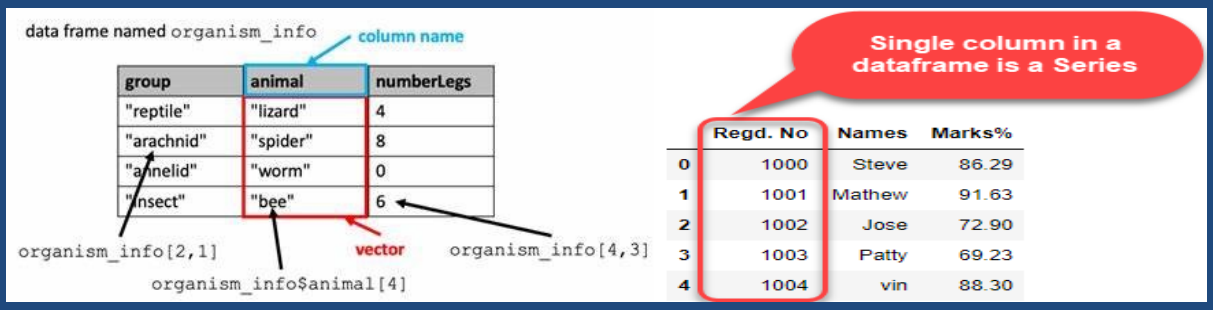
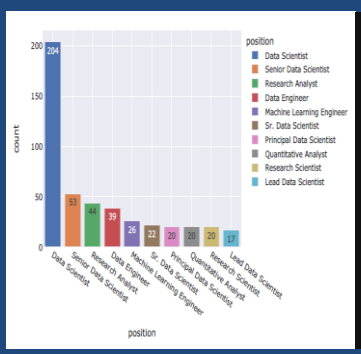
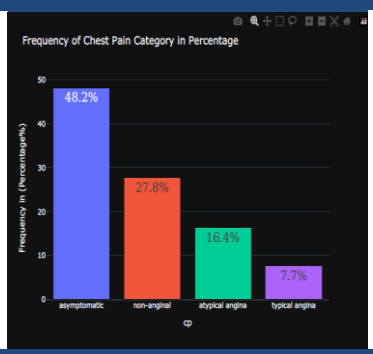
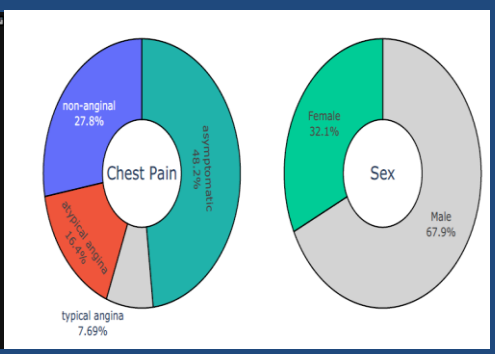


Python
Master Data Manipulation
&
Visualization

Prepared by: Syed Afroz Ali
Data Scientist (Kaggle Grandmaster)







Data Manipulation in Python for Data Analysis

Kaggle Notebook: : Prepared by: Syed Afroz Ali (Kaggle Grandmaster)

https://www.kaggle.com/code/pythonafroz/python-for-machine-learning-part-01

Follow for more AI content: https://www.linkedin.com/in/syed-afroz-70939914/

In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import plotly.express as px
import matplotlib.pyplot as plt
%matplotlib inline


sns.set(rc={"axes.facecolor":"Beige" , "axes.grid" : False})

import warnings
warnings.filterwarnings("ignore")
```

In [2]:
```
# Set Display

pd.set_option('display.max_columns',None)
pd.set_option('display.max_rows',None)
pd.set_option('display.precision', 2)
```

In [3]:
```
# Check Library Version

import numpy
print('numpy:{}'.format(numpy.__version__))
```

```
numpy:1.26.4
```

In [4]:
```
# Load the dataset

df = pd.read_csv("titanic.csv")
display(df.shape)
df.head()
```

```
(891, 12)
```

Out[4]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.28	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.10	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S

In [5]:
```
# Set Table Properties

df.head(3).style.set_properties(**{'background-color': 'blue',
                           'color': 'white',
                           'border-color': 'darkblack'})
```

Out[5]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.000000	1	0	A/5 21171	7.250000	nan	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)	female	38.000000	1	0	PC 17599	71.283300	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.000000	0	0	STON/O2. 3101282	7.925000	nan	S

In [6]:
```
# Replacing Values/Names in a Column:

df1 = df.copy('Deep')
df1["Survived"].replace({0:"Died" , 1:"Saved"},inplace = True)
df1.head(3)
```

Out[6]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	Died	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S
1	2	Saved	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.28	C85	C
2	3	Saved	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S

In [7]:
```
# Drop Columns
df1 = df.copy('Deep')
df1 = df1.drop(['PassengerId','Ticket'],axis=1)
df1.head(3)
```

Out[7]:

	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Fare	Cabin	Embarked
0	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	7.25	NaN	S
1	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	71.28	C85	C
2	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	7.92	NaN	S

In [8]:
```
# Drop Rows

df = df.drop(labels=[1,3,5,7],axis=0)
df.head()
```

Out[8]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S

In [9]:
```
# Missing Value check

print('Method 1:')
df.isnull().sum()
```

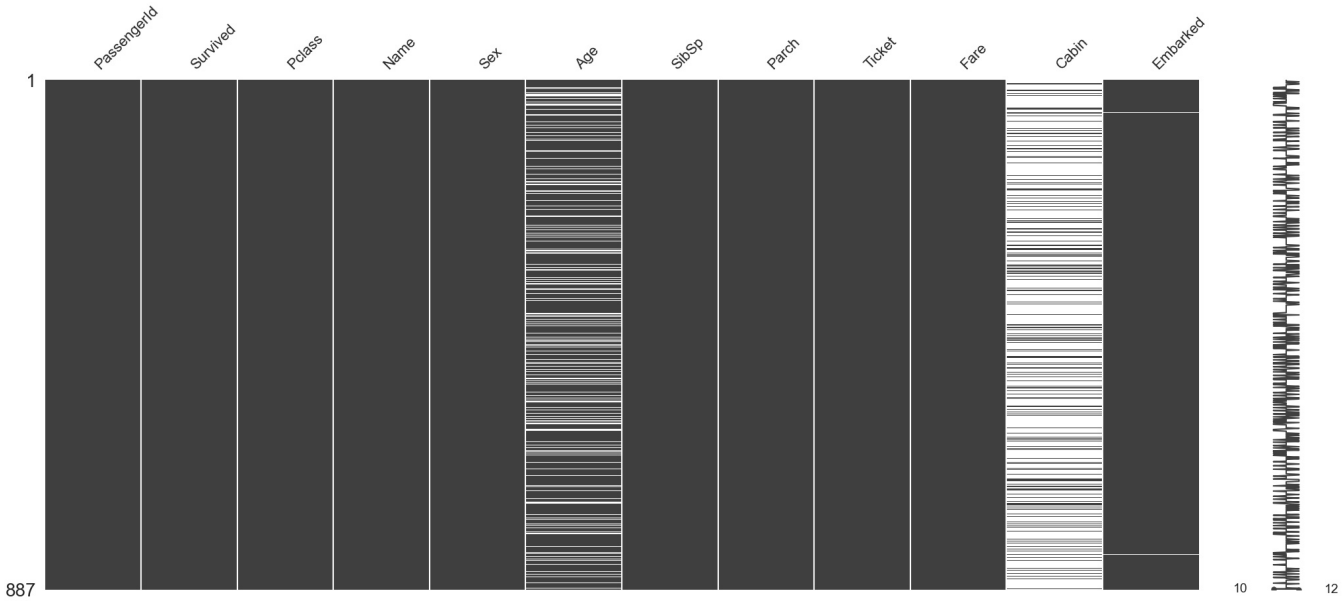
Out[9]:
```
Method 1:
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            176
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          685
Embarked         2
dtype: int64
```

In [10]:
```
var1 = [col for col in df.columns if df[col].isnull().sum() != 0]
print(df[var1].isnull().sum())
```

```
Age         176
Cabin       685
Embarked      2
dtype: int64
```

In [11]:
```
# Missing Value check

print('Method 12:')
import missingno as msno
msno.matrix(df)
plt.show()
```

```
Method 12:
```



In [12]:
```
df[df['Embarked'].isnull()]
```

Out[12]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
61	62	1	1	Icard, Miss. Amelie	female	38.0	0	0	113572	80.0	B28	NaN
829	830	1	1	Stone, Mrs. George Nelson (Martha Evelyn)	female	62.0	0	0	113572	80.0	B28	NaN

In [13]:
```
sample_incomplete_rows =df[df.isnull().any(axis=1)].head()
sample_incomplete_rows
```

Out[13]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S
9	10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14.0	1	0	237736	30.07	NaN	C

In [14]:
```
df.describe()
```

Out[14]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	887.00	887.00	887.00	711.00	887.00	887.00	887.00
mean	447.99	0.38	2.31	29.72	0.52	0.38	32.18
std	256.22	0.49	0.83	14.52	1.10	0.81	49.78
min	1.00	0.00	1.00	0.42	0.00	0.00	0.00
25%	226.50	0.00	2.00	20.25	0.00	0.00	7.90
50%	448.00	0.00	3.00	28.00	0.00	0.00	14.45
75%	669.50	1.00	3.00	38.00	1.00	0.00	31.00
max	891.00	1.00	3.00	80.00	8.00	6.00	512.33

In [15]:
```
# Describe
df[df['Survived']==0].describe().T.style.background_gradient(subset=['mean','std','50%','count'], cmap='RdPu')
```

Out[15]:

	count	mean	std	min	25%	50%	75%	max
PassengerId	547.000000	448.625229	259.750818	1.000000	213.500000	457.000000	675.500000	891.000000
Survived	547.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Pclass	547.000000	2.530165	0.736605	1.000000	2.000000	3.000000	3.000000	3.000000
Age	423.000000	30.693853	14.120135	1.000000	21.000000	28.000000	39.000000	74.000000
SibSp	547.000000	0.550274	1.286281	0.000000	0.000000	0.000000	1.000000	8.000000
Parch	547.000000	0.329068	0.824052	0.000000	0.000000	0.000000	0.000000	6.000000
Fare	547.000000	22.144765	31.440164	0.000000	7.854200	10.500000	26.000000	263.000000

In [16]:
```
df.describe(percentiles=[0.05,0.25,0.35,0.5,0.75,0.85,0.95,0.995,0.999])
```

Out[16]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	887.00	887.00	887.00	711.00	887.00	887.00	887.00
mean	447.99	0.38	2.31	29.72	0.52	0.38	32.18
std	256.22	0.49	0.83	14.52	1.10	0.81	49.78
min	1.00	0.00	1.00	0.42	0.00	0.00	0.00
5%	49.30	0.00	1.00	4.00	0.00	0.00	7.22
25%	226.50	0.00	2.00	20.25	0.00	0.00	7.90
35%	315.10	0.00	2.00	24.00	0.00	0.00	9.00
50%	448.00	0.00	3.00	28.00	0.00	0.00	14.45
75%	669.50	1.00	3.00	38.00	1.00	0.00	31.00
85%	758.10	1.00	3.00	45.00	1.00	1.00	56.50
95%	846.70	1.00	3.00	56.00	2.70	2.00	112.56
99.5%	886.57	1.00	3.00	70.73	8.00	5.00	263.00
99.9%	890.11	1.00	3.00	75.74	8.00	5.11	512.33
max	891.00	1.00	3.00	80.00	8.00	6.00	512.33

In [17]:
```
# Agg
df[['Age','Fare','Pclass']].agg(['sum','max','mean','std','skew','kurt'])
```

Out[17]:

	Age	Fare	Pclass
sum	21130.17	28540.03	2049.00
max	80.00	512.33	3.00
mean	29.72	32.18	2.31
std	14.52	49.78	0.83
skew	0.40	4.79	-0.63
kurt	0.18	33.33	-1.27

In [18]:
```
# value_counts
df['Embarked'].value_counts().to_frame()
```

Out[18]:

	count
Embarked	
S	642
C	167
Q	76

In [19]:
```
df['Embarked'].value_counts().tolist()
```

Out[19]:
```
[642, 167, 76]
```

In [20]:
```
# value_counts for Multiple Columns
for col in df[['Survived','Sex','Embarked']]:
    print(df[col].value_counts().to_frame())
    print("****"*7)
```

```
          count
Survived
0           547
1           340
**************************
        count
Sex
male      575
female    312
**************************
          count
Embarked
S           642
C           167
Q            76
**************************
```

In [21]:
```
#Count
df[['Age','Embarked','Sex']].count()
```

Out[21]:
```
Age         711
Embarked    885
Sex         887
dtype: int64
```

In [22]:
```
df['Embarked'][df['Sex']=='female'].value_counts(normalize=True)*100
```

Out[22]:
```
Embarked
S    65.16
C    23.23
Q    11.61
Name: proportion, dtype: float64
```

In [23]:
```
df['Embarked'].value_counts()/len(df['Embarked'])
```

Out[23]:
```
Embarked
S    0.72
C    0.19
Q    0.09
Name: count, dtype: float64
```

In [24]:
```
#Shuffling the data
df2 = df.sample(frac=1,random_state=3)
df2.head()
```

Out[24]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
733	734	0	2	Berriman, Mr. William John	male	23.0	0	0	28425	13.00	NaN	S
95	96	0	3	Shorney, Mr. Charles Joseph	male	NaN	0	0	374910	8.05	NaN	S
161	162	1	2	Watt, Mrs. James (Elizabeth "Bessie" Inglis Mi...	female	40.0	0	0	C.A. 33595	15.75	NaN	S
392	393	0	3	Gustafsson, Mr. Johan Birger	male	28.0	2	0	3101277	7.92	NaN	S
614	615	0	3	Brocklebank, Mr. William Alfred	male	35.0	0	0	364512	8.05	NaN	S

In [25]:
```
df1 = df.copy()

columns = ['Age']

for col in columns:
    df1[col].replace(0, np.NaN, inplace=True)

df1.describe()
```

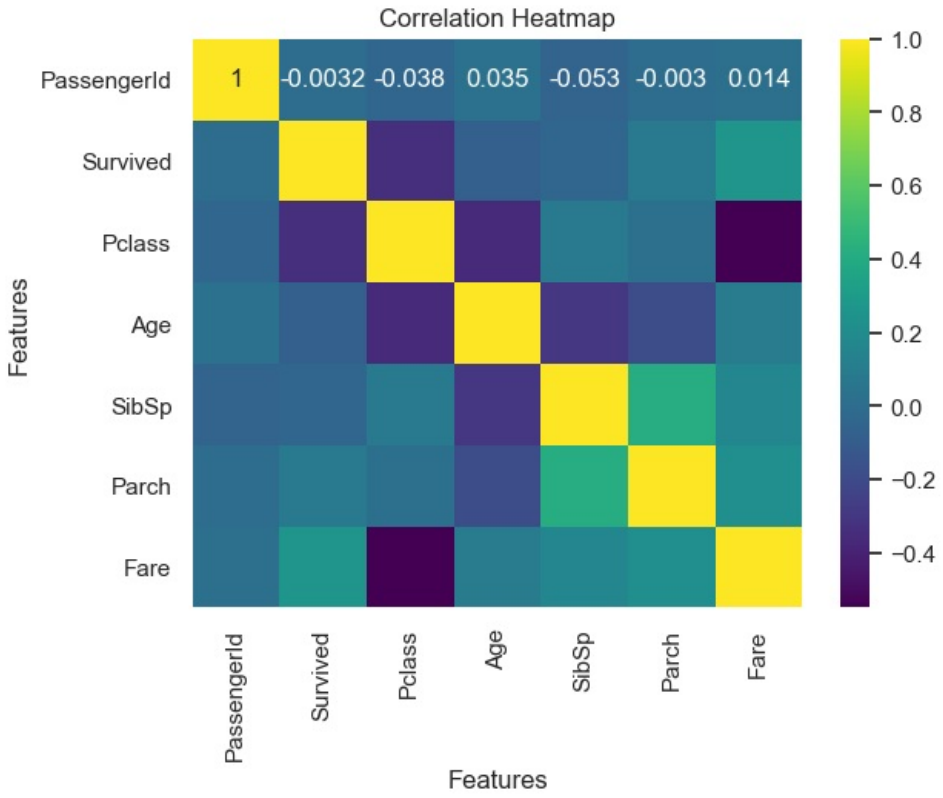
Out[25]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	887.00	887.00	887.00	711.00	887.00	887.00	887.00
mean	447.99	0.38	2.31	29.72	0.52	0.38	32.18
std	256.22	0.49	0.83	14.52	1.10	0.81	49.78
min	1.00	0.00	1.00	0.42	0.00	0.00	0.00
25%	226.50	0.00	2.00	20.25	0.00	0.00	7.90
50%	448.00	0.00	3.00	28.00	0.00	0.00	14.45
75%	669.50	1.00	3.00	38.00	1.00	0.00	31.00
max	891.00	1.00	3.00	80.00	8.00	6.00	512.33

In [26]:
```
corr = df.select_dtypes('number').corr()
display(corr)

sns.heatmap(corr, annot=True, cmap='viridis')

plt.xlabel('Features')
plt.ylabel('Features')
```

```
plt.title('Correlation Heatmap')
plt.show()
```

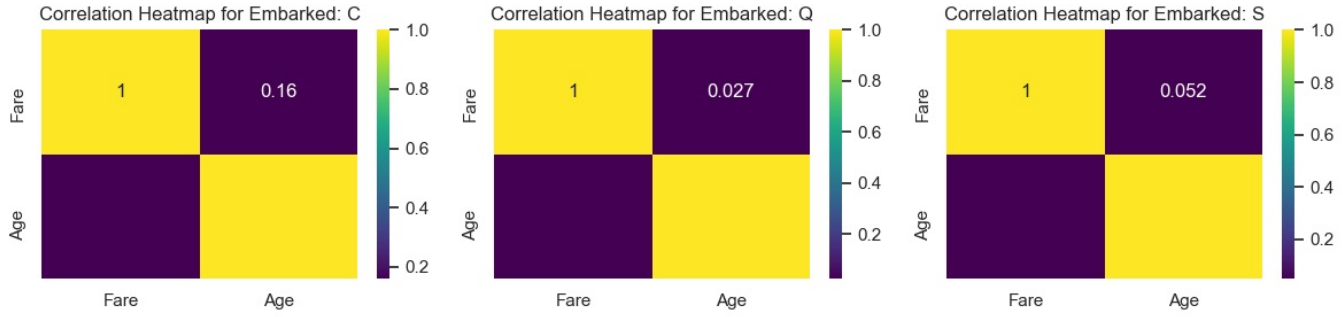
	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.00e+00	-3.15e-03	-0.04	0.03	-0.05	-2.95e-03	0.01
Survived	-3.15e-03	1.00e+00	-0.33	-0.08	-0.04	8.35e-02	0.26
Pclass	-3.84e-02	-3.35e-01	1.00	-0.37	0.08	1.66e-02	-0.55
Age	3.49e-02	-8.15e-02	-0.37	1.00	-0.30	-1.87e-01	0.09
SibSp	-5.30e-02	-3.52e-02	0.08	-0.30	1.00	4.15e-01	0.16
Parch	-2.95e-03	8.35e-02	0.02	-0.19	0.41	1.00e+00	0.22
Fare	1.38e-02	2.56e-01	-0.55	0.09	0.16	2.17e-01	1.00



In [27]:

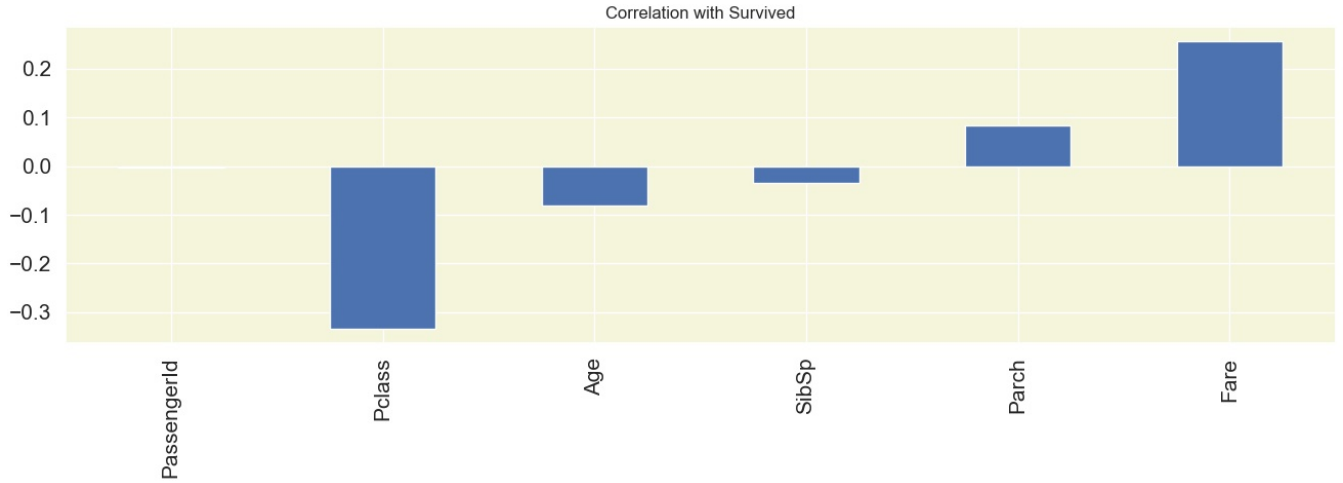
```
corr = df.groupby(["Embarked"])[["Fare", "Age"]].corr()
display(corr)

n_groups = len(corr.index.levels[0])

fig, axes = plt.subplots(nrows=1, ncols=min(3, n_groups), figsize=(12, 3))

group_count = 0
for embarked_group in corr.index.levels[0]:
    ax = axes.flat[group_count]
    sns.heatmap(corr.xs(embarked_group), annot=True, cmap='viridis', ax=ax)
    ax.set_title(f"Correlation Heatmap for Embarked: {embarked_group}")
    group_count += 1

plt.tight_layout()
plt.show()
```

		Fare	Age
Embarked			
C	**Fare**	1.00	0.16
	Age	0.16	1.00
Q	**Fare**	1.00	0.03
	Age	0.03	1.00
S	**Fare**	1.00	0.05
	Age	0.05	1.00



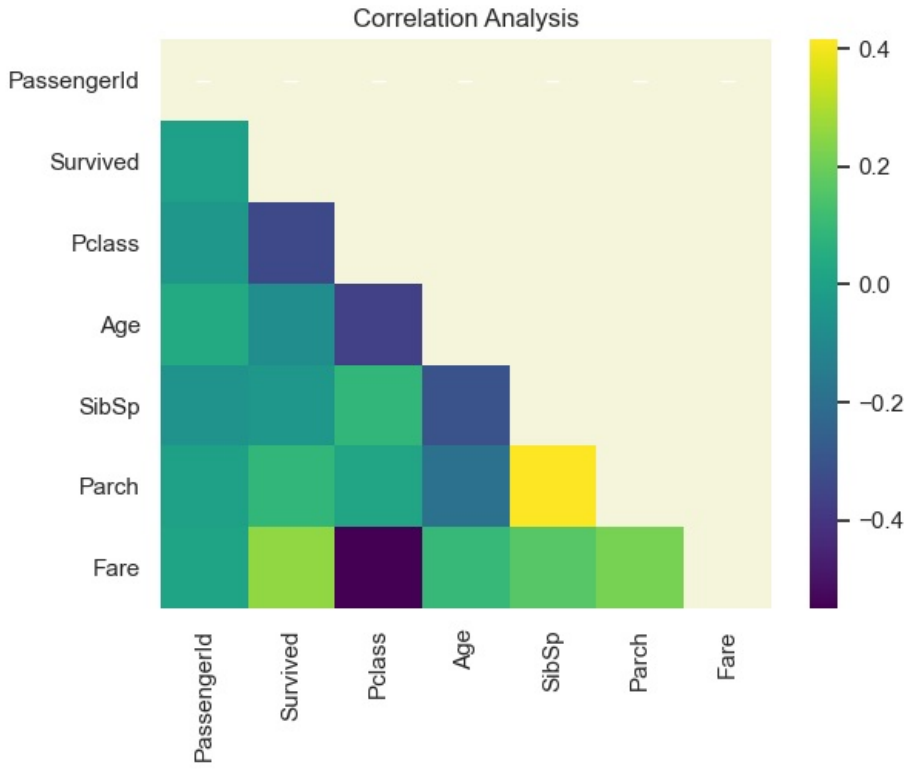
In [28]:

```
X = df.select_dtypes('number').drop(['Survived'],axis=1)
y = df.select_dtypes('number')['Survived']
X.corrwith(y).plot.bar(
        figsize = (16, 4), title = "Correlation with Survived", fontsize = 15,
        rot = 90, grid = True)
plt.show()
```



In [29]:

```
corr = df.select_dtypes('number').corr()
mask = np.triu(np.ones_like(corr,dtype = bool))
plt.figure(dpi=100)
plt.title('Correlation Analysis')
sns.heatmap(corr,mask=mask,annot=True,lw=0,linecolor='white',cmap='viridis',fmt = "0.2f")
plt.xticks(rotation=90)
plt.yticks(rotation = 0)
plt.show()
```



In [30]:
```
abs(df.select_dtypes('number').corr()).style.highlight_min(axis=0)
```

Out[30]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.000000	0.003153	0.038432	0.034866	0.052966	0.002953	0.013752
Survived	0.003153	1.000000	0.334575	0.081455	0.035186	0.083506	0.255761
Pclass	0.038432	0.334575	1.000000	0.367249	0.083521	0.016574	0.548991
Age	0.034866	0.081455	0.367249	1.000000	0.304297	0.187338	0.094965
SibSp	0.052966	0.035186	0.083521	0.304297	1.000000	0.414724	0.159978
Parch	0.002953	0.083506	0.016574	0.187338	0.414724	1.000000	0.217091
Fare	0.013752	0.255761	0.548991	0.094965	0.159978	0.217091	1.000000

In [31]:
```
df1 = df1[df1['Cabin'].notna()]
df1.head()
```

Out[31]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
10	11	1	3	Sandstrom, Miss. Marguerite Rut	female	4.0	1	1	PP 9549	16.70	G6	S
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.55	C103	S
21	22	1	2	Beesley, Mr. Lawrence	male	34.0	0	0	248698	13.00	D56	S
23	24	1	1	Sloper, Mr. William Thompson	male	28.0	0	0	113788	35.50	A6	S

In [32]:
```
print('Passenger Survived in Titanic: {:d}'.format(df1['Survived'].value_counts()[0]))
print('Passenger Died in Titanic: {:d}'.format(df1['Survived'].value_counts()[1]))
```

```
Passenger Survived in Titanic: 68
Passenger Died in Titanic: 134
```

In [33]:
```
print('Survived sample ratio: {:.3f} %'.format(df1['Survived'].value_counts()[0]/len(df1)*100))
print('Died sample ratio: {:.3f} %'.format(df1['Survived'].value_counts()[1]/len(df1)*100))
```

```
Survived sample ratio: 33.663 %
Died sample ratio: 66.337 %
```

In [34]:
```
# Fillna Method

df1 = df.copy()
df1 = df1.dropna()
```

In [35]:
```
# Fillna Method

df1 = df.copy()
df1.fillna(method="ffill", inplace=True)
```

In [36]:
```
# Fill Null Values by Mean Value

df1 = df.copy()
```

```
df1["Age"] = df1["Age"].fillna(df1["Age"].mean())
```

In [37]:
```
# Fill Null Values by Desiresd Value

df1 = df.copy()
df1['Embarked'] = df1['Embarked'].fillna(df1['Embarked'] == 'Q')
df1.head(3)
```

Out[37]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S

In [38]:
```
#Fill Method :
df1 = df.copy()
df1['Age'] = df1['Age'].fillna(0)
df1['Age'] = df1['Age'].fillna('None')
df1["Age"].fillna(method="backfill",inplace=True)
df1["Embarked"].fillna(value="A",inplace=True)
df1["Pclass"].fillna(value= 0,inplace=True)
df1.head()
```

Out[38]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S

In [39]:
```
# Find Method/Select Method

# Find All Null Values in the dataframe

df1 = df.copy()
df1 = df1.drop('Cabin',axis =1)

sample_incomplete_rows = df1[df1.isnull().any(axis=1)]
display(sample_incomplete_rows.shape)
sample_incomplete_rows.head()
```

```
(178, 11)
```

Out[39]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
17	18	1	2	Williams, Mr. Charles Eugene	male	NaN	0	0	244373	13.00	S
19	20	1	3	Masselmani, Mrs. Fatima	female	NaN	0	0	2649	7.22	C
26	27	0	3	Emir, Mr. Farred Chehab	male	NaN	0	0	2631	7.22	C
28	29	1	3	O'Dwyer, Miss. Ellen "Nellie"	female	NaN	0	0	330959	7.88	Q
29	30	0	3	Todoroff, Mr. Lalio	male	NaN	0	0	349216	7.90	S

In [40]:
```
titanic_Fare500 = df1[df1['Fare'] > 500][['Name','Embarked']]
display(titanic_Fare500.shape)
titanic_Fare500
```

```
(3, 2)
```

Out[40]:

	Name	Embarked
258	Ward, Miss. Anna	C
679	Cardeza, Mr. Thomas Drake Martinez	C
737	Lesurer, Mr. Gustave J	C

In [41]:
```
titanic_age_70 = df1.loc[df1['Age'] > 70, ["Name","Embarked","Sex"]]
display(titanic_age_70.shape)
titanic_age_70
```

```
(5, 3)
```

Out[41]:

	Name	Embarked	Sex
96	Goldschmidt, Mr. George B	C	male
116	Connors, Mr. Patrick	Q	male
493	Artagaveytia, Mr. Ramon	C	male
630	Barkworth, Mr. Algernon Henry Wilson	S	male
851	Svensson, Mr. Johan	S	male

In [42]:
```
titanic_age_selection = df[(df["Sex"] == "male") & (df["Age"] > 50.00)]
display(titanic_age_selection.shape)
titanic_age_selection.head()
```

```
(47, 12)
```

Out[42]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
33	34	0	2	Wheadon, Mr. Edward H	male	66.0	0	0	C.A. 24579	10.50	NaN	S
54	55	0	1	Ostby, Mr. Engelhart Cornelius	male	65.0	0	1	113509	61.98	B30	C
94	95	0	3	Coxon, Mr. Daniel	male	59.0	0	0	364500	7.25	NaN	S
96	97	0	1	Goldschmidt, Mr. George B	male	71.0	0	0	PC 17754	34.65	A5	C

In [43]:
```
women = df1.loc[df1['Sex'] == 'female']["Survived"]
rate_women = (women.sum()/len(women)).round(3)*100
print("Percentage of women who survived:",rate_women,"%")
```

```
Percentage of women who survived: 74.0 %
```

In [44]:
```
men = df1.loc[df1['Sex'] == 'male']["Survived"]
rate_men = (men.sum()/len(men)).round(3)*100
print("Percentage of Men who survived:", rate_men,"%")
```

```
Percentage of Men who survived: 19.0 %
```

In [45]:
```
titanic_Pclass = df1[df1["Pclass"].isin([1, 2])]
display(titanic_Pclass.shape)
titanic_Pclass.head()
```

```
(398, 11)
```

Out[45]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	S
9	10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14.0	1	0	237736	30.07	C
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.55	S
15	16	1	2	Hewlett, Mrs. (Mary D Kingcome)	female	55.0	0	0	248706	16.00	S
17	18	1	2	Williams, Mr. Charles Eugene	male	NaN	0	0	244373	13.00	S

In [46]:
```
df1 = df.copy()
cabin_no_na = df1[df1["Cabin"].notna()]
display(cabin_no_na.shape)
cabin_no_na.head()
```

```
(202, 12)
```

Out[46]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
10	11	1	3	Sandstrom, Miss. Marguerite Rut	female	4.0	1	1	PP 9549	16.70	G6	S
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.55	C103	S
21	22	1	2	Beesley, Mr. Lawrence	male	34.0	0	0	248698	13.00	D56	S
23	24	1	1	Sloper, Mr. William Thompson	male	28.0	0	0	113788	35.50	A6	S

In [47]:
```
titanic_Pclass = df1[(df1["Pclass"] == 1) & (df1["Sex"] == 'female') & (df1["Age"] > 50 ) ]

display(titanic_Pclass.shape)
titanic_Pclass.head()
```

```
(13, 12)
```

Out[47]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.55	C103	S
195	196	1	1	Lurette, Miss. Elise	female	58.0	0	0	PC 17569	146.52	B80	C
268	269	1	1	Graham, Mrs. William Thompson (Edith Junkins)	female	58.0	0	1	PC 17582	153.46	C125	S
275	276	1	1	Andrews, Miss. Kornelia Theodosia	female	63.0	1	0	13502	77.96	D7	S
366	367	1	1	Warren, Mrs. Frank Manley (Anna Sophia Atkinson)	female	60.0	1	0	110813	75.25	D37	C

In [48]:
```
# np.where

df1 = df.copy()
df1['Cabin_null'] = np.where(df1['Cabin'].isnull(),0,1)
df1.head()
```

Out[48]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Cabin_null
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	0
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	0
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	1
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0

In [49]:
```
df1 = df.copy()
df1["Bucket"] = np.where(df1["Fare"] < 250, "Low", "High")
df1.head()
```

Out[49]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Bucket
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	Low
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	Low
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	Low
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	Low
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	Low

In [50]:
```
df1 = df.copy()

titanic_age_missing_first  = df1.sort_values(by='Age',ascending=False, na_position='first')
titanic_age_missing_first.head()
```

Out[50]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
17	18	1	2	Williams, Mr. Charles Eugene	male	NaN	0	0	244373	13.00	NaN	S
19	20	1	3	Masselmani, Mrs. Fatima	female	NaN	0	0	2649	7.22	NaN	C
26	27	0	3	Emir, Mr. Farred Chehab	male	NaN	0	0	2631	7.22	NaN	C
28	29	1	3	O'Dwyer, Miss. Ellen "Nellie"	female	NaN	0	0	330959	7.88	NaN	Q
29	30	0	3	Todoroff, Mr. Lalio	male	NaN	0	0	349216	7.90	NaN	S

In [51]:
```
df1 = df.copy()
df1.sort_values(by = 'Age' , ascending = False)[['Name','Ticket','Survived','Pclass', 'Age' ]].head()
```

Out[51]:

	Name	Ticket	Survived	Pclass	Age
630	Barkworth, Mr. Algernon Henry Wilson	27042	1	1	80.0
851	Svensson, Mr. Johan	347060	0	3	74.0
96	Goldschmidt, Mr. George B	PC 17754	0	1	71.0
493	Artagaveytia, Mr. Ramon	PC 17609	0	1	71.0
116	Connors, Mr. Patrick	370369	0	3	70.5

In [52]:
```
Numerical_data = df1.select_dtypes(include=['number'])
Numerical_data.head()
```

Out[52]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
0	1	0	3	22.0	1	0	7.25
2	3	1	3	26.0	0	0	7.92
4	5	0	3	35.0	0	0	8.05
6	7	0	1	54.0	0	0	51.86
8	9	1	3	27.0	0	2	11.13

In [53]:
```
Categorical_data = df1.select_dtypes(include=['object'])
Categorical_data.head()
```

Out[53]:

	Name	Sex	Ticket	Cabin	Embarked
0	Braund, Mr. Owen Harris	male	A/5 21171	NaN	S
2	Heikkinen, Miss. Laina	female	STON/O2. 3101282	NaN	S
4	Allen, Mr. William Henry	male	373450	NaN	S
6	McCarthy, Mr. Timothy J	male	17463	E46	S
8	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	347742	NaN	S

In [54]:
```
cabin_notna = df1[df1['Cabin'].notna()]
cabin_notna.head()
```

Out[54]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
10	11	1	3	Sandstrom, Miss. Marguerite Rut	female	4.0	1	1	PP 9549	16.70	G6	S
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.55	C103	S
21	22	1	2	Beesley, Mr. Lawrence	male	34.0	0	0	248698	13.00	D56	S
23	24	1	1	Sloper, Mr. William Thompson	male	28.0	0	0	113788	35.50	A6	S

In [55]:
```
#groupby

df1 = df.copy()
titanic_room = df1.groupby(['Embarked'])['Age'].mean().reset_index()
titanic_room.head()
```

Out[55]:

	Embarked	Age
0	C	30.76
1	Q	28.09
2	S	29.49

In [56]:
```
df1.groupby("Embarked").agg({"Fare": np.mean, "Sex": np.size})
```

Out[56]:

	Fare	Sex
Embarked		
C	59.89	167
Q	13.34	76
S	27.05	642

In [57]:
```
temp = df1.groupby("Sex")['Age'].min().to_frame().reset_index()
temp
```

Out[57]:

	Sex	Age
0	female	0.75
1	male	0.42

In [58]:
```
df1.groupby(["Embarked", "Pclass"]).agg({"Fare": [np.size, np.mean]})
```

Out[58]:

		Fare	
		size	mean
Embarked	Pclass		
C	1	84	105.12
	2	17	25.36
	3	66	11.21
Q	1	2	90.00
	2	3	12.35
	3	71	11.22
S	1	126	70.50
	2	164	20.33
	3	352	14.63

In [59]:
```
df1.groupby(['Survived',"Sex"])['Fare'].first().to_frame()
```

Out[59]:

		Fare
Survived	Sex	
0	female	7.85
	male	7.25
1	female	7.92
	male	13.00

In [60]:
```
Tit_groupby = df1.groupby("Pclass")["Pclass"].count().to_frame()
Tit_groupby
```

Out[60]:

	Pclass
Pclass	
1	214
2	184
3	489

In [61]:
```
df1.groupby('Survived')['Sex'].value_counts().to_frame()
```

Out[61]:

		count
Survived	Sex	
0	male	466
	female	81
1	female	231
	male	109

In [62]:
```
df1.groupby(['Survived',"Sex"])['Pclass'].count()/df1.groupby(["Sex"])['Pclass'].count()*100
```

Out[62]:
```
Survived  Sex
0         female    25.96
          male      81.04
1         female    74.04
          male      18.96
Name: Pclass, dtype: float64
```

In [63]:
```
(df1.groupby(['Embarked','Pclass']).count()['Fare']/df1.groupby(['Embarked']).count()['Fare'])*100
```

Out[63]:
```
Embarked  Pclass
C         1         50.30
          2         10.18
          3         39.52
Q         1          2.63
          2          3.95
          3         93.42
S         1         19.63
          2         25.55
          3         54.83
Name: Fare, dtype: float64
```

In [64]:
```
df1.groupby("Sex")[["Age","Pclass"]].mean()
```

Out[64]:

Sex	Age	Pclass
female	27.85	2.17
male	30.79	2.39

In [65]:
```
df1.groupby(["Sex", "Pclass"])["Fare"].mean()
```

Out[65]:
```
Sex     Pclass
female  1         107.08
        2          21.97
        3          16.12
male    1          67.23
        2          19.74
        3          12.65
Name: Fare, dtype: float64
```

In [66]:
```
titanic_summed = df1.groupby(["Sex", "Embarked"])[["Fare", "Age"]].sum()
titanic_summed
```

Out[66]:

Sex	Embarked	Fare	Age
female	C	5416.11	1691.00
	Q	454.86	291.50
	S	7811.31	5130.50
male	C	4584.90	2276.92
	Q	558.94	495.00
	S	9553.92	11145.25

In [67]:
```
df1.groupby(["Embarked", "Pclass"]).agg({"Fare": [np.size, np.mean]})
```

Out[67]:

		Fare	
		size	mean
Embarked	Pclass		
C	1	84	105.12
	2	17	25.36
	3	66	11.21
Q	1	2	90.00
	2	3	12.35
	3	71	11.22
S	1	126	70.50
	2	164	20.33
	3	352	14.63

In [68]:
```
temp = df1.groupby("Sex")['Age'].min().reset_index()
temp
```

Out[68]:

	Sex	Age
0	female	0.75
1	male	0.42

In [69]:
```
titanic_room= df1.groupby(['Embarked','Sex'])[['Age','Fare']].mean().reset_index()
titanic_room
```

Out[69]:

	Embarked	Sex	Age	Fare
0	C	female	28.18	75.22
1	C	male	33.00	48.26
2	Q	female	24.29	12.63
3	Q	male	30.94	13.97
4	S	female	27.73	38.67
5	S	male	30.37	21.71

In [70]:
```
df1.groupby(['Survived',"Sex","Embarked"])['Pclass'].count().to_frame()
```

Out[70]:

Survived	Sex	Embarked	Pclass
0	female	C	9
		Q	9
		S	63
	male	C	66
		Q	37
		S	363
1	female	C	63
		Q	27
		S	139
	male	C	29
		Q	3
		S	77

In [71]:
```
df1.groupby("Embarked").agg({"Fare": np.mean, "Sex": np.size})
```

Out[71]:

Embarked	Fare	Sex
C	59.89	167
Q	13.34	76
S	27.05	642

In [72]:
```
(df1.groupby(['Survived',"Sex"])['Fare'].count()/df1.groupby(['Survived'])['Fare'].count()).to_frame()*100
```

Out[72]:

Survived	Sex	Fare
0	female	14.81
	male	85.19
1	female	67.94
	male	32.06

In [73]:
```
df1.groupby('Sex')['Embarked'].count().nlargest(2).reset_index()
```

Out[73]:

	Sex	Embarked
0	male	575
1	female	310

In [74]:
```
df1[['Pclass', 'Fare']].groupby(['Pclass'], as_index=True).mean()
```

Out[74]:

Pclass	Fare
1	84.36
2	20.66
3	13.67

In [75]:
```
#pivot_table

