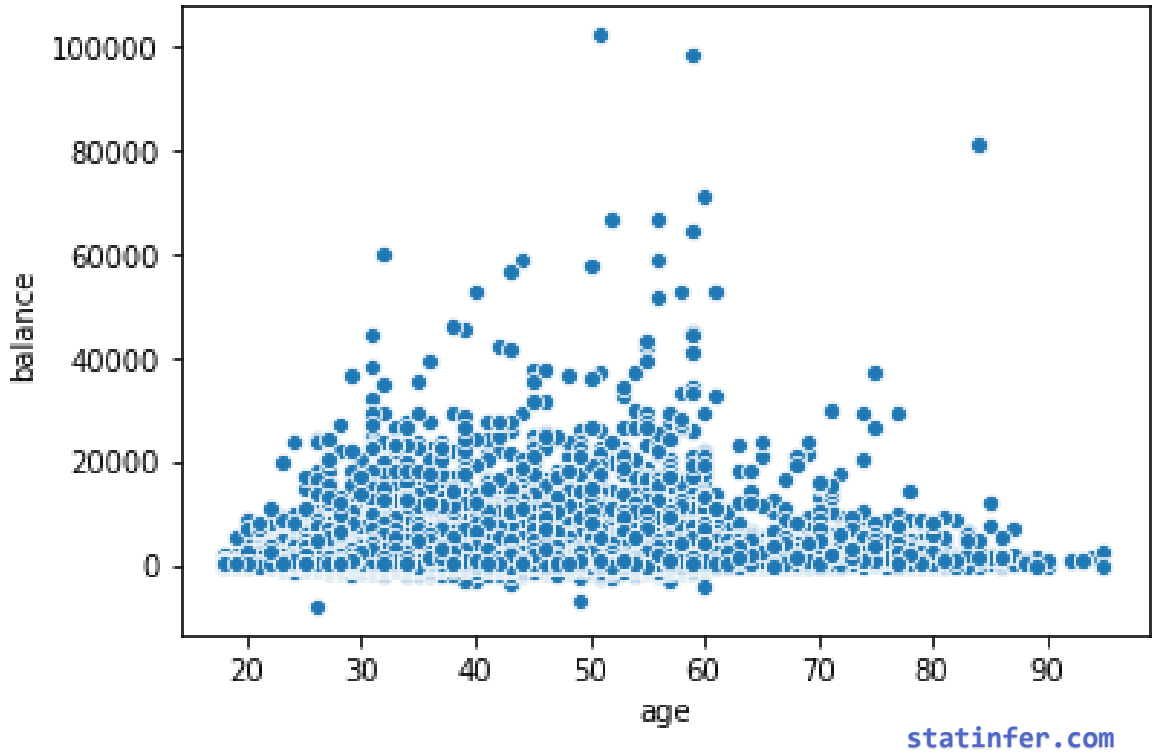
- Which store type has maximum count?
- Which Assortment type has minimum count?

Continuous vs Continuous

Continuous vs Continuous

- Scatter plot is for showing relation between Continuous Numerical Variables

```
import seaborn as sns
import matplotlib.pyplot as plt
sns.scatterplot(x="age", y="balance", data=bank_data)
```



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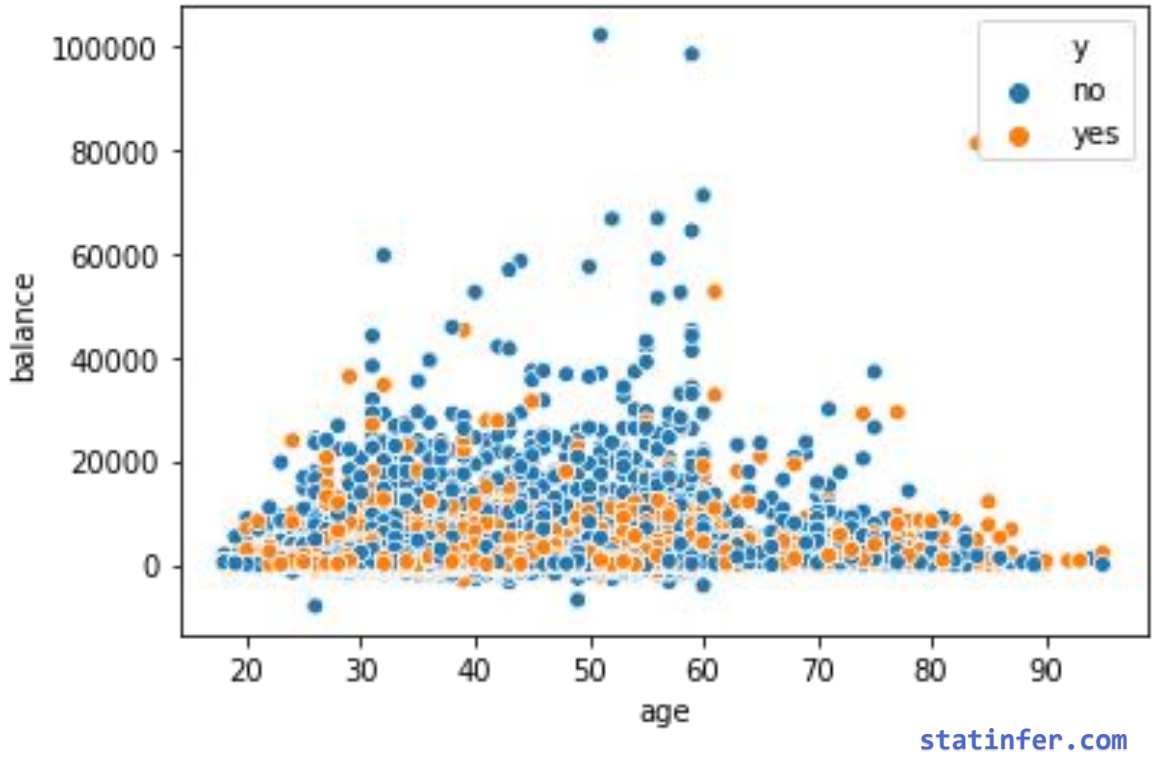
Continuous vs Continuous