quality_pivot = df1.pivot_table(index='Pclass',values='Age', aggfunc=np.mean)
quality_pivot
```

Out[75]:

Pclass	Age
1	38.25
2	29.88
3	25.21

In [76]:
```
x=pd.DataFrame(pd.pivot_table(df1,index=['Sex','Embarked'],aggfunc='count')['Fare'])
x
```

Out[76]:

Sex	Embarked	Fare
female	C	72
	Q	36
	S	202
male	C	95
	Q	40
	S	440

In [77]:
```
quality_pivot = df1.pivot_table(index='Pclass',values='Age', aggfunc=np.median)
quality_pivot
```

Out[77]:

Pclass	Age
1	37.0
2	29.0
3	24.0

In [78]:
```
pd.crosstab(df1['Pclass'],df1['Survived'])
```

Out[78]:

Survived	0	1
Pclass		
1	80	134
2	97	87
3	370	119

In [79]:
```
#Cross Tab
pd.crosstab(df1['Sex'],df1['Embarked'])
```

Out[79]:

Embarked	C	Q	S
Sex			
female	72	36	202
male	95	40	440

In [80]:
```
#Cross Tab
plot_criteria= ['Sex', 'Pclass']
cm = sns.light_palette("red", as_cmap=True)
(round(pd.crosstab(df1[plot_criteria[0]], df1[plot_criteria[1]], normalize='columns') * 100,2)).style.backgroun
```

Out[80]:

Pclass	1	2	3
Sex			
female	42.990000	41.300000	29.450000
male	57.010000	58.700000	70.550000

In [81]:
```
pd.crosstab(df1['Sex'],df1['Embarked'],normalize = "index" ).style.background_gradient(cmap='crest')
```

Out[81]:

Embarked	C	Q	S
Sex			
female	0.232258	0.116129	0.651613
male	0.165217	0.069565	0.765217

In [82]:
```
plot_criteria= ['Embarked', 'Pclass']
cm = sns.light_palette("red", as_cmap=True)
(round(pd.crosstab(df1[plot_criteria[0]], df1[plot_criteria[1]], normalize='columns') * 100,2)).style.backgroun
```

Out[82]:

Pclass	1	2	3
Embarked			
C	39.620000	9.240000	13.500000
Q	0.940000	1.630000	14.520000
S	59.430000	89.130000	71.980000

In [83]:
```
pd.crosstab(df1['Pclass'], df1['Survived'], margins=True)
```

Out[83]:

Survived	0	1	All
Pclass			
1	80	134	214
2	97	87	184
3	370	119	489
All	547	340	887

In [84]:
```
#Create New Column

df1['sex Titanic map']=df1['Sex'].map({'male':1,'female':0})
df1.head()
```

Out[84]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	1
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	1
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	1
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0

In [85]:
```
df1["Fare Range"] = np.where(df1["Fare"] < 200, "low", "high")
df1.head()
```

Out[85]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	1	low
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0	low
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	1	low
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	1	low
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0	low

In [86]:
```
df1["age_bins"]= pd.cut(df1["Age"] ,bins=[1,18,29 , 40 , 50 , 60 ,  80] ,labels=["child","teen","adult" , "fort
df1.head()
```

Out[86]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	1	low	teen
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0	low	teen
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	1	low	adult
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	1	low	old
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0	low	teen

In [87]:
```
df1['is_train'] = np.random.uniform(0,1,len(df1)) <=.75
df1.head()
```

Out[87]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	is_tr
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	1	low	teen	Fa
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0	low	teen	T
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	1	low	adult	T
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	1	low	old	Fa
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0	low	teen	T

In [88]:
```
#iloc & loc
df1.iloc[9:12, 2:5]  # [Row , Column]
```

Out[88]:

	Pclass	Name	Sex
13	3	Andersson, Mr. Anders Johan	male
14	3	Vestrom, Miss. Hulda Amanda Adolfina	female
15	2	Hewlett, Mrs. (Mary D Kingcome)	female

In [89]:
```
df1.iloc[2:4, 3:6]
```

Out[89]:

	Name	Sex	Age
4	Allen, Mr. William Henry	male	35.0
6	McCarthy, Mr. Timothy J	male	54.0

In [90]:
```
df1.iloc[0:4, 3] = "Anonymous"
df1.head()
```

Out[90]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	is_
0	1	0	3	Anonymous	male	22.0	1	0	A/5 21171	7.25	NaN	S	1	low	teen	F
2	3	1	3	Anonymous	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0	low	teen	
4	5	0	3	Anonymous	male	35.0	0	0	373450	8.05	NaN	S	1	low	adult	
6	7	0	1	Anonymous	male	54.0	0	0	17463	51.86	E46	S	1	low	old	F
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0	low	teen	

In [91]:
```
df1.iloc[[3,6,9],[2,3]]
```

Out[91]:

	Pclass	Name
6	1	Anonymous
10	3	Sandstrom, Miss. Marguerite Rut
13	3	Andersson, Mr. Anders Johan

In [92]:
```
#Replace
df1["Survived"].replace({0:"Died" , 1:"Saved"} , inplace=True)
df1.head()
```

Out[92]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	is_
0	1	Died	3	Anonymous	male	22.0	1	0	A/5 21171	7.25	NaN	S	1	low	teen	
2	3	Saved	3	Anonymous	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0	low	teen	
4	5	Died	3	Anonymous	male	35.0	0	0	373450	8.05	NaN	S	1	low	adult	
6	7	Died	1	Anonymous	male	54.0	0	0	17463	51.86	E46	S	1	low	old	
8	9	Saved	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0	low	teen	

In [93]:
```
#Rename
df1.rename(columns={"Name" : 'Person Name'},inplace=True)
df1.head()
```

Out[93]:

	PassengerId	Survived	Pclass	Person Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	is_
0	1	Died	3	Anonymous	male	22.0	1	0	A/5 21171	7.25	NaN	S	1	low	teen	
2	3	Saved	3	Anonymous	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0	low	teen	
4	5	Died	3	Anonymous	male	35.0	0	0	373450	8.05	NaN	S	1	low	adult	
6	7	Died	1	Anonymous	male	54.0	0	0	17463	51.86	E46	S	1	low	old	
8	9	Saved	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0	low	teen	

In [94]:
```
# Replace the codes with their full names
df1['Embarked'] = df1['Embarked'].replace({'S': 'Southampton', 'C': 'Cherbourg', 'Q': 'Queenstown'})
df1.sample(5)
```

Out[94]:

	PassengerId	Survived	Pclass	Person Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	is
290	291	Saved	1	Barber, Miss. Ellen "Nellie"	female	26.0	0	0	19877	78.85	NaN	Southampton	0	low	teen	
887	888	Saved	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00	B42	Southampton	0	low	teen	
135	136	Died	2	Richard, Mr. Emile	male	23.0	0	0	SC/PARIS 2133	15.05	NaN	Cherbourg	1	low	teen	
41	42	Died	2	Turpin, Mrs. William John Robert (Dorothy Ann ...	female	27.0	1	0	11668	21.00	NaN	Southampton	0	low	teen	
500	501	Died	3	Calic, Mr. Petar	male	17.0	0	0	315086	8.66	NaN	Southampton	1	low	child	

In [95]:
```
df1['Pclass'][df1['Pclass'] == 1] = 'Rich'
df1['Pclass'][df1['Pclass'] == 2] = 'Middel Class'
df1['Pclass'][df1['Pclass'] == 3] = 'Poor'
df1.head()
```

Out[95]:

	PassengerId	Survived	Pclass	Person Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	i
0	1	Died	Poor	Anonymous	male	22.0	1	0	A/5 21171	7.25	NaN	Southampton	1	low	teen	
2	3	Saved	Poor	Anonymous	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	Southampton	0	low	teen	
4	5	Died	Poor	Anonymous	male	35.0	0	0	373450	8.05	NaN	Southampton	1	low	adult	
6	7	Died	Rich	Anonymous	male	54.0	0	0	17463	51.86	E46	Southampton	1	low	old	
8	9	Saved	Poor	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	Southampton	0	low	teen	

In [96]:
```
#Converting Zero Value to NaN Value
df1.loc[df1['Fare'] == 0,'Fare'] = np.nan
df1.head()
```

Out[96]:

	PassengerId	Survived	Pclass	Person Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	sex Titanic map	Fare Range	age_bins	i
0	1	Died	Poor	Anonymous	male	22.0	1	0	A/5 21171	7.25	NaN	Southampton	1	low	teen	
2	3	Saved	Poor	Anonymous	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	Southampton	0	low	teen	
4	5	Died	Poor	Anonymous	male	35.0	0	0	373450	8.05	NaN	Southampton	1	low	adult	
6	7	Died	Rich	Anonymous	male	54.0	0	0	17463	51.86	E46	Southampton	1	low	old	
8	9	Saved	Poor	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	Southampton	0	low	teen	

In [97]:
```
# Replace First Three name with any symbol or Value
df1 = df.copy()
df1.loc[0:2, 'Name'] = '?'
df1.head()
```

Out[97]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	?	male	22.0	1	0	A/5 21171	7.25	NaN	S
2	3	1	3	?	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S

In [98]:
```
#Replace '?' values in workclass variable with NaN
df1['Name'].replace('?', np.NaN, inplace=True)
df1.head()
```

Out[98]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	NaN	male	22.0	1	0	A/5 21171	7.25	NaN	S
2	3	1	3	NaN	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S

In [99]:
```
#Saving to Excel Format
df1.to_excel('titanic.xlsx',sheet_name="Passenger",index=False)
```

In [100…
```
df1 = df.copy()
df1[df1['Age'].isnull()].index
```

Out[100]:
```
Index([ 17,  19,  26,  28,  29,  31,  32,  36,  42,  45,
       ...
       832, 837, 839, 846, 849, 859, 863, 868, 878, 888],
      dtype='int64', length=176)
```

In [101…
```
#Join
```

In [101…
```
#Join
Join = df1.join(df1, lsuffix = '_1') # lsuffix = Left Suffix
Join.head(2)
```

Out[101]:

	PassengerId_1	Survived_1	Pclass_1	Name_1	Sex_1	Age_1	SibSp_1	Parch_1	Ticket_1	Fare_1	Cabin_1	Embarked_1	PassengerI
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	

In [102…
```
#Melt
Melt = pd.melt(df1,id_vars = ['Embarked'], value_vars = ['Survived'])
Melt.head()
```

Out[102]:

	Embarked	variable	value
0	S	Survived	0
1	S	Survived	1
2	S	Survived	0
3	S	Survived	0
4	S	Survived	1

In [103…
```
df1 = df.copy()
df1.dtypes
```

Out[103]:
```
PassengerId      int64
Survived         int64
Pclass           int64
Name            object
Sex             object
Age            float64
SibSp            int64
Parch            int64
Ticket          object
Fare           float64
Cabin           object
Embarked        object
dtype: object
```

In [104…
```
df1["Sex"] = df1.Sex.apply(lambda  x:'male' if x==1 else 'female')
```

In [105…
```
df1['Pclass_New'] = df1['Pclass'].apply(lambda x: 'UpperClass' if x == 1 else 0)
display(df1.head())
df1['Pclass_New'].value_counts().to_frame()
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Pclass_New
0	1	0	3	Braund, Mr. Owen Harris	female	22.0	1	0	A/5 21171	7.25	NaN	S	0
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	0
4	5	0	3	Allen, Mr. William Henry	female	35.0	0	0	373450	8.05	NaN	S	0
6	7	0	1	McCarthy, Mr. Timothy J	female	54.0	0	0	17463	51.86	E46	S	UpperClass
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	0

Out[105]:

Pclass_New	count
0	673
UpperClass	214

In [106…
```
df1['Pclass_New'] = df1['Pclass'].apply(lambda x: 5 if x > 2 else 0)
display(df1.head())
df1['Pclass_New'].value_counts().to_frame()
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Pclass_New
0	1	0	3	Braund, Mr. Owen Harris	female	22.0	1	0	A/5 21171	7.25	NaN	S	5
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	5
4	5	0	3	Allen, Mr. William Henry	female	35.0	0	0	373450	8.05	NaN	S	5
6	7	0	1	McCarthy, Mr. Timothy J	female	54.0	0	0	17463	51.86	E46	S	0
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	5

Out[106]:

Pclass_New	count
5	489
0	398

In [107…
```
df1.columns.tolist()
```

Out[107]:
```
['PassengerId',
 'Survived',
 'Pclass',
 'Name',
 'Sex',
 'Age',
 'SibSp',
 'Parch',
 'Ticket',
 'Fare',
 'Cabin',
 'Embarked',
 'Pclass_New']
```

In [108…
```
df1.nunique()
```

Out[108]:
```
PassengerId    887
Survived         2
Pclass           3
Name           887
Sex              1
Age             88
SibSp            7
Parch            7
Ticket         679
Fare           246
Cabin          146
Embarked         3
Pclass_New       2
dtype: int64
```

In [109…
```
df1 = df.copy()

women = df1.loc[df1['Sex'] == 'female']["Survived"]
rate_women = (women.sum()/len(women)).round(3)*100
print("Percentage of women who survived:", rate_women,"%")

men = df1.loc[df1['Sex'] == 'male']["Survived"]
rate_men = (men.sum()/len(men)).round(3)*100
print("Percentage of men who survived  :", rate_men,"%")
```

```
Percentage of women who survived: 74.0 %
Percentage of men who survived  : 19.0 %
```

In [110…
```
df1 = df.copy()
df1['Age_Range'] = pd.cut(df1['Age'],
bins=[0.,15,30,45,60,65,np.inf],
labels=[1,2,3,4,5,6])
df1.head()
```

Out[110]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Age_Range
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	2
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	2
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	3
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	4
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	2

In [111…
```
df1 = df.copy()
df1['AgeBand'] = pd.cut(df1['Age'], 5)
```

```
df1[['AgeBand', 'Survived']].groupby(['AgeBand'], as_index=False).mean().sort_values(by='AgeBand', ascending=Tr
```

Out[111]:

	AgeBand	Survived
0	(0.34, 16.336]	0.56
1	(16.336, 32.252]	0.37
2	(32.252, 48.168]	0.40
3	(48.168, 64.084]	0.43
4	(64.084, 80.0]	0.09

In [112…
```
Cabin_Not_NA = df1[df1['Cabin'].notna()]
Cabin_Not_NA.head()
```

Out[112]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	AgeBand
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	(48.168, 64.084]
10	11	1	3	Sandstrom, Miss. Marguerite Rut	female	4.0	1	1	PP 9549	16.70	G6	S	(0.34, 16.336]
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.55	C103	S	(48.168, 64.084]
21	22	1	2	Beesley, Mr. Lawrence	male	34.0	0	0	248698	13.00	D56	S	(32.252, 48.168]
23	24	1	1	Sloper, Mr. William Thompson	male	28.0	0	0	113788	35.50	A6	S	(16.336, 32.252]

In [113…
```
Cabin_NaN = df1[df1['Cabin'].isnull()]
Cabin_NaN.head()
```

Out[113]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	AgeBand
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	(16.336, 32.252]
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	(16.336, 32.252]
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	(32.252, 48.168]
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	(16.336, 32.252]
9	10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14.0	1	0	237736	30.07	NaN	C	(0.34, 16.336]

In [114…
```
df1 = pd.get_dummies(df1, columns = ['Embarked'], drop_first=True)
df1.head()
```

Out[114]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	AgeBand	Embarked_Q	Embarked_S
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	(16.336, 32.252]	False	True
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	(16.336, 32.252]	False	True
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	(32.252, 48.168]	False	True
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	(48.168, 64.084]	False	True
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	(16.336, 32.252]	False	True

In [115…
```
df1 = df.copy()

def Grade(Percentage):
    if Percentage >= 500:
        return 'High'
    if Percentage >= 300:
        return 'Medium'
    if Percentage >= 200:
        return 'Average'
    if Percentage >= 100:
        return 'Low'
    if Percentage >= 50:
```

```
        return 'VeryLow'
    return 'Free'

df1['Fare_Range']=df1.apply(lambda x: Grade(x['Fare']),axis=1)
df1.head()
```

Out[115]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Fare_Range
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.25	NaN	S	Free
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.92	NaN	S	Free
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.05	NaN	S	Free
6	7	0	1	McCarthy, Mr. Timothy J	male	54.0	0	0	17463	51.86	E46	S	VeryLow
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.0	0	2	347742	11.13	NaN	S	Free

In [116…
```
wine = pd.read_csv('WineQT.csv')
wine.head(3)
```

Out[116]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality	Id
0	7.4	0.70	0.00	1.9	0.08	11.0	34.0	1.0	3.51	0.56	9.4	5	0
1	7.8	0.88	0.00	2.6	0.10	25.0	67.0	1.0	3.20	0.68	9.8	5	1
2	7.8	0.76	0.04	2.3	0.09	15.0	54.0	1.0	3.26	0.65	9.8	5	2

In [117…
```
# Create correlation matrix
corr_matrix = wine.corr().abs()
# Select upper triangle of correlation matrix
upper = corr_matrix.where(np.triu(np.ones(corr_matrix.shape), k=1).astype(bool))
# Find features with correlation greater than 0.95
to_drop = [column for column in upper.columns if any(upper[column] > 0.30)]
to_drop
```

Out[117]:
```
['citric acid',
 'total sulfur dioxide',
 'density',
 'pH',
 'sulphates',
 'alcohol',
 'quality',
 'Id']
```

In [118…
```
wine['good_quality']=["yes" if x>=7 else 'no' for x in wine['quality']]
wine.head()
```

Out[118]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality	Id	good_quality
0	7.4	0.70	0.00	1.9	0.08	11.0	34.0	1.0	3.51	0.56	9.4	5	0	no
1	7.8	0.88	0.00	2.6	0.10	25.0	67.0	1.0	3.20	0.68	9.8	5	1	no
2	7.8	0.76	0.04	2.3	0.09	15.0	54.0	1.0	3.26	0.65	9.8	5	2	no
3	11.2	0.28	0.56	1.9	0.07	17.0	60.0	1.0	3.16	0.58	9.8	6	3	no
4	7.4	0.70	0.00	1.9	0.08	11.0	34.0	1.0	3.51	0.56	9.4	5	4	no

In [119…
```
#Removing all Negative values

wine['residual sugar'] = wine['residual sugar'].abs()
wine.head()
```

Out[119]:

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality	Id	good_quality
0	7.4	0.70	0.00	1.9	0.08	11.0	34.0	1.0	3.51	0.56	9.4	5	0	no
1	7.8	0.88	0.00	2.6	0.10	25.0	67.0	1.0	3.20	0.68	9.8	5	1	no
2	7.8	0.76	0.04	2.3	0.09	15.0	54.0	1.0	3.26	0.65	9.8	5	2	no
3	11.2	0.28	0.56	1.9	0.07	17.0	60.0	1.0	3.16	0.58	9.8	6	3	no
4	7.4	0.70	0.00	1.9	0.08	11.0	34.0	1.0	3.51	0.56	9.4	5	4	no

In [120…
```
# Print Row
row_30 = wine.iloc[75]
print(row_30)
```

```
fixed acidity            7.8
volatile acidity        0.41
citric acid             0.68
residual sugar           1.7
chlorides               0.47
free sulfur dioxide     18.0
total sulfur dioxide    69.0
density                  1.0
pH                      3.08
sulphates               1.31
alcohol                  9.3
quality                    5
Id                       106
good_quality              no
Name: 75, dtype: object
```

In [121…
```
any_negative_yield = (wine['chlorides'] < 0).any()

if any_negative_yield:
    print("The 'chlorides' column contains negative values.")
else:
    print("The 'chlorides' column does not contain negative values.")
```

```
The 'chlorides' column does not contain negative values.
```

In [122…
```
geo = pd.read_csv('gapminder_full.csv')
geo.head(3)
```

Out[122]:

	country	year	population	continent	life_exp	gdp_cap
0	Afghanistan	1952	8425333	Asia	28.80	779.45
1	Afghanistan	1957	9240934	Asia	30.33	820.85
2	Afghanistan	1962	10267083	Asia	32.00	853.10

In [123…
```
geo[(geo['population']>10000000) & (geo['country']=='Afghanistan')][['gdp_cap','life_exp','continent']]
```

Out[123]:

	gdp_cap	life_exp	continent
2	853.10	32.00	Asia
3	836.20	34.02	Asia
4	739.98	36.09	Asia
5	786.11	38.44	Asia
6	978.01	39.85	Asia
7	852.40	40.82	Asia
8	649.34	41.67	Asia
9	635.34	41.76	Asia
10	726.73	42.13	Asia
11	974.58	43.83	Asia

In [124…
```
reg_medal=geo.groupby(['country','continent']).size().reset_index().head(10)
reg_medal
```

Out[124]:

	country	continent	0
0	Afghanistan	Asia	12
1	Albania	Europe	12
2	Algeria	Africa	12
3	Angola	Africa	12
4	Argentina	Americas	12
5	Australia	Oceania	12
6	Austria	Europe	12
7	Bahrain	Asia	12
8	Bangladesh	Asia	12
9	Belgium	Europe	12

In [125…
```
df2=geo.groupby('country')['continent'].nunique().reset_index()
df2.head()
```

Out[125]:

	country	continent
0	Afghanistan	1
1	Albania	1
2	Algeria	1
3	Angola	1
4	Argentina	1

In [126…
```
geo.groupby('country')['continent'].count().nlargest(20).reset_index().head(10)
```

Out[126]:

	country	continent
0	Afghanistan	12
1	Albania	12
2	Algeria	12
3	Angola	12
4	Argentina	12
5	Australia	12
6	Austria	12
7	Bahrain	12
8	Bangladesh	12
9	Belgium	12

In [127…
```
Highest_Population = geo.nlargest(10, 'population', keep='all')
Highest_Population.head(10)
```

Out[127]:

	country	year	population	continent	life_exp	gdp_cap
299	China	2007	1318683096	Asia	72.96	4959.11
298	China	2002	1280400000	Asia	72.03	3119.28
297	China	1997	1230075000	Asia	70.43	2289.23
296	China	1992	1164970000	Asia	68.69	1655.78
707	India	2007	1110396331	Asia	64.70	2452.21
295	China	1987	1084035000	Asia	67.27	1378.90
706	India	2002	1034172547	Asia	62.88	1746.77
294	China	1982	1000281000	Asia	65.53	962.42
705	India	1997	959000000	Asia	61.77	1458.82
293	China	1977	943455000	Asia	63.97	741.24

In [128…
```
Lowest_Population = geo.nsmallest(10, 'population', keep='all')
Lowest_Population.head(10)
```

Out[128]:

	country	year	population	continent	life_exp	gdp_cap
1296	Sao Tome and Principe	1952	60011	Africa	46.47	879.58
1297	Sao Tome and Principe	1957	61325	Africa	48.95	860.74
420	Djibouti	1952	63149	Africa	34.81	2669.53
1298	Sao Tome and Principe	1962	65345	Africa	51.89	1071.55
1299	Sao Tome and Principe	1967	70787	Africa	54.42	1384.84
421	Djibouti	1957	71851	Africa	37.33	2864.97
1300	Sao Tome and Principe	1972	76595	Africa	56.48	1532.99
1301	Sao Tome and Principe	1977	86796	Africa	58.55	1737.56
422	Djibouti	1962	89898	Africa	39.69	3020.99
1302	Sao Tome and Principe	1982	98593	Africa	60.35	1890.22

In [129…
```
Population = geo.groupby(by = ['country'], axis = 0)['population'].sum()
Range = pd.DataFrame(Population).reset_index()
Range.sort_values(by= ['population'], ascending = False, inplace = True)
Range.head(10)
```

Out[129]:

	country	population
24	China	11497920623
58	India	8413568878
134	United States	2738534790
59	Indonesia	1779874000
14	Brazil	1467745520
66	Japan	1341105696
97	Pakistan	1124200629
8	Bangladesh	1089064744
47	Germany	930564520
94	Nigeria	884496214

In [130…
```
print(f"\033[031m\033[1m")
print("Unique continent Names :", geo['continent'].nunique())
geo['continent'].value_counts().nlargest(10).to_frame().style.background_gradient(cmap='copper')
```

Unique continent Names : 5

Out[130]:

continent	count
Africa	624
Asia	396
Europe	360
Americas	300
Oceania	24

In [131…
```
df1 = geo[geo['continent']=='Asia']
df1.groupby('country')['life_exp'].max().sort_values(ascending=False).head(5).reset_index()
```

Out[131]:

	country	life_exp
0	Japan	82.60
1	Hong Kong, China	82.21
2	Israel	80.75
3	Singapore	79.97
4	Korea, Rep.	78.62

In [132…
```
geo.groupby('country')['gdp_cap'].mean().sort_values(ascending=False).index[0:5]
```

Out[132]:
```
Index(['Kuwait', 'Switzerland', 'Norway', 'United States', 'Canada'], dtype='object', name='country')
```

In [133…
```
geo.groupby('country')['gdp_cap'].mean().sort_values(ascending=False).head(10)
```

Out[133]:
```
country
Kuwait            65332.91
Switzerland       27074.33
Norway            26747.31
United States     26261.15
Canada            22410.75
Netherlands       21748.85
Denmark           21671.82
Germany           20556.68
Iceland           20531.42
Austria           20411.92
Name: gdp_cap, dtype: float64
```

In [134…
```
data = geo[geo['continent']=='Africa']
data[data['gdp_cap'] == data['gdp_cap'].max()]['country']
```

Out[134]:
```
905    Libya
Name: country, dtype: object
```

In [135…
```
data = geo[geo['continent']=='Africa']
data[data['gdp_cap'] == data['gdp_cap'].min()]['country']
```

Out[135]:
```
334    Congo, Dem. Rep.
Name: country, dtype: object
```

In [136…
```
df1 = geo[(geo['continent'] == 'Europe')]
df1 = df1[df1['gdp_cap'] == df1['gdp_cap'].max()]
df1
```

```
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score
from lazypredict.Supervised import LazyClassifier
import matplotlib.pyplot as plt

# Assuming df is your DataFrame containing the Titanic dataset
titanic_data = df.copy()
titanic_data = titanic_data.dropna()

# Select relevant features
features = ['Pclass', 'Sex', 'Age', 'SibSp', 'Parch', 'Fare']
X = titanic_data[features]
y = titanic_data['Survived']

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, r
andom_state=42)

# Create a LazyClassifier
clf = LazyClassifier(verbose=0, ignore_warnings=True, custom_metri
c=None)
models, predictions = clf.fit(X_train, X_test, y_train, y_test)
print("Models performance:")
models
```

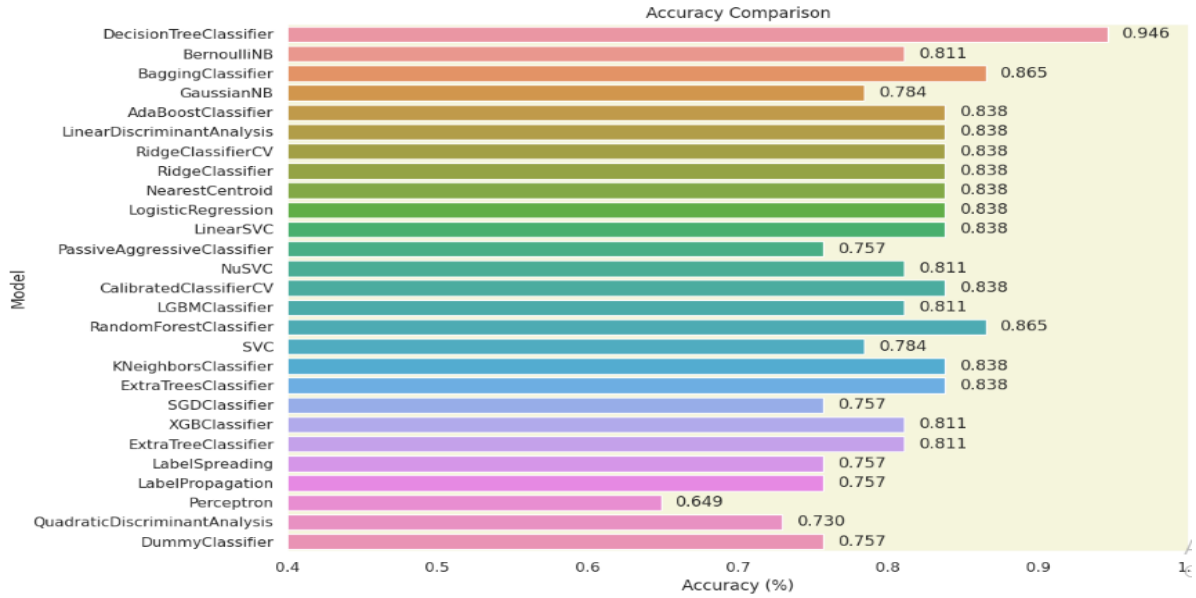
Model	Accuracy	Balanced Accuracy	ROC AUC	F1 Score	Time Taken
DecisionTreeClassifier	0.95	0.93	0.93	0.95	0.02
BernoulliNB	0.81	0.84	0.84	0.82	0.03
BaggingClassifier	0.86	0.84	0.84	0.87	0.06
GaussianNB	0.78	0.82	0.82	0.80	0.02
AdaBoostClassifier	0.84	0.82	0.82	0.84	0.14
LinearDiscriminantAnalysis	0.84	0.82	0.82	0.84	0.04
RidgeClassifierCV	0.84	0.82	0.82	0.84	0.02
RidgeClassifier	0.84	0.82	0.82	0.84	0.03
NearestCentroid	0.84	0.82	0.82	0.84	0.03
LogisticRegression	0.84	0.82	0.82	0.84	0.03
LinearSVC	0.84	0.82	0.82	0.84	0.03
PassiveAggressiveClassifier	0.76	0.80	0.80	0.77	0.03
NuSVC	0.81	0.80	0.80	0.82	0.13
CalibratedClassifierCV	0.84	0.78	0.78	0.84	0.07

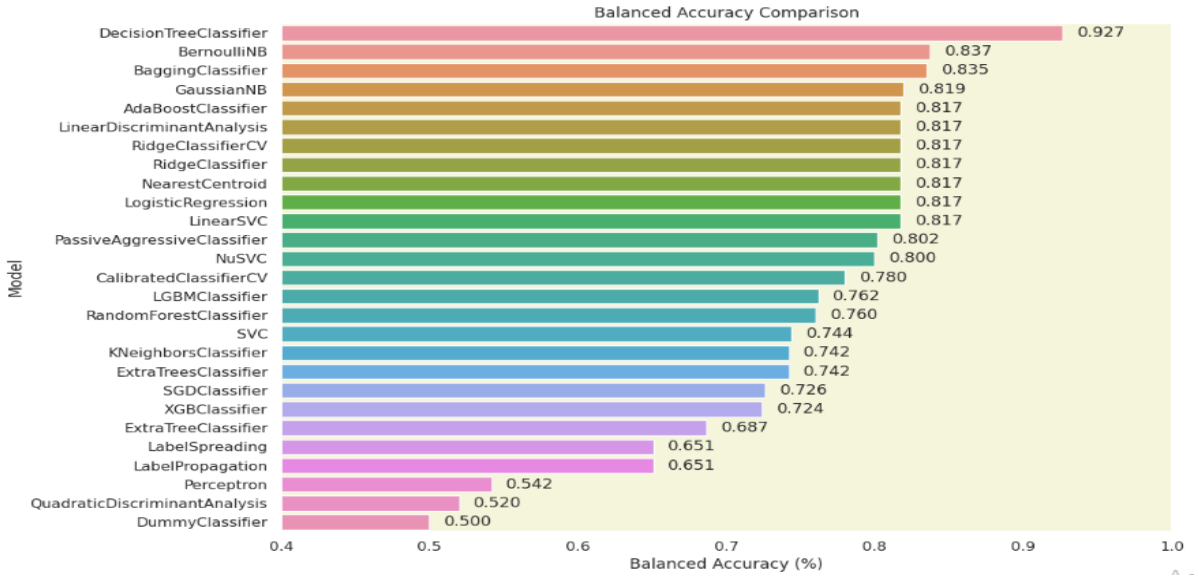
LGBMClassifier	0.81	0.76	0.76	0.81	0.08
RandomForestClassifier	0.86	0.76	0.76	0.85	0.25
SVC	0.78	0.74	0.74	0.79	0.02
KNeighborsClassifier	0.84	0.74	0.74	0.83	0.03
ExtraTreesClassifier	0.84	0.74	0.74	0.83	0.20
SGDClassifier	0.76	0.73	0.73	0.77	0.02
XGBClassifier	0.81	0.72	0.72	0.81	0.11
ExtraTreeClassifier	0.81	0.69	0.69	0.80	0.02
LabelSpreading	0.76	0.65	0.65	0.75	0.02
LabelPropagation	0.76	0.65	0.65	0.75	0.02
Perceptron	0.65	0.54	0.54	0.65	0.02
QuadraticDiscriminantAnalysis	0.73	0.52	0.52	0.68	0.03
DummyClassifier	0.76	0.50	0.50	0.65	0.02

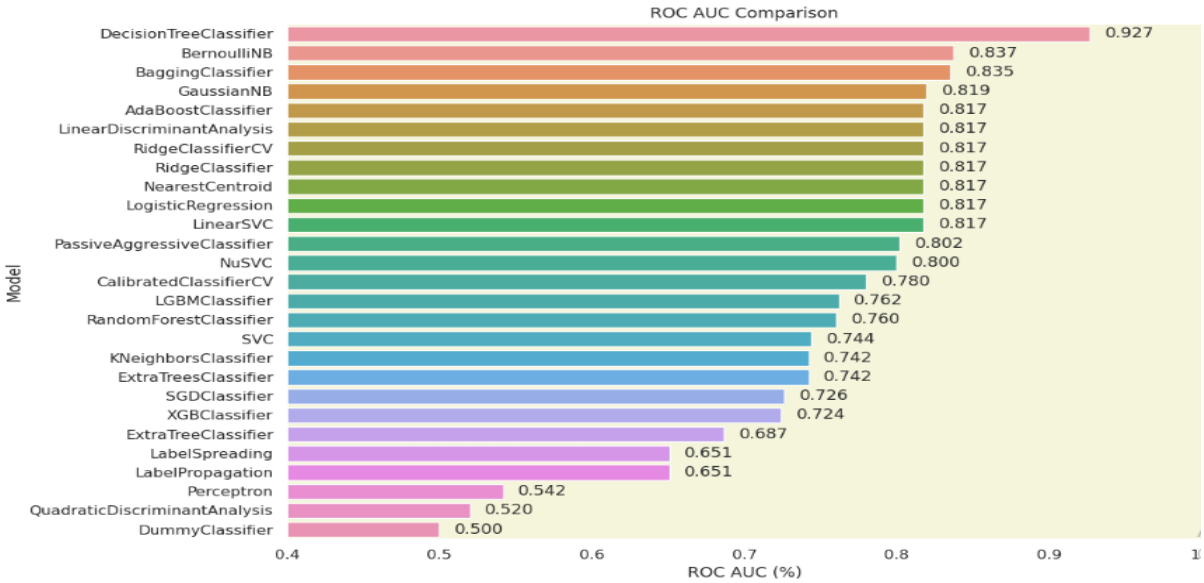
```
# If you want to evaluate a specific model (e.g., the best performing one)
if not models.empty:
    best_model = models.index[0]
    print(f"\nBest model: {best_model}")

    if best_model in predictions.columns:
        best_model_predictions = predictions[best_model]
        accuracy = accuracy_score(y_test, best_model_predictions)
        print(f"Accuracy of the best model: {accuracy}")
    else:
        print(f"Warning: Predictions for {best_model} not found in the pr
edictions DataFrame.")
        print("Available models in predictions:")
        print(predictions.columns)
else:
    print("No models were successfully trained.")

print("\nShape of predictions DataFrame:", predictions.shape)
print("\nFirst few rows of predictions DataFrame:")
predictions
```

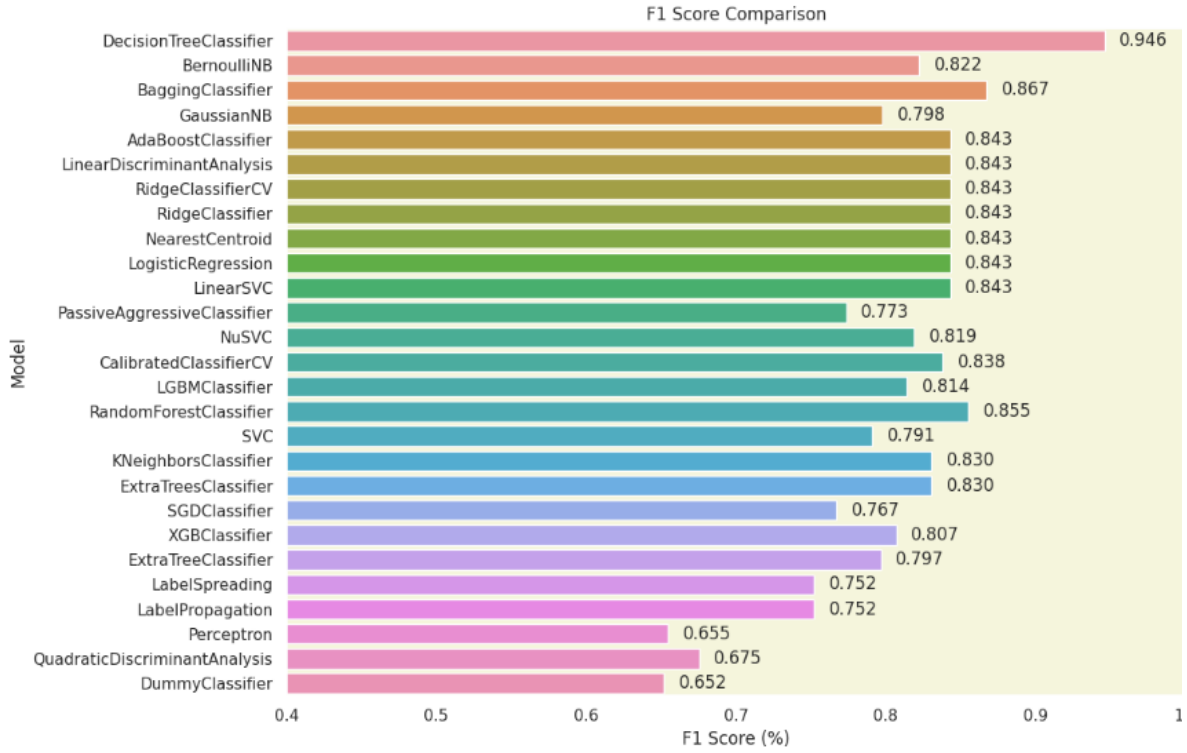
Model	Accuracy	Balanced Accuracy	ROC AUC	F1 Score	Time Taken
DecisionTreeClassifier	0.95	0.93	0.93	0.95	0.02
BernoulliNB	0.81	0.84	0.84	0.82	0.03
BaggingClassifier	0.86	0.84	0.84	0.87	0.06
GaussianNB	0.78	0.82	0.82	0.80	0.02
AdaBoostClassifier	0.84	0.82	0.82	0.84	0.14
LinearDiscriminantAnalysis	0.84	0.82	0.82	0.84	0.04
RidgeClassifierCV	0.84	0.82	0.82	0.84	0.02
RidgeClassifier	0.84	0.82	0.82	0.84	0.03
NearestCentroid	0.84	0.82	0.82	0.84	0.03
LogisticRegression	0.84	0.82	0.82	0.84	0.03
LinearSVC	0.84	0.82	0.82	0.84	0.03
PassiveAggressiveClassifier	0.76	0.80	0.80	0.77	0.03
NuSVC	0.81	0.80	0.80	0.82	0.13
CalibratedClassifierCV	0.84	0.78	0.78	0.84	0.07
LGBMClassifier	0.81	0.76	0.76	0.81	0.08
RandomForestClassifier	0.86	0.76	0.76	0.85	0.25
SVC	0.78	0.74	0.74	0.79	0.02
KNeighborsClassifier	0.84	0.74	0.74	0.83	0.03
ExtraTreesClassifier	0.84	0.74	0.74	0.83	0.20
SGDClassifier	0.76	0.73	0.73	0.77	0.02

```
plt.figure(figsize=(12, 30))
metrics = ['Accuracy', 'Balanced Accuracy', 'ROC AUC', 'F1 Score']

for i, metric in enumerate(metrics):
    plt.subplot(4, 1, i+1)
    ax = sns.barplot(x=models[metric], y=models.index, orient='h')
    plt.title(f'{metric} Comparison')
    plt.xlabel(f'{metric} (%)')
    plt.ylabel('Model')

    # Set x-axis to start from 0.40
    plt.xlim(0.40, 1.0)

    # Add value labels on the bars
    for j, v in enumerate(models[metric]):
        ax.text(v + 0.01, j, f'{v:.3f}', va='center')

plt.tight_layout()
plt.show()
```

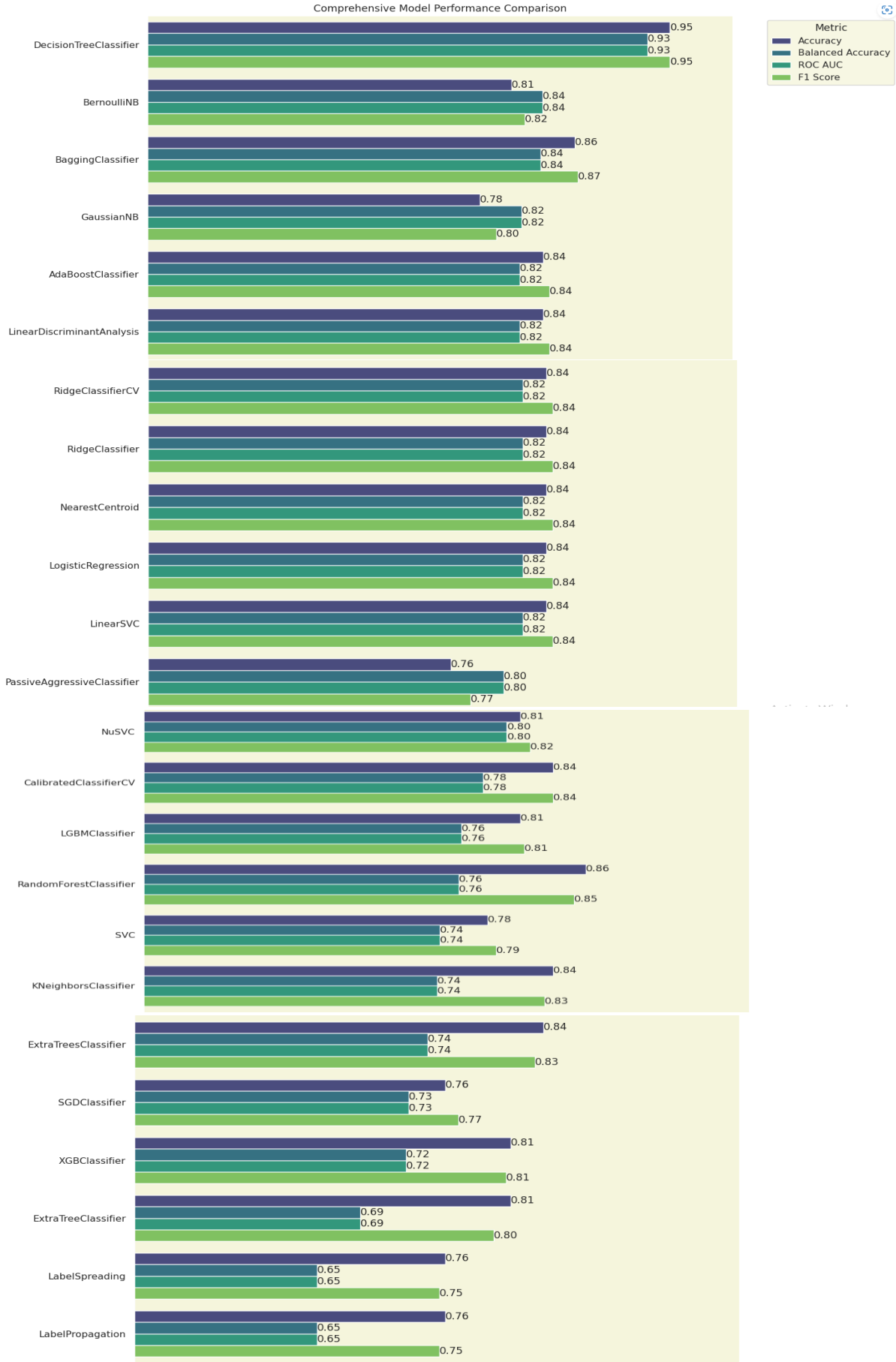

Accuracy Comparison
DecisionTreeClassifier 0.946
BernoulliNB 0.811
BaggingClassifier 0.865
GaussianNB 0.784
AdaBoostClassifier 0.838
LinearDiscriminantAnalysis 0.838
RidgeClassifierCV 0.838
RidgeClassifier 0.838
NearestCentroid 0.838
LogisticRegression 0.838
LinearSVC 0.838
PassiveAggressiveClassifier 0.757
NuSVC 0.811
CalibratedClassifierCV 0.838
LGBMClassifier 0.811
RandomForestClassifier 0.865
SVC 0.784
KNeighborsClassifier 0.838
ExtraTreesClassifier 0.838
SGDClassifier 0.757
XGBClassifier 0.811
ExtraTreeClassifier 0.811
LabelSpreading 0.757
LabelPropagation 0.757
Perceptron 0.649
QuadraticDiscriminantAnalysis 0.730
DummyClassifier 0.757
Model
0.4 0.5 0.6 0.7 0.8 0.9
Accuracy (%)


Balanced Accuracy Comparison
DecisionTreeClassifier 0.927
BernoulliNB 0.837
BaggingClassifier 0.835
GaussianNB 0.819
AdaBoostClassifier 0.817
LinearDiscriminantAnalysis 0.817
RidgeClassifierCV 0.817
RidgeClassifier 0.817
NearestCentroid 0.817
LogisticRegression 0.817
LinearSVC 0.817
PassiveAggressiveClassifier 0.802
NuSVC 0.800
CalibratedClassifierCV 0.780
LGBMClassifier 0.762
RandomForestClassifier 0.760
SVC 0.744
KNeighborsClassifier 0.742
ExtraTreesClassifier 0.742
SGDClassifier 0.726
XGBClassifier 0.724
ExtraTreeClassifier 0.687
LabelSpreading 0.651
LabelPropagation 0.651
Perceptron 0.542
QuadraticDiscriminantAnalysis 0.520
DummyClassifier 0.500
Model
0.4 0.5 0.6 0.7 0.8 0.9 1.0
Balanced Accuracy (%)


ROC AUC Comparison
DecisionTreeClassifier 0.927
BernoulliNB 0.837
BaggingClassifier 0.835
GaussianNB 0.819
AdaBoostClassifier 0.817
LinearDiscriminantAnalysis 0.817
RidgeClassifierCV 0.817
RidgeClassifier 0.817
NearestCentroid 0.817
LogisticRegression 0.817
LinearSVC 0.817
PassiveAggressiveClassifier 0.802
NuSVC 0.800
CalibratedClassifierCV 0.780
LGBMClassifier 0.762
RandomForestClassifier 0.760
SVC 0.744
KNeighborsClassifier 0.742
ExtraTreesClassifier 0.742
SGDClassifier 0.726
XGBClassifier 0.724
ExtraTreeClassifier 0.687
LabelSpreading 0.651
LabelPropagation 0.651
Perceptron 0.542
QuadraticDiscriminantAnalysis 0.520
DummyClassifier 0.500
Model
0.4 0.5 0.6 0.7 0.8 0.9
ROC AUC (%)




```
# Assuming 'models' and 'metrics' are already defined DataFrames
summary_df = models[metrics].copy()
summary_df['Model'] = models.index
summary_df = summary_df.melt(id_vars=['Model'], var_name='Metric'
, value_name='Score')

plt.figure(figsize=(15, 30))
barplot = sns.barplot(x='Score', y='Model', hue='Metric', data=summ
ary_df, orient='h', palette='viridis')

# Add values at the edge of the bars
for container in barplot.containers:
    barplot.bar_label(container, fmt='%.2f', label_type='edge')

plt.title('Comprehensive Model Performance Comparison')
plt.xlabel('Score (%)')
plt.ylabel('Model')
plt.legend(title='Metric', bbox_to_anchor=(1.05, 1), loc='upper left')

# Set x-axis to start from 0.50
plt.xlim(0.50, 1.0)
plt.tight_layout()
plt.show()
```


Comprehensive Model Performance Comparison
Metric
Accuracy
Balanced Accuracy
ROC AUC
F1 Score
DecisionTreeClassifier 0.95 0.93 0.93 0.95
BernoulliNB 0.81 0.84 0.84 0.82
BaggingClassifier 0.86 0.84 0.84 0.87
GaussianNB 0.78 0.82 0.82 0.80
AdaBoostClassifier 0.84 0.82 0.82 0.84
LinearDiscriminantAnalysis 0.84 0.82 0.82 0.84
RidgeClassifierCV 0.84 0.82 0.82 0.84
RidgeClassifier 0.84 0.82 0.82 0.84
NearestCentroid 0.84 0.82 0.82 0.84
LogisticRegression 0.84 0.82 0.82 0.84
LinearSVC 0.84 0.82 0.82 0.84
PassiveAggressiveClassifier 0.76 0.80 0.80 0.77
NuSVC 0.81 0.80 0.80 0.82
CalibratedClassifierCV 0.84 0.78 0.78 0.84
LGBMClassifier 0.81 0.76 0.76 0.81
RandomForestClassifier 0.86 0.76 0.76 0.85
SVC 0.78 0.74 0.74 0.79
KNeighborsClassifier 0.84 0.74 0.74 0.83
ExtraTreesClassifier 0.84 0.74 0.74 0.83
SGDClassifier 0.76 0.73 0.73 0.77
XGBClassifier 0.81 0.72 0.72 0.81
ExtraTreeClassifier 0.81 0.69 0.69 0.80
LabelSpreading 0.76 0.65 0.65 0.75
LabelPropagation 0.76 0.65 0.65 0.75

Prepared By: Syed Afroz Ali (Kaggle Grand Master)

All Types of Data Visualization Kaggle Note Book

Python for Machine Learning Visualization Part 01:

https://www.kaggle.com/code/pythonafroz/python-for-machine-learning-visualization-part-01

Python for Machine Learning Visualization Part 02:

https://www.kaggle.com/code/pythonafroz/python-for-machine-learning-visualization-part-03

In [128…
```
import pandas as pd
import numpy as np
import seaborn as sns

import plotly.express as px
import plotly.graph_objects as go
import plotly.figure_factory as ff
from plotly.subplots import make_subplots

pd.set_option('display.precision', 2)
```

In [2]:
```
# Load the dataset
df = pd.read_csv("heart_disease_uci.csv")
df = df.dropna()
df.head(2)
```

Out[2]:

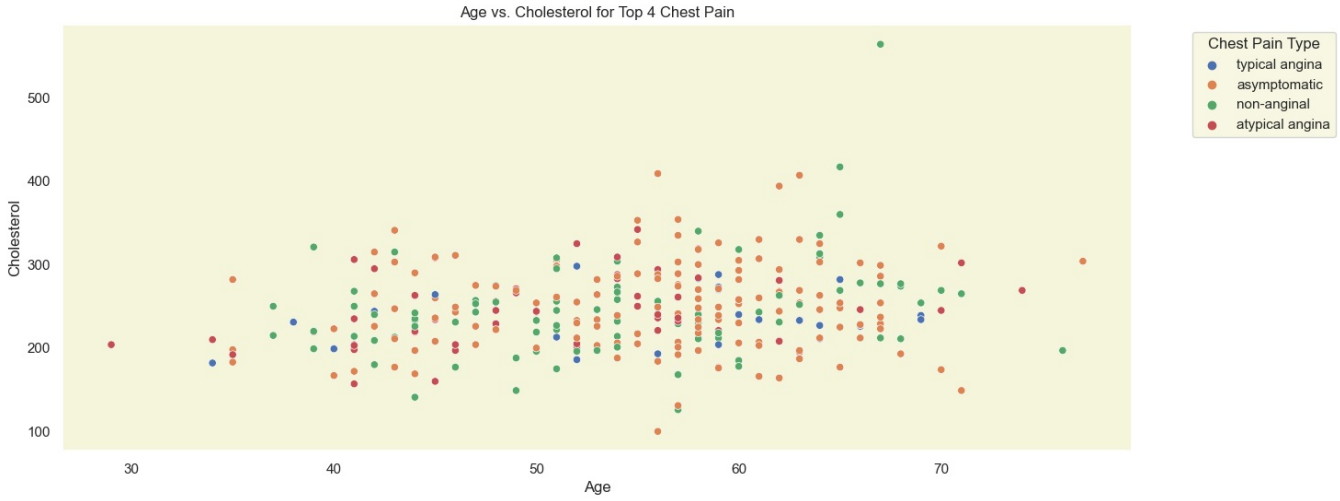
	id	age	sex	dataset	cp	trestbps	chol	fbs	restecg	thalch	exang	oldpeak	slope	ca	thal	num
0	1	63	Male	Cleveland	typical angina	145.0	233.0	True	lv hypertrophy	150.0	False	2.3	downsloping	0.0	fixed defect	0
1	2	67	Male	Cleveland	asymptomatic	160.0	286.0	False	lv hypertrophy	108.0	True	1.5	flat	3.0	normal	2

In [3]:
```
print(f"Records: {df.shape[0]}")
print(f"Columns: {df.shape[1]}")
```

```
Records: 299
Columns: 16
```

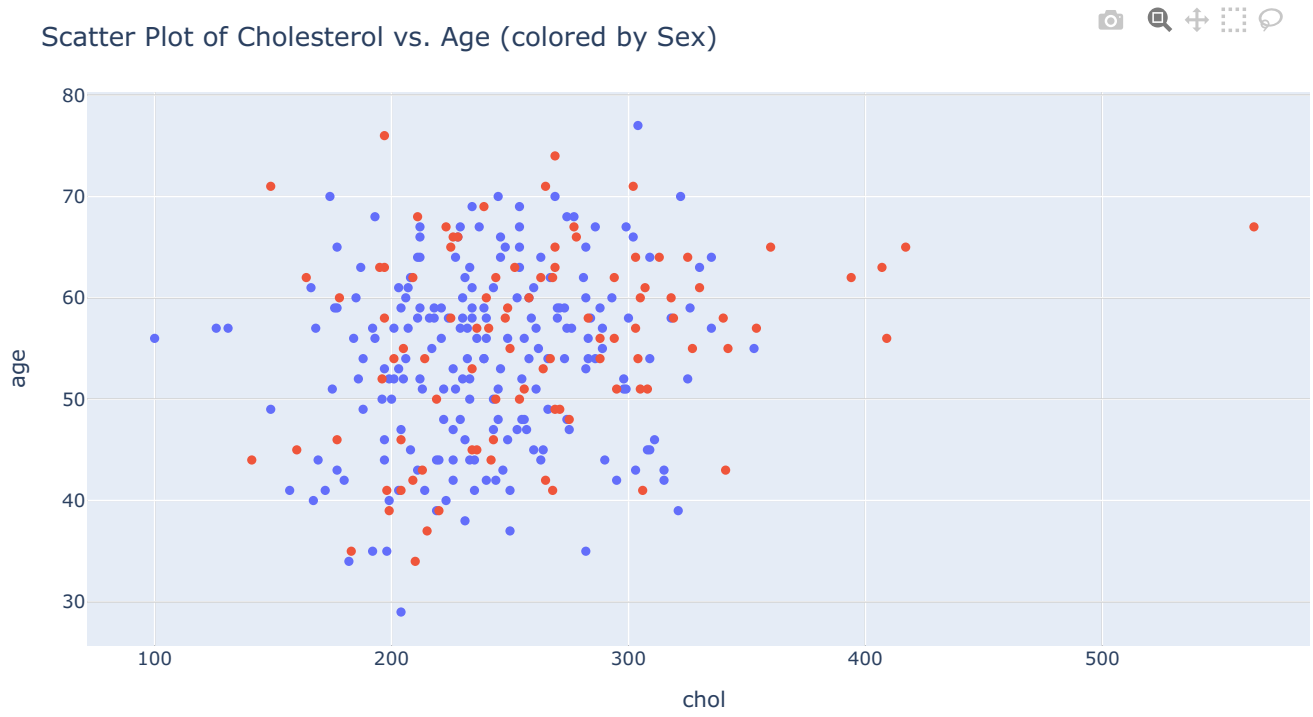
In [4]:
```
top_leagues = df['cp'].value_counts().nlargest(4).index
display(top_leagues)

plt.figure(figsize=(15, 6))
sns.scatterplot(x='age', y='chol', data=df[df['cp'].isin(top_leagues)], hue='cp')
plt.title('Age vs. Cholesterol for Top 4 Chest Pain')
plt.xlabel('Age')
plt.ylabel('Cholesterol')
plt.legend(title='Chest Pain Type', bbox_to_anchor=(1.05, 1), loc='upper left')
plt.show()
```

```
Index(['asymptomatic', 'non-anginal', 'atypical angina', 'typical angina'], dtype='object', name='cp')
```

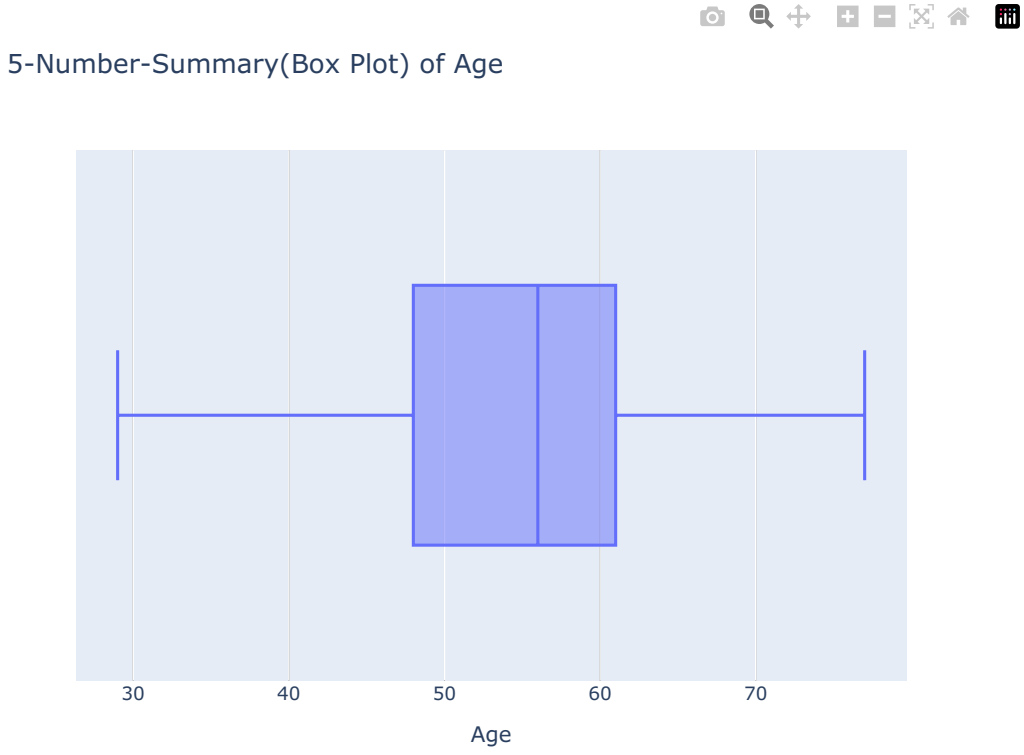


In [130…
```
import plotly.express as px


fig = px.scatter(df, x='chol', y='age', color='sex')

fig.update_layout(width=1000, height=500)
```

```
fig.update_layout(title_text='Scatter Plot of Cholesterol vs. Age (colored by Sex)')

fig.show()
```

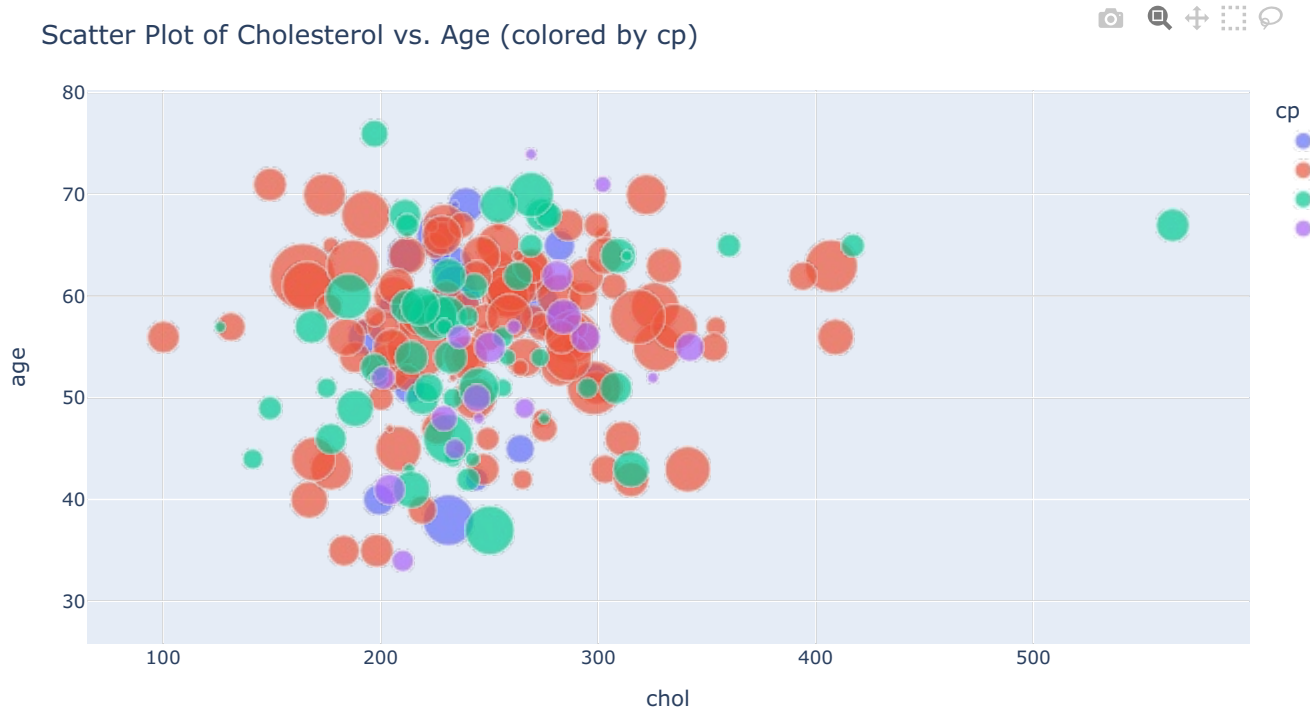


In [6]:
```
from plotly.offline import iplot

fig = px.box(x = df["age"],
             labels={"x":"Age"},
             title="5-Number-Summary(Box Plot) of Age")
iplot(fig)
```



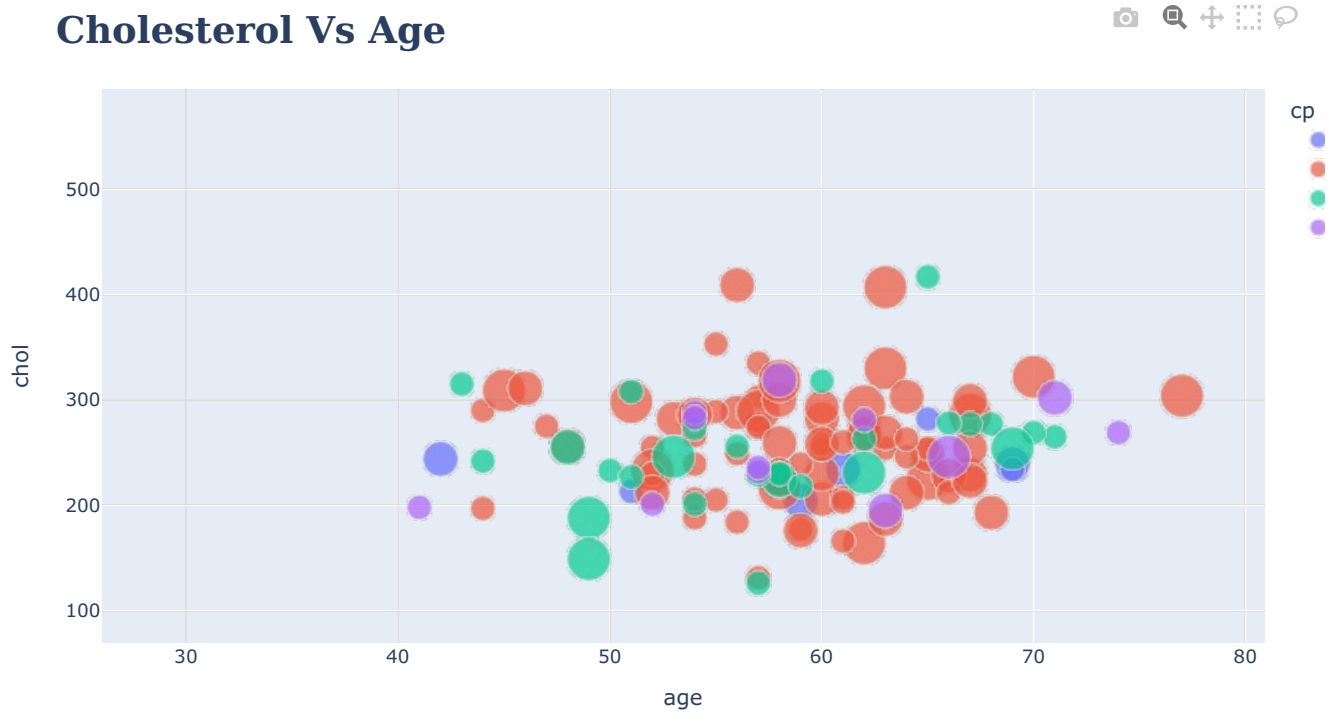
In [131…
```
import plotly.express as px


fig = px.scatter(df, x='chol', y='age', color='cp', size = 'oldpeak', size_max = 30, hover_name = 'exang')

fig.update_layout(width=1000, height=500)

fig.update_layout(title_text='Scatter Plot of Cholesterol vs. Age (colored by cp)')
```

```
fig.show()
```



In [132…

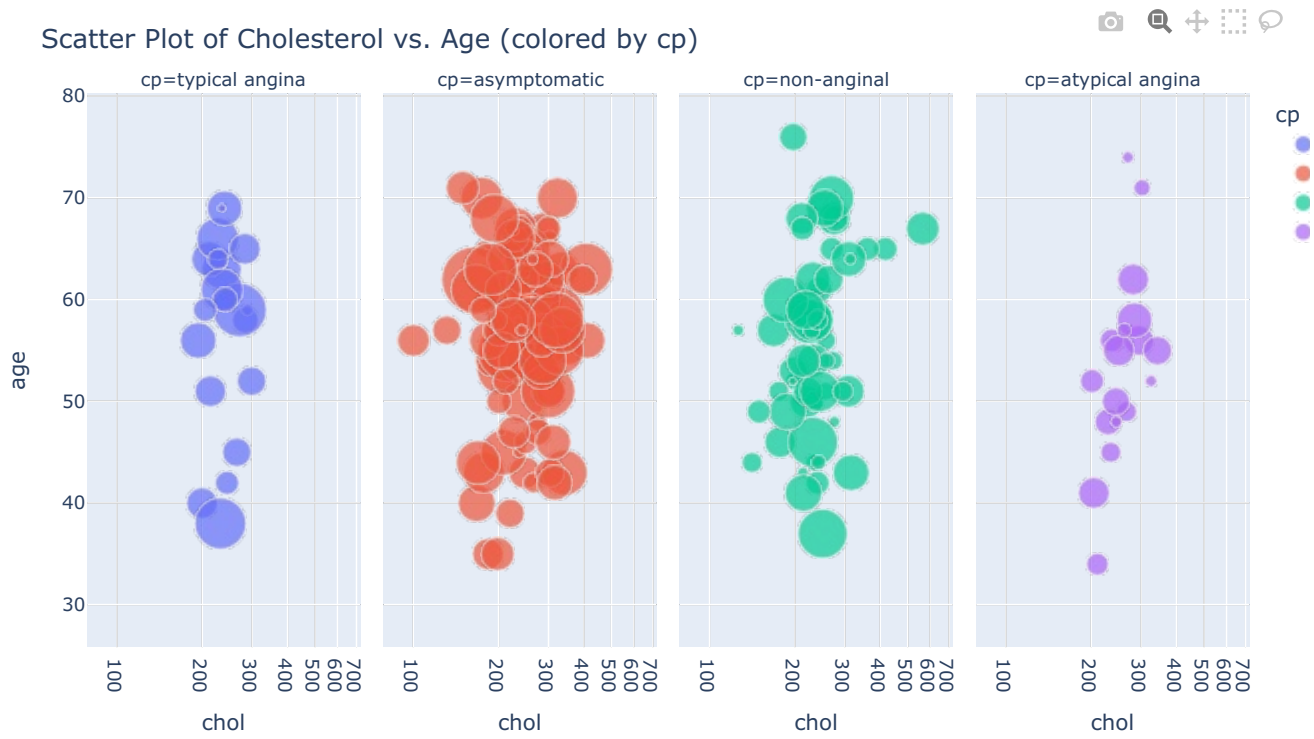
```
fig = px.scatter(data_frame = df,
                 x="age",
                 y="chol",
                 color="cp",
                 size='ca',
                 hover_data=['oldpeak'])

fig.update_layout(title_text="<b> Cholesterol Vs Age <b>",
                  titlefont={'size': 24, 'family':'Serif'},
                  width=1000,
                  height=500,
                 )

fig.show()
```



In [133…

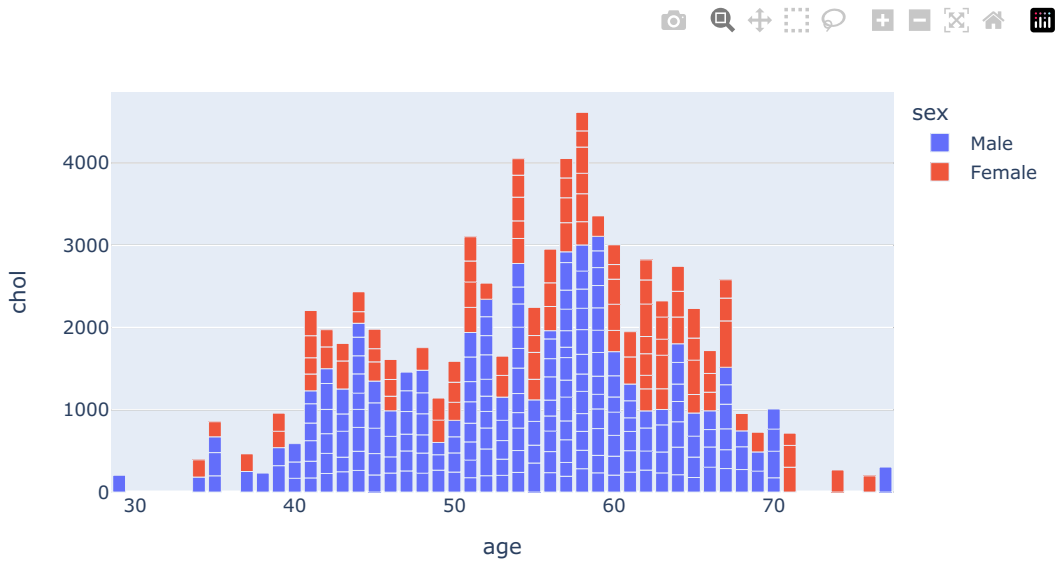
```
import plotly.express as px


fig = px.scatter(df, x='chol', y='age', color='cp', size = 'oldpeak', size_max = 30, hover_name = 'exang',facet
```

```
fig.update_layout(width=1000, height=500)

fig.update_layout(title_text='Scatter Plot of Cholesterol vs. Age (colored by cp)')

fig.show()
```



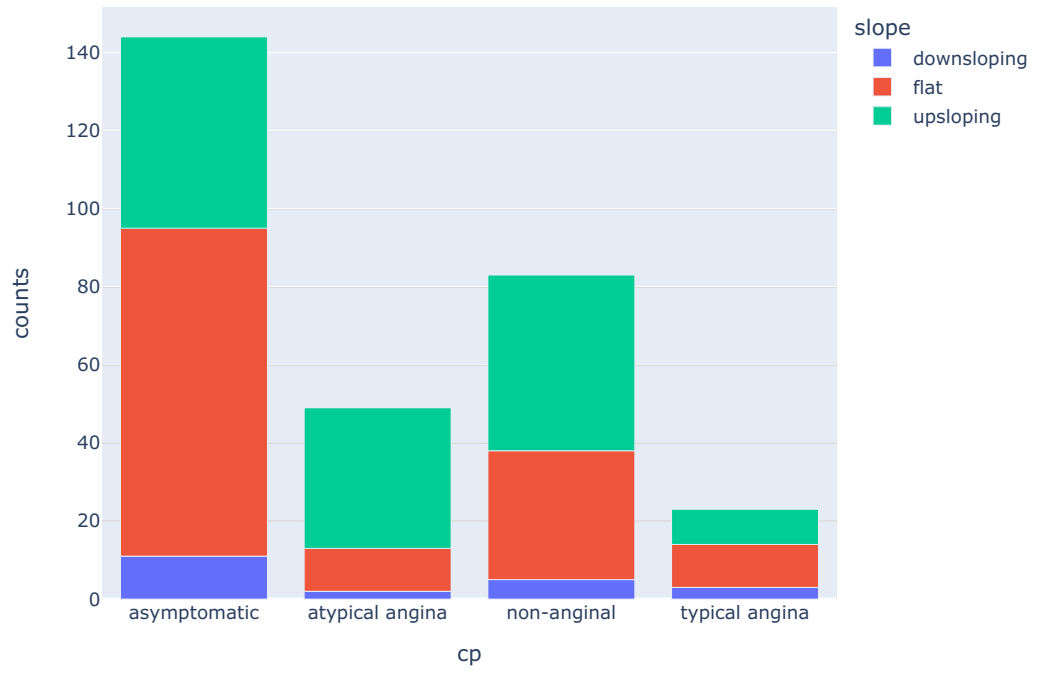
hover_name='exang' means that the values in the 'exang' column will be shown as tooltips when you hover over the data points on the scatter plot. This is useful for providing additional information about each data point without cluttering the plot with labels.

In [10]:
```
fig=px.bar(df,x='age',y='chol',hover_data=['oldpeak'],color='sex',height=400)
fig.show()
```

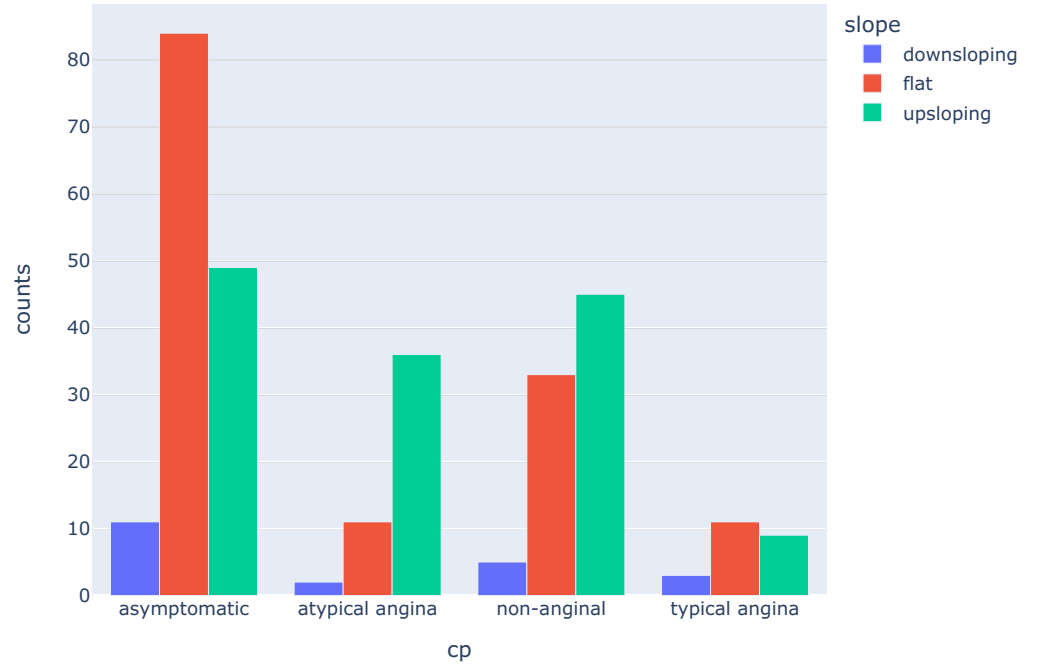


In [11]:
```
def generate_rating_df(df):
    rating_df = df.groupby(['cp', 'slope']).agg({'id': 'count'}).reset_index()
    rating_df = rating_df[rating_df['id'] != 0]
    rating_df.columns = ['cp', 'slope', 'counts']
    rating_df = rating_df.sort_values('slope')
    return rating_df

rating_df = generate_rating_df(df)
fig = px.bar(rating_df, x='cp', y='counts', color='slope')

fig.update_traces(textposition='auto',
                  textfont_size=20)

fig.update_layout(barmode='stack')
```

```
fig.show()
```

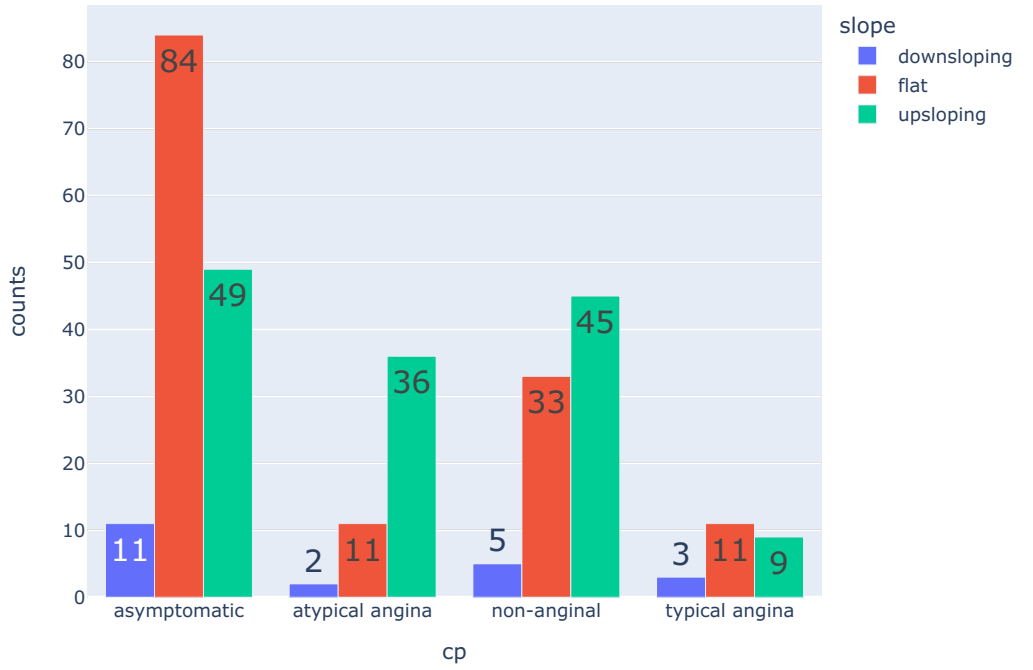


In [12]:
```
def generate_rating_df(df):
    rating_df = df.groupby(['cp', 'slope']).agg({'id': 'count'}).reset_index()
    rating_df = rating_df[rating_df['id'] != 0]
    rating_df.columns = ['cp', 'slope', 'counts']
    rating_df = rating_df.sort_values('slope')
    return rating_df

rating_df = generate_rating_df(df)
fig = px.bar(rating_df, x='cp', y='counts', color='slope')

fig.update_traces(textposition='auto',
                  textfont_size=20)

fig.update_layout(barmode='group')

fig.show()
```



In [13]:
```
import plotly.express as px
```

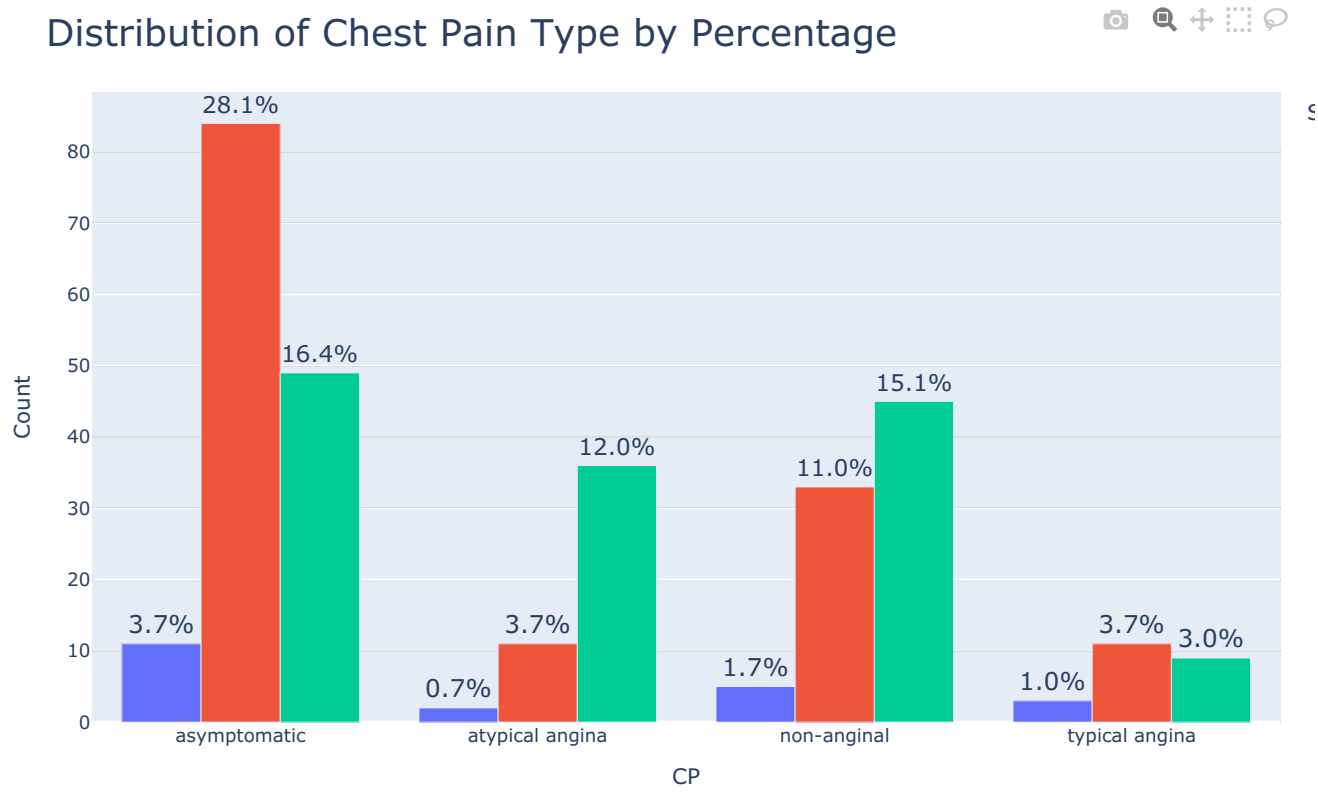
```
def generate_rating_df(df):
    rating_df = df.groupby(['cp', 'slope']).agg({'id': 'count'}).reset_index()
    rating_df = rating_df[rating_df['id'] != 0]
    rating_df.columns = ['cp', 'slope', 'counts']
    rating_df = rating_df.sort_values('slope')
    return rating_df

rating_df = generate_rating_df(df)


fig = px.bar(rating_df, x='cp', y='counts', color='slope', barmode='group',
             text='counts',
             )

fig.update_traces(textposition='auto',
                  textfont_size=20)

fig.show()
```



In [14]:

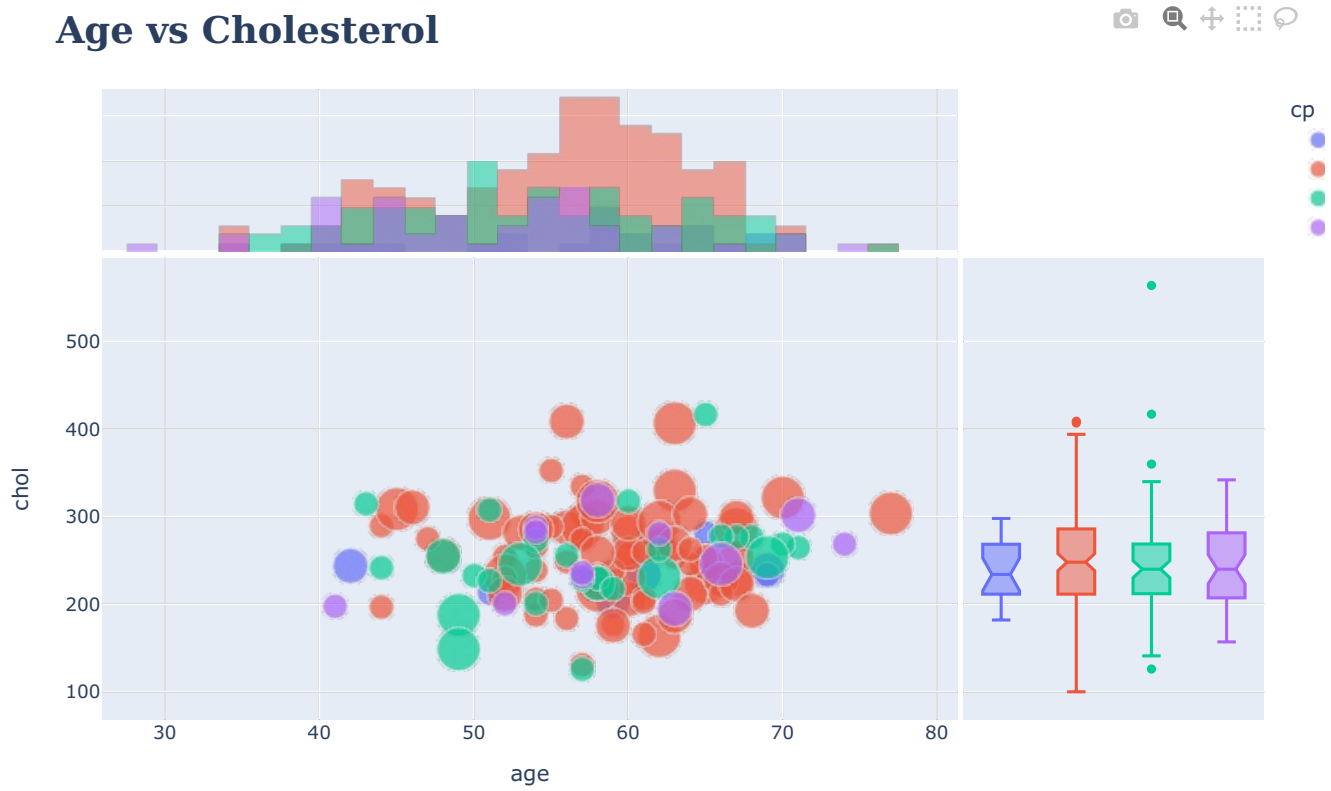
```
def generate_rating_df(df):
    rating_df = df.groupby(['cp', 'slope']).agg({'id': 'count'}).reset_index()
    rating_df = rating_df[rating_df['id'] != 0]
    rating_df.columns = ['cp', 'slope', 'counts']
    rating_df = rating_df.sort_values('slope')