- Scatter plot is for showing relation between Continuous Numerical Variables

```
import seaborn as sns
import matplotlib.pyplot as plt
sns.scatterplot(x="age", y="balance", hue="y", data=bank_data)
```



- Adding hue to the dots using a different variable

LAB: Rossman Store Sales Data

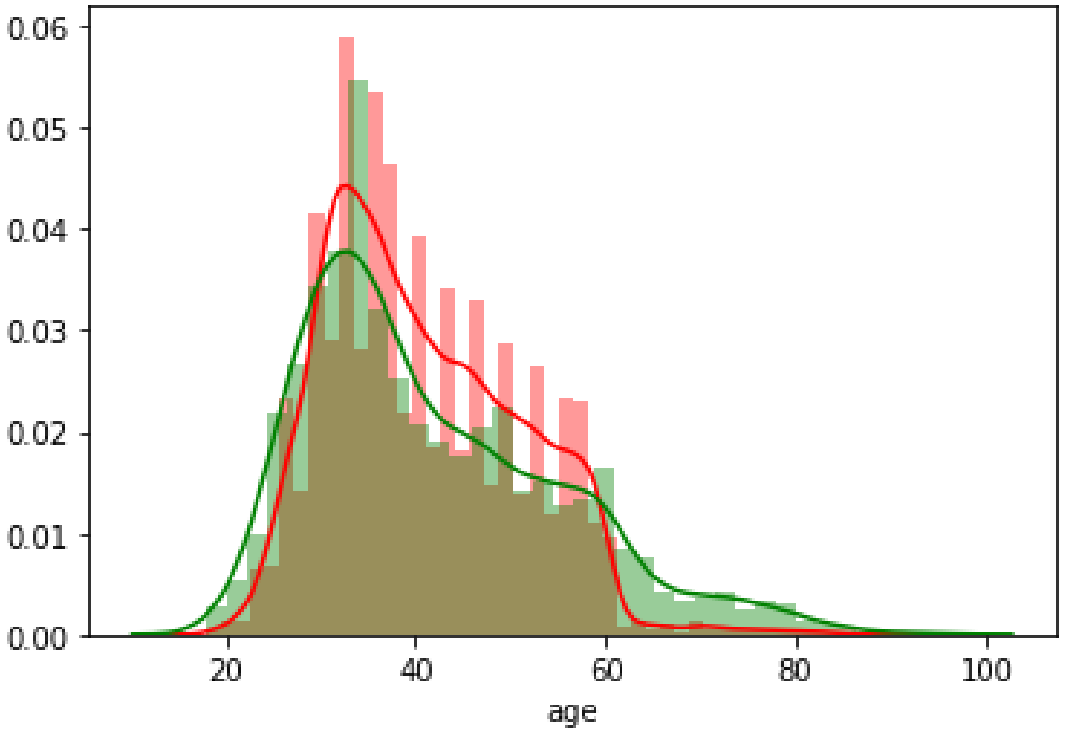
- Is there any relation between number of customers and sales?
- Is there any relation between competition distance and sales?

Continuous vs Categorical

Continuous vs Categorical

- Histograms for categories

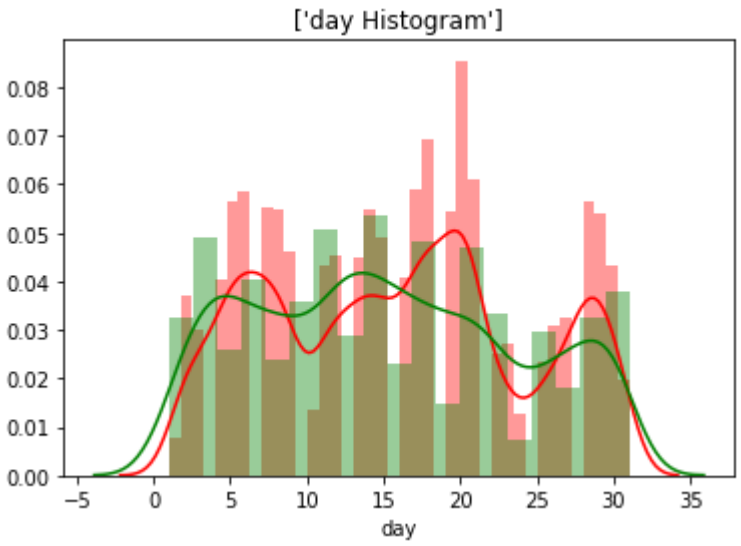
```
sns.distplot(bank_data[bank_data["y"]=="no"]["age"], color="red")
sns.distplot(bank_data[bank_data["y"]=="yes"]["age"], color="green")
```