    # Calculate percentages
    total_counts = rating_df['counts'].sum()
    rating_df['percentage'] = rating_df['counts'] / total_counts * 100

    return rating_df

rating_df = generate_rating_df(df)

fig = px.bar(rating_df, x='cp', y='counts', color='slope', text='percentage')

fig.update_traces(
    texttemplate='%{text:.1f}%',
    textposition='outside',
    textfont_size=16
)

fig.update_layout(
    barmode='group',
    yaxis_title='Count',
    xaxis_title='CP',
    legend_title='Slope'
)

fig.update_layout(
    height=550,
    width=1000,
    title_text="Distribution of Chest Pain Type by Percentage",
    title_font_size=24
)
```

```
fig.show()
```



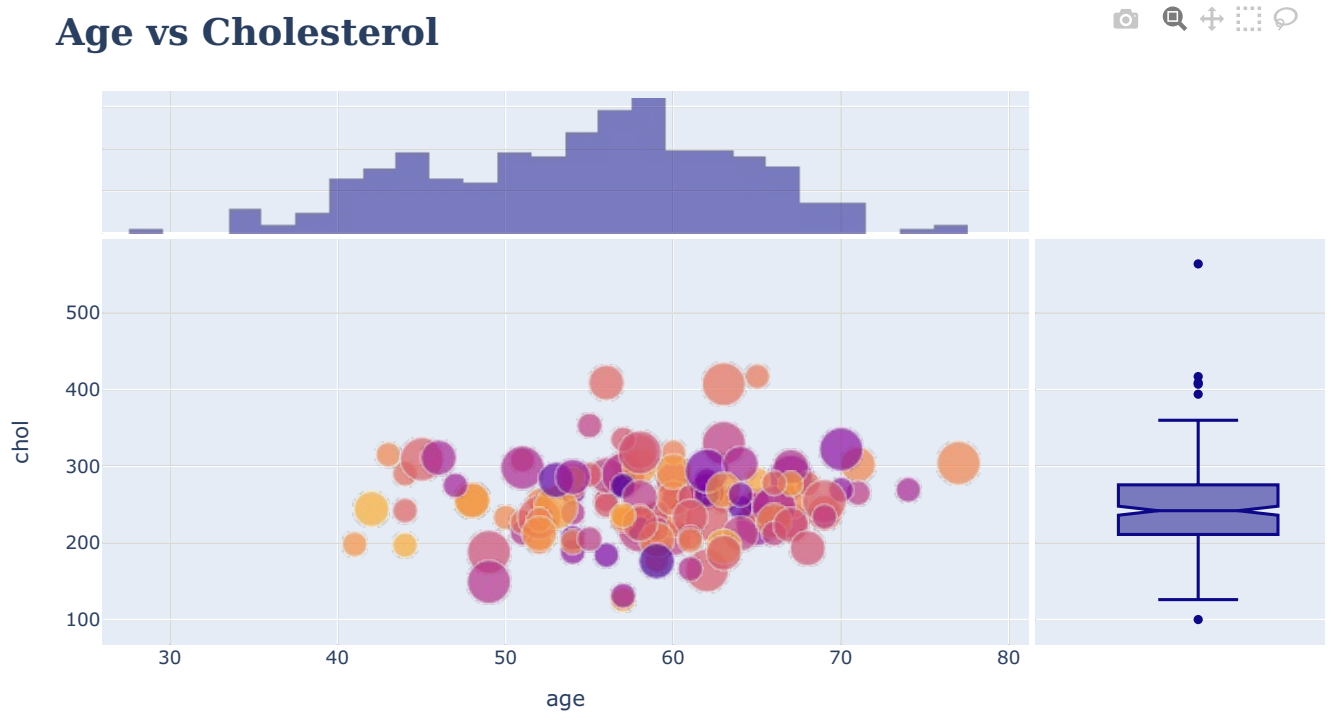
In [15]:

```
fig = px.scatter(data_frame = df,
                 x="age",
                 y="chol",
                 color="cp",
                 size='ca',
                 hover_data=['oldpeak'],
                 marginal_x="histogram",
                 marginal_y="box",)

fig.update_layout(title_text="<b> Age vs Cholesterol <b>",
                  titlefont={'size': 24, 'family':'Serif'},
                  width=1000,
                  height=550,
                 )

fig.show()
```



In [134…

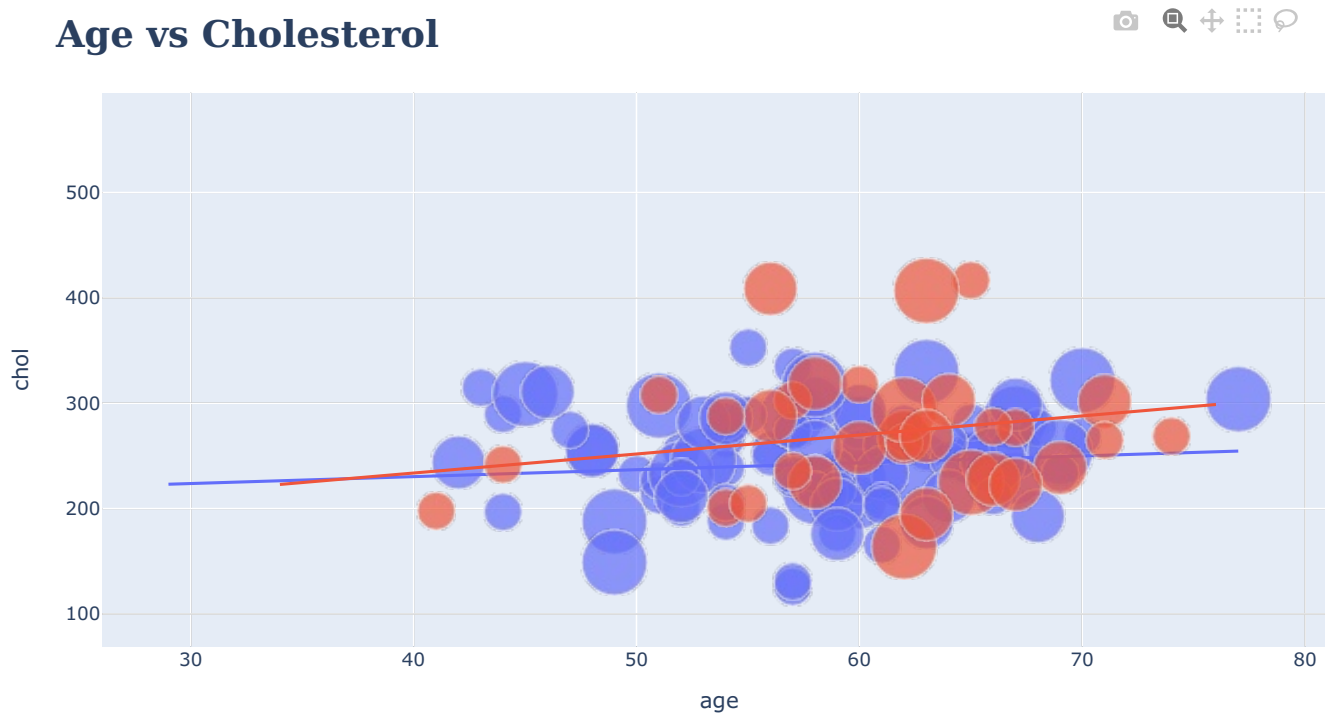
```
fig = px.scatter(data_frame = df,
                 x="age",
                 y="chol",
                 color="thalch",
                 size='ca',
                 hover_data=['oldpeak'],
                 marginal_x="histogram",
                 marginal_y="box")

fig.update_layout(title_text="<b> Age vs Cholesterol <b>",
                  titlefont={'size': 24, 'family':'Serif'},
                  width=1000,
                  height=500,
                 )

fig.show()
```



In [135…

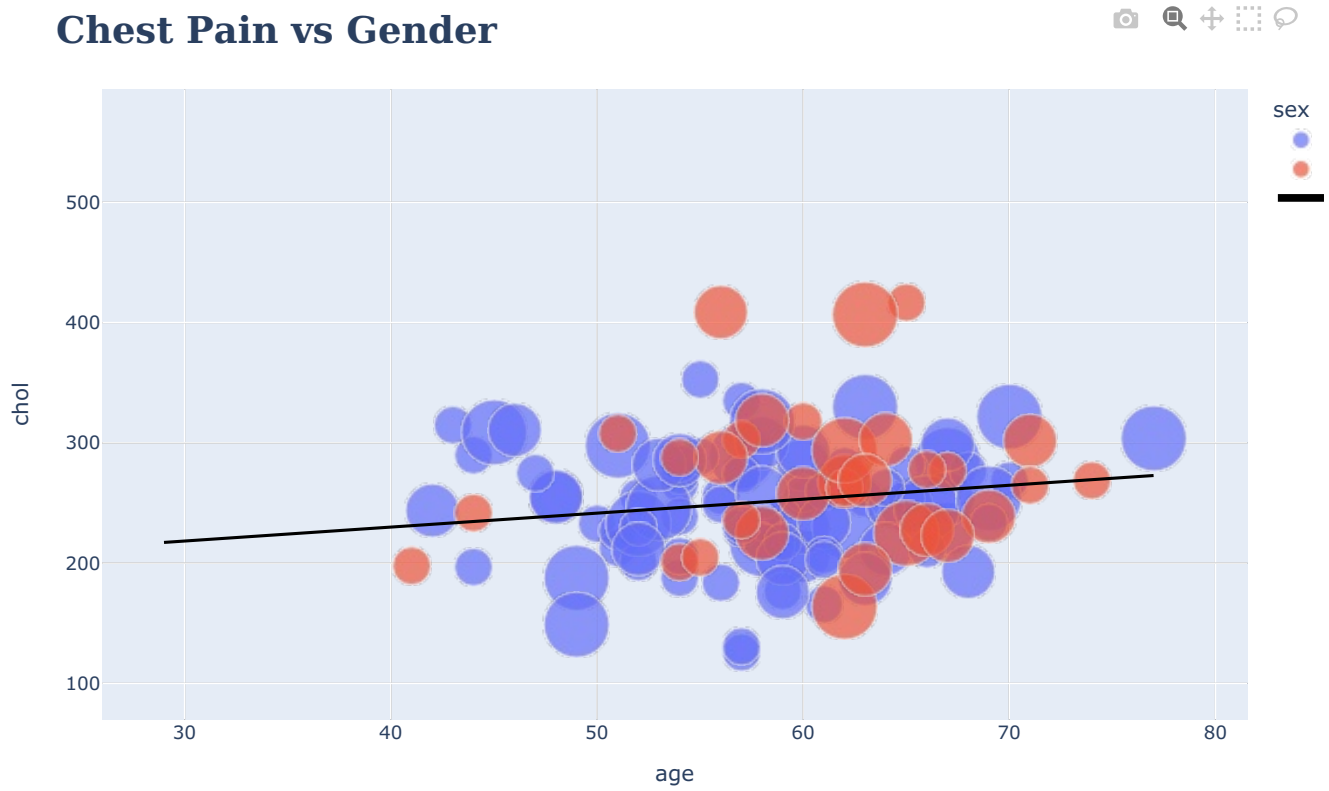
```
fig = px.scatter(data_frame = df,
                 x="age",
```

```
                y="chol",
                size ="ca",
                size_max=30,
                color= "sex",
                trendline="ols")
fig.update_layout(title_text="<b> Age vs Cholesterol <b>",
                  titlefont={'size': 24, 'family':'Serif'},
                  width=1000,
                  height=500,
                 )

fig.show()
```

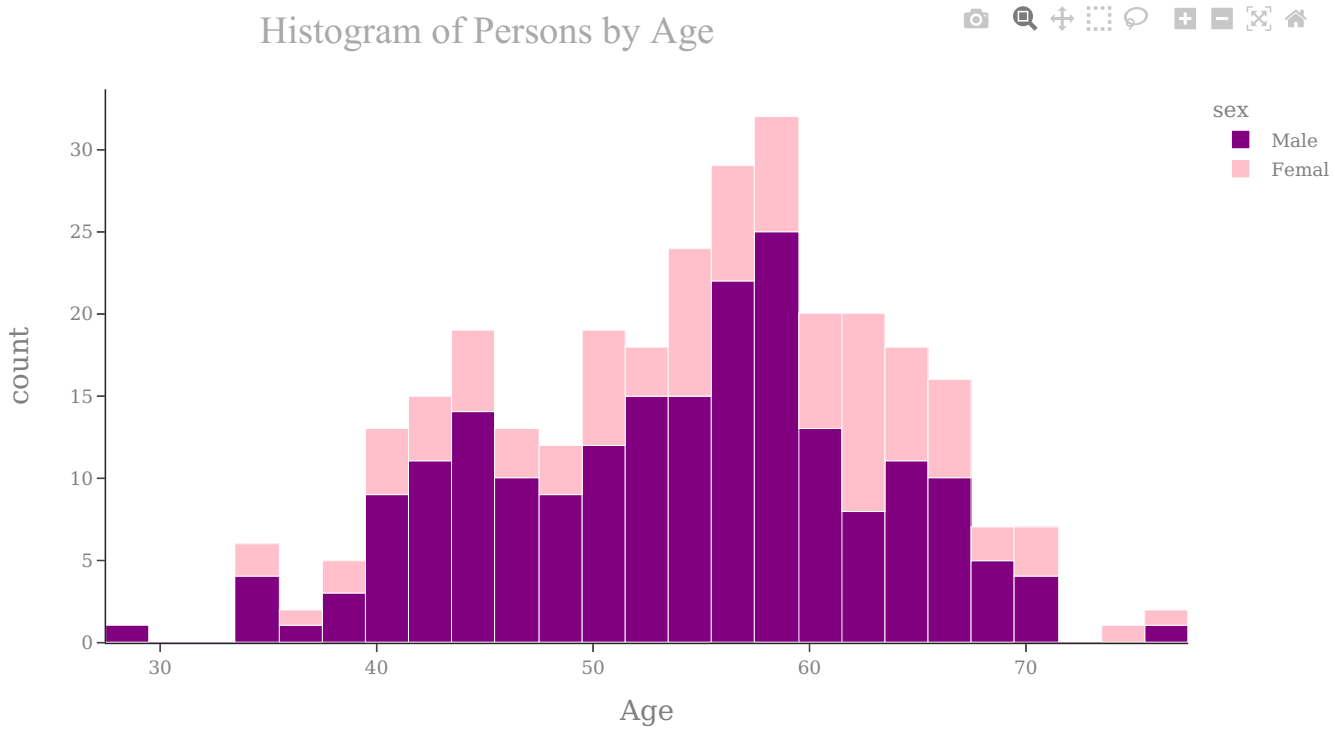


In [18]:

```
fig = px.scatter(data_frame = df,
                x="age",
                y="chol",
                size ="ca",
                size_max=30,
                color= "sex",
                trendline="ols",
                trendline_scope="overall",
                trendline_color_override="black")

fig.update_layout(title_text="<b>Chest Pain vs Gender<b>",
                  titlefont={'size': 24, 'family':'Serif'},
                  width=1000,
                  height=550,
                 )
fig.show()
```

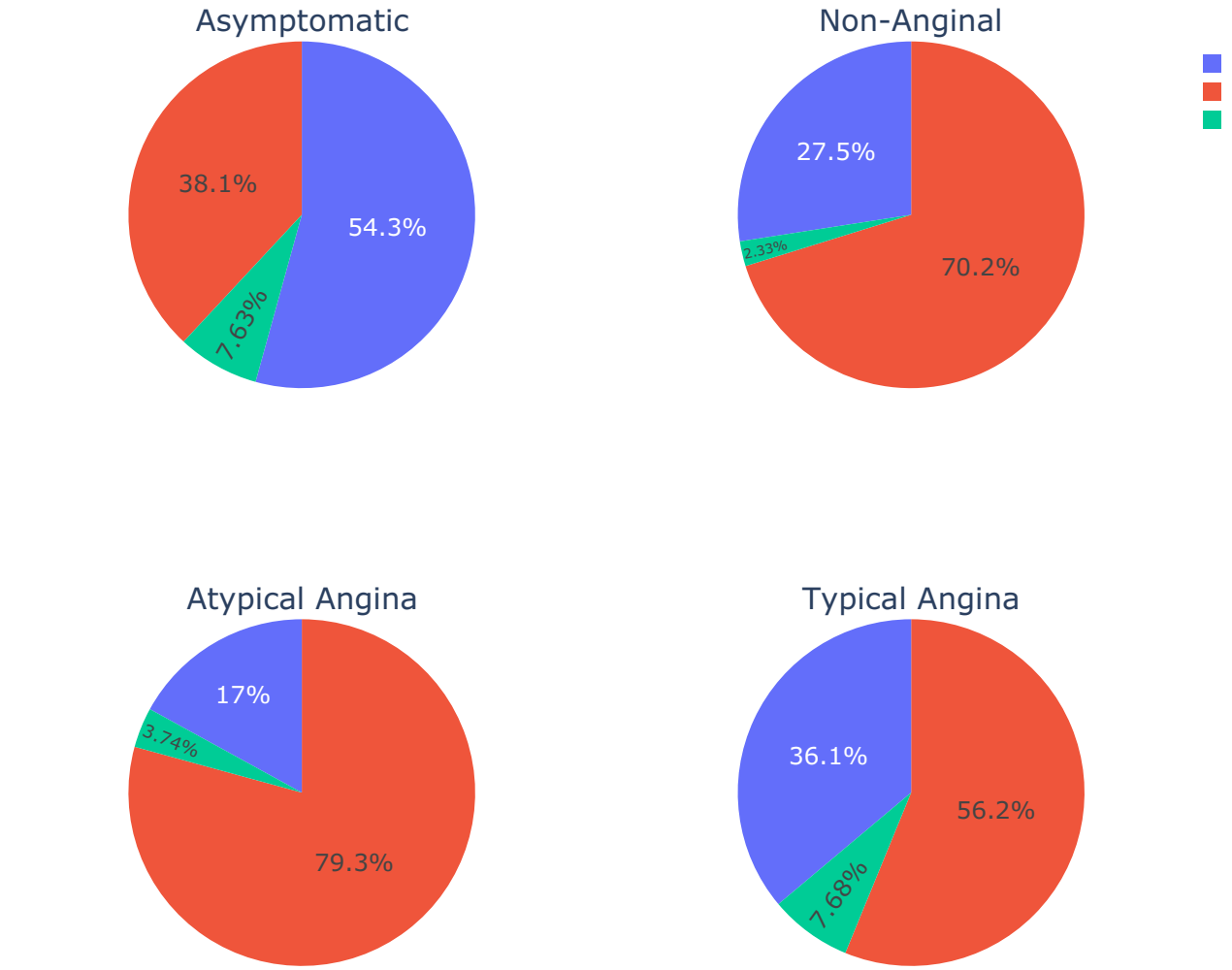


In [19]:
```
fig= px.histogram(df, x='age',height=500,width=900,template='simple_white',
                  color='sex', # adding categorical column
                  color_discrete_sequence=['purple','pink'])



fig.update_layout(title={'text':'Histogram of Persons by Age','font':{'size':25}}
                   ,title_font_family="Times New Roman",
    title_font_color="darkgrey",


                 title_x=0.2)

fig.update_layout(
    font_family='classic-roman',
                  font_color= 'grey',
                  yaxis_title={'text': " count", 'font': {'size':18}},
                xaxis_title={'text': " Age", 'font': {'size':18}}
)
fig.show()
```

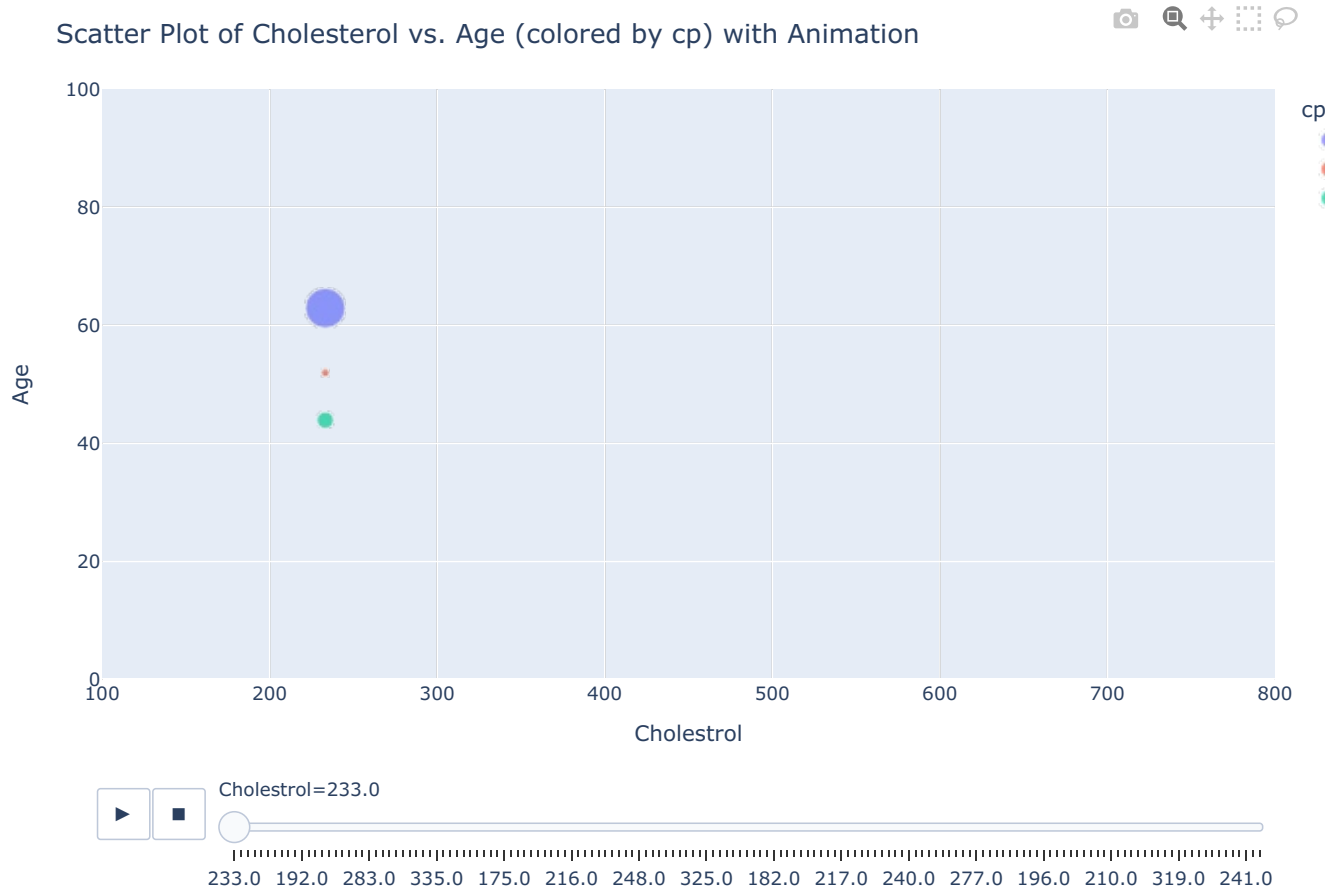


In [20]:

```
import plotly.graph_objects as go
from plotly.subplots import make_subplots

# Assuming df is your DataFrame
asymptomatic = df[df['cp'] == 'asymptomatic']
non_anginal = df[df['cp'] == 'non-anginal']
atypical_angina = df[df['cp'] == 'atypical angina']
typical_angina = df[df['cp'] == 'typical angina']

fig = make_subplots(rows=2,
                    cols=2,
                    specs=[[{'type':'domain'}, {'type':'domain'}],
                           [{'type':'domain'}, {'type':'domain'}]],
                    subplot_titles=("Asymptomatic", "Non-Anginal",
                                    "Atypical Angina", "Typical Angina"))

fig.add_trace(go.Pie(labels=asymptomatic["thal"], values=asymptomatic["chol"], name="asymptomatic"), 1, 1)
fig.add_trace(go.Pie(labels=non_anginal["thal"], values=non_anginal["chol"], name="non_anginal"), 1, 2)
fig.add_trace(go.Pie(labels=atypical_angina["thal"], values=atypical_angina["chol"], name="atypical_angina"), 2
fig.add_trace(go.Pie(labels=typical_angina["thal"], values=typical_angina["chol"], name="typical_angina"), 2, 2

# Update layout to increase the size of the plot and add main title
fig.update_layout(
    height=800,
    width=1000,
    title_text="Distribution of Cholesterol Levels by Chest Pain Type",
    title_font_size=24
)

# Update traces
fig.update_traces(textposition='inside', textfont_size=16)
fig.update_annotations(font_size=20)
fig.show()
```

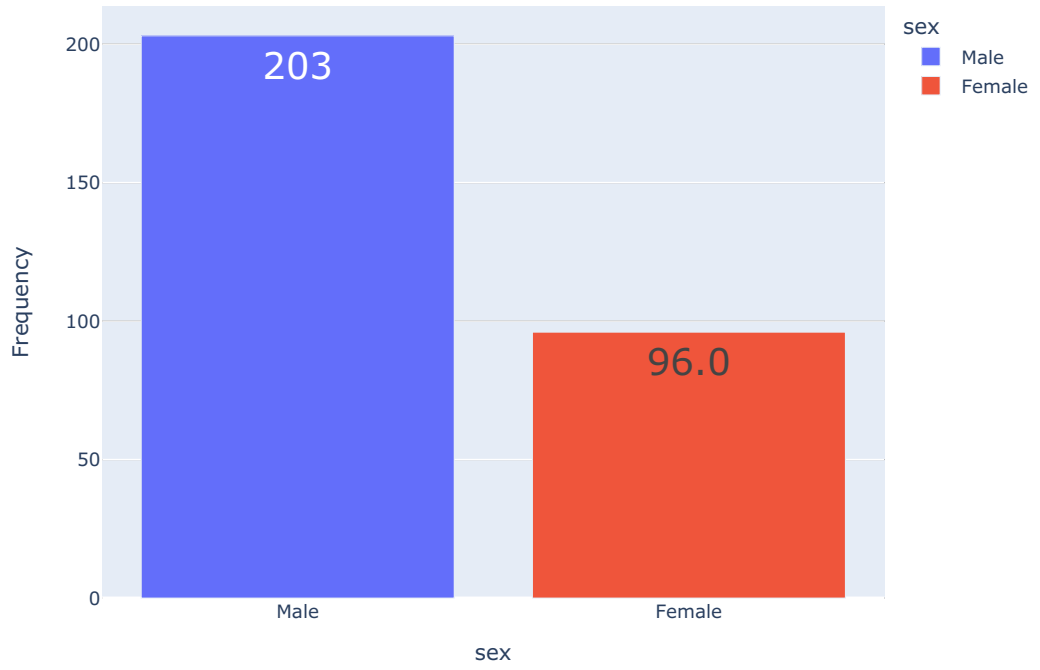


In [21]:
```
import plotly.express as px


fig = px.scatter(df, x='chol', y='age', color='cp', size = 'oldpeak', size_max = 30, hover_name = 'exang', rang
                 labels = dict(oldpeak = 'oldpeak', chol = 'Cholestrol', age = "Age" ), animation_frame = "chol"

fig.update_layout(width=1000, height=600)

fig.update_layout(title_text='Scatter Plot of Cholesterol vs. Age (colored by cp) with Animation')

fig.show()
```



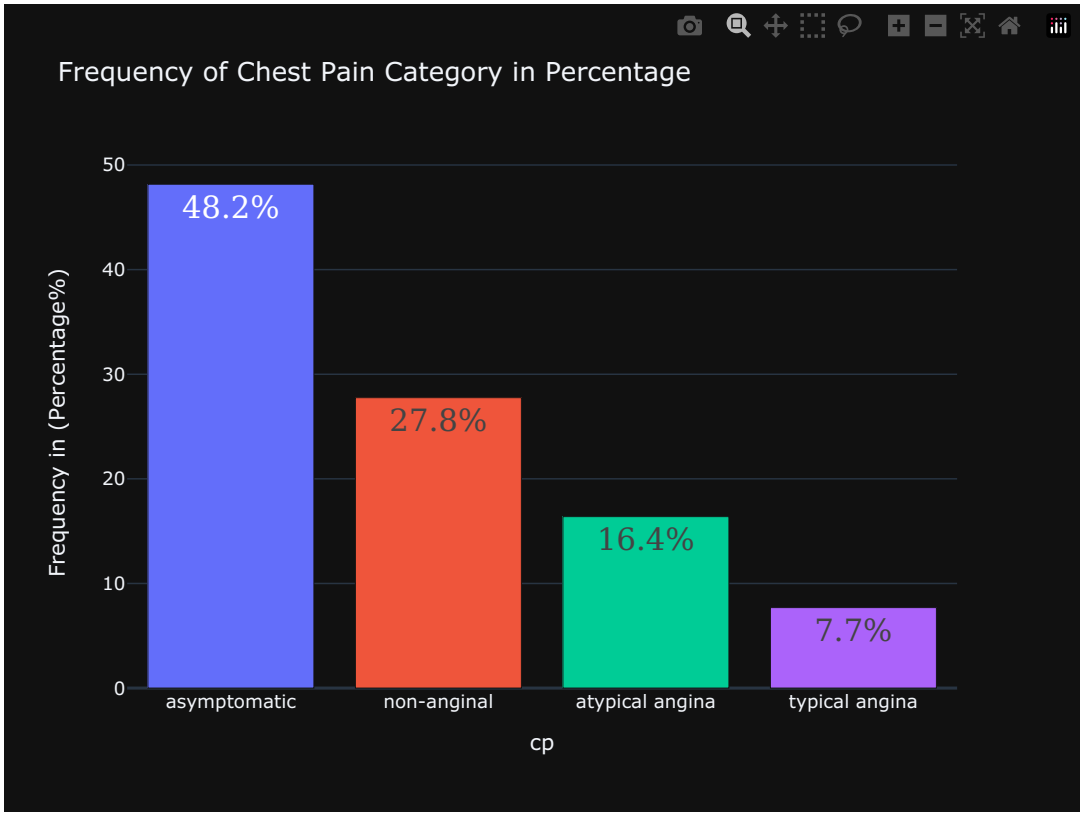
In [22]:
```
from plotly.offline import iplot

gender = df["sex"].value_counts()
display(gender.head().to_frame())

fig = px.bar(data_frame=gender,
       x = gender.index,
       y = gender,
       color=gender.index,
       text_auto="0.3s",
       labels={"y": "Frequency", "index": "Gender"}

      )
fig.update_traces(textfont_size=24)

iplot(fig)
```

sex	count
Male	203
Female	96

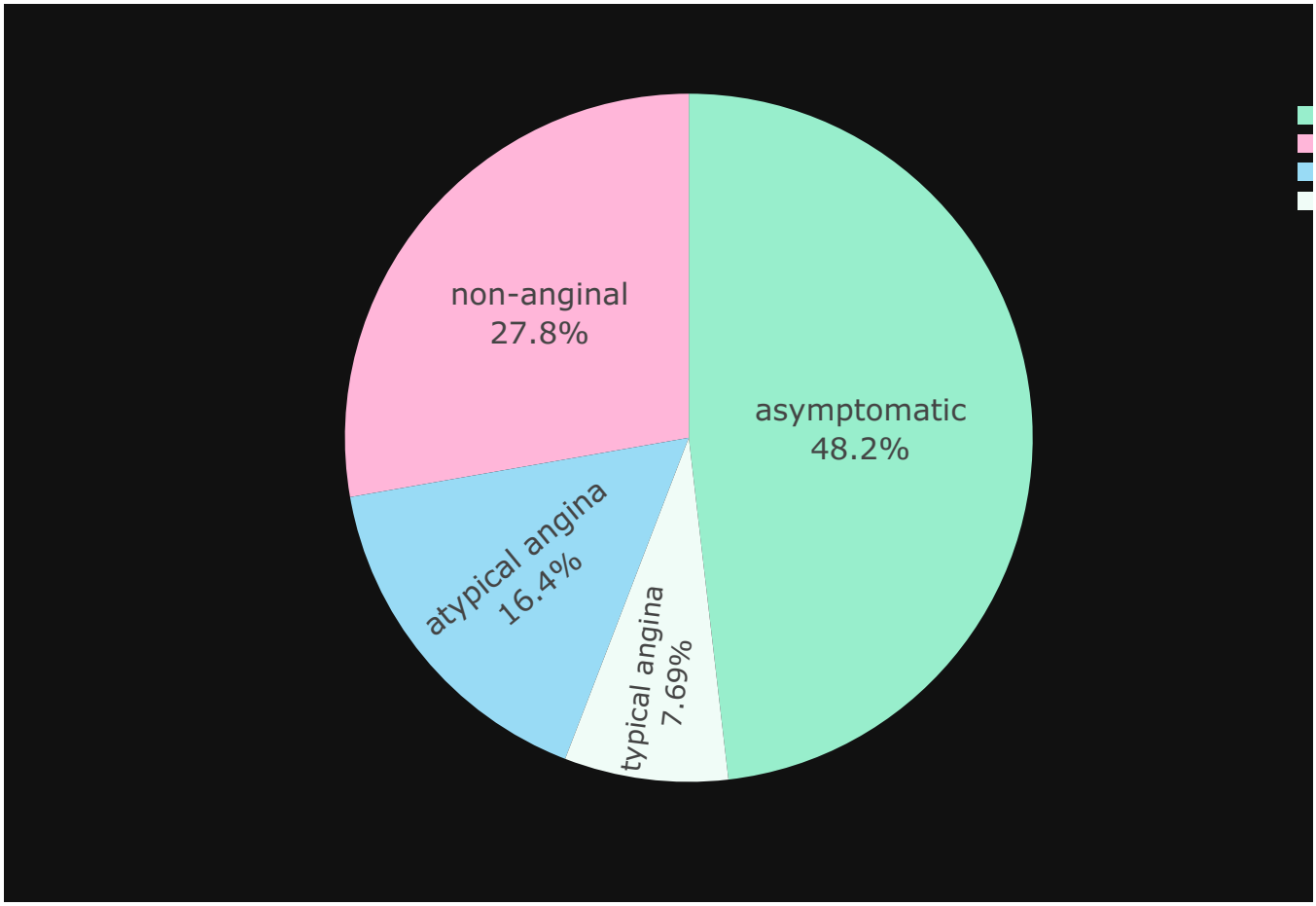


In [23]:

```
from plotly.offline import iplot

category = df["cp"].value_counts()

fig = px.bar(category,
             x = category.index,
             y =  (category / sum(category)) *  100,
             color=category.index,
             labels={"y" : "Frequency in (Percentage%)", "category":"Category"},
             title="Frequency of Chest Pain Category in Percentage",
             text = category.apply(lambda x: f'{(x / sum(category)) * 100:.1f}%'),
             template="plotly_dark"
            )

fig.update_layout(showlegend=False)
fig.update_traces(
    textfont= {
        "family": "consolas",
        "size": 20,
    }
)


iplot(fig)
```

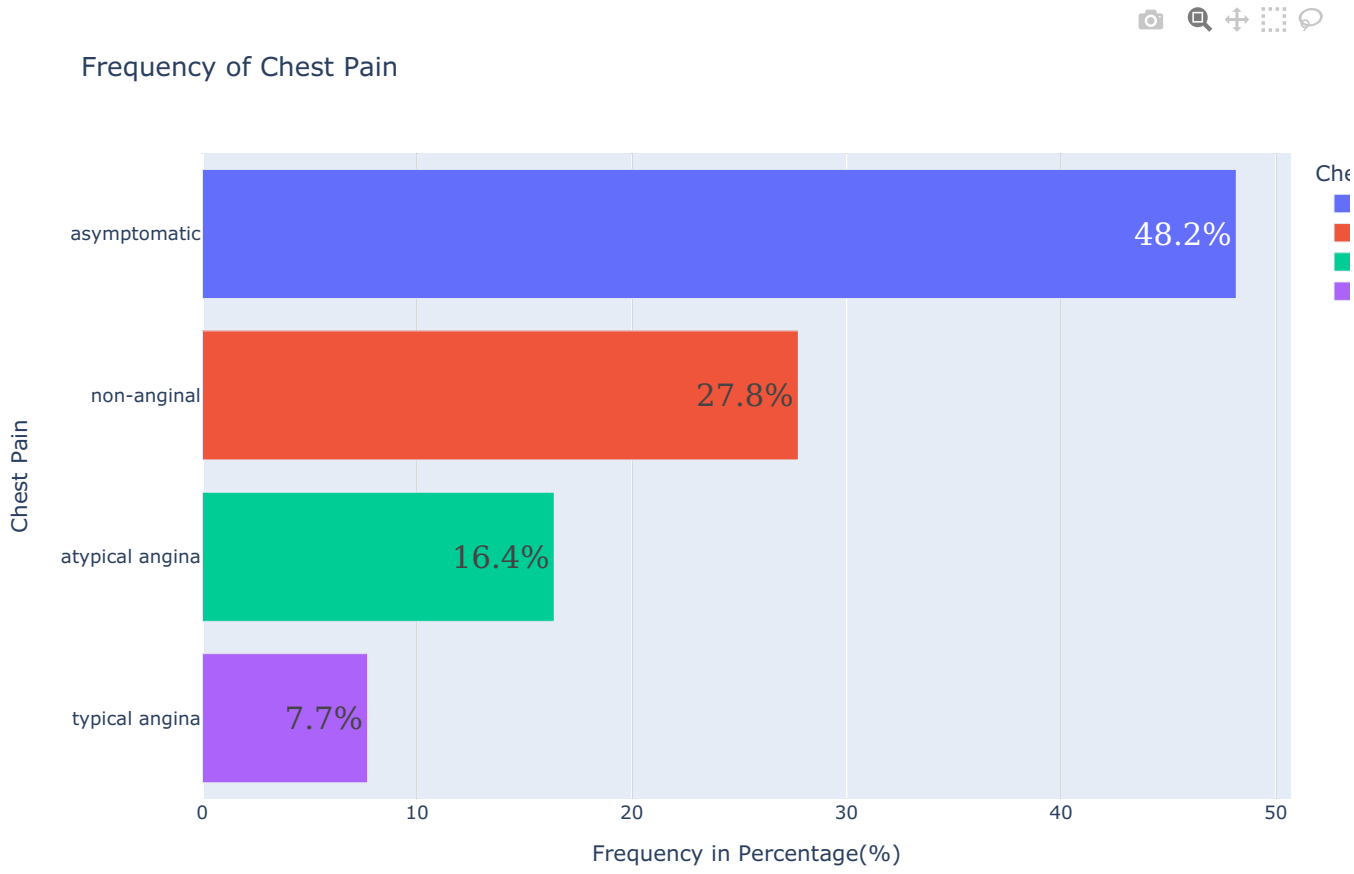


In [24]:
```
from plotly.offline import iplot

ChestPain = df["cp"].value_counts()

fig = px.pie(values=ChestPain, names = ChestPain.index,
             color_discrete_sequence= ["#98EECC", "#FFB6D9", "#99DBF5"],
             template="plotly_dark"
            )

fig.update_traces(textposition='inside', textfont_size= 20, textinfo='percent+label')
fig.update_layout(showlegend=True,width=1000, height=600)

iplot(fig)
```



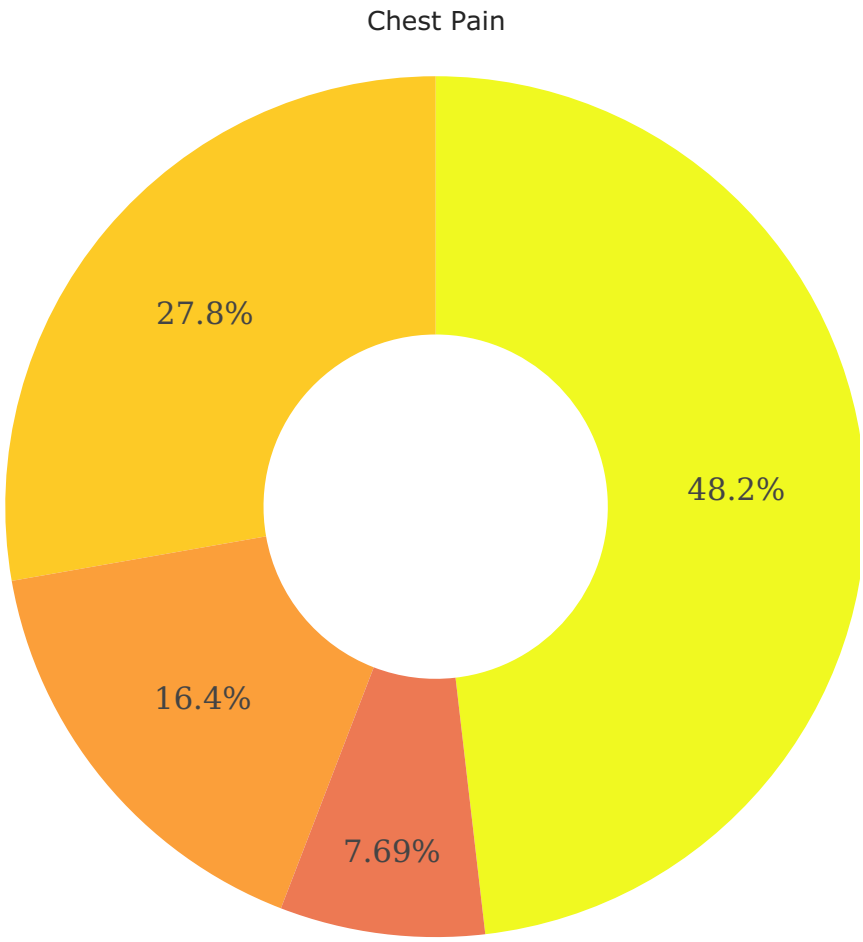
In [25]:
```
cp = df["cp"].value_counts()
```

```
fig = px.bar(cp,
             y = cp.index,
             x = (cp / sum(cp)) *  100,
             color=cp.index,
             labels={"x" : "Frequency in Percentage(%)", "cp":"Chest Pain"},
             orientation="h",
             title="Frequency of Chest Pain",
             text = cp.apply(lambda x: f'{(x / sum(cp)) * 100:.1f}%'),
            )

fig.update_layout(showlegend=True,width=1000, height=600)

fig.update_traces(
    textfont= {
        "family": "consolas",
        "size": 20
    }
)


iplot(fig)
```



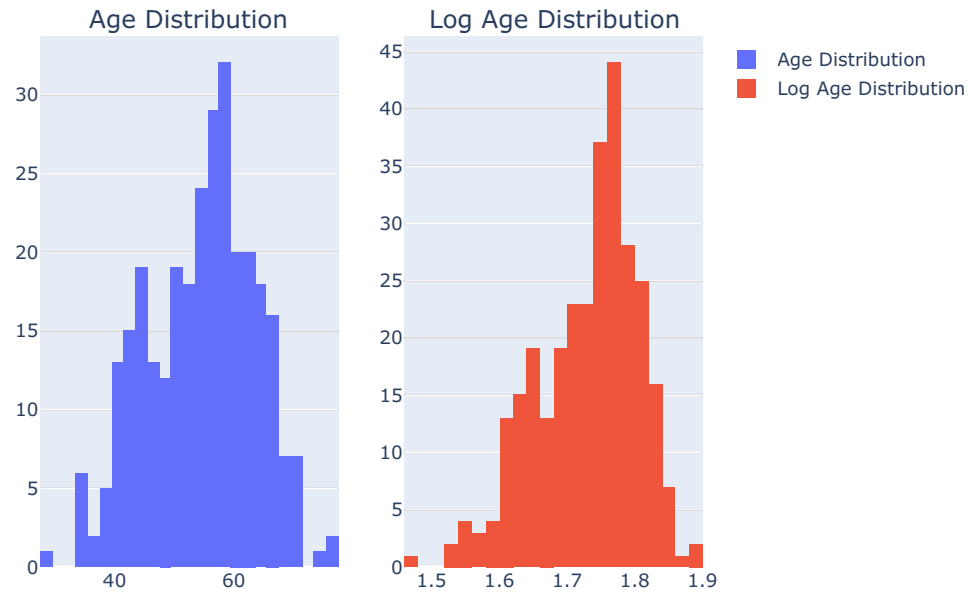
In [26]:

```
fig=px.pie(df.groupby('cp',as_index=False)['sex'].count().sort_values(by='sex',ascending=False).reset_index(dro
           names='cp',values='sex',color='sex',color_discrete_sequence=px.colors.sequential.Plasma_r,
           labels={'cp':'Chest Pain','Sex':'Count'}, template='seaborn',hole=0.4)

fig.update_layout(autosize=False, width=1200, height=700,legend=dict(orientation='v', yanchor='bottom',y=0.40,x
                  title_x=0.5, showlegend=True)

fig.update_traces(
    textfont= {
        "family": "consolas",
        "size": 20
    }
)

fig.show()
```



In [27]:

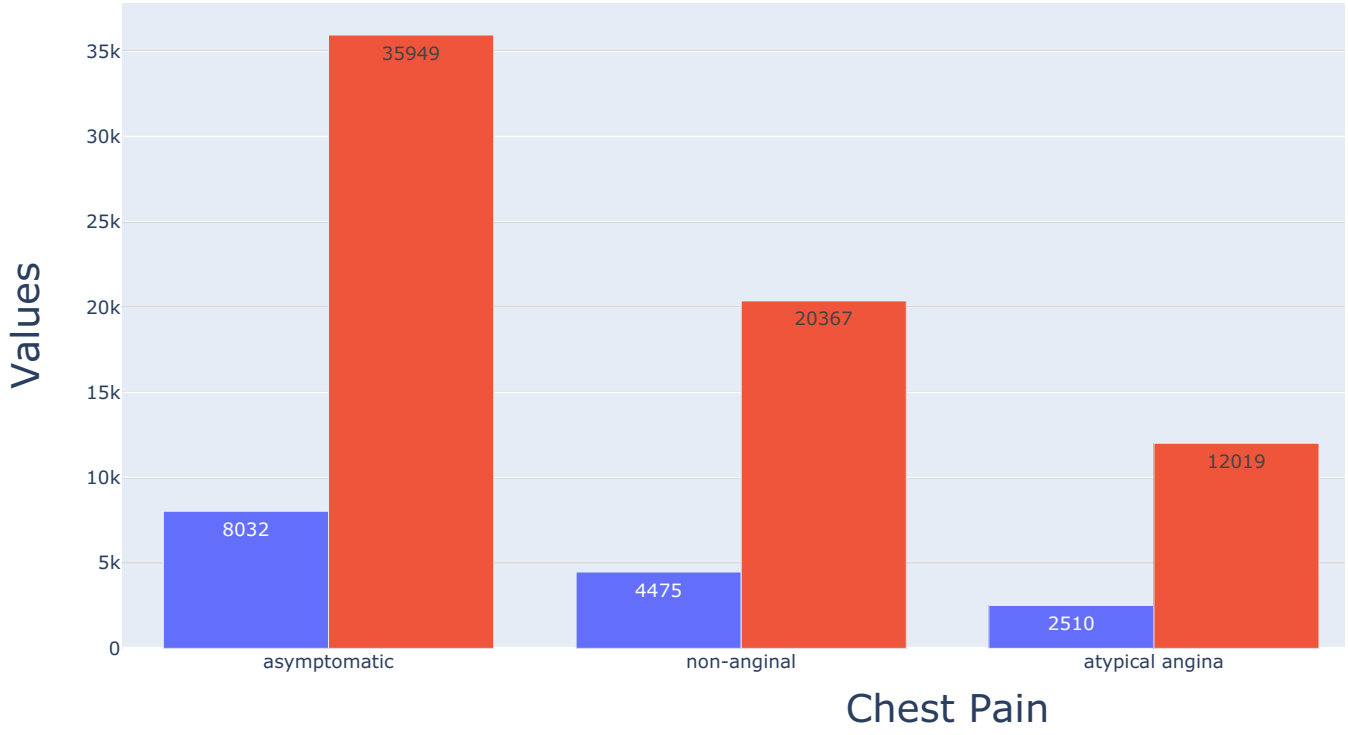
```
import plotly.express as px
from plotly.offline import iplot
import plotly.graph_objects as go
from plotly.subplots import make_subplots

fig = make_subplots(1,2,subplot_titles=('Age Distribution','Log Age Distribution'))

fig.append_trace(go.Histogram(x=df['age'],
                              name='Age Distribution') ,1,1)

fig.append_trace(go.Histogram(x=np.log10(df['age']),
                               name='Log Age Distribution')  ,1,2)

iplot(dict(data=fig))
```



In [28]:

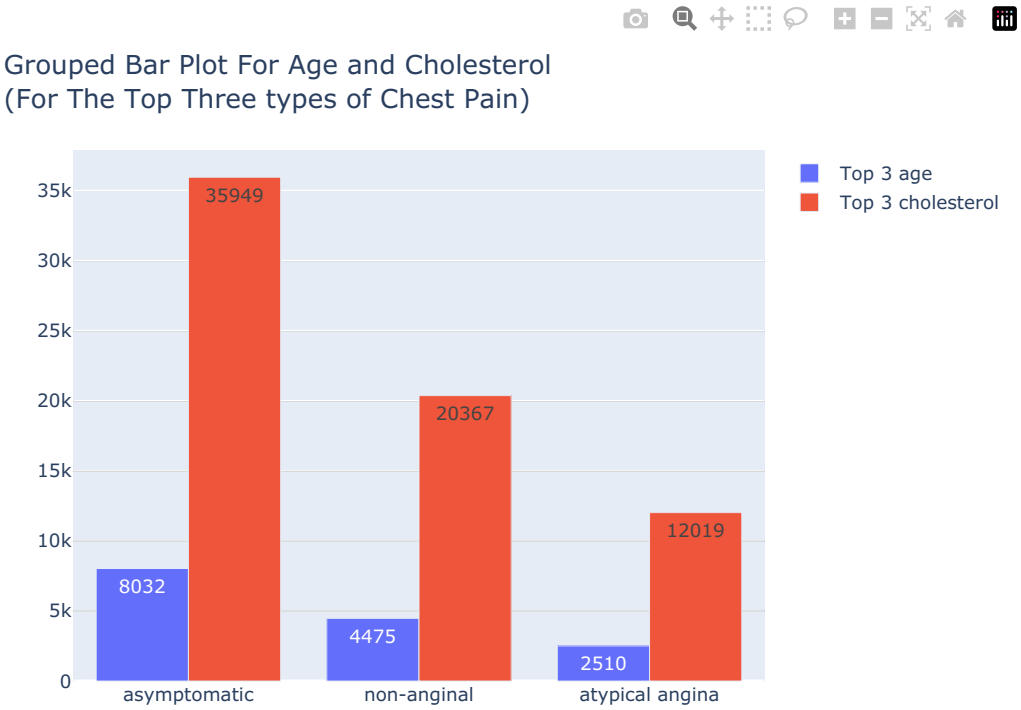
```
import numpy as np
import plotly.graph_objs as go
from plotly.offline import iplot

# Calculate quartiles and IQR
Q25 = np.quantile(df['chol'], q=0.25)
Q75 = np.quantile(df['chol'], q=0.75)
IQR = Q75 - Q25
cut_off = IQR * 1.5

# Print number of outliers
print('Number of Cholesterol Lower Outliers:', df[df['chol'] <= (Q25 - cut_off)]['chol'].count())
print('Number of Cholesterol Upper Outliers:', df[df['chol'] >= (Q75 + cut_off)]['chol'].count())

# Group by 'cp' and sort by 'age'
temp = df.groupby('cp').sum().sort_values('age', ascending=False)

# Create bar data
data = [
    go.Bar(x=temp.index, y=temp['age'], name='Age', text=temp['age'], textposition='auto'),
    go.Bar(x=temp.index, y=temp['chol'], name='Cholesterol', text=temp['chol'], textposition='auto')
]

# Define layout
layout = go.Layout(
    xaxis=dict(title='Chest Pain', titlefont=dict(size=25)),
    yaxis=dict(title='Values', titlefont=dict(size=25)),
    showlegend=True,
    width=1300,
    height=600
)

# Create figure and plot
fig = go.Figure(data=data, layout=layout)
iplot(fig)
```

```
Number of Cholesterol Lower Outliers: 1
Number of Cholesterol Upper Outliers: 5
```



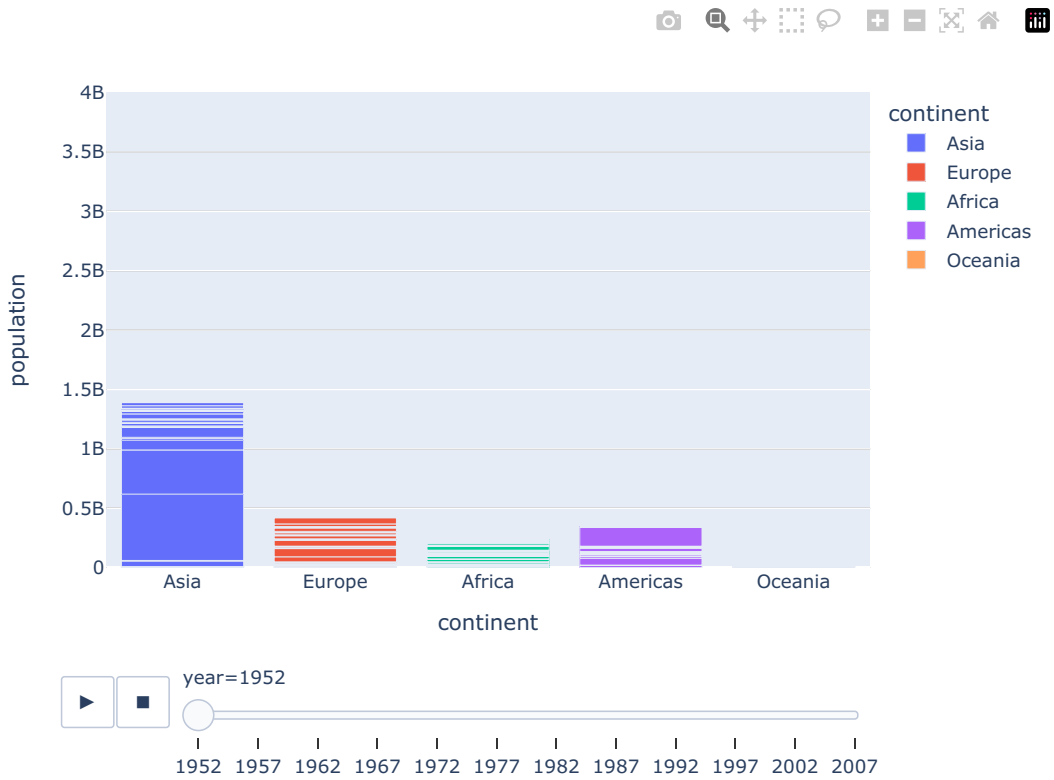
In [29]:

```
import plotly.graph_objs as go
from plotly.offline import iplot

# Assuming df is your DataFrame
top_03_cp = df.groupby('cp').sum()['age'].sort_values(ascending=False)[0:3]
top_03_AGE = df.groupby(by='cp').sum().sort_values(by='age', ascending=False)[0:3]['chol']

data = [
    go.Bar(
        x=top_03_cp.index,
        y=top_03_cp,
        name='Top 3 age',
        text=top_03_cp,
        textposition='auto'
    ),
    go.Bar(
        x=top_03_AGE.index,
        y=top_03_AGE,
        name='Top 3 cholesterol',
        text=top_03_AGE,
        textposition='auto'
    )
]

layout = go.Layout(
    title="Grouped Bar Plot For Age and Cholesterol<br>(For The Top Three types of Chest Pain)",
    barmode='group'
)

iplot(dict(data=data, layout=layout))
```



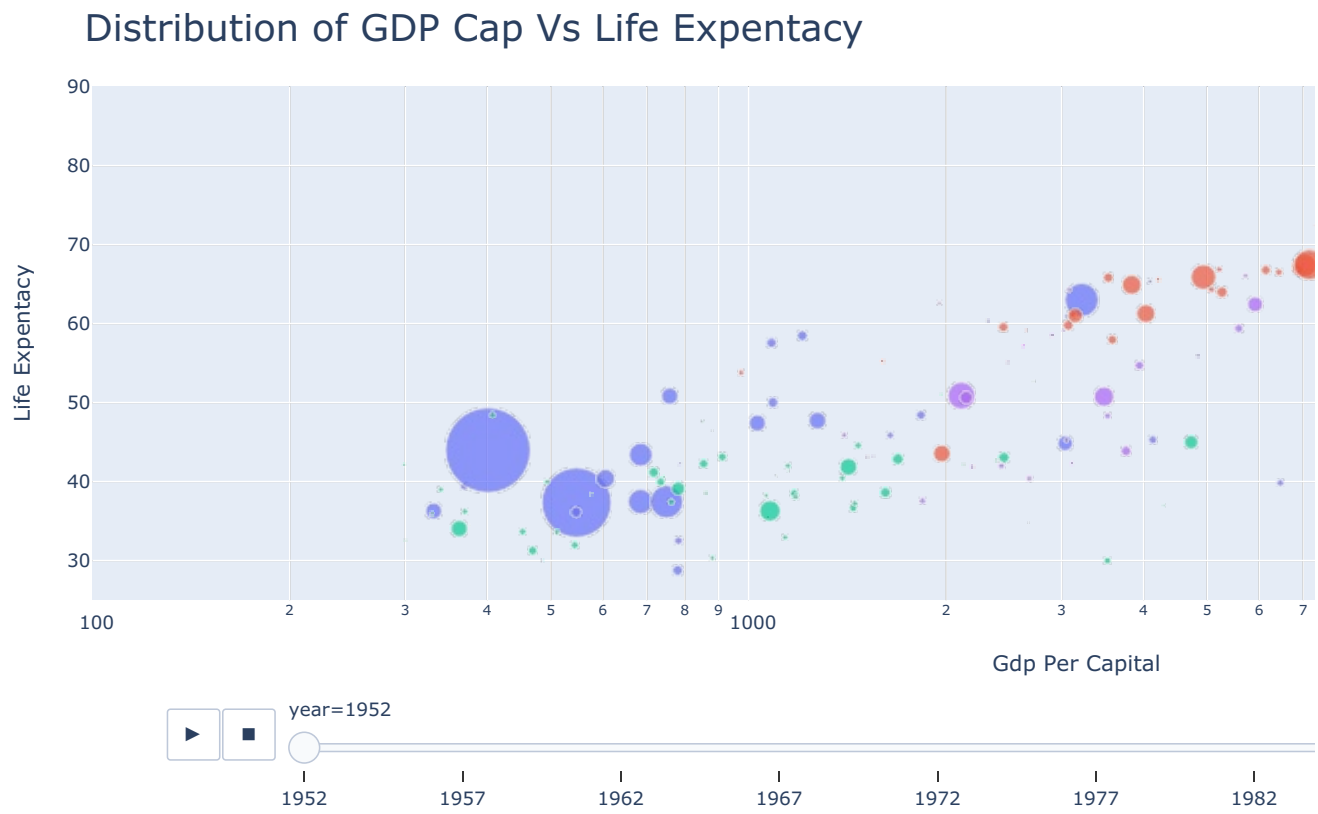
In [37]:
```
gap_df = pd.read_csv("gapminder_full.csv")

display(gap_df.head(2))

fig = px.bar(data_frame=gap_df,
             x="continent",
             y="population",
             color="continent",
             animation_frame="year",
             animation_group="country",
             range_y=[0,4000000000])
fig.show()
```

	country	year	population	continent	life_exp	gdp_cap
0	Afghanistan	1952	8425333	Asia	28.80	779.45
1	Afghanistan	1957	9240934	Asia	30.33	820.85



In [40]:
```
fig = px.scatter(gap_df,x='gdp_cap',y='life_exp',color='continent',size='population',size_max=60,hover_name="co
           animation_frame="year",animation_group='country',log_x=True,range_x=[100,100000],range_y=[25,90],
```

```
            labels=dict(Population ="Populations",gdp_cap="Gdp Per Capital",life_exp="Life Expentacy"))

fig.update_layout(
    height=550,
    width=1500,
    title_text="Distribution of GDP Cap Vs Life Expentacy",
    title_font_size=24
)

fig.show()
```

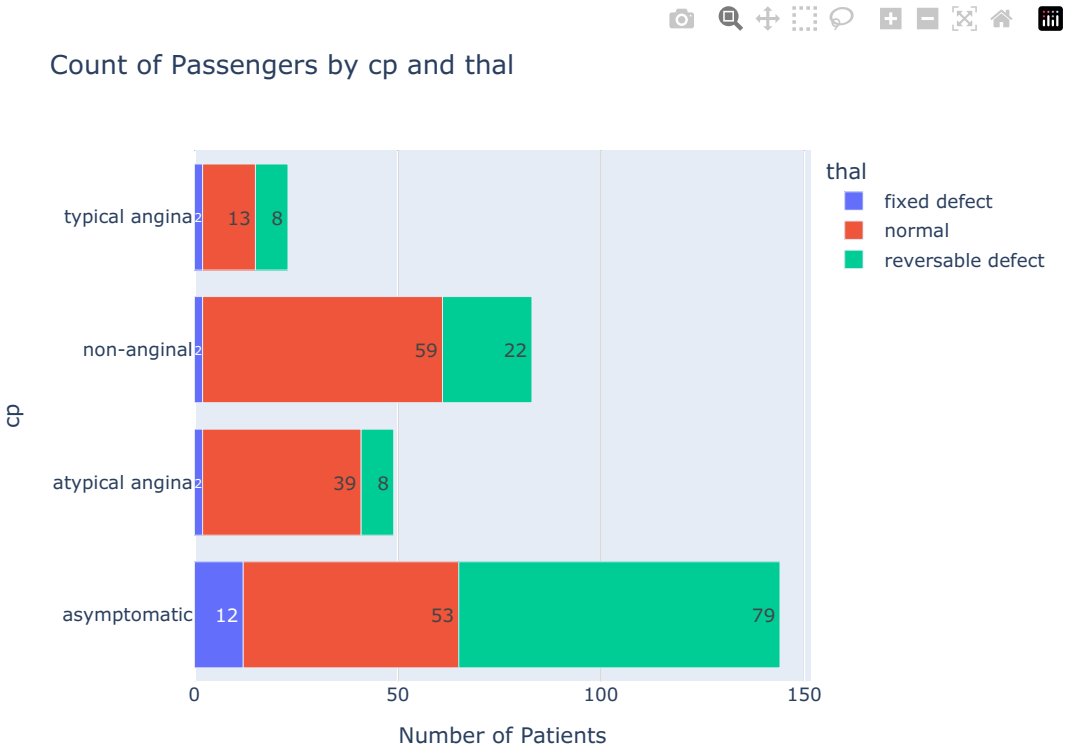


In [41]:
```
#Grouping the data by state
df1 = df[['cp','age','chol','num']]
df1.groupby('cp').sum().head(10).style.background_gradient(cmap='Blues')
```

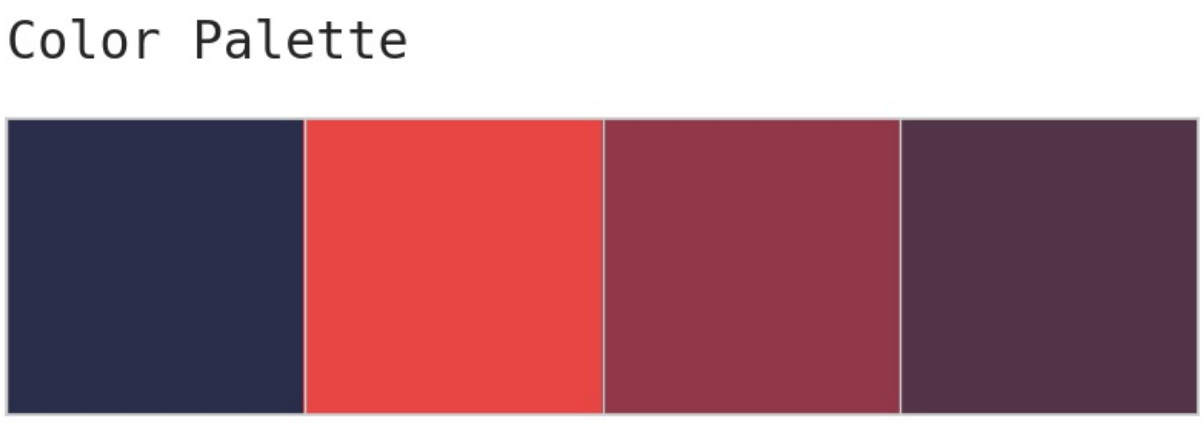
Out[41]:

cp	age	chol	num
asymptomatic	8032	35949.000000	225
atypical angina	2510	12019.000000	14
non-anginal	4475	20367.000000	33
typical angina	1285	5454.000000	11

In [42]:
```
import pandas as pd
import plotly.express as px

grouped_df = df.groupby(['cp', 'thal']).size().reset_index(name='count')

fig = px.bar(grouped_df,
             y="cp",
             x='count',
             color='thal',
             title='Count of Passengers by cp and thal',
             labels={'count': 'Number of Patients'},
             text_auto=True)
fig.show()
```



In [43]:
```
# color palette for visualizations
import matplotlib.pyplot as plt

colors = ['#2B2E4A', '#E84545', '#903749', '#53354A',]
palette = sns.color_palette( palette = colors)

sns.palplot(palette, size = 2.5)

plt.text(-0.5,
         -0.7,
         'Color Palette',
         {'font':'monospace',
          'size': 24,
          'weight':'normal'}
        )

plt.show()
```

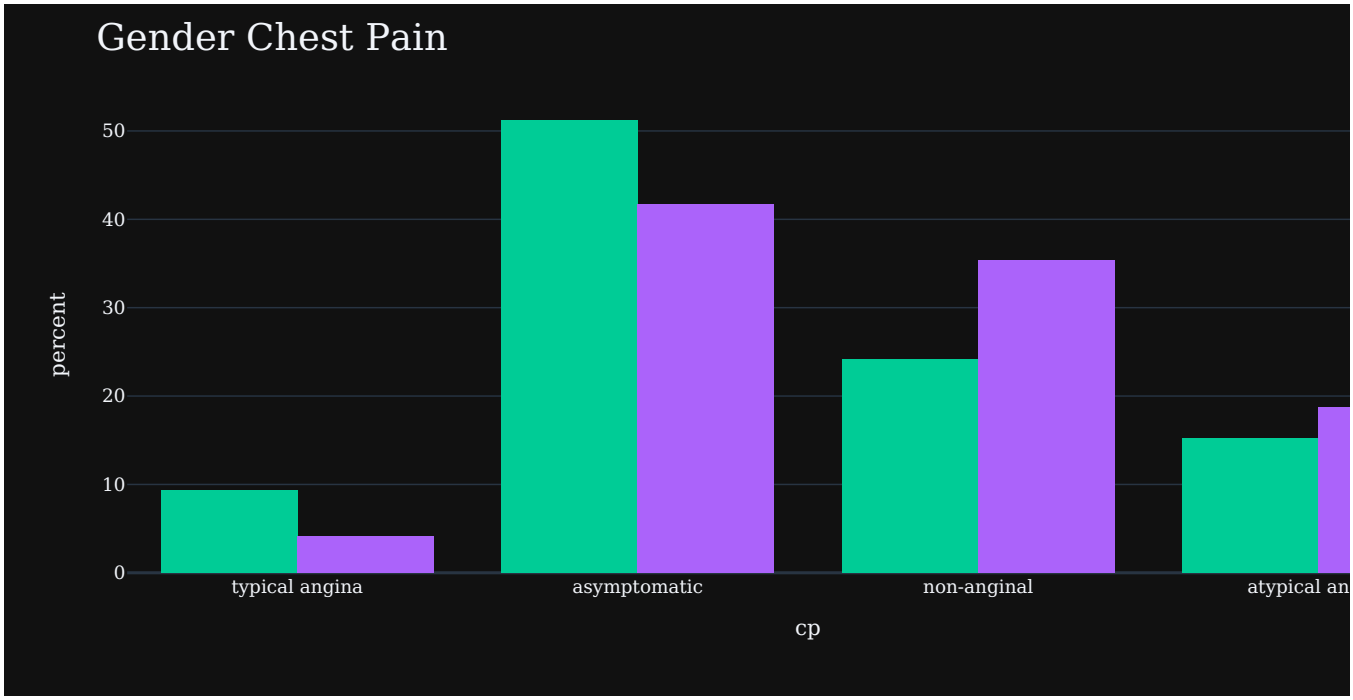


In [44]:
```
def format_title(title, subtitle=None, subtitle_font=None, subtitle_font_size=None):
    title = f'<b>{title}</b>'
    if not subtitle:
        return title
    subtitle = f'<span style="font-family: {subtitle_font}; font-size: {subtitle_font_size}px;">{subtitle}</spa
    return f'{title}<br>{subtitle}'


import plotly.figure_factory as ff

_ = df.groupby(['cp', 'thal']).chol.size().unstack()
z = _.values.tolist()
x = _.columns.tolist()
y = _.index.tolist()

fig = ff.create_annotated_heatmap(z = z,
                                  x = x,
                                  y = y,
```

```
                                xgap = 3,
                                ygap = 3,
                                colorscale = ['#53354A', '#E84545']
                               )

title = format_title('cp',
                     'thal.',
                     'Chol',
                     12
                    )

fig.update_layout(title_text = title,
                  title_x = 0.5,
                  titlefont={'size': 24,
                             'family': 'Proxima Nova',
                            },
                  template='plotly_dark',
                  paper_bgcolor='#2B2E4A',
                  plot_bgcolor='#2B2E4A',

                  xaxis = {'side': 'bottom'},
                  xaxis_showgrid = False,
                  yaxis_showgrid = False,
                  yaxis_autorange = 'reversed',
                  )

fig.show()
```

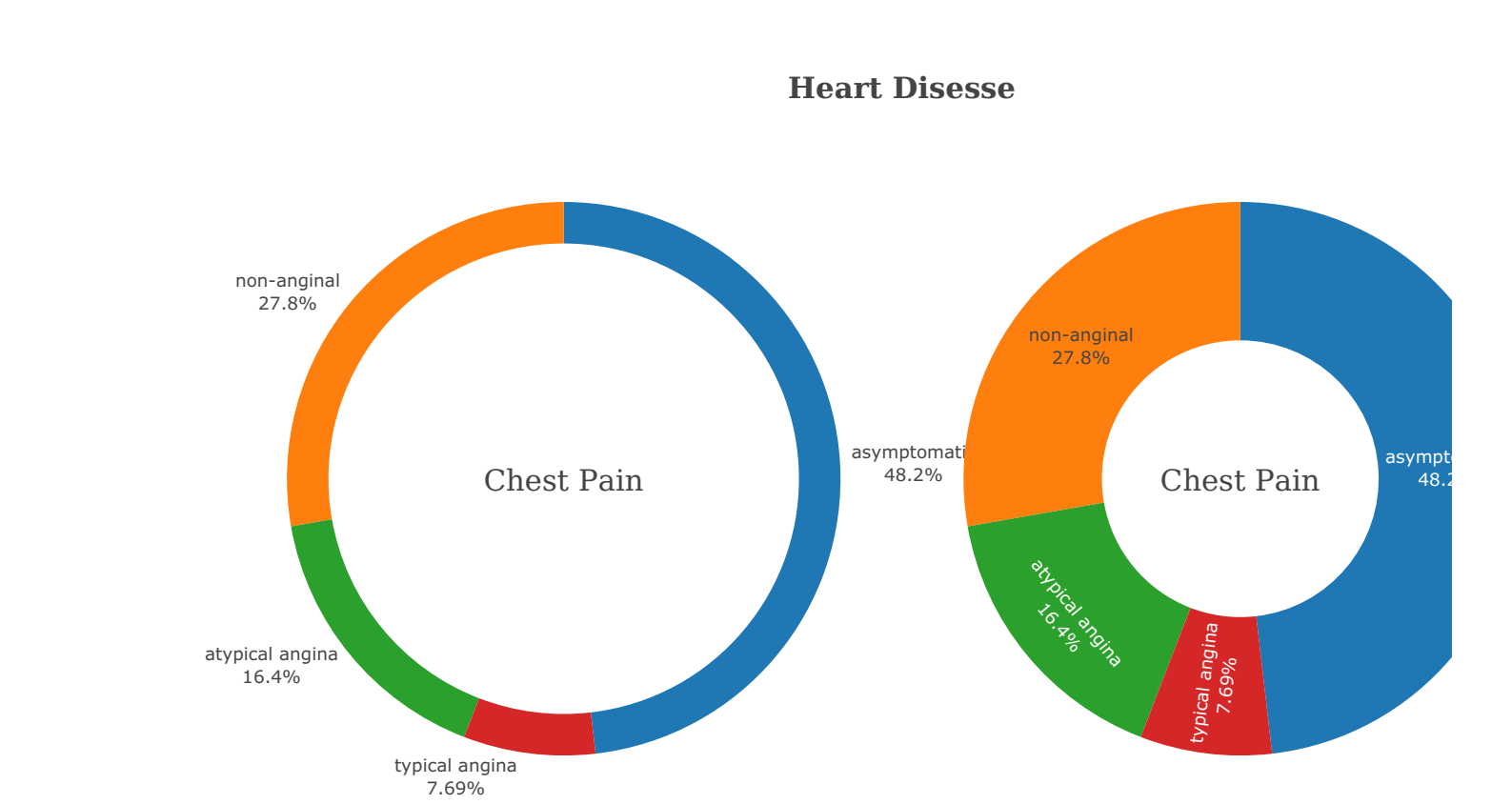
In [45]:

```
# available templates
template = ['ggplot2','plotly_dark', 'seaborn', 'simple_white', 'plotly']


fig = px.histogram(df,
                   x="cp",
                   y=None,
                   color="sex",
                   width=1200,
                   height=450,
                   histnorm='percent',
                   color_discrete_map={
                       "male": "RebeccaPurple", "female": "lightsalmon"
                       },
                   template="plotly_dark"
                   )

fig.update_layout(title="Gender Chest Pain",
                  font_family="San Serif",
                  bargap=0.2,
                  barmode='group',
                  titlefont={'size': 24},
                  legend=dict(
                  orientation="v", y=1, yanchor="top", x=1.25, xanchor="right")
                  )
fig.show()
```



In [46]:

```
from plotly.subplots import make_subplots

# data students performance
fig = make_subplots(rows=1, cols=2,
                    specs=[[{'type':'domain'}, {'type':'domain'}],
                           ])
fig.add_trace(
    go.Pie(
        labels=df['cp'],
        title="Chest Pain",
                  titlefont={'size':20, 'family': 'Serif',},
        values=None,
        hole=0.85,
        ),  col=1, row=1,
    )
fig.update_traces(
    hoverinfo='label+value',
    textinfo='label+percent',
    textfont_size=12,
    )

fig.add_trace(
    go.Pie(
        labels=df['cp'],
        title="Chest Pain",
                  titlefont={'size':20, 'family': 'Serif',},
        values=None,
        hole=0.5,
        ),  col=2, row=1,
    )
fig.update_traces(
    hoverinfo='label+value',
    textinfo='label+percent',
    textfont_size=12,
    )
fig.layout.update(title="<b> Heart Disesse <b>",
                  titlefont={'size':20, 'family': 'Serif',},
                  showlegend=False,
                  height=600,
                  width=1000,
                  template=None,
                 )

fig.show()
```

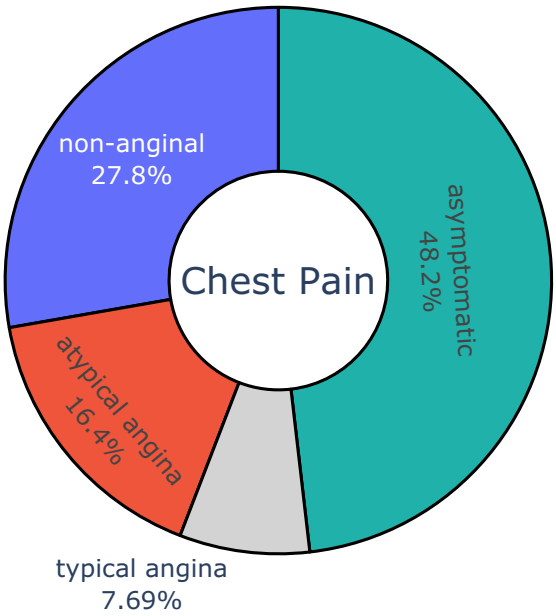


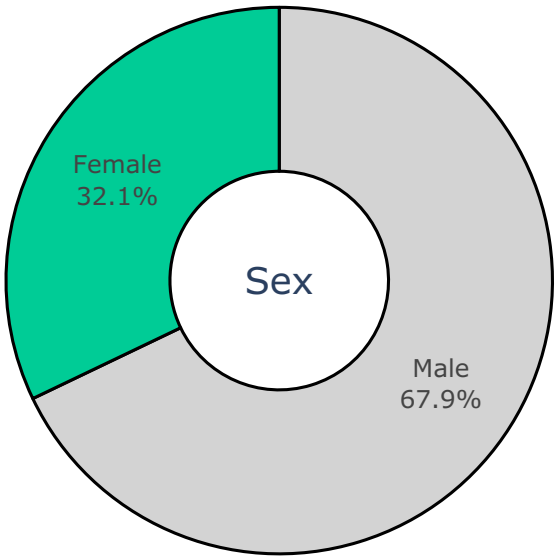
In [47]:

```
from plotly.subplots import make_subplots

# data titanic
fig = make_subplots(rows=1, cols=2,
                    specs=[[{'type':'domain'}, {'type':'domain'}],
                           ])
fig.add_trace(
    go.Pie(
        labels=df['cp'],
        values=None,
        hole=.4,
        title='Chest Pain',
        titlefont={'color':None, 'size': 24},