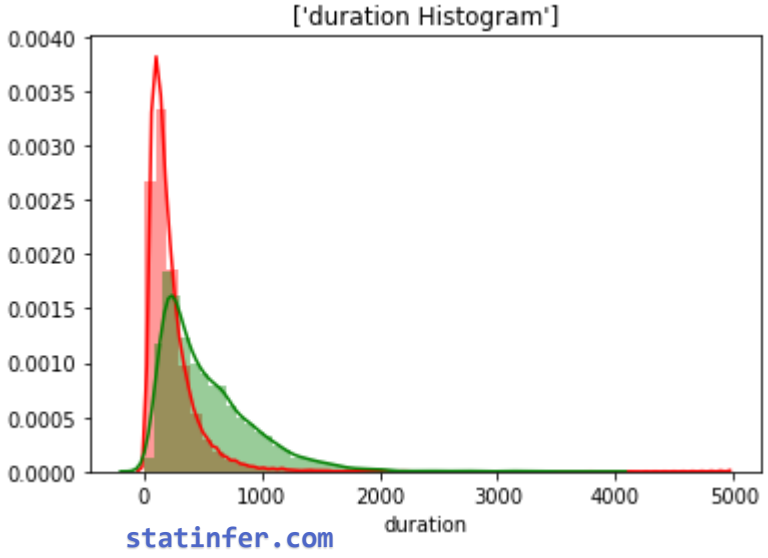


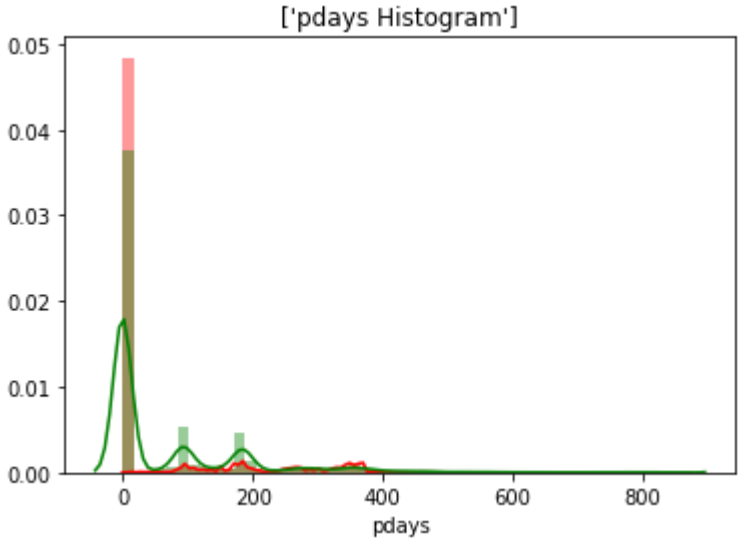
Continuous vs Categorical

- Histograms for categories

```
plt.figure()
for col in numeric_cols:
    sns.distplot(bank_data[bank_data["y"]=="no"][col], color="red")
    sns.distplot(bank_data[bank_data["y"]=="yes"][col], color="green")
    plt.title([col + " Histogram"])
    plt.show()
```







Continuous vs Categorical– Using Box Plots

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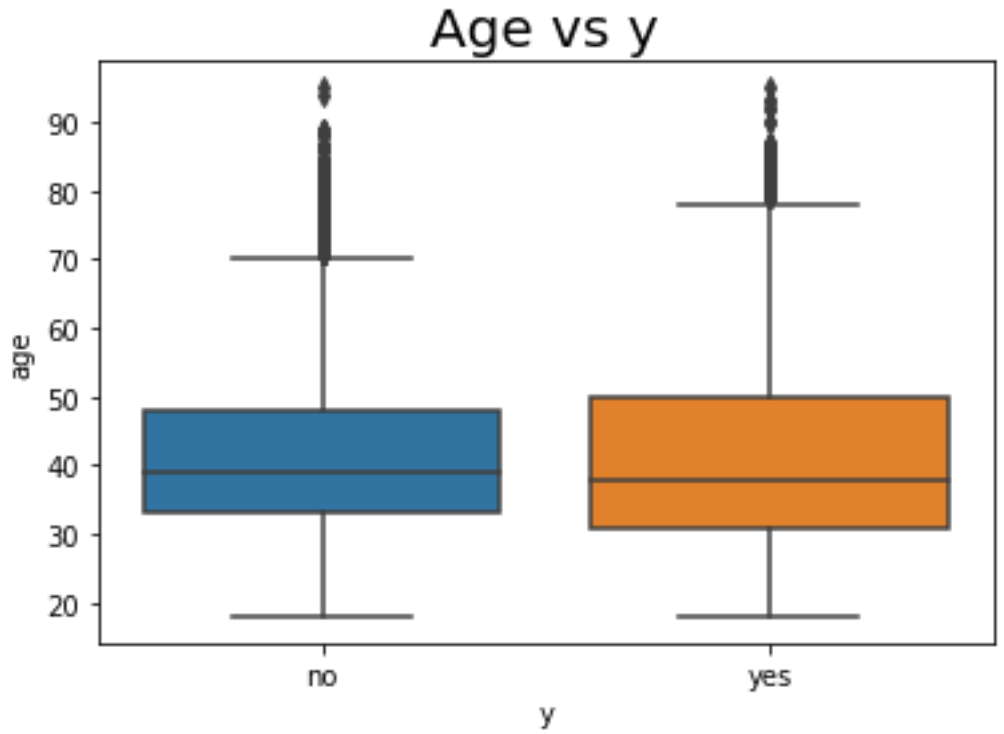
```
sns.boxplot( x=bank_data["y"], y=bank_data["age"])
plt.title('Age vs y', fontsize=20)
```



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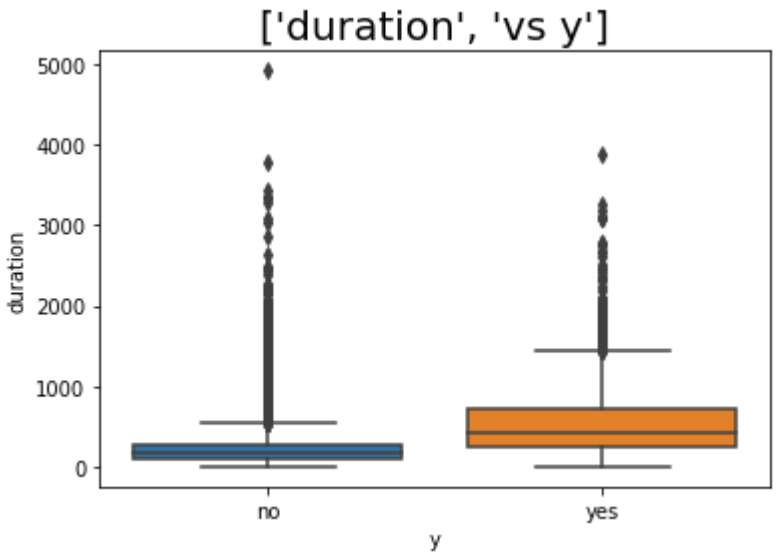
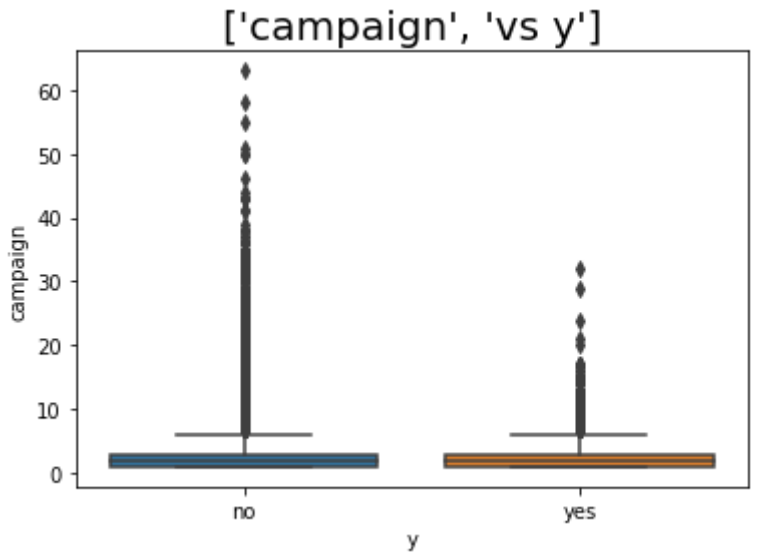
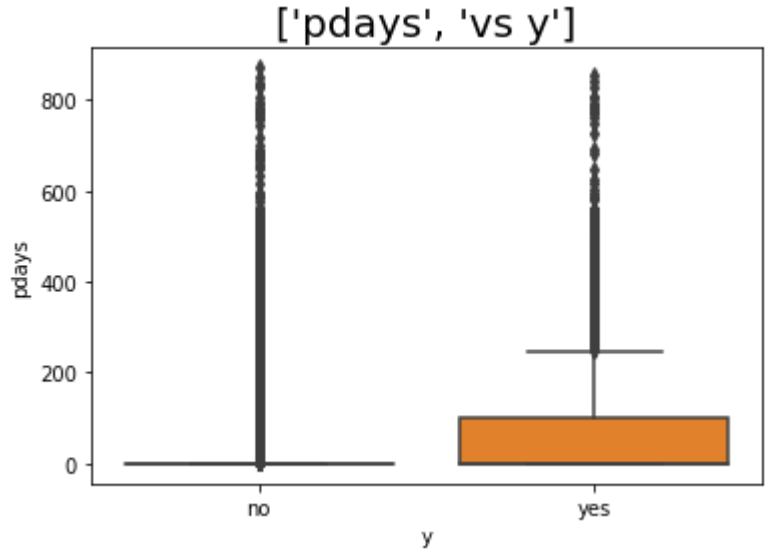
Continuous vs Categorical–Box Plots

```
for col in numeric_cols:
  sns.boxplot( x=bank_data["y"], y=bank_data[col])
  plt.title([col, "vs y"], fontsize=20)
  plt.show()
```

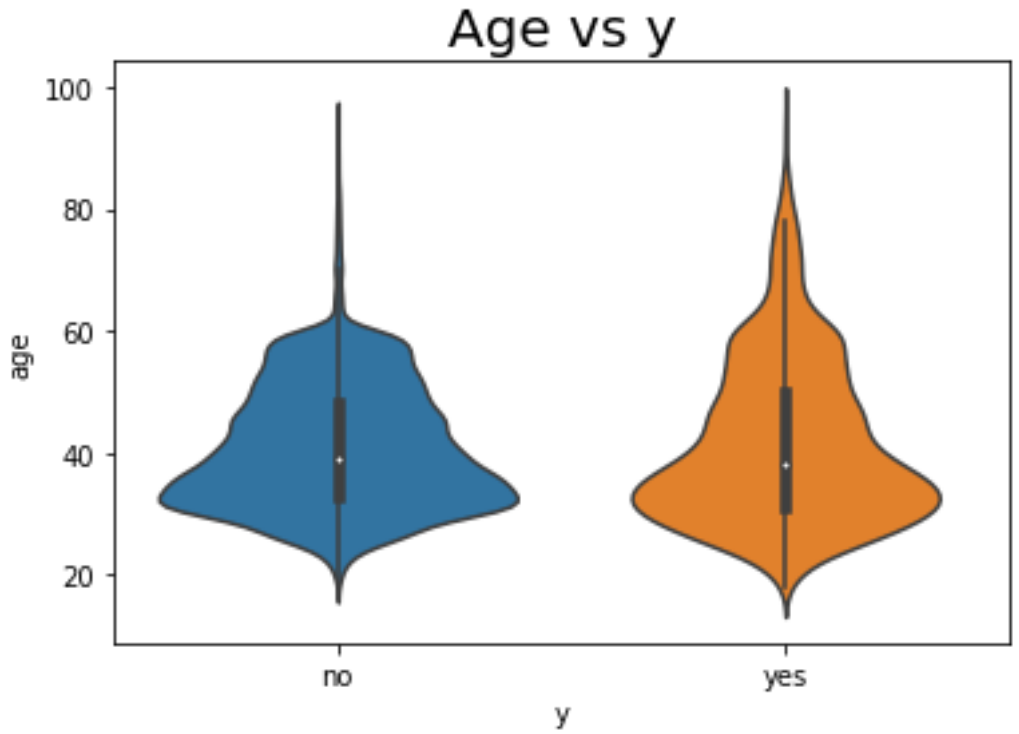






Continuous vs Categorical–Violin plots

```
sns.violinplot( x=bank_data["y"], y=bank_data["age"])
plt.title('Age vs y', fontsize=20)
```