        ),
    row=1,col=1
    )
fig.update_traces(
    hoverinfo='label+value',
    textinfo='label+percent',
    textfont_size=12,
    marker=dict(
        colors=['lightgray', 'lightseagreen'],
        line=dict(color='#000000',
                  width=2)
        )
    )

fig.add_trace(
    go.Pie(
        labels=df['sex'],
        values=None,
        hole=.4,
        title='Sex',
        titlefont={'color':None, 'size': 24},
        ),
    row=1,col=2
    )
fig.update_traces(
    hoverinfo='label+value',
    textinfo='label+percent',
    textfont_size=16,
    marker=dict(
        colors=['lightgray', 'lightseagreen'],
        line=dict(color='#000000',
                  width=2)
        )
    )
fig.layout.update(title="<b> Heart Desies <b>",
```

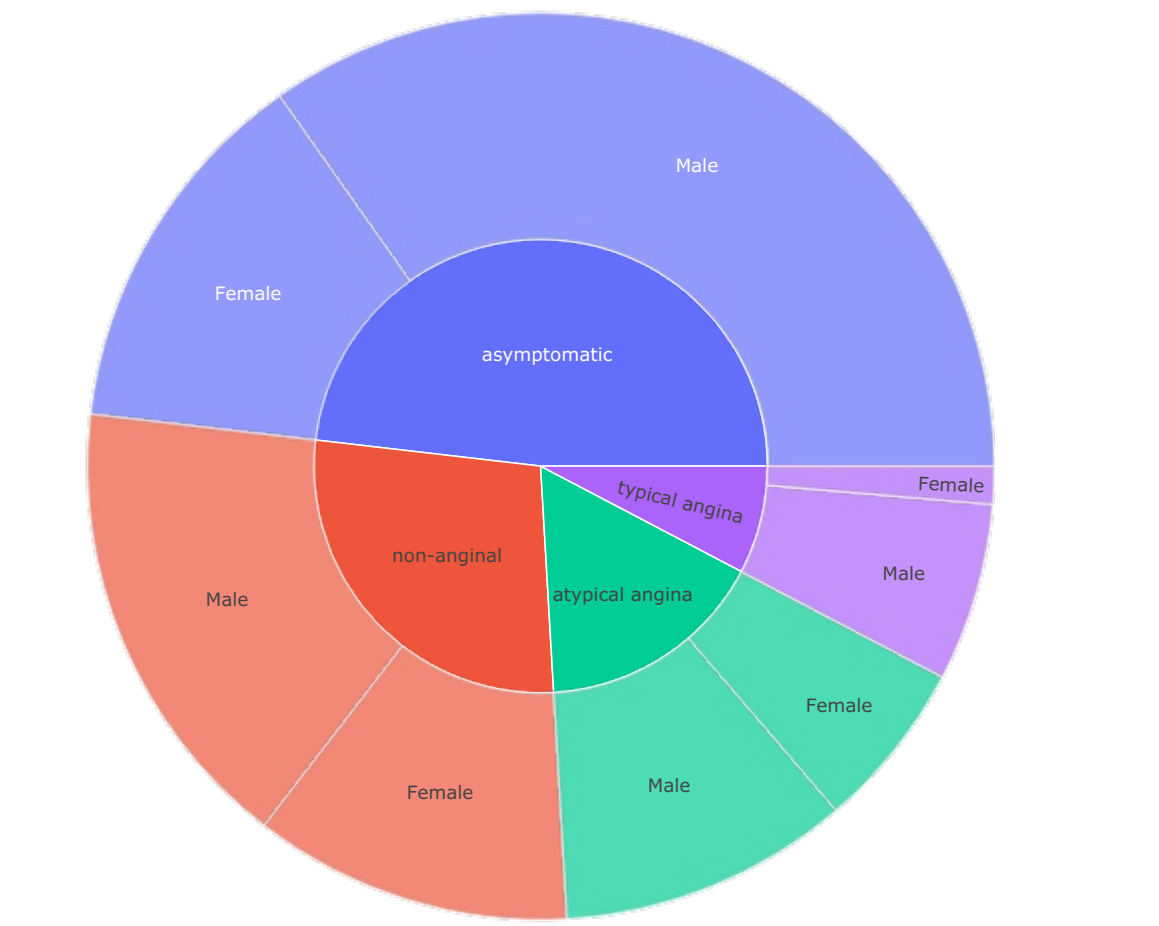
```
                  titlefont={'color':None, 'size': 24, 'family': 'San-Serif'},
                  showlegend=False,
                  height=600,
                  width=950,
                  )
fig.show()
```

Heart Desies

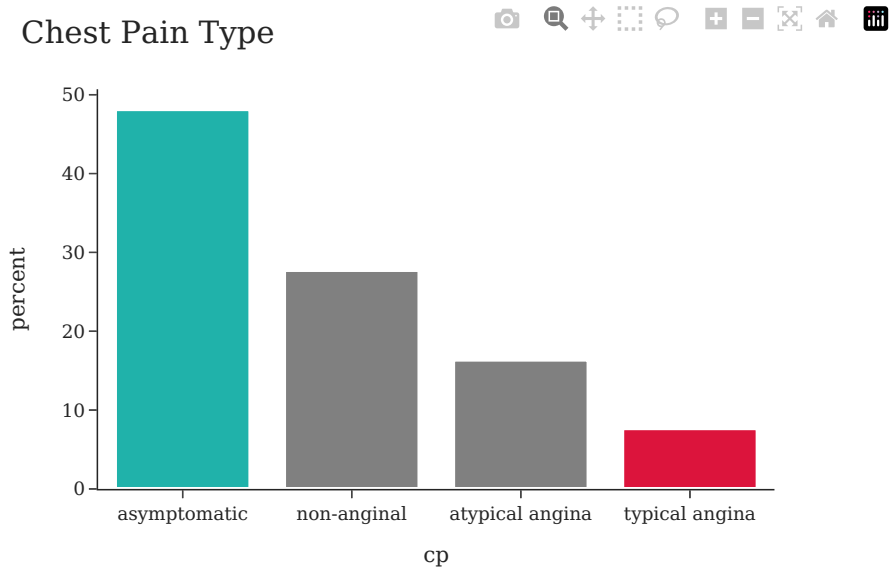




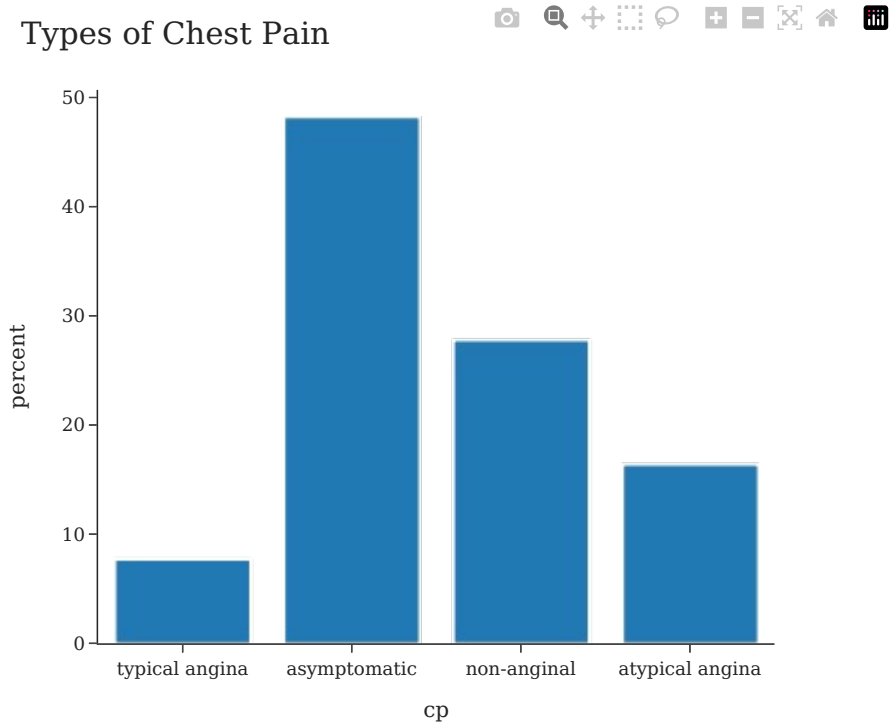
In [48]:
```
# data students performance
fig = px.sunburst(df,
                  path=['cp', 'sex'])
fig.update_layout(title_text="<b>Chest Pain vs Gender<b>",
                  titlefont={'size': 24, 'family':'Serif'},
                  width=750,
                  height=750,
                 )
fig.show()
```



In [49]:
```
fig = px.histogram(df, x="cp",
                   width=600,
                   height=400,
                   histnorm='percent',
                   category_orders={
                       "cp": ["asymptomatic", "non-anginal", "atypical angina", "typical angina"],
                       "sex": ["Male", "Female"]
                   },
                   color_discrete_map={
                       "Male": "RebeccaPurple", "Female": "lightsalmon",
                       },
                   template="simple_white"
                   )

fig.update_layout(title="Chest Pain Type",
                  font_family="San Serif",
                  titlefont={'size': 20},
                  legend=dict(
                  orientation="v", y=1, yanchor="top", x=1.0, xanchor="right" )
                 ).update_xaxes(categoryorder='total descending')
# custom color
colors = ['gray',] * 4
colors[3] = 'crimson'
colors[0] = 'lightseagreen'


fig.update_traces(marker_color=colors, marker_line_color=None,
                  marker_line_width=2.5, opacity=None)
fig.show()
```

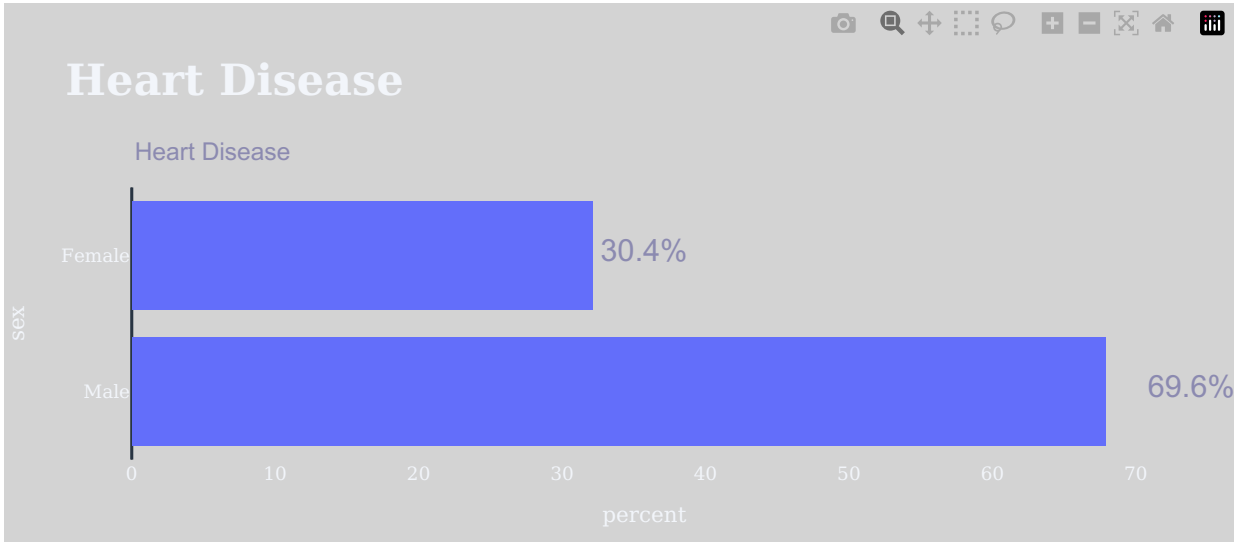


In [50]:
```
fig = px.histogram(df, x="cp",
                   width=600,
                   height=500,
                   histnorm='percent',
                   template="simple_white",
                   )
fig.update_layout(title="Types of Chest Pain",
                  font_family="San Serif",
                  titlefont={'size': 20},
                  showlegend=True,
                  legend=dict(
                      orientation="v",
                      y=1.0,
                      yanchor="top",
                      x=1.0,
                      xanchor="right"
                  )
                 )
fig.update_traces(marker_color=None, marker_line_color='white',
                  marker_line_width=1.5, opacity=0.99)
fig.show()
```



In [51]:
```
colors = ['rgba(38, 24, 74, 0.8)', 'rgba(71, 58, 131, 0.8)',
          'rgba(122, 120, 168, 0.8)', 'rgba(164, 163, 204, 0.85)',
          'rgba(190, 192, 213, 1)']

data = df[['sex']]

fig = px.histogram(df,
                   y="sex",
```

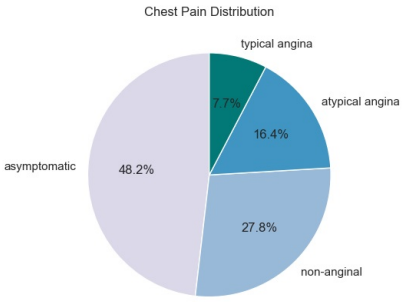
```
                    orientation='h',
                    width=800,
                    height=350,
                    histnorm='percent',
                    template="plotly_dark"
                    )
fig.update_layout(title="<b>Heart Disease<b>",
                  font_family="San Serif",
                  bargap=0.2,
                  barmode='group',
                  titlefont={'size': 28},
                  paper_bgcolor='lightgray',
                  plot_bgcolor='lightgray',
                  legend=dict(
                  orientation="v",
                      y=1,
                      yanchor="top",
                      x=1.250,
                      xanchor="right",)
                  )
annotations = []
annotations.append(dict(xref='paper', yref='paper',
                        x=0.0, y=1.2,
                        text='Heart Disease',
                             font=dict(family='Arial', size=16, color=colors[2]),
                        showarrow=False))
annotations.append(dict(xref='paper', yref='paper',
                        x=0.50, y=0.85,
                        text='30.4%',
                             font=dict(family='Arial', size=20, color=colors[2]),
                        showarrow=False))
annotations.append(dict(xref='paper', yref='paper',
                        x=1.08, y=0.19,
                        text='69.6%',
                             font=dict(family='Arial', size=20, color=colors[2]),
                        showarrow=False))

fig.update_layout(
    autosize=False,
    width=800,
    height=350,
    margin=dict(
        l=50,
        r=50,
        b=50,
        t=120,
    ),
)

fig.update_layout(annotations=annotations)
fig.update_xaxes(showgrid=False)
fig.update_yaxes(showgrid=False)
fig.show()
```

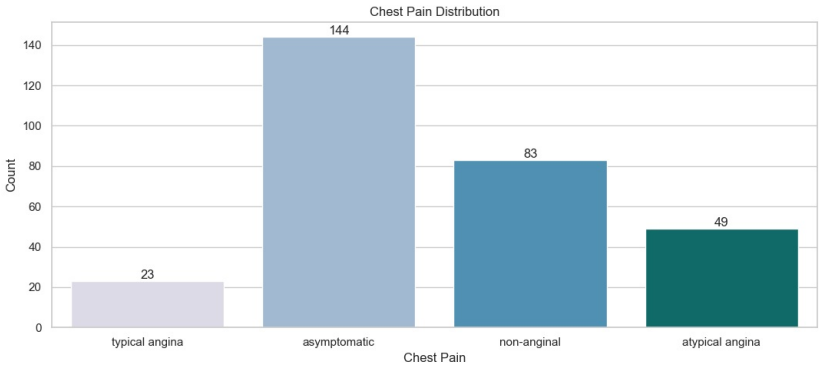


In [52]:

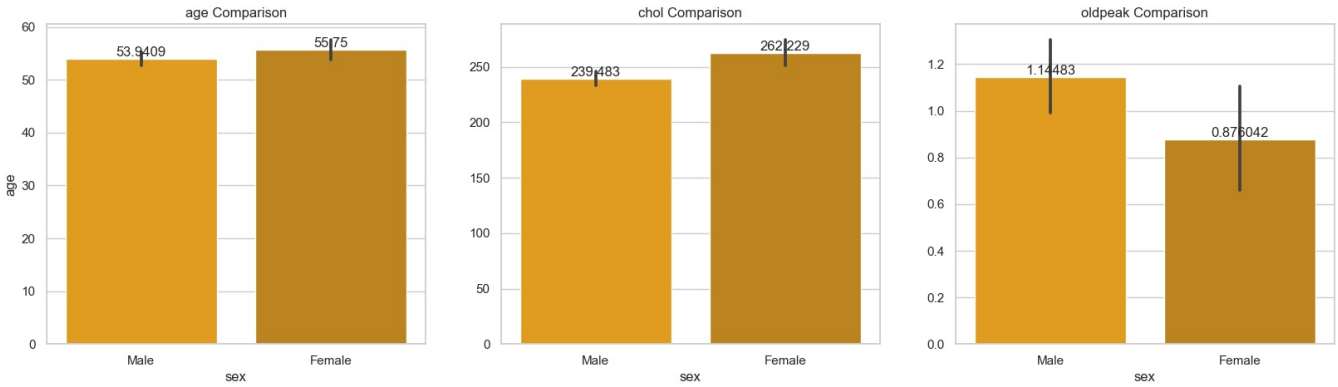
```
# Plotting the pie chart
plt.figure(figsize=(20, 5))

# Pie chart
plt.subplot(1, 2, 1)
quality_counts = df['cp'].value_counts()
plt.pie(quality_counts, labels=quality_counts.index, colors=sns.color_palette('PuBuGn', len(quality_counts)), a
plt.title('Chest Pain Distribution')

# Count plot
plt.subplot(1, 2, 2)
ax = sns.countplot(data=df, x='cp',palette='PuBuGn')
```

```
# Add count values above each bar
for i in range(len(ax.containers)):
    ax.bar_label(ax.containers[i], label_type='edge')

plt.title('Chest Pain Distribution')
plt.xlabel('Chest Pain')
plt.ylabel('Count')
plt.tight_layout()
plt.show()
```



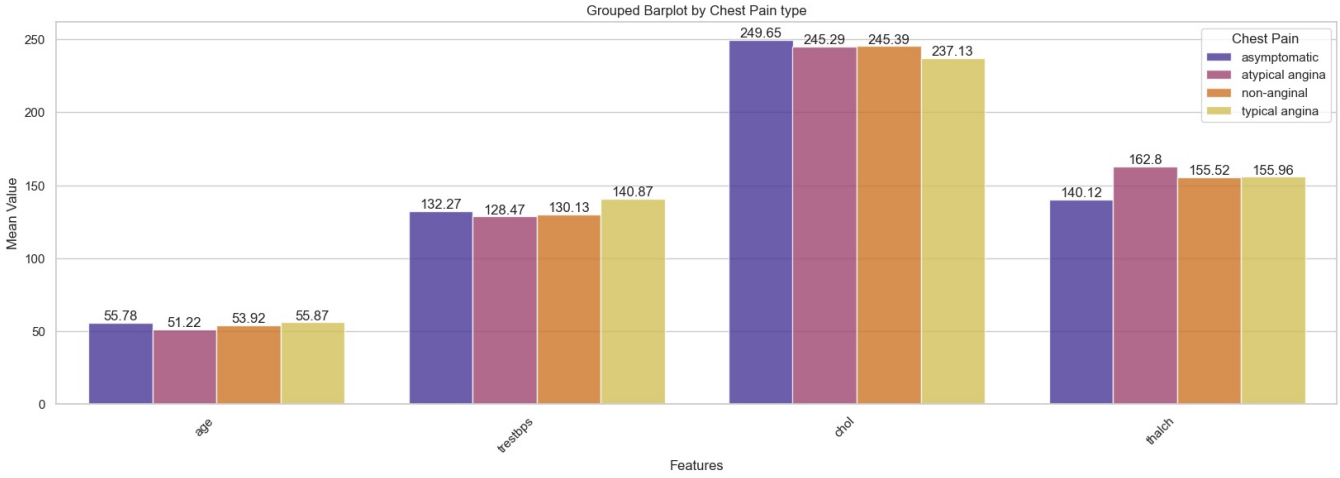


In [53]:
```
plt.figure(figsize=(20, 5))

for i, col in enumerate(['age', 'chol', 'oldpeak'], 1):
    plt.subplot(1, 3, i)
    ax = sns.barplot(x='sex', y=col, data=df)
    plt.title(f'{col} Comparison')
    plt.ylabel(col if i == 1 else '')

    # Add count values above each bar
    for i in range(len(ax.containers)):
        ax.bar_label(ax.containers[i], label_type='edge')

plt.show()
```

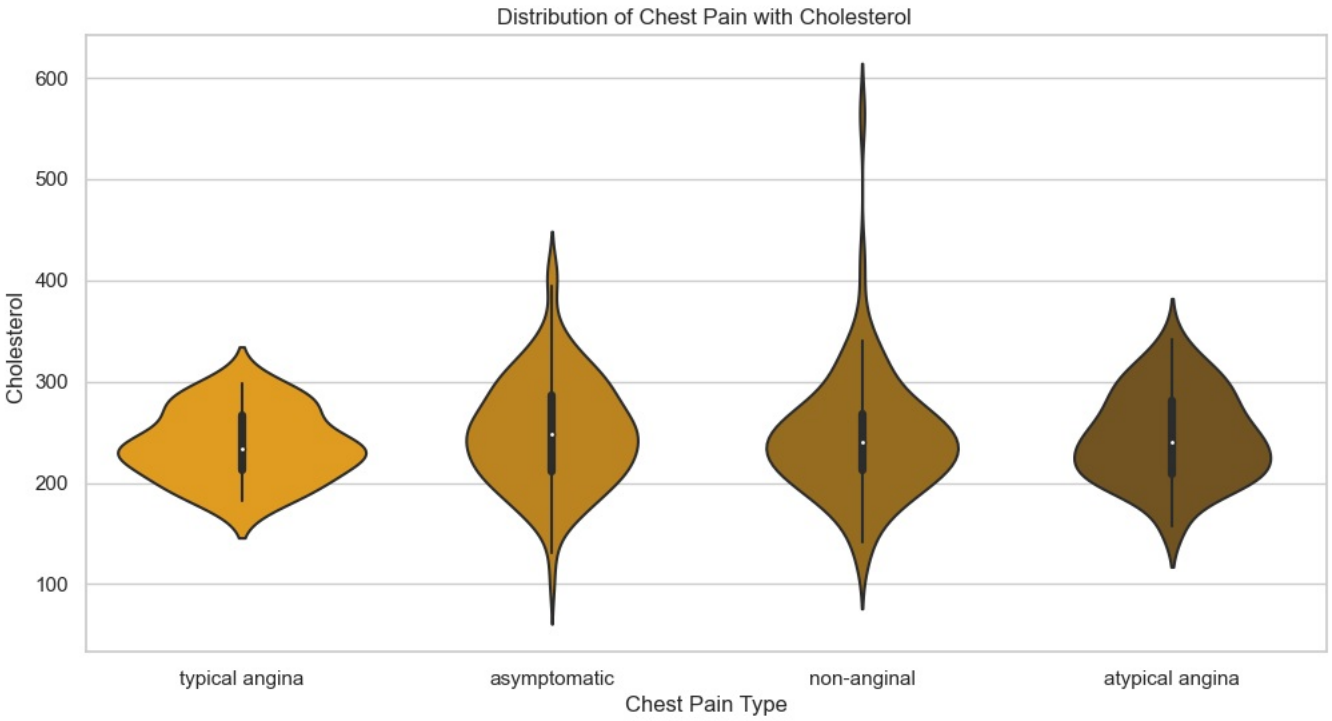


In [54]:
```
sns.pairplot(df[['cp','age','chol','thalch']], hue='cp', aspect=1.5,dropna=True,palette='bright')
plt.show()
```

In [55]:
```
# Group by quality and calculate the mean for each quality
grouped_mean = df[['cp','age','trestbps','chol','thalch']].groupby('cp').mean().round(2)

plt.figure(figsize=(20, 6))

# Plot the grouped bars using Seaborn's barplot
ax = sns.barplot(data=grouped_mean.reset_index().melt(id_vars='cp'),
            x='variable', y='value', hue='cp', palette='CMRmap', alpha=0.8)

# Add count values above each bar
for i in range(len(ax.containers)):
    ax.bar_label(ax.containers[i], label_type='edge')

plt.xlabel('Features')
plt.ylabel('Mean Value')
plt.title('Grouped Barplot by Chest Pain type')

# Rotate x-axis labels
plt.xticks(rotation=45, ha='right')

plt.legend(title='Chest Pain')
plt.show()
```

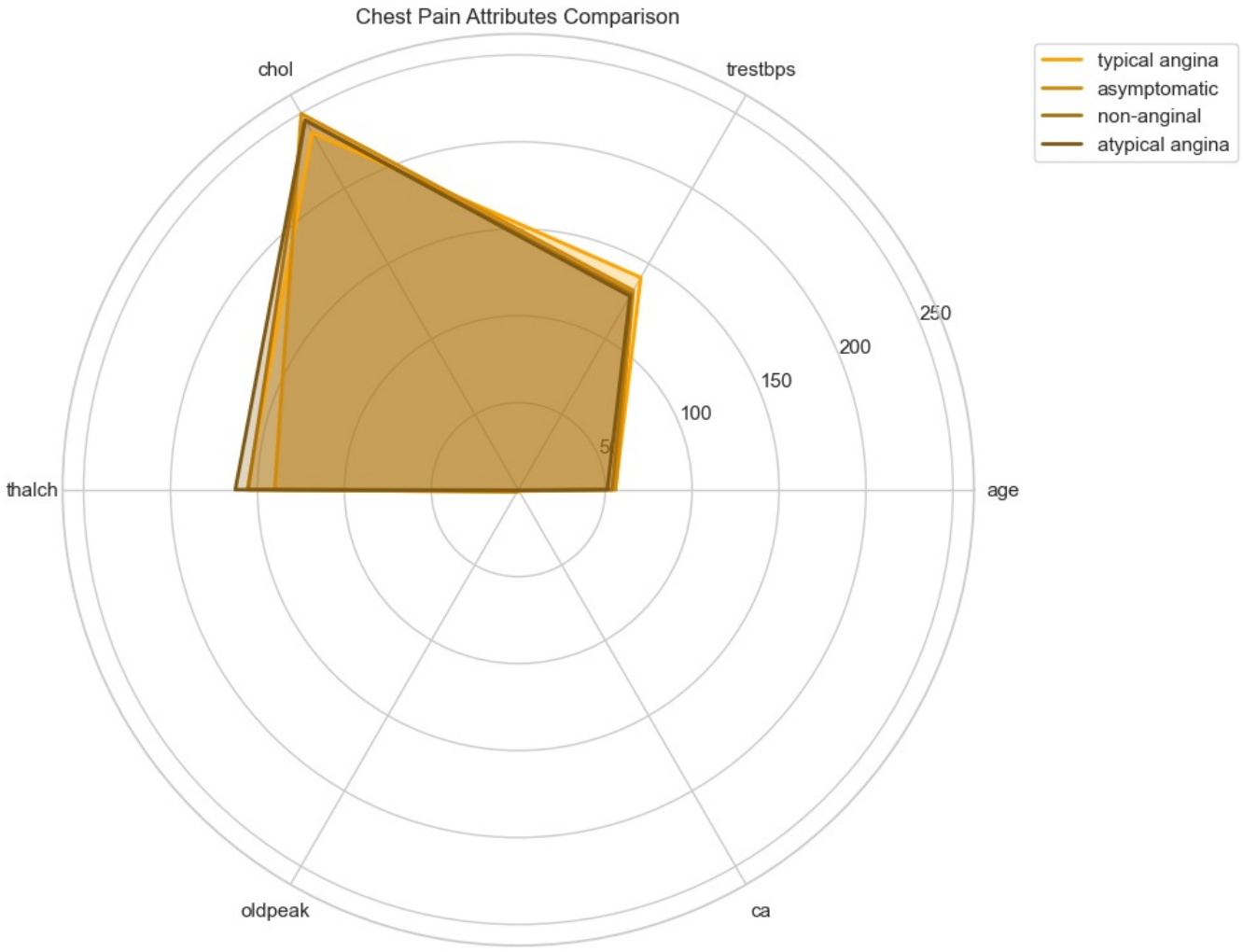


In [56]:
```
# Visualization 8: Violin Plot - Skill Moves Distribution
plt.figure(figsize=(12, 6))
sns.violinplot(x='cp', y='chol', data=df)
plt.title('Distribution of Chest Pain with Cholesterol ')
plt.xlabel('Chest Pain Type')
plt.ylabel('Cholesterol ')
plt.show()
```



In [57]:

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# Assuming 'df' is your DataFrame
cp_attributes_comparison = df.loc[df['cp'].isin(['asymptomatic', 'non-anginal', 'atypical angina','typical angi
attributes_to_compare = ['age', 'trestbps', 'chol', 'thalch', 'oldpeak', 'ca']

fig, ax = plt.subplots(figsize=(10, 10), subplot_kw=dict(polar=True))

for cp in cp_attributes_comparison['cp'].unique():
    cp_data = cp_attributes_comparison.loc[cp_attributes_comparison['cp'] == cp]

    # Calculate mean values for each attribute
    values = cp_data[attributes_to_compare].mean().values.flatten().tolist()
    values += values[:1]  # Close the circle for radar plot

    angles = [n / float(len(attributes_to_compare)) * 2 * np.pi for n in range(len(attributes_to_compare))]
    angles += angles[:1]

    ax.plot(angles, values, linewidth=2, linestyle='solid', label=cp)
    ax.fill(angles, values, alpha=0.25)

# Set the labels
ax.set_xticks(angles[:-1])
ax.set_xticklabels(attributes_to_compare)

# Add legend
plt.legend(loc='upper right', bbox_to_anchor=(1.3, 1))

# Add title
plt.title('Chest Pain Attributes Comparison')

# Show the plot
plt.tight_layout()
plt.show()
```



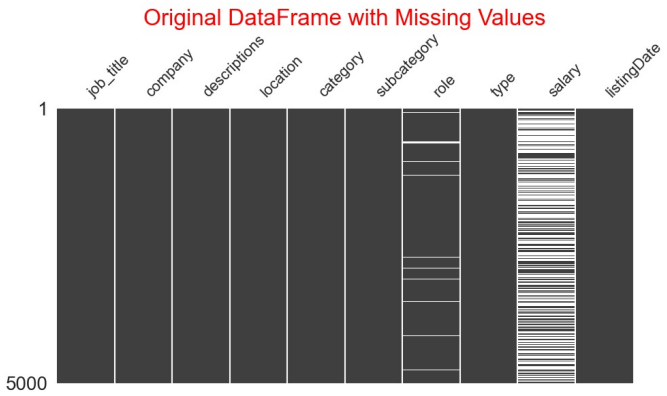
In [58]:
```
jobs = pd.read_csv("jobstreet_all_job_dataset.csv")
jobs = jobs.sample(5000)
jobs = jobs.drop(columns=['job_id'], axis=1)
jobs = jobs.reset_index()
jobs = jobs.drop(columns=['index'], axis=1)
display(jobs.shape)
jobs.head(2)
```

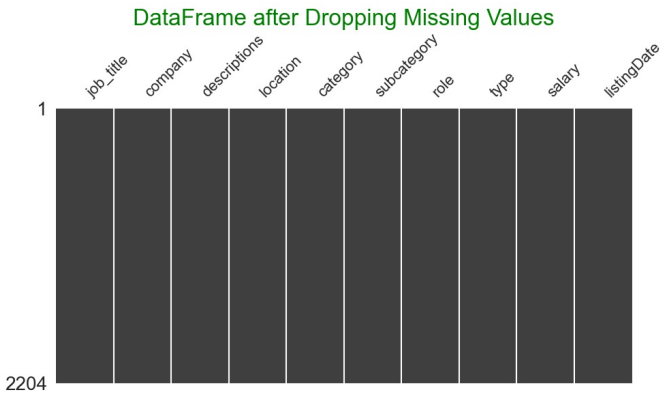
```
(5000, 10)
```

Out[58]:

	job_title	company	descriptions	location	category	subcategory	role	type	salary	listi
0	MARKETING EXECUTIVE	AESD INTERNATIONAL (M) SDN. BHD.	JOB DESCRIPTIONS\nWork closely with the sales ...	Petaling	Marketing & Communications	Marketing Assistants/Coordinators	marketing-executive	Full time	RM 3,000 – RM 4,000 per month	2(21T08
1	E-Commerce Sales Admin	JOBSGURU SDN. BHD.	Job Description\nPerform CS activities by repl...	Petaling	Administration & Office Support	Client & Sales Administration	sales-administration	Full time	RM 2,500 – RM 3,500 per month	2(24T12

In [59]:
```
import missingno as msno

# Create a figure with two subplots arranged in a 1x2 grid
fig, axes = plt.subplots(nrows=1, ncols=2, figsize=(20, 6))

# Plot the original DataFrame with missing values
msno.matrix(jobs, ax=axes[0])
axes[0].set_title("Original DataFrame with Missing Values",fontsize=24,color='Red')

# Drop rows with missing values and plot the resulting DataFrame
job = jobs.dropna()

msno.matrix(job, ax=axes[1])
axes[1].set_title("DataFrame after Dropping Missing Values",fontsize=24,color='Green')

plt.tight_layout()
plt.show()
```





In [60]:

```
import re

def clean_and_calculate_mean(salary):
    try:
        # Remove currency symbols, words, and extra characters
        salary = salary.replace('RM', '').replace('MYR', '').replace('$', '').replace('per month', '').replace(

        # Handle ranges with different separators
        if '–' in salary:
            salary_range = salary.split('–')
        elif '-' in salary:
            salary_range = salary.split('-')
        elif '–' in salary:
            salary_range = salary.split('–')
        else:
            salary_range = [salary]

        # Convert values to integers, handling potential errors
        salary_values = []
        for value in salary_range:
            try:
                value = int(float(value.replace(',', '').strip()))
                salary_values.append(value)
            except ValueError:
                pass  # Ignore non-numeric values

        # Calculate mean if at least two valid values are found
        if len(salary_values) >= 2:
            salary_mean = sum(salary_values) / len(salary_values)
            return salary_mean
        else:
            return None

    except Exception as e:
        print(f"Error processing salary '{salary}': {e}")
        return None

# Apply the function to the salary column
job['Salary'] = job['salary'].apply(clean_and_calculate_mean)
job = job.drop('salary',axis=1)
job.head(2)
```

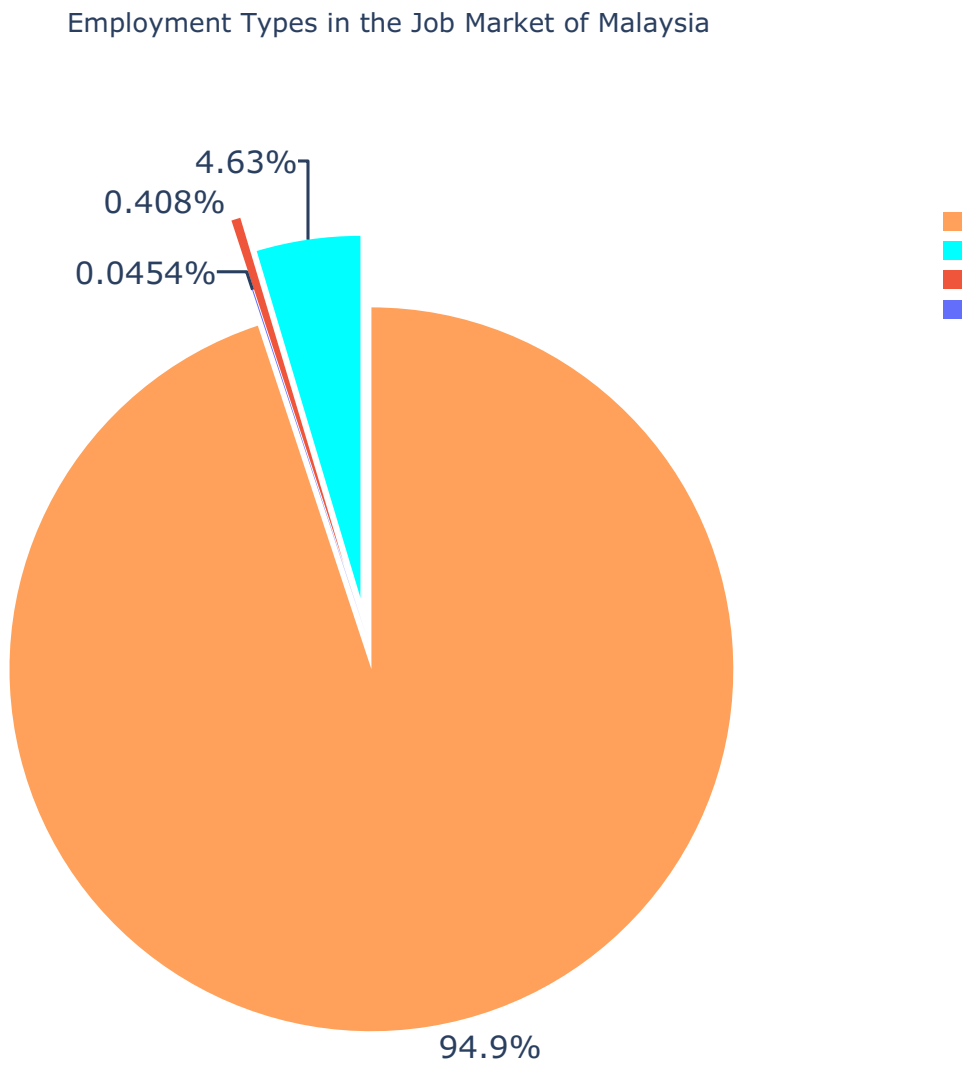
Out[60]:

	job_title	company	descriptions	location	category	subcategory	role	type	listingDate	Sa
0	MARKETING EXECUTIVE	AESD INTERNATIONAL (M) SDN. BHD.	JOB DESCRIPTIONS\nWork closely with the sales ...	Petaling	Marketing & Communications	Marketing Assistants/Coordinators	marketing-executive	Full time	2024-03-21T08:08:18Z	35
1	E-Commerce Sales Admin	JOBSGURU SDN. BHD.	Job Description\nPerform CS activities by repl...	Petaling	Administration & Office Support	Client & Sales Administration	sales-administration	Full time	2024-05-24T12:59:40Z	30

In [61]:

```
import plotly.express as px
from plotly.offline import init_notebook_mode
init_notebook_mode(connected=True)

jobType = job['type'].value_counts()

fig = px.pie(values=jobType.values, names=jobType.index.tolist(), color=jobType.index.tolist(),color_discrete_s

fig.update_layout(width=1000, height=800)

fig.update_traces(textfont_size=20)

fig.update_traces(pull=[0.1, 0.1, 0.2], textposition='outside')

# Set layout properties
fig.update_layout(margin = dict(t=50, l=10, r=10, b=25),
                  title='Employment Types in the Job Market of Malaysia',
                  title_x=0.5,
```

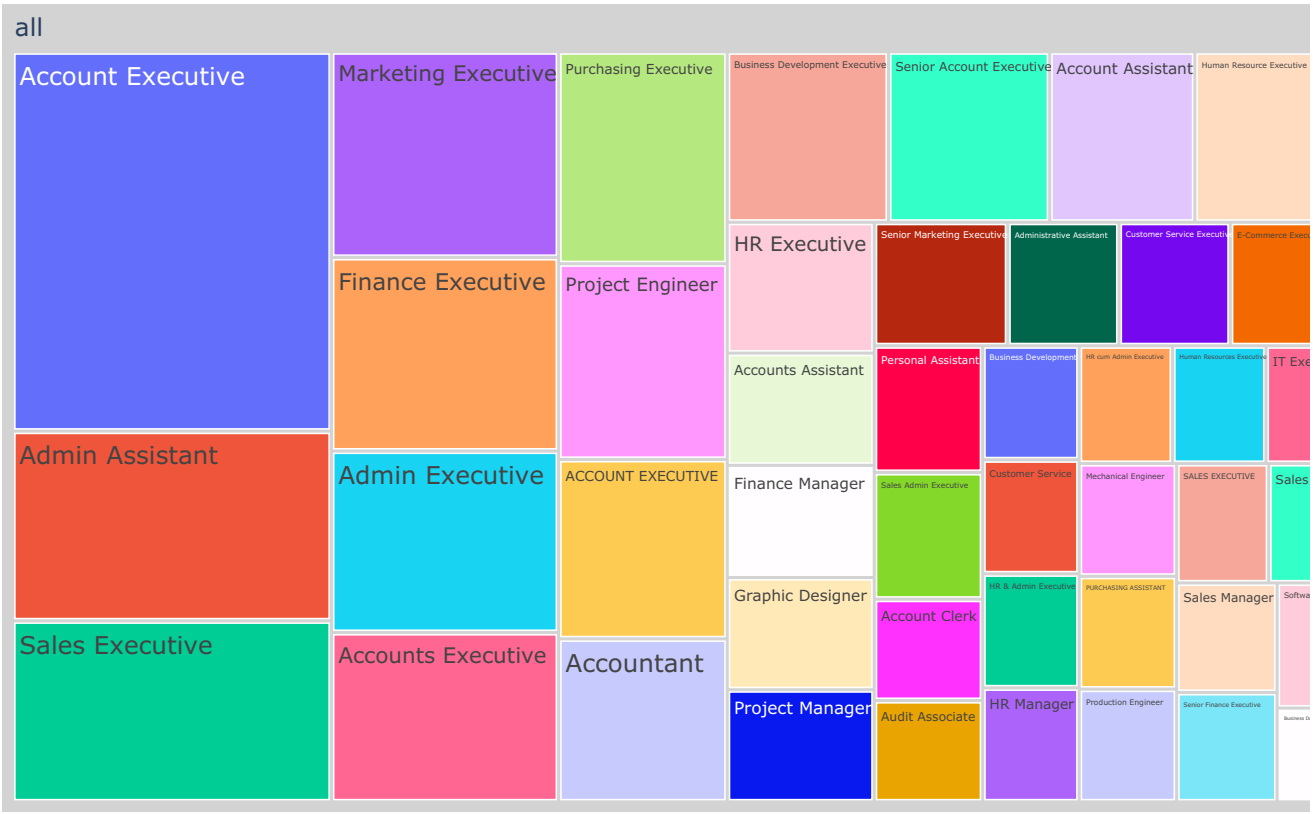
```
                  title_y=0.98)

fig.show()
```



In [79]:

```
top_n = 50

filtered_data = job['job_title'].value_counts().head(top_n).reset_index()
filtered_data.columns = ['job_title', 'count']

fig = px.treemap(filtered_data, path=[px.Constant('all'), 'job_title'], values='count')
fig.update_traces(root_color='lightgrey')

fig.update_traces(textfont_size=16)

fig.update_layout(width=1000, height=600)
fig.update_layout(margin=dict(t=50, l=25, r=25, b=25),
                  title='Top Job Openings: Job Roles in Malaysia',
                  title_x=0.5,
                  title_y=0.98)

fig.show()
```

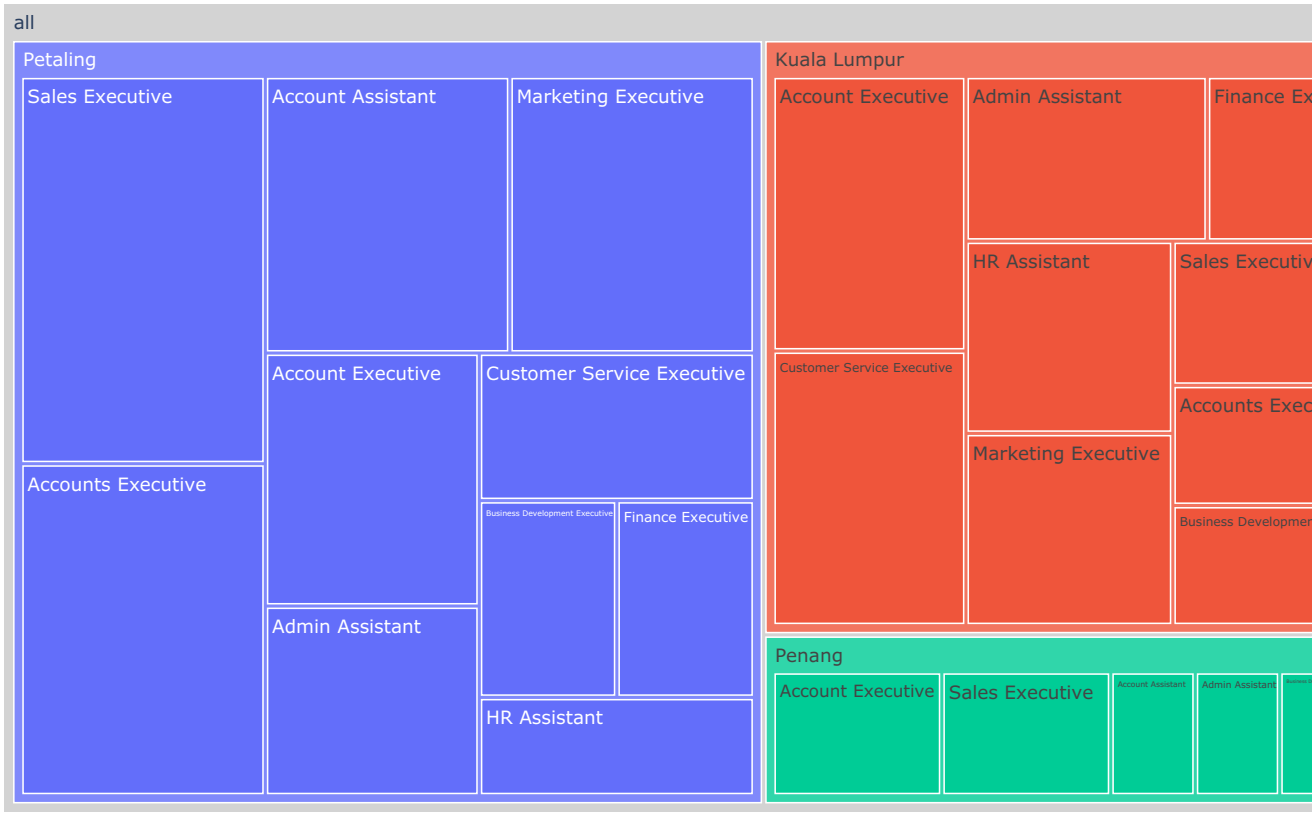
Top Job Openings: Job Roles in Malaysia



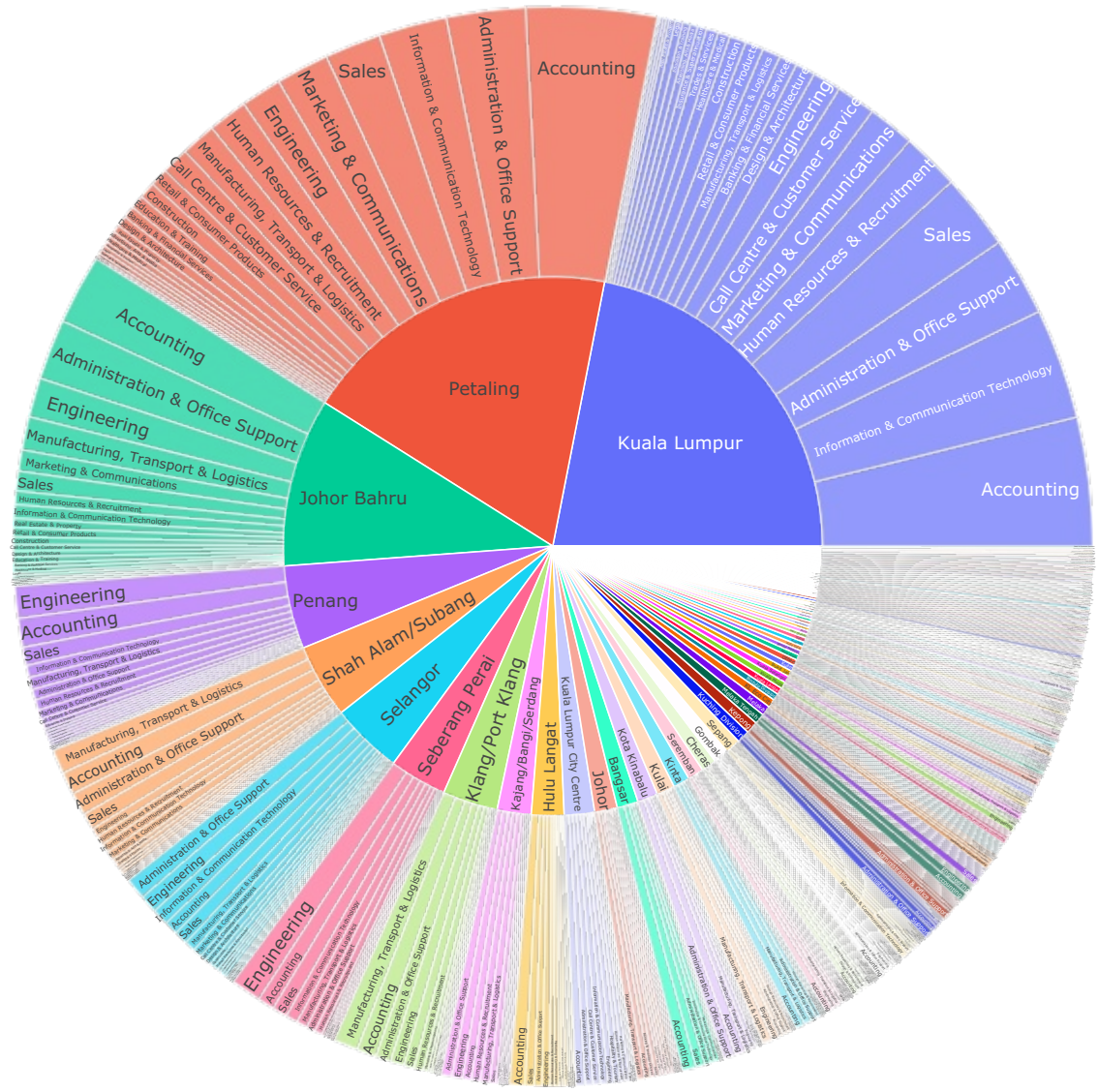
In [63]:

```
job.replace('Kuala Lumpur Sentral','Kuala Lumpur', inplace=True)
job.replace('Bangsar South', 'Bangsar', inplace=True)
job.replace('Klang District', 'Klang/Port Klang', inplace=True)
job.replace('Penang Island', 'Penang', inplace=True)
job['location'] = job['location'].str.replace(' District', '')

top_location = ['Kuala Lumpur', 'Petaling', 'Penang']
filtered_data = job[job['location'].isin(top_location)]

job_title_counts = filtered_data['job_title'].value_counts()

top_n = 10
top_job_titles = job_title_counts.head(top_n).index.tolist()

filtered_data = filtered_data[filtered_data['job_title'].isin(top_job_titles)]

fig = px.treemap(filtered_data, path=[px.Constant('all'), 'location', 'job_title'])
fig.update_traces(root_color='lightgrey')
fig.update_layout(width=1000, height=600)
fig.update_layout(margin=dict(t=50, l=25, r=25, b=25),
                  title='Top Job Opportunities in Kuala Lumpur, Petaling, and Penang',
                  title_x=0.5,
                  title_y=0.98)
fig.show()
```