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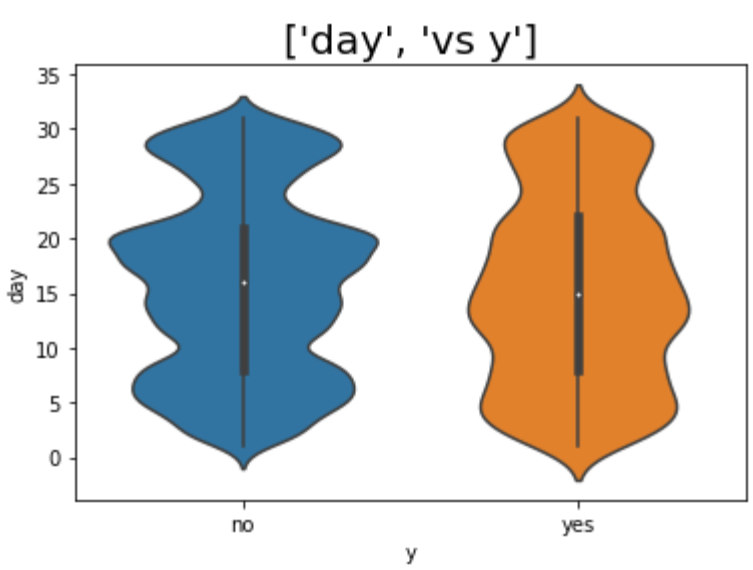
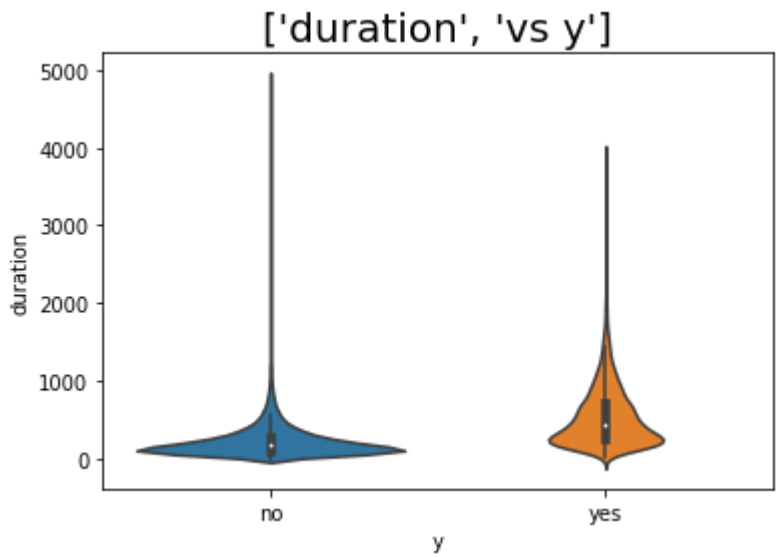
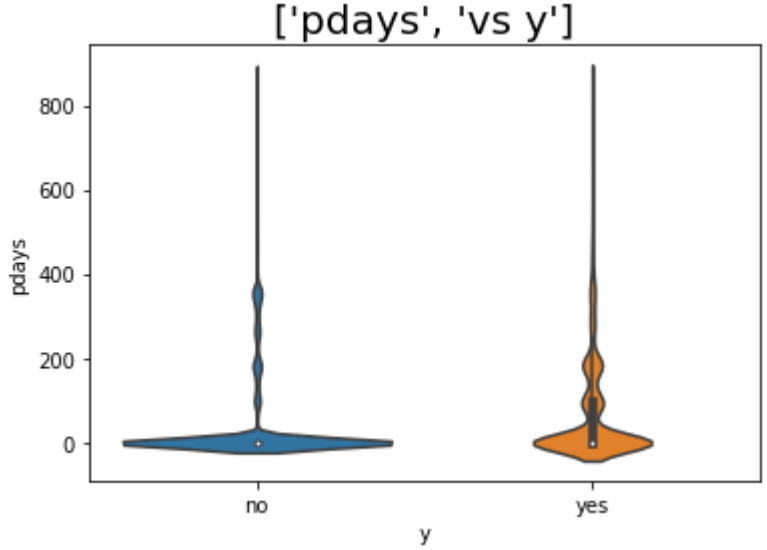
Continuous vs Categorical–Violin plots

```
for col in numeric_cols:
  sns.violinplot( x=bank_data["y"], y=bank_data[col])
  plt.title([col, "vs y"], fontsize=20)
  plt.show()
```







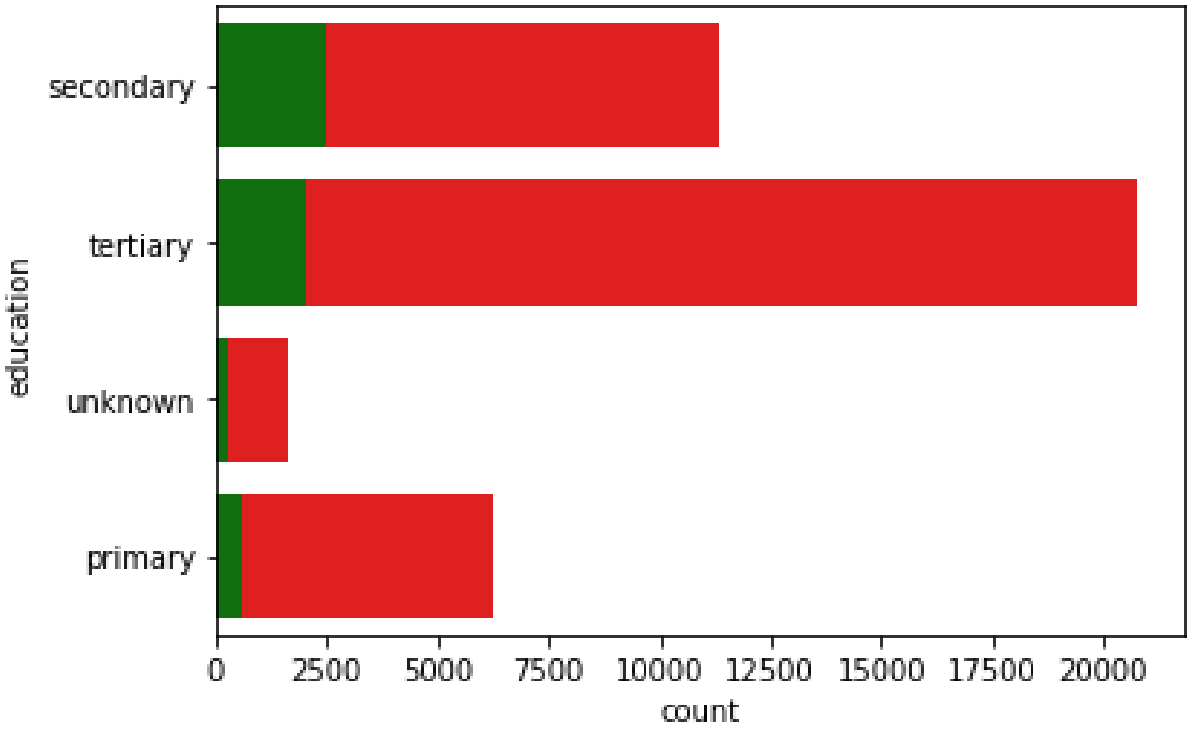
LAB: Rossman Store Sales Data

- Is there any relation between Promo and sales?
- Is there any relation between StateHoliday and sales? Is the sales high on a holiday?
- Is there any relation between DayOfWeek and sales? Is there a day with high or low sales?

Categorical vs Categorical

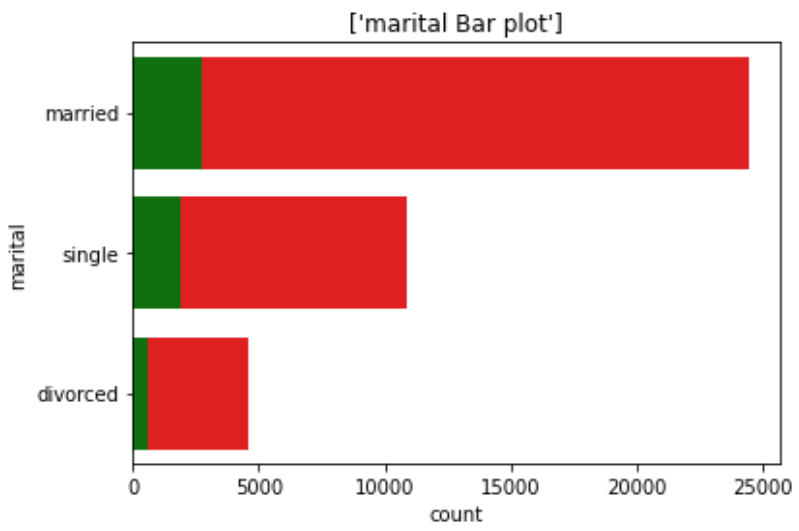
Categorical vs Categorical

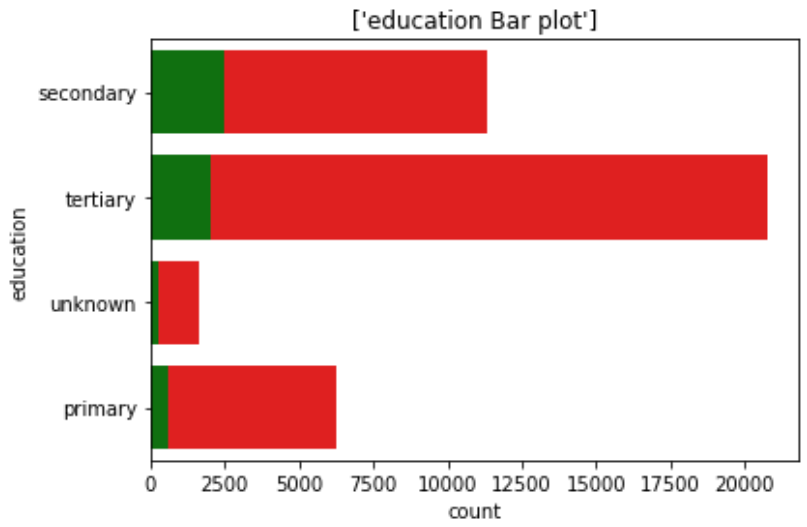
```
sns.countplot(y="education", data=bank_data[bank_data["y"]=="no"], color="red")
sns.countplot(y="education", data=bank_data[bank_data["y"]=="yes"], color="green")
```

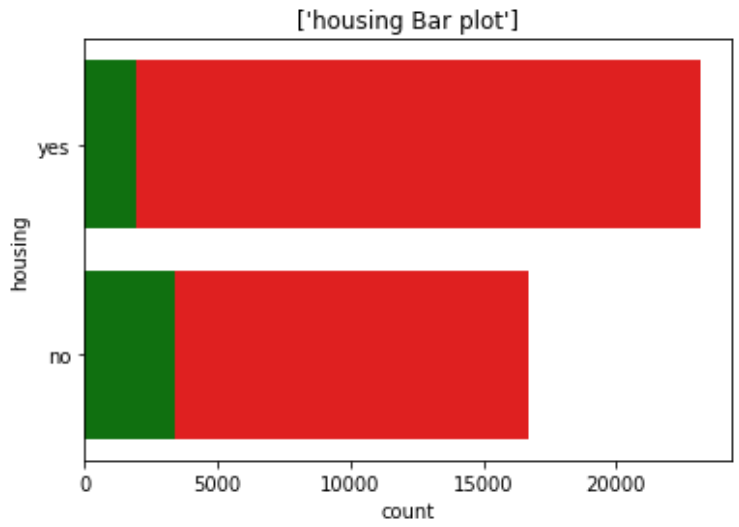


Categorical vs Categorical

```
plt.figure()
for col in categorical_cols:
  sns.countplot(y=col,  data=bank_data[bank_data["y"]=="no"], color="red")
  sns.countplot(y=col,  data=bank_data[bank_data["y"]=="yes"], color="green")
  plt.title([col + " Bar plot"])
  plt.show()
```