Top Job Opportunities in Kuala Lumpur, Petaling, and Penang



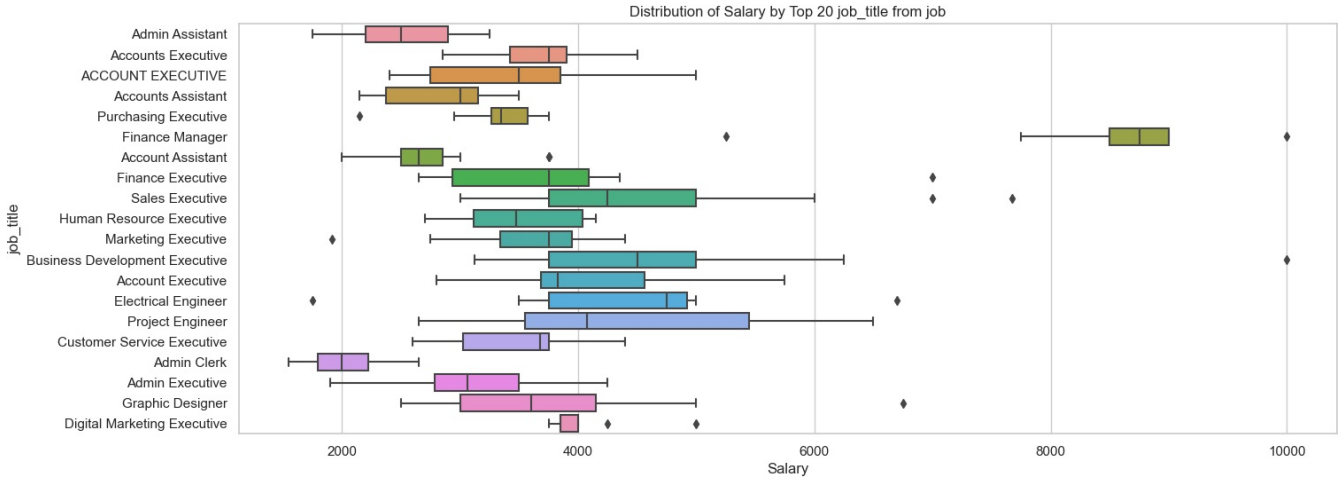
In [64]:
```
# plot a sunburst chart
fig = px.sunburst(job, path=['location','category'])

# configurate the plot layout
fig.update_layout(
    margin=dict(t=50, l=25, r=25, b=25),
    width=900,  # Set the width of the plot
    height=800,  # Set the height of the plot
    title='Job Vacancies Available Across Malaysia by Category',
    title_x=0.48,
    title_y=0.98
)

fig.show()
```

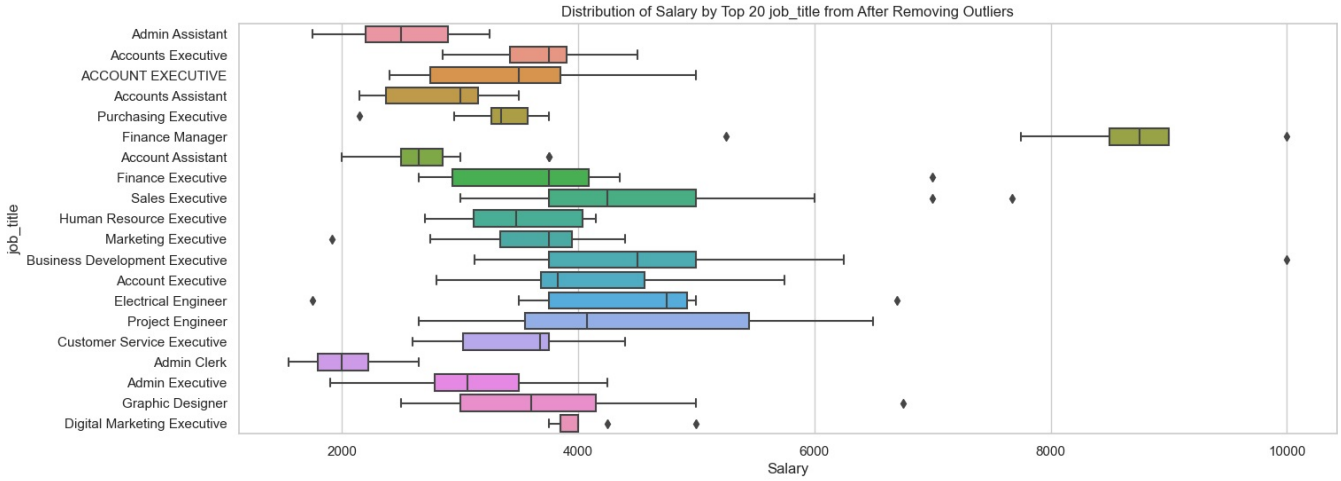


In [65]:

```
def remove_outliers_iqr(df, column):
  Q1 = df[column].quantile(0.10)
  Q3 = df[column].quantile(0.85)

  IQR = Q3 - Q1

  lower_bound = Q1 - 1.5 * IQR
  upper_bound = Q3 + 1.5 * IQR

  df_outlier_free = df[(df[column] >= lower_bound) & (df[column] <= upper_bound)]

  return df_outlier_free

jobs = remove_outliers_iqr(job, 'Salary')

#=============================================================================================================#

# Get top 20 job titles from both DataFrames
top_leagues_job = job['job_title'].value_counts().nlargest(20).index
top_leagues_jobs = jobs['job_title'].value_counts().nlargest(20).index

# Combine the top job titles
top_leagues = top_leagues_job.union(top_leagues_jobs)

# Plotting
plt.figure(figsize=(16, 6))
sns.boxplot(x='Salary', y='job_title', data=job[job['job_title'].isin(top_leagues)])
plt.title('Distribution of Salary by Top 20 job_title from job')
plt.xlabel('Salary')
plt.ylabel('job_title')
plt.show()

plt.figure(figsize=(16, 6))
sns.boxplot(x='Salary', y='job_title', data=jobs[jobs['job_title'].isin(top_leagues)])
plt.title('Distribution of Salary by Top 20 job_title from After Removing Outliers')
plt.xlabel('Salary')
```

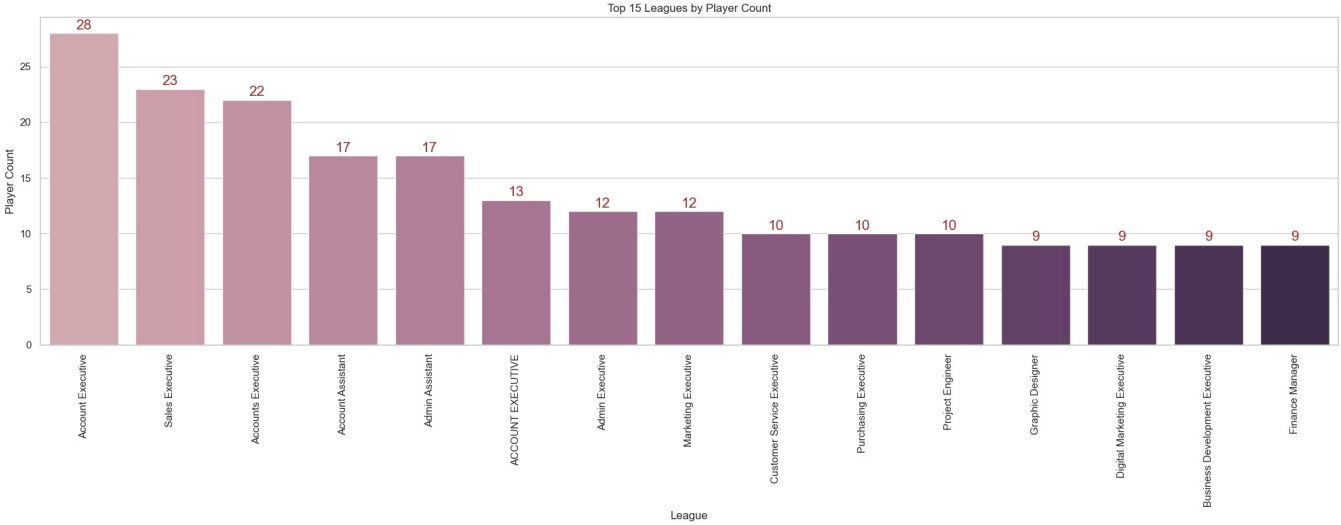
```
plt.ylabel('job_title')
plt.show()
```





In [66]:

```
top_leagues = jobs['job_title'].value_counts().nlargest(15)

plt.figure(figsize=(20, 8))

colors = sns.cubehelix_palette(len(top_leagues), light=0.7, dark=0.2)
bar_plot = sns.barplot(x=top_leagues.index, y=top_leagues.values, palette=colors)

for index, value in enumerate(top_leagues.values):
    label = f"{value:,}"
    plt.text(index, value + 0.1, label, ha='center', va='bottom', fontsize=15, color='#A52A2A')

plt.title('Top 15 Leagues by Player Count')
plt.xlabel('League')
plt.ylabel('Player Count')
plt.xticks(rotation=90)
plt.tight_layout()

plt.show()
```



In [67]:

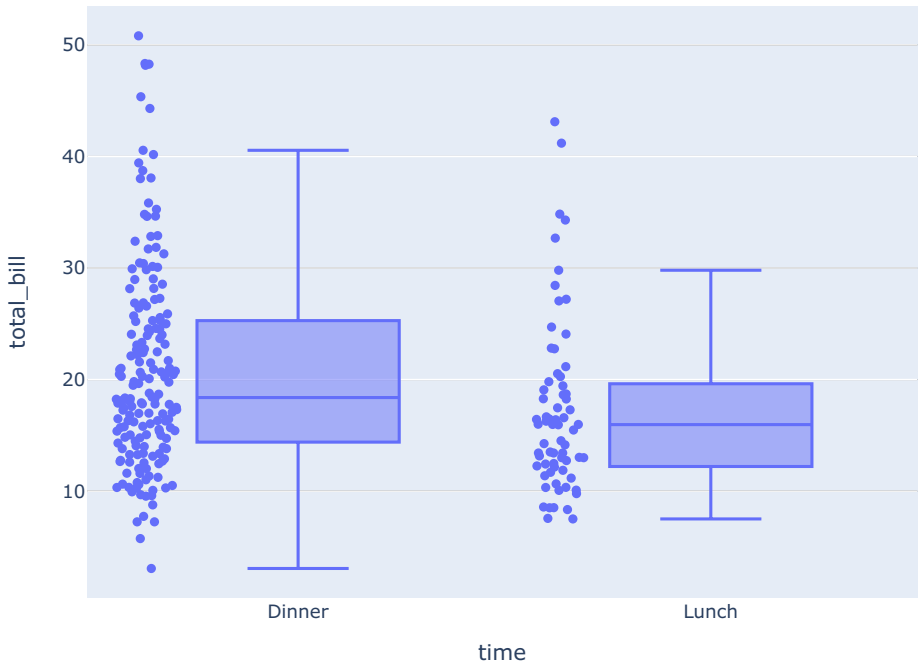
```
tips_df = pd.read_csv("tip.csv")

display(tips_df.head(2))
```

```
fig = px.bar(tips_df,
             x="sex",
             y="total_bill",
             color="smoker",
             barmode="group",
             facet_row="time",
             facet_col="day",
             category_orders={"day": ["Thur", "Fri", "Sat", "Sun"],
                              "time": ["Lunch", "Dinner"]})
fig.show()
```

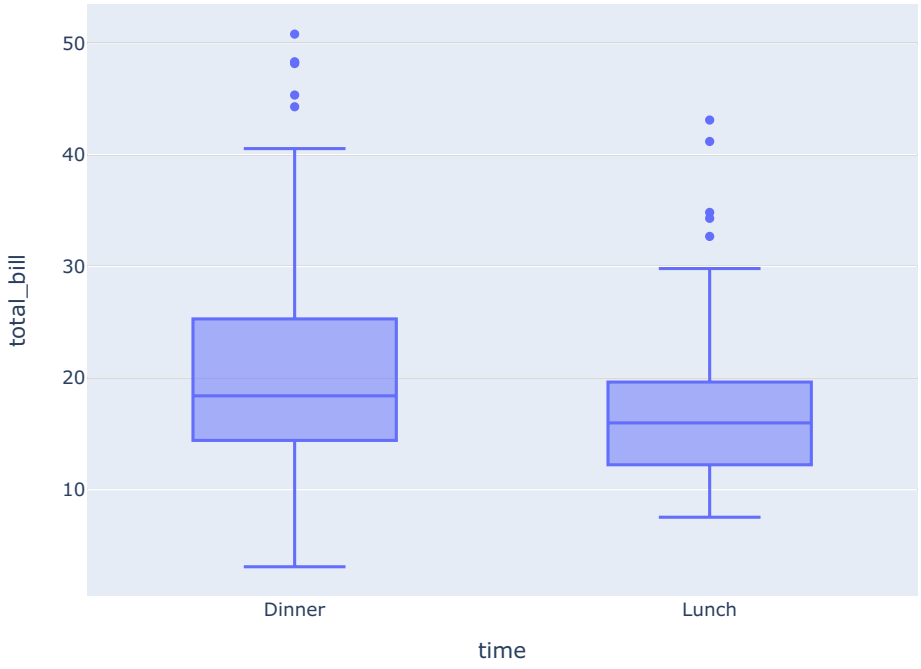
	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3

In [68]:

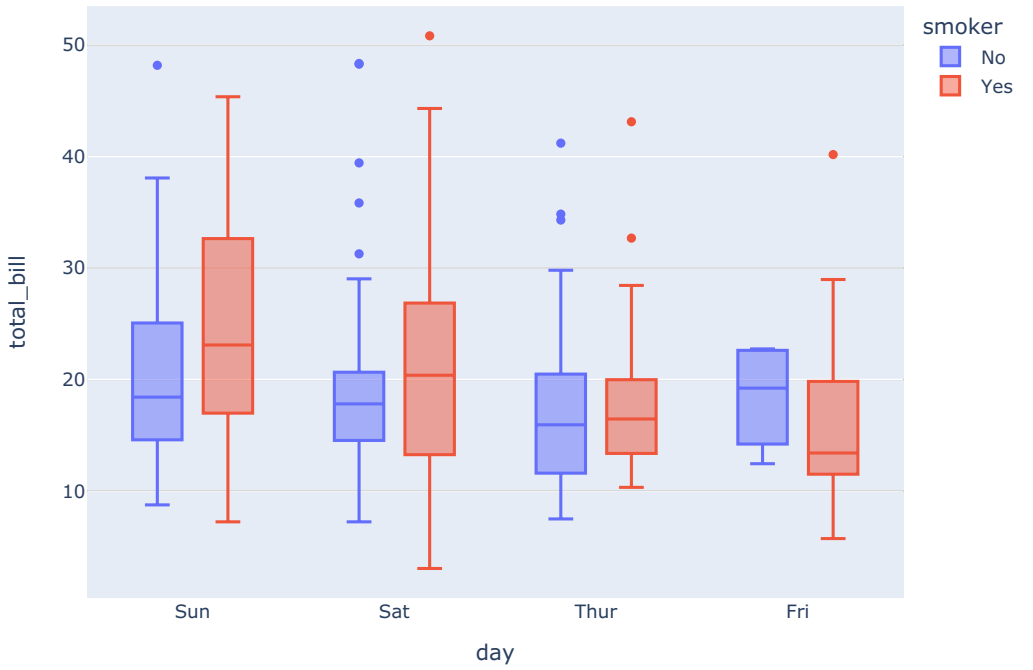
```
fig = px.box(tips_df,
             x="time",
             y="total_bill",
             points="all")
fig.show()
```



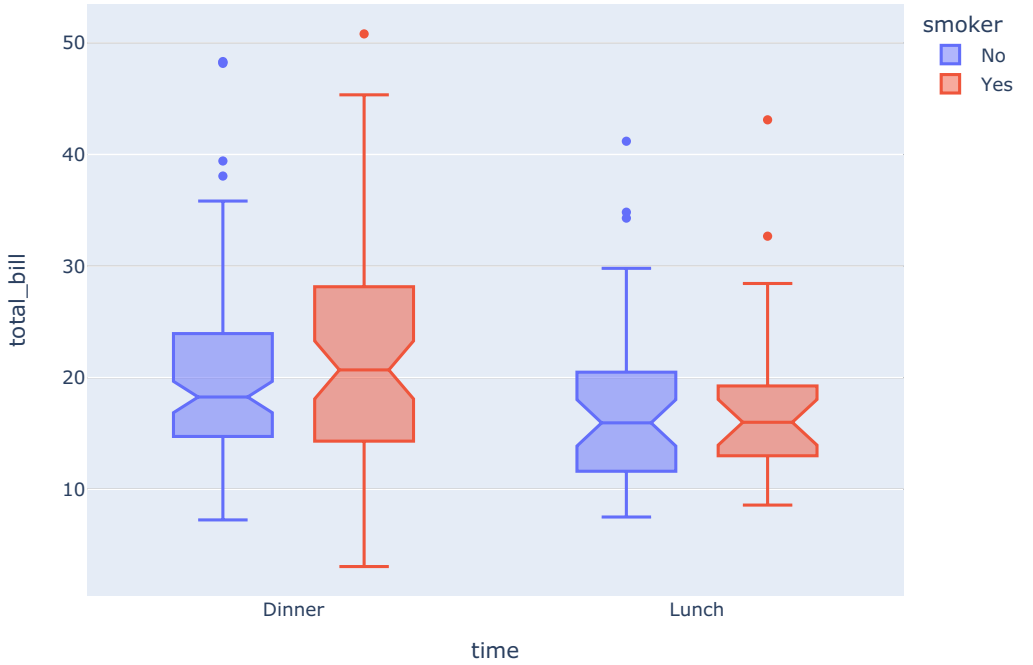
In [69]:
```
fig = px.box(tips_df,
             x="time",
             y="total_bill",
             points="outliers")
fig.show()
```



In [70]:
```
fig = px.box(tips_df,
             x="day",
             y="total_bill",
             color="smoker" )
fig.update_traces(quartilemethod="linear")
fig.show()
```

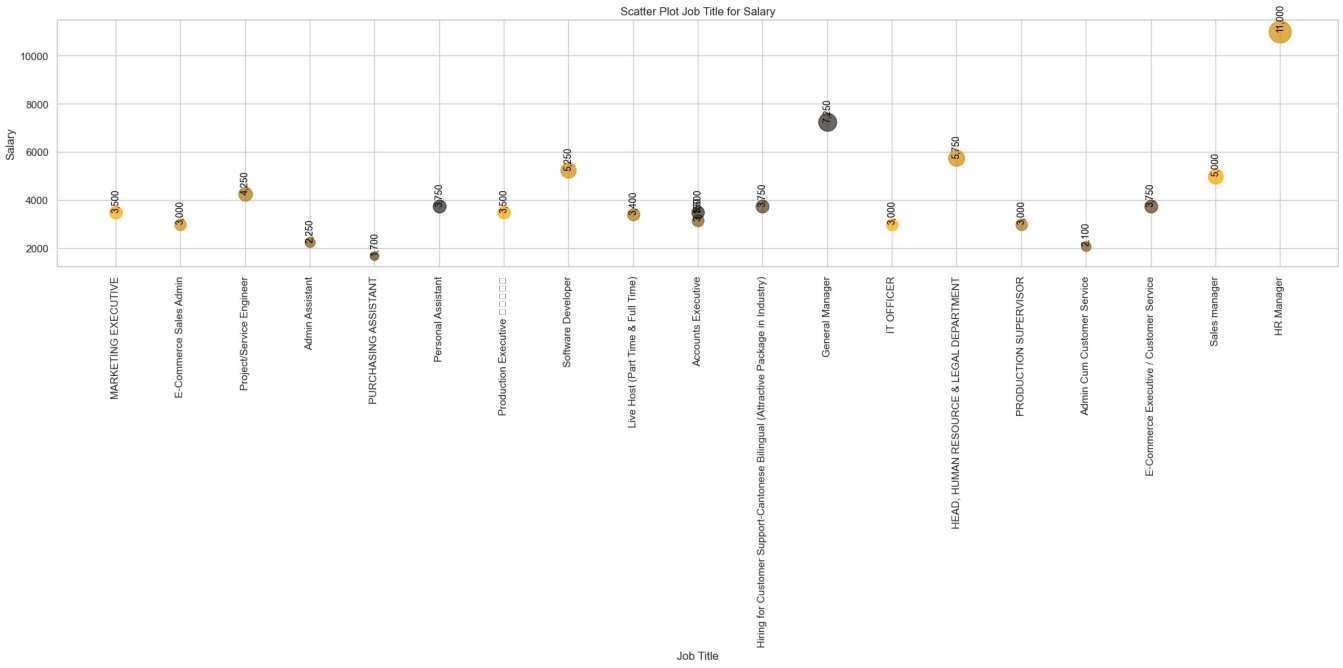


In [71]:
```
fig = px.box(tips_df,
             x="time",
             y="total_bill",
             color="smoker",
             notched=True,
             hover_data=["day"] # add day column to hover data
            )
fig.show()
```



In [72]:
```
plt.figure(figsize=(20, 10))

x = jobs['job_title'].head(20)
y = jobs['Salary'].head(20)

# Plot the scatter plot with country names and numbers on y-axis
marker_sizes = jobs['Salary']
for i, country in enumerate(x):
    plt.scatter(country, y.iloc[i], s=(marker_sizes.iloc[i])/20, label=country, alpha=0.7)
    plt.text(country, y.iloc[i], f'{y.iloc[i]:,.0f}', ha='center', va='bottom', rotation='vertical', fontsize=1
```

```
# Set y-axis to display numbers in billions
plt.ticklabel_format(style='plain', axis='y', useOffset=False, scilimits=(9, 9))

plt.xlabel('Job Title')
plt.ylabel('Salary')
plt.title('Scatter Plot Job Title for Salary')
plt.xticks(rotation=90)
plt.grid(True)
plt.tight_layout()

plt.show()
```



In [73]:

```
jobs = pd.read_csv("jobstreet_all_job_dataset.csv")
jobs = jobs.sample(5000)
jobs = jobs.drop(columns=['job_id'], axis=1)
jobs = jobs.reset_index()
jobs = jobs.drop(columns=['index'], axis=1)
display(jobs.shape)
display(jobs.head(2))

from wordcloud import WordCloud

text = str(list(jobs['category'])).replace(',', '').replace('[', '').replace("'", '').replace(']', '')

wordcloud = WordCloud(background_color = 'white', width = 1600,  height = 800, max_words = 121).generate(text)
plt.imshow(wordcloud)

plt.axis('off')
plt.show()
```

(5000, 10)

	job_title	company	descriptions	location	category	subcategory	role	type	salary	listingDate
0	Manager, Government & Authority Liasion	Mass Rapid Transit Corporation Sdn Bhd	JOB PURPOSE :\nTo organize & participate in a ...	Kuala Lumpur	Construction	Project Management	manager	Contract/Temp	NaN	2024-05-10T04:06:31Z
1	Junior IT Executive	Saraya Goodmaid Sdn Bhd	Designing solutions, implementation, customiza...	Seremban District	Information & Communication Technology	Developers/Programmers	information-technology-executive	Full time	NaN	2024-04-08T00:14:09Z

In [74]:
```
# Drop rows with missing values and plot the resulting DataFrame
job = jobs.dropna()

import re

def clean_and_calculate_mean(salary):
    try:
        # Remove currency symbols, words, and extra characters
        salary = salary.replace('RM', '').replace('MYR', '').replace('$', '').replace('per month', '').replace(

        # Handle ranges with different separators
        if '–' in salary:
            salary_range = salary.split('–')
        elif '-' in salary:
            salary_range = salary.split('-')
        elif '–' in salary:
            salary_range = salary.split('–')
        else:
            salary_range = [salary]

        # Convert values to integers, handling potential errors
        salary_values = []
        for value in salary_range:
            try:
                value = int(float(value.replace(',', '').strip()))
                salary_values.append(value)
            except ValueError:
                pass  # Ignore non-numeric values

        # Calculate mean if at least two valid values are found
        if len(salary_values) >= 2:
            salary_mean = sum(salary_values) / len(salary_values)
            return salary_mean
        else:
            return None

    except Exception as e:
        print(f"Error processing salary '{salary}': {e}")
        return None

# Apply the function to the salary column
job['Salary'] = job['salary'].apply(clean_and_calculate_mean)
job = job.drop('salary',axis=1)
job.head(2)
```

Out[74]:

	job_title	company	descriptions	location	category	subcategory	role	type	listingDate	Salary
4	Specialist, Contact Centre	CTOS Data Systems Sdn Bhd	Attend to all inbound and outbound calls/ emai...	Kuala Lumpur	Call Centre & Customer Service	Customer Service - Call Centre	call-centre-role	Full time	2024-04-19T02:57:09Z	2750.0
5	Multilingual | Customer Support Specialist	Private Advertiser	Skills and Abilities:\nSkilled communicator.\n...	Kampung Malaysia Raya	Call Centre & Customer Service	Customer Service - Call Centre	customer-support-specialist	Full time	2024-04-05T12:56:47Z	5500.0

In [75]:
```
dfp = job['role'].value_counts().head(10).sort_values(ascending = True).reset_index()
dfl = job['location'].value_counts().head(10).sort_values(ascending = True).reset_index()
dfc = job['company'].value_counts().head(10).sort_values(ascending = True).reset_index()

fig = go.Figure()

fig.add_trace(go.Bar(y = dfp['role'],
                     orientation='h',
                     name = 'Position',
                     marker = dict(color = 'LightCoral')))

fig.add_trace(go.Bar(y = dfl['location'],
                     orientation='h',
                     name = 'Location',
                     marker = dict(color = 'CadetBlue')))

fig.add_trace(go.Bar(y = dfc['company'],
                     orientation='h',
                     name = 'Company',
                     marker = dict(color = 'SteelBlue')))

fig.update_layout(
    updatemenus=[
        dict(
            type = "buttons",
            direction="left",
            pad={"r": 10, "t": 10},
            showactive=True,
            x=0.16,
            xanchor="left",
            y=1.12,
            yanchor="top",
            font = dict(color = 'Indigo',size = 14),
```

```
            buttons=list([
                dict(label="All",
                     method="update",
                     args=[ {"visible": [True, True, True]},
                            {'showlegend' : True}
                        ]),
                dict(label="Position",
                     method="update",
                     args=[ {"visible": [True, False, False]},
                            {'showlegend' : True}
                        ]),
                dict(label='Location',
                     method="update",
                     args=[ {"visible": [False, True, False]},
                            {'showlegend' : True}
                     ]),
                dict(label='Company',
                     method="update",
                     args=[ {"visible": [False, False, True]},
                            {'showlegend' : True}]),
            ]),
        )])

fig.update_layout(
    annotations=[
        dict(text="Choose:", showarrow=False,
             x=0, y=1.075, yref="paper", align="right",
             font=dict(size=16,color = 'DarkSlateBlue'))])

fig.update_layout(title ="Top 10 Positions, Locations and Companies",
                  title_x = 0.5,
                  title_font = dict(size = 20, color = 'MidnightBlue'))

fig.show()
```

In [76]:
```
# Read data
df = pd.read_csv('US_Job_Market.csv')
df.head(3)
```

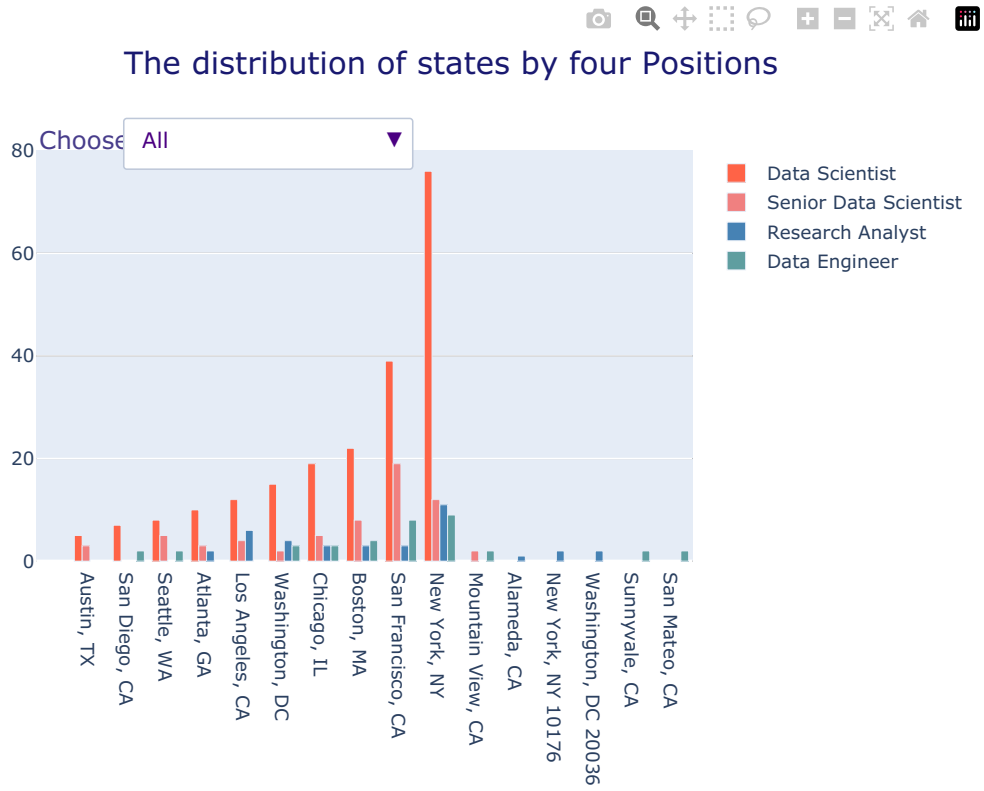
Out[76]:

	position	company	description	reviews	location
0	Development Director	ALS TDI	Development Director\nALS Therapy Development ...	NaN	Atlanta, GA 30301
1	An Ostentatiously-Excitable Principal Research...	The Hexagon Lavish	Job Description\n\n"The road that leads to acc...	NaN	Atlanta, GA
2	Data Scientist	Xpert Staffing	Growing company located in the Atlanta, GA are...	NaN	Atlanta, GA

In [77]:
```
#!pip install dash
```

In [78]:
```
import pandas as pd
from dash import Dash, dcc, html
from dash.dependencies import Input, Output
```

```
import plotly.graph_objects as go


dfd1 = df[df['position']== 'Data Scientist']
dfd2 = df[df['position']== 'Senior Data Scientist']
dfd3 = df[df['position']== 'Research Analyst']
dfd4 = df[df['position']== 'Data Engineer']

# Add 'position' column to each dataframe
redf1 = dfd1[["location", "position"]].value_counts().nlargest(10).sort_values(ascending = True).reset_index()
redf2 = dfd2[["location", "position"]].value_counts().nlargest(10).sort_values(ascending = True).reset_index()
redf3 = dfd3[["location", "position"]].value_counts().nlargest(10).sort_values(ascending = True).reset_index()
redf4 = dfd4[["location", "position"]].value_counts().nlargest(10).sort_values(ascending = True).reset_index()
# Create Plotly figure
fig = go.Figure()

fig.add_trace(go.Bar(x = redf1["location"],
                     y = redf1["count"],
                     marker = dict(color = 'Tomato'),
                     name = 'Data Scientist'))
fig.add_trace(go.Bar(x = redf2['location'],
                     y = redf2['count'],
                     name = 'Senior Data Scientist',
                     marker = dict(color = 'LightCoral')))
fig.add_trace(go.Bar(x = redf3['location'],
                     y = redf3['count'],
                     name = 'Research Analyst',
                     marker = dict(color = 'SteelBlue')))
fig.add_trace(go.Bar(x = redf4['location'],
                     y = redf4['count'],
                     name = 'Data Engineer',
                     marker = dict(color = 'CadetBlue')))

# Update Layout with dropdown functionality
fig.update_layout(
    updatemenus=[
        dict(
            direction="down",
            pad={"r": 10, "t": 10},
            showactive=True,
            x=0.13,
            xanchor="left",
            y=1.12,
            yanchor="top",
            font = dict(color = 'Indigo',size = 14),
            buttons=list([
                dict(label="All",
                     method="update",
                     args=[ {"visible": [True, True, True, True]},
                            {'showlegend' : True}
                        ]),
                dict(label="Data Scientist",
                     method="update",
                     args=[ {"visible": [True, False, False, False]},
                            {'showlegend' : True}
                        ]),
                dict(label='Senior Data Scientist',
                     method="update",
                     args=[ {"visible": [False, True, False, False]},
                            {'showlegend' : True}
                        ]),
                dict(label='Research Analyst',
                     method="update",
                     args=[ {"visible": [False, False, True, False]},
                            {'showlegend' : True}
                        ]),
                dict(label='Data Engineer',
                     method="update",
                     args=[ {"visible": [False, False, False, True]},
                            {'showlegend' : True}]),
            ]),
        )])

fig.update_layout(
    annotations=[
        dict(text="Choose:", showarrow=False,
             x=0, y=1.075, yref="paper", align="right",
             font=dict(size=16,color = 'DarkSlateBlue'))])

fig.update_layout(title ="The distribution of states by four Positions",
                  title_x = 0.5,
                  title_font = dict(size = 20, color = 'MidnightBlue'))

fig.show()
```

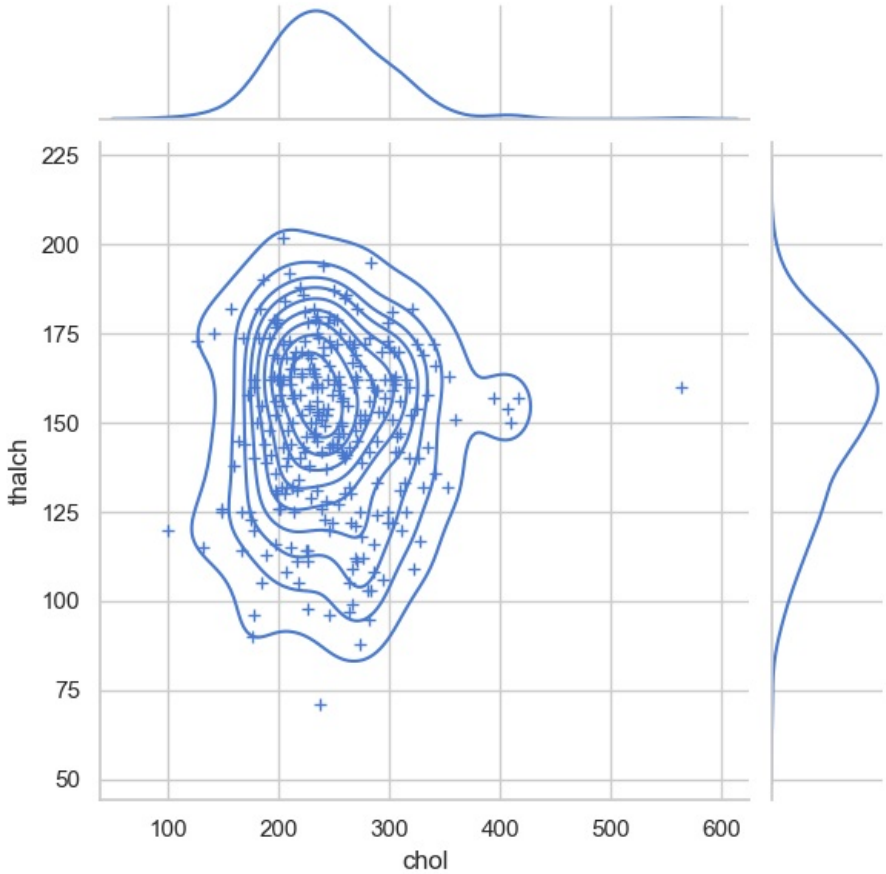


In [81]:
```
df =  pd.read_csv("heart_disease_uci.csv")
df = df.dropna()
df.head(2)
```

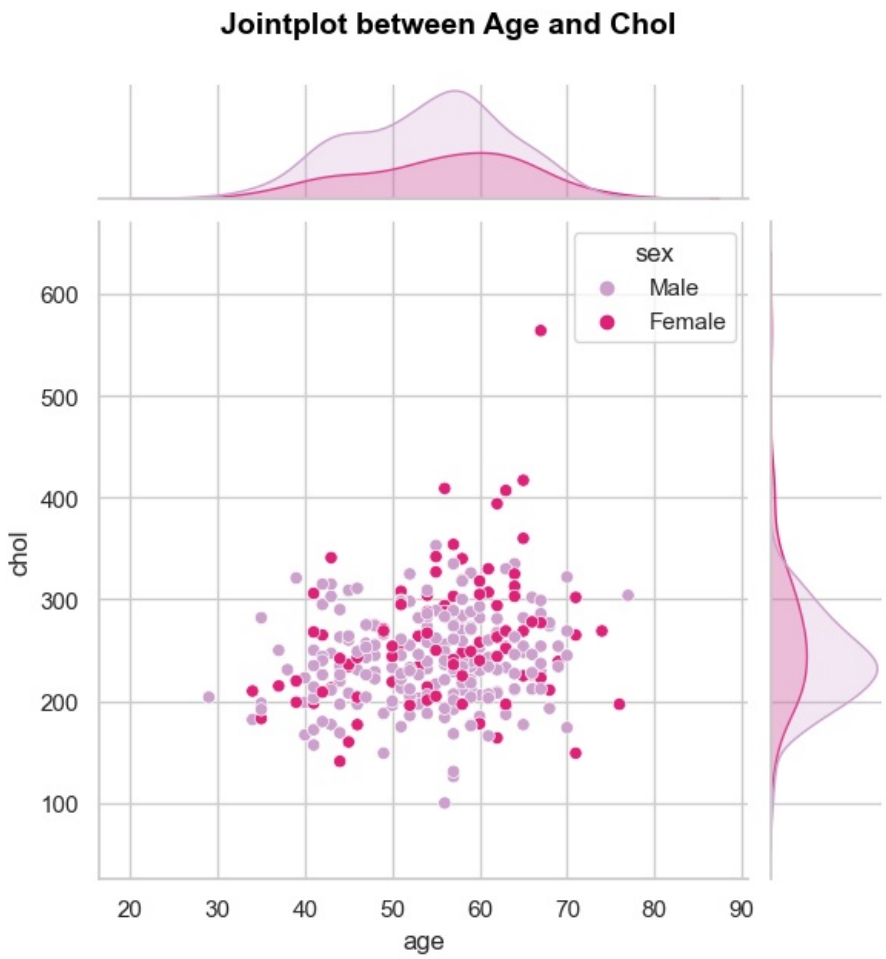
Out[81]:

	id	age	sex	dataset	cp	trestbps	chol	fbs	restecg	thalch	exang	oldpeak	slope	ca	thal	num
0	1	63	Male	Cleveland	typical angina	145.0	233.0	True	lv hypertrophy	150.0	False	2.3	downsloping	0.0	fixed defect	0
1	2	67	Male	Cleveland	asymptomatic	160.0	286.0	False	lv hypertrophy	108.0	True	1.5	flat	3.0	normal	2