Categorical vs Categorical – Alternate method

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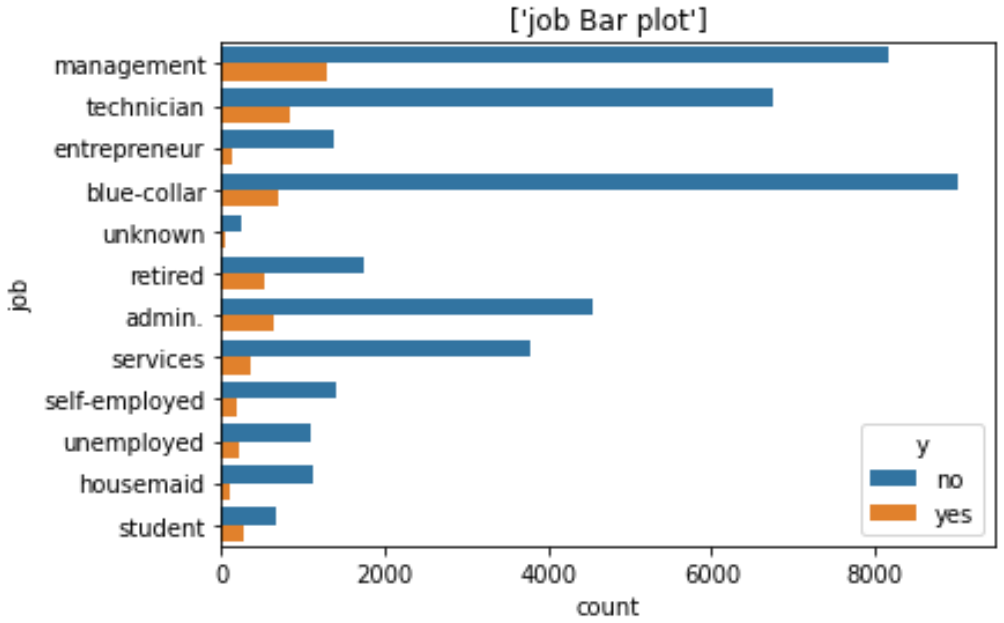
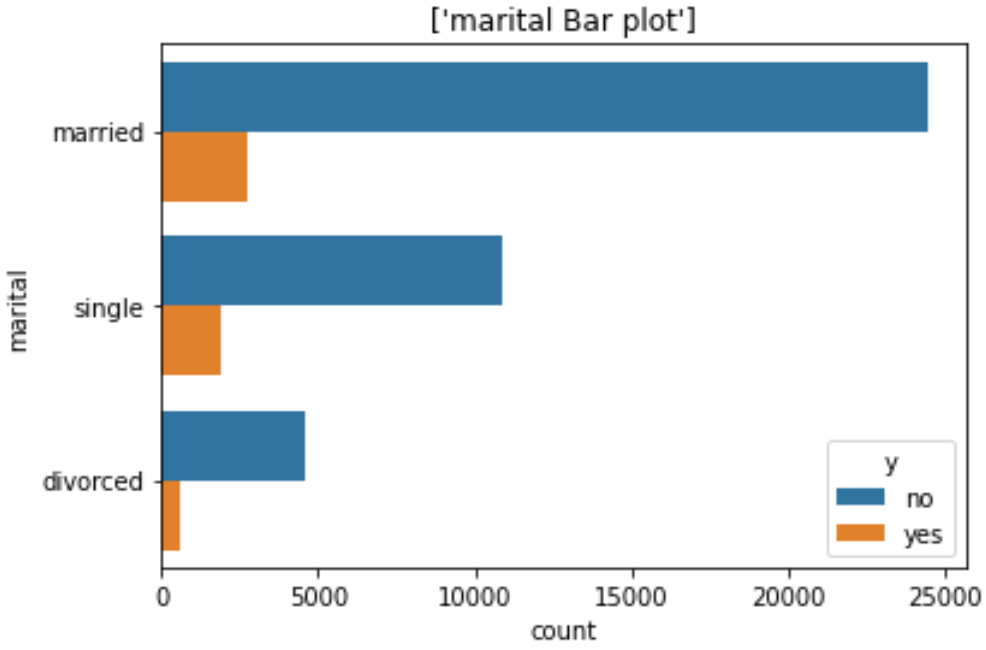
```
plt.figure()
for col in categorical_cols:
  sns.countplot(y=col,  data=bank_data,hue="y")
  plt.title([col + " Bar plot"])
  plt.show()
```





Cross tables

```
for col in categorical_cols:
  print(pd.crosstab(bank_data[col], bank_data['y']))
```

y	no	yes
job		
admin.	4540	631
blue-collar	9024	708
entrepreneur	1364	123
housemaid	1131	109
management	8157	1301
retired	1748	516
self-employed	1392	187
services	3785	369
student	669	269
technician	6757	840
unemployed	1101	202
unknown	254	34

y	no	yes
marital		
divorced	4585	622
married	24459	2755
single	10878	1912

LAB: Rossman Store Sales Data

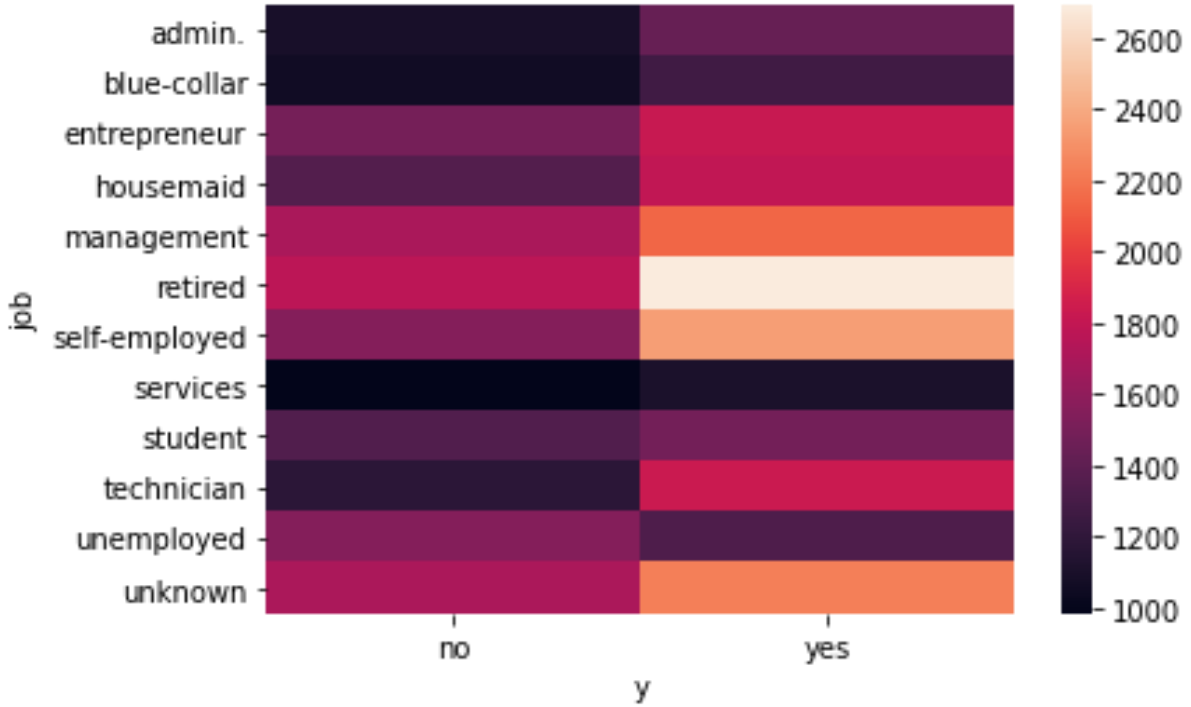
- Was there a promotion on all days? Or are there any days without any promotion?

Pivot table visualization

Heat maps

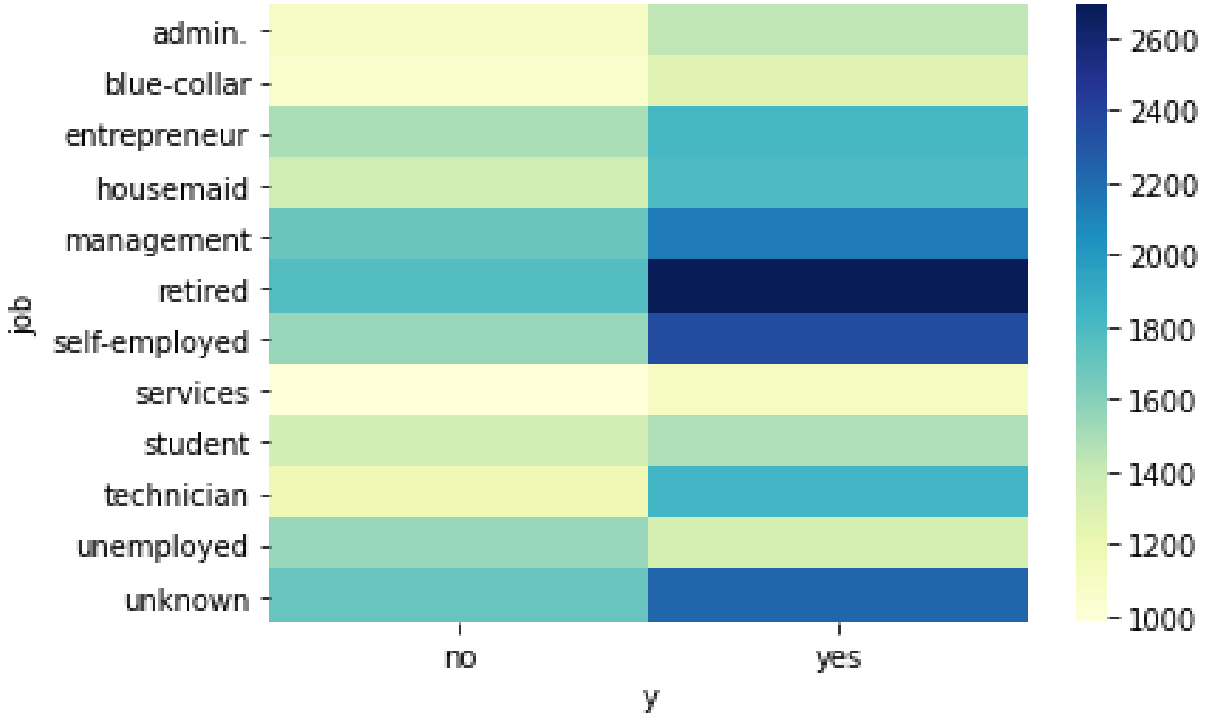
```
pivot=pd.pivot_table(bank_data,values='balance', index=['job'], columns='y')
print(pivot)
sns.heatmap(pivot)
```

y	no	yes
job		
admin.	1093.942070	1437.283677
blue-collar	1063.402371	1275.420904
entrepreneur	1494.642229	1818.975610
housemaid	1353.740053	1793.486239
management	1703.472723	2140.707917
retired	1775.685927	2690.627907
self-employed	1553.418103	2351.807487
services	985.851783	1112.344173
student	1347.578475	1488.739777
technician	1179.842830	1838.152381
unemployed	1556.144414	1334.257426
unknown	1710.712598	2232.882353



Heat maps

```
pivot=pd.pivot_table(bank_data,values='balance', index=['job'], columns='y')
sns.heatmap(pivot, cmap="YlGnBu")
```



Groupby

```
bank_data.groupby("y")['balance'].mean()
```

```
y
no     1303.714969
yes    1804.267915
Name: balance, dtype: float64
```

Groupby

```
for col in numeric_cols:
  print(bank_data.groupby("y")[col].mean())
  print("============================\n")
```

```
y
no     40.838986
yes    41.670070
Name: age, dtype: float64
============================

y
no     1303.714969
yes    1804.267915
Name: balance, dtype: float64
============================

y
no     15.892290
yes    15.158253
Name: day, dtype: float64
============================
```

LAB: Rossman Store Sales Data

- What is the average sales when promotion is on and off?
- Which day has highest average sales?
- Is there a day where sales is almost same for promotion and no-promotion?

Thank you