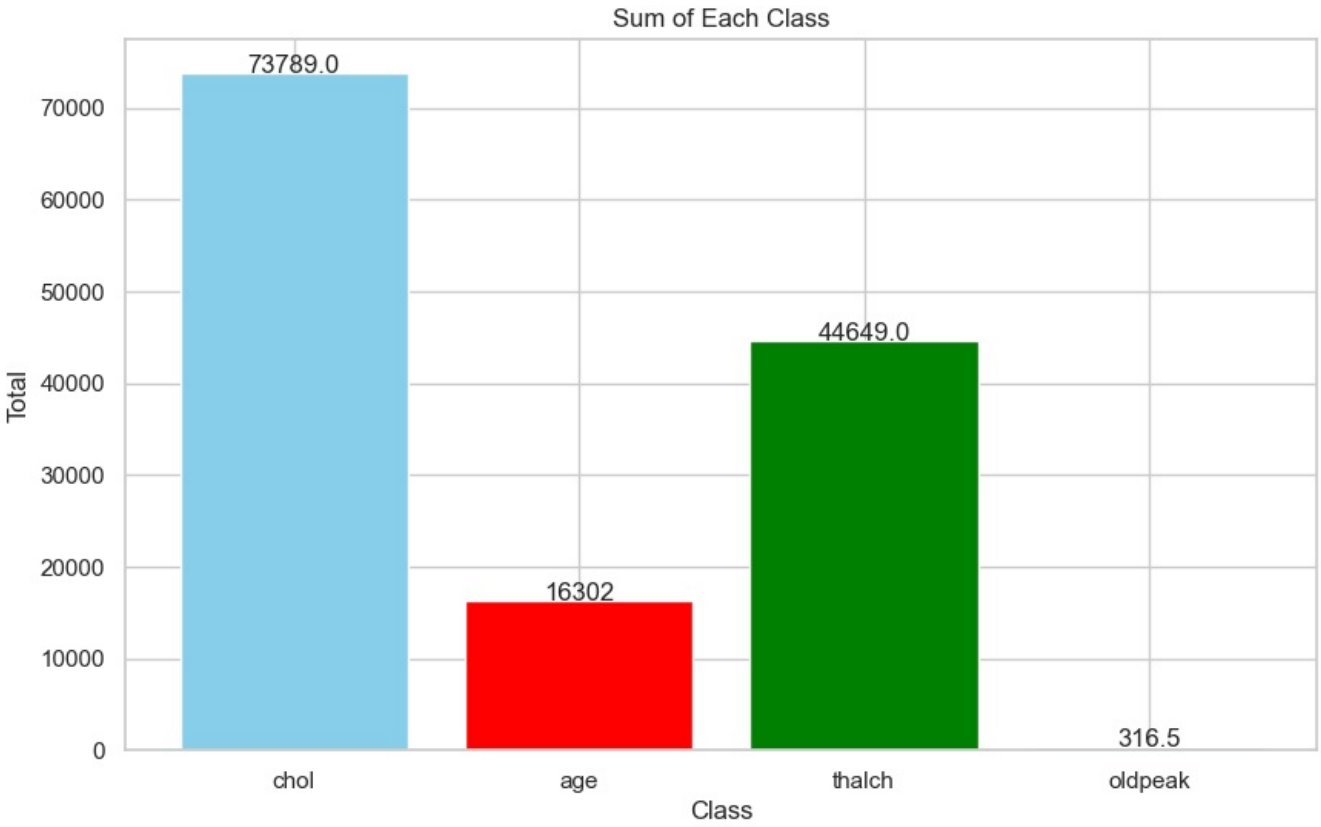
In [82]:
```
g = sns.jointplot(x="chol", y="thalch", data=df, kind="kde", color="b")
g.plot_joint(plt.scatter, c="b", s=30, linewidth=1, marker="+")
g.ax_joint.collections[0].set_alpha(0)
g.set_axis_labels("chol", "thalch");
```



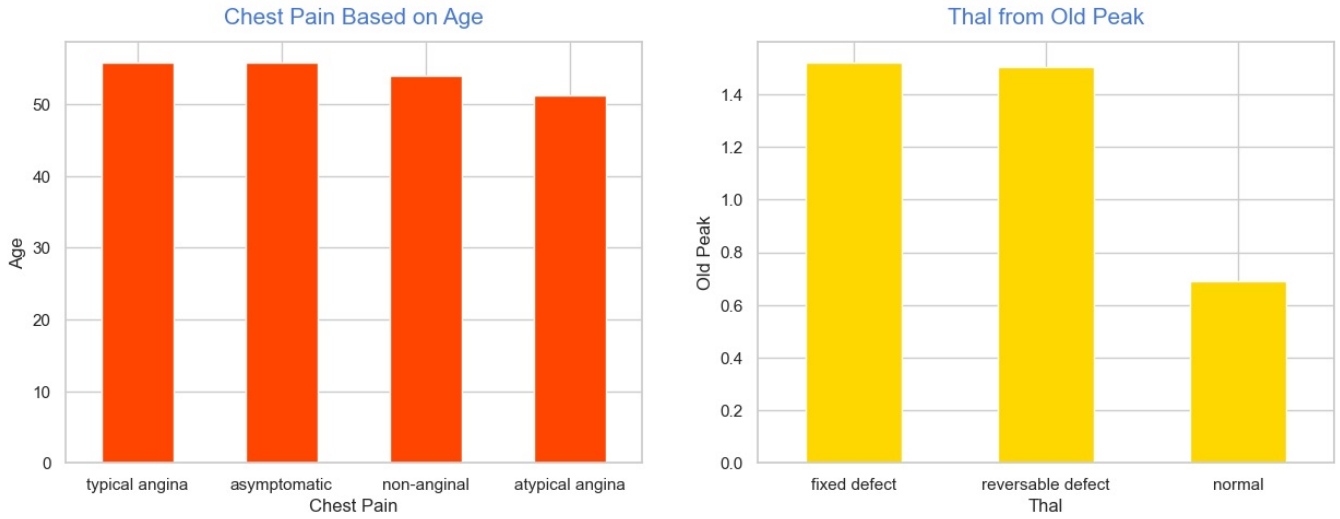
In [83]:
```
# --- Create Jointplot ---
jointplot = sns.jointplot(x = 'age', y = 'chol', data = df, hue = 'sex', palette = 'PuRd')


# --- Jointplot Titles & Text ---
jointplot.fig.suptitle('Jointplot between Age and Chol', fontweight = 'heavy', y = 1.05, fontsize = '14',
                       fontfamily = 'sans-serif', color = 'black');
```



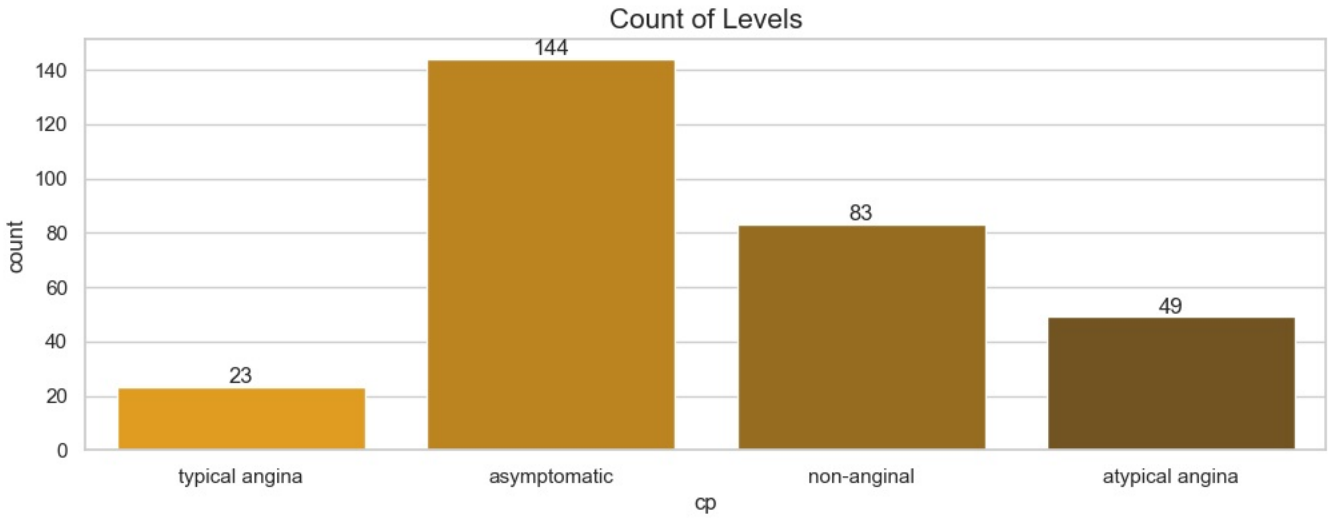
In [84]:
```
import matplotlib.pyplot as plt

# Define the labels
labels = ['chol', 'age', 'thalch','oldpeak']

# Calculate counts
counts = [df[label].sum() for label in labels]

# Create the bar plot
plt.figure(figsize=(10, 6))
bars = plt.bar(labels, counts, color=['skyblue', 'Red', 'Green'])

# Add value labels on top of each bar with some vertical offset
for bar, count in zip(bars, counts):
    yval = bar.get_height() + 0.1  # Add a small offset
    plt.text(bar.get_x() + bar.get_width() / 2, yval, str(count), ha='center')

plt.title('Sum of Each Class')
plt.xlabel('Class')
plt.ylabel('Total')
plt.show()
```



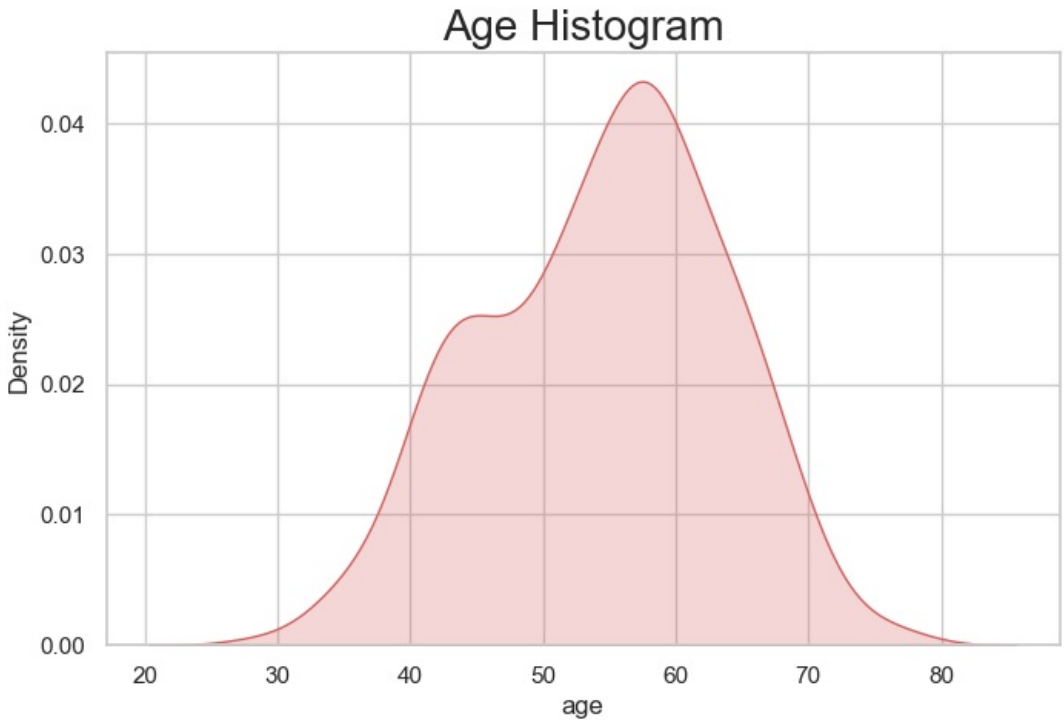
In [85]:
```
plt.rcParams['figure.figsize'] = (15,5)
plt.subplot(1, 2, 1)
chart = df.groupby('cp')['age'].mean().sort_values(ascending = False).plot(kind = 'bar', color = 'orangered')
chart.set_xticklabels(chart.get_xticklabels(), rotation = 0)
plt.title('Chest Pain Based on Age', fontsize = 15, color = 'b', pad = 12)
plt.xlabel('Chest Pain')
plt.ylabel('Age')

plt.subplot(1, 2, 2)
chart = df.groupby('thal')['oldpeak'].mean().sort_values(ascending = False).plot(kind = 'bar', color = 'gold')
chart.set_xticklabels(chart.get_xticklabels(), rotation = 0)
plt.title('Thal from Old Peak', fontsize = 15, color = 'b', pad = 12)
plt.xlabel('Thal')
plt.ylabel('Old Peak')
plt.show()
```



In [86]:
```
plt.figure(figsize = (12,4))
ax = sns.countplot(x=df.cp)
for bars in ax.containers:
    ax.bar_label(bars)
plt.title("Count of Levels", fontsize = 15);
```



In [87]:
```
plt.figure(figsize = (8,5))
sns.kdeplot(df.age, shade = True, color = "r")
plt.title("Age Histogram", fontsize = 20)
plt.show()
print("Histogram's skewness is {} and kurtosis is {}".format(df.age.skew(), df.age.kurtosis()))
```




```
Histogram's skewness is -0.21485314045391055 and kurtosis is -0.5174882052116159
```

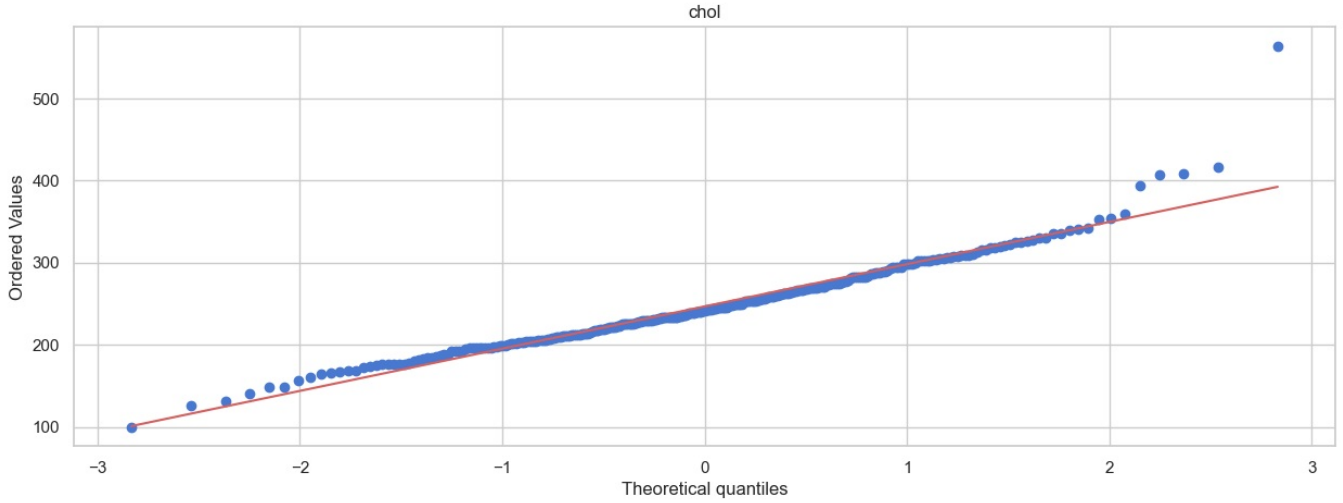
In [88]:
```
import scipy.stats as stats

df_numeric = df.select_dtypes(include='number')

results = []

for col in df_numeric.columns:
    skewness = df_numeric[col].skew()
    kurtosis = df_numeric[col].kurt()
    results.append([col, skewness, kurtosis])

df_stats = pd.DataFrame(results, columns=['Column', 'Skewness', 'Kurtosis'])
df_stats
```

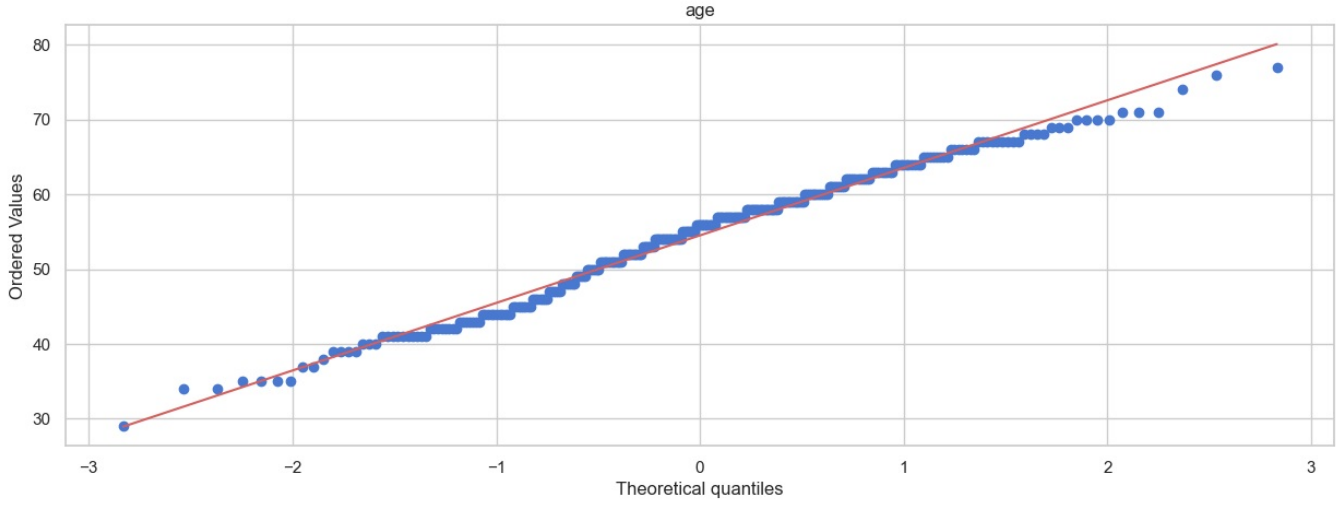
Out[88]:

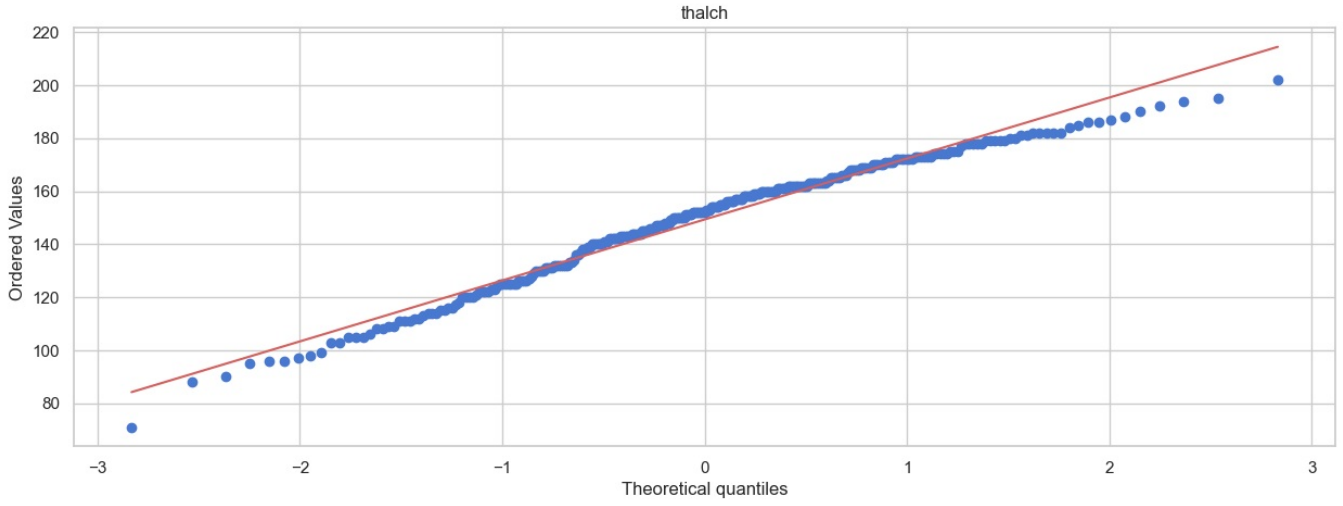
	Column	Skewness	Kurtosis
0	id	0.90	3.95
1	age	-0.21	-0.52
2	trestbps	0.70	0.80
3	chol	1.03	4.35
4	thalch	-0.53	-0.09
5	oldpeak	1.24	1.52
6	ca	1.19	0.26
7	num	1.05	-0.16

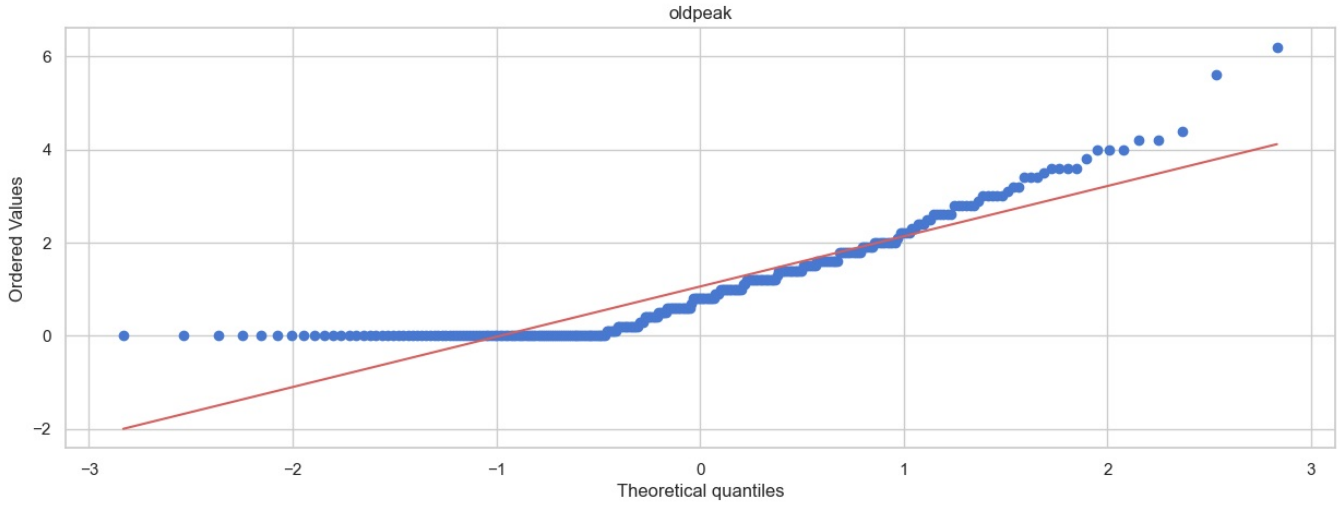
In [89]:

```
from scipy.stats import norm

dfx = df[['chol', 'age', 'thalch','oldpeak']]

for col in dfx:
    stats.probplot(dfx[col],plot=plt)
    plt.title(col)
    plt.show();
```

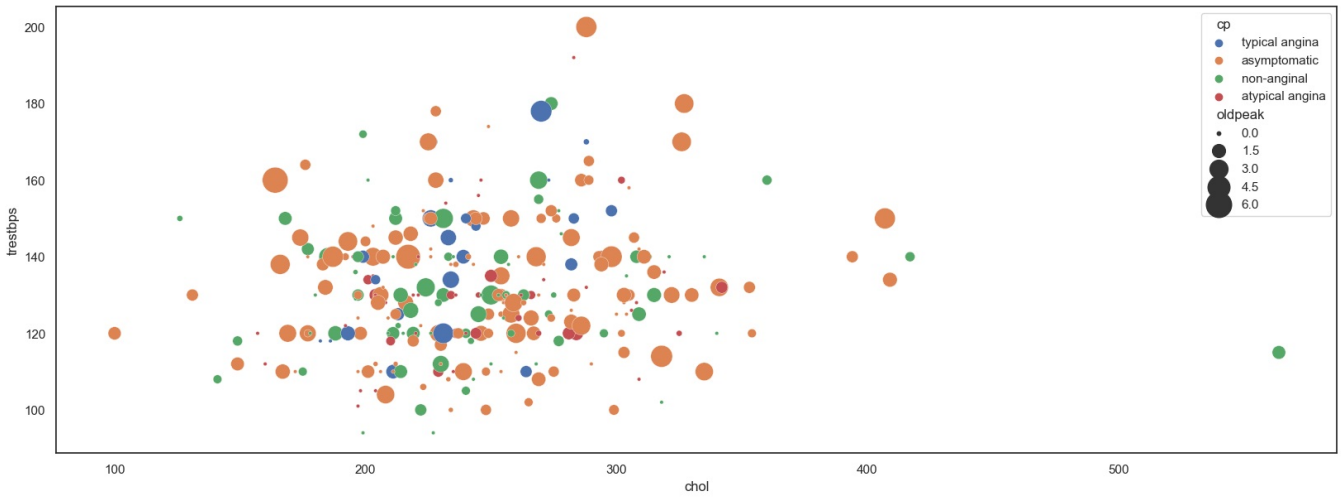




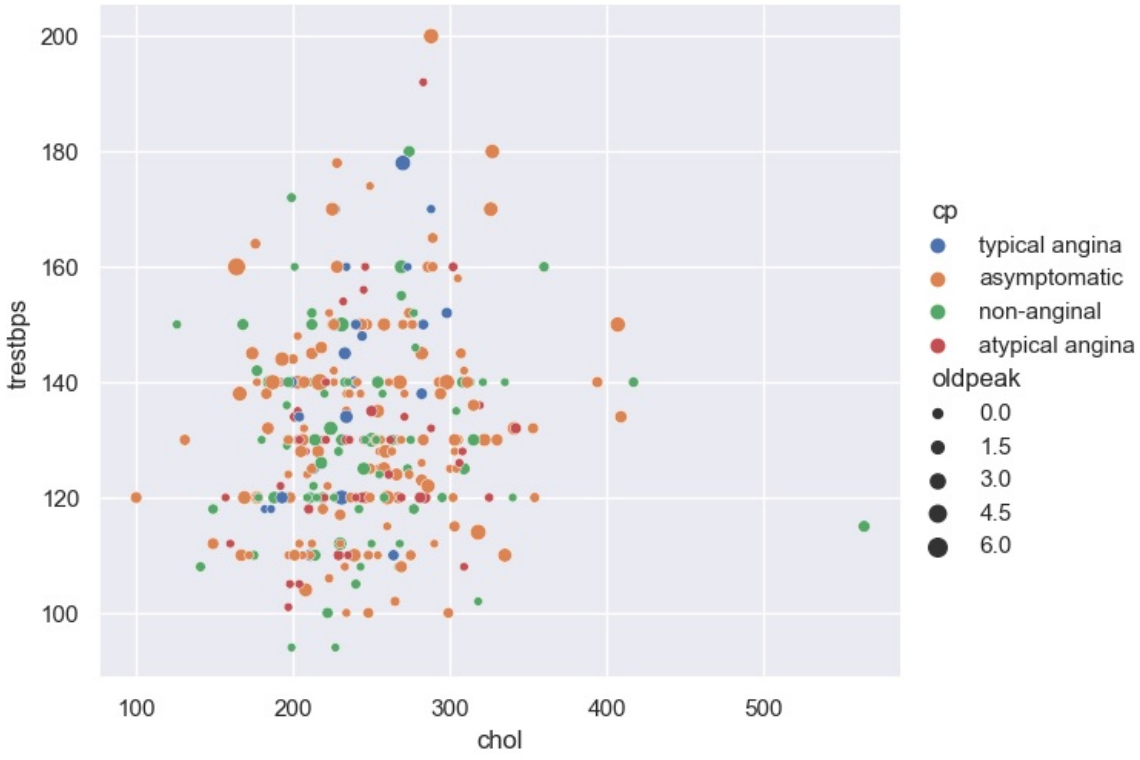




In [90]:
```
sns.set(rc={'figure.figsize':(20,7)})
sns.set_style("white")
sns.scatterplot(data=df, x="chol", y="trestbps", size="oldpeak", hue='cp',legend=True, sizes=(10, 500));
```

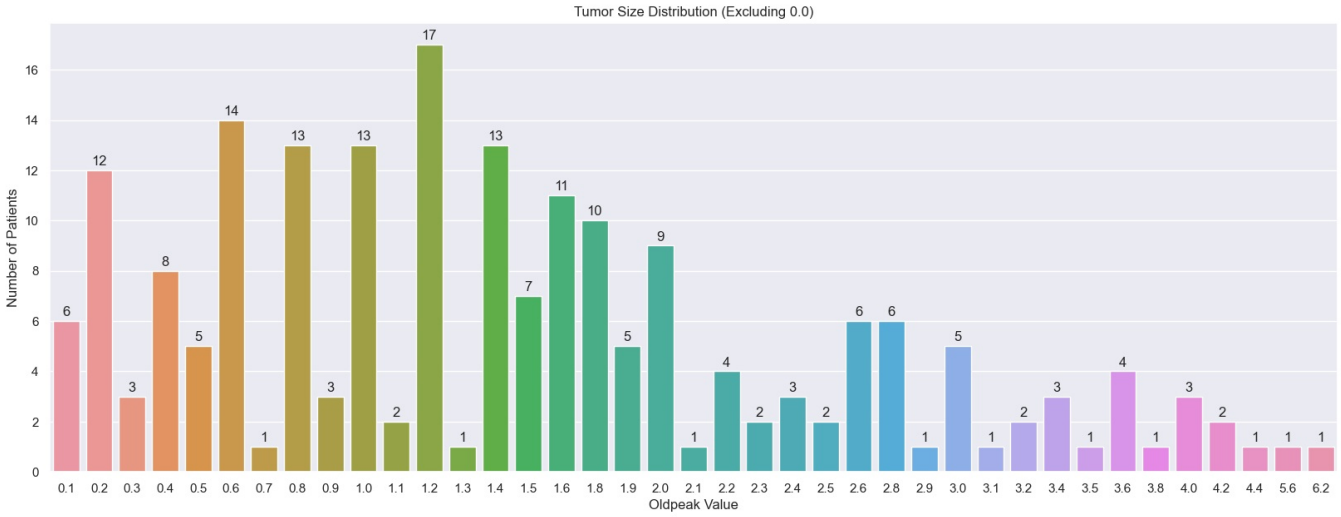


In [91]:
```
sns.set(rc={'figure.figsize':(20,7)})
sns.relplot(y='trestbps',x='chol',data=df,kind='scatter',size='oldpeak',hue='cp',aspect=1.2);
```



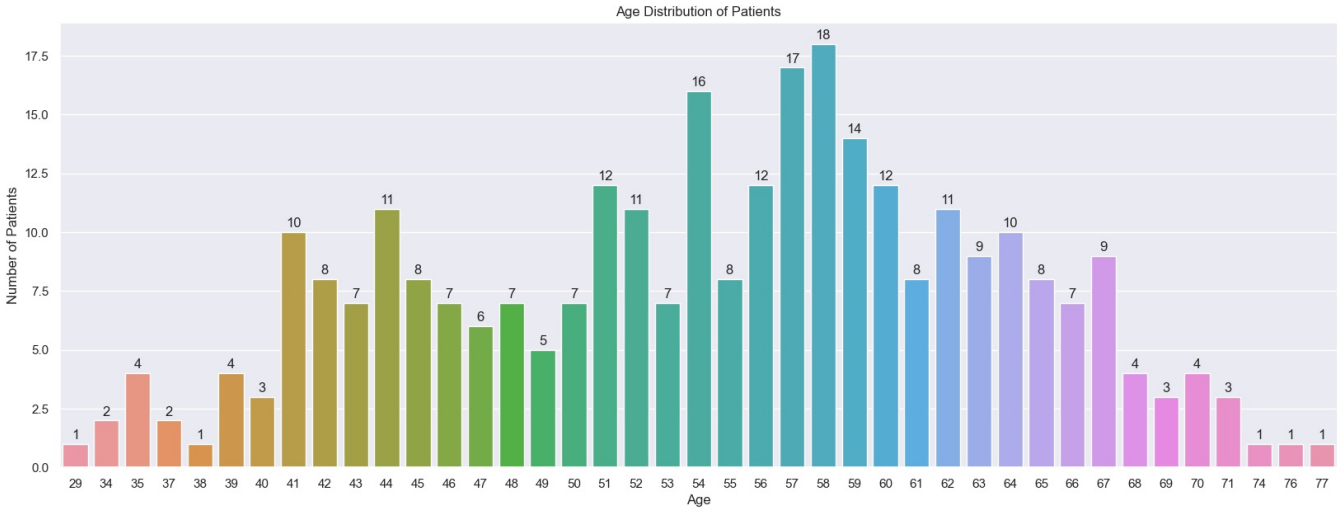
In [92]:
```
# Filter out rows with 'oldpeak' equal to 0.0
df_filtered = df[df['oldpeak'] != 0.0]

# Create the countplot
plt.figure(figsize=(20, 7))
```

```
sns.countplot(data=df_filtered, x='oldpeak', order=sorted(df_filtered['oldpeak'].unique()))

# Access bars through the current axes
for bar in plt.gca().patches:
    plt.text(bar.get_x() + bar.get_width() / 2, bar.get_height() + 0.1, int(bar.get_height()), ha='center', va=

# Add labels and title
plt.title('Tumor Size Distribution (Excluding 0.0)')
plt.ylabel('Number of Patients')
plt.xlabel('Oldpeak Value')
plt.xticks(rotation=0)  # Rotate x-axis labels for better readability
plt.show()
```



In [93]:

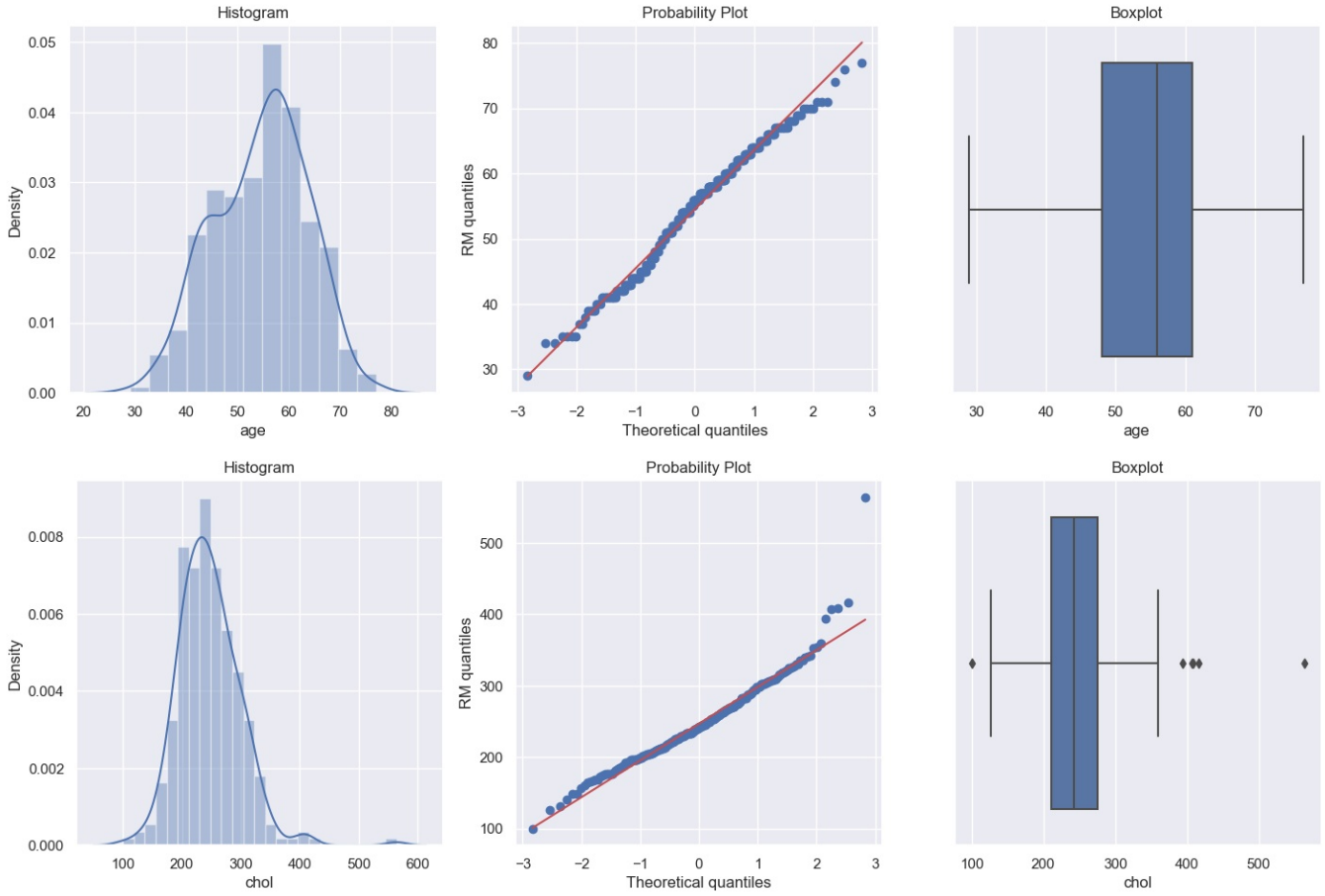
```
plt.figure(figsize=(20, 7))
# Create the countplot
sns.countplot(data=df, x='age', order=sorted(df['age'].unique()))

# Access bars through the current axes
for bar in plt.gca().patches:
    plt.text(bar.get_x() + bar.get_width() / 2, bar.get_height() + 0.1, int(bar.get_height()), ha='center', va=

# Add labels and title
plt.title('Age Distribution of Patients')
plt.ylabel('Number of Patients')
plt.xlabel('Age')
plt.show()
```



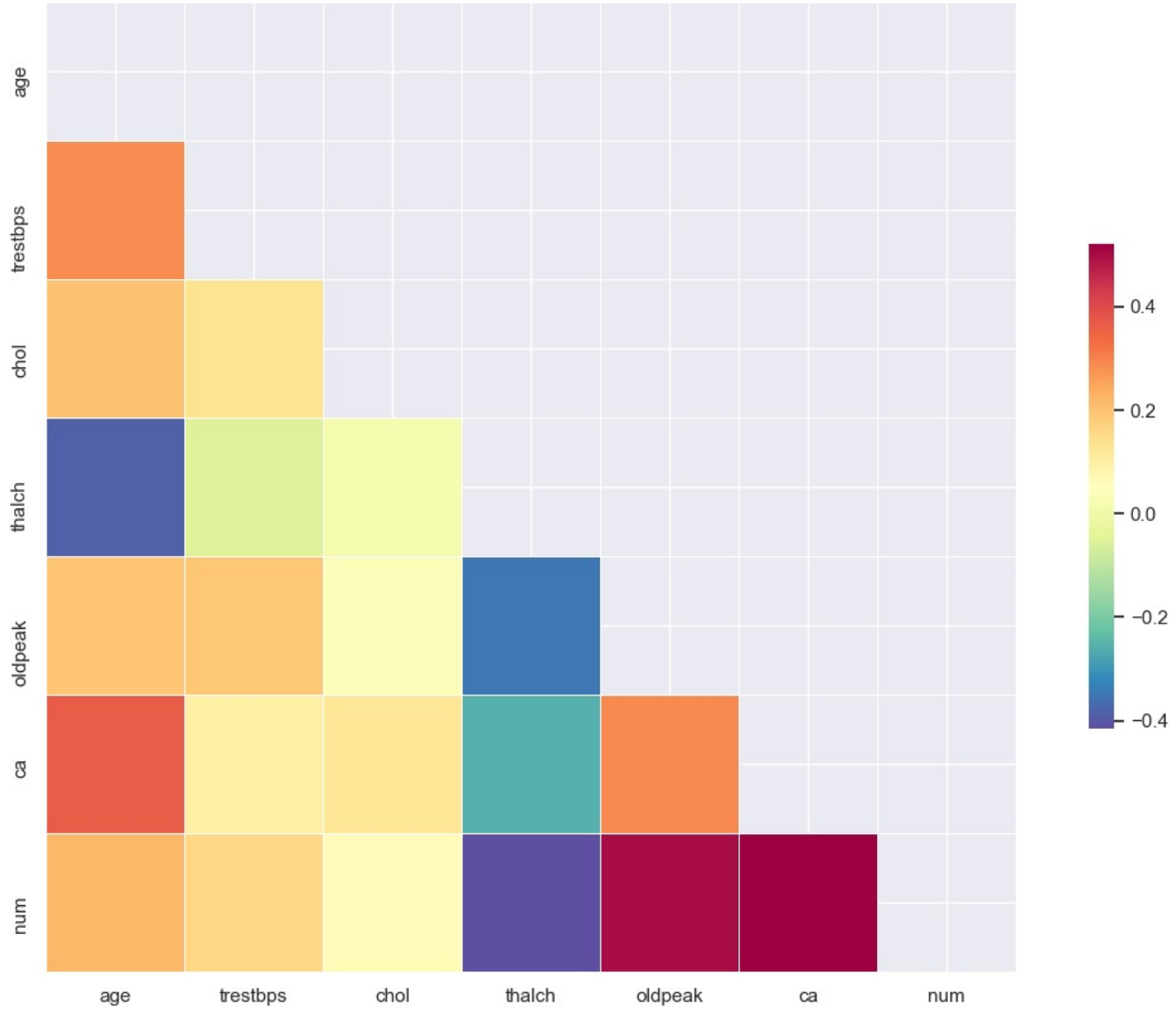
In [94]:

```
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats  # Import stats module

def diagnostic_plots(df, variable):

    plt.figure(figsize=(17, 5))
    plt.subplot(1, 3, 1)
    sns.distplot(df[variable])
    plt.title('Histogram')

    plt.subplot(1, 3, 2)
    stats.probplot(df[variable], dist="norm", plot=plt)  # Use stats.probplot
    plt.ylabel('RM quantiles')

    plt.subplot(1, 3, 3)
    sns.boxplot(x=df[variable])
    plt.title('Boxplot')
```

```
    plt.show()

for col in df[['age','chol']].select_dtypes(exclude="O").columns[:20].to_list():
     diagnostic_plots(df,col)
```



In [95]:
```
corr = df.select_dtypes('number').drop('id',axis=1).corr()
# Generate a mask for the upper triangle
mask = np.zeros_like(corr)
mask[np.triu_indices_from(mask)] = True
fig, ax = plt.subplots(figsize=(15,10))
sns.heatmap(corr, cmap='Spectral_r', mask=mask, square=True, annot=True, linewidth=0.5, cbar_kws={"shrink" : 0.
```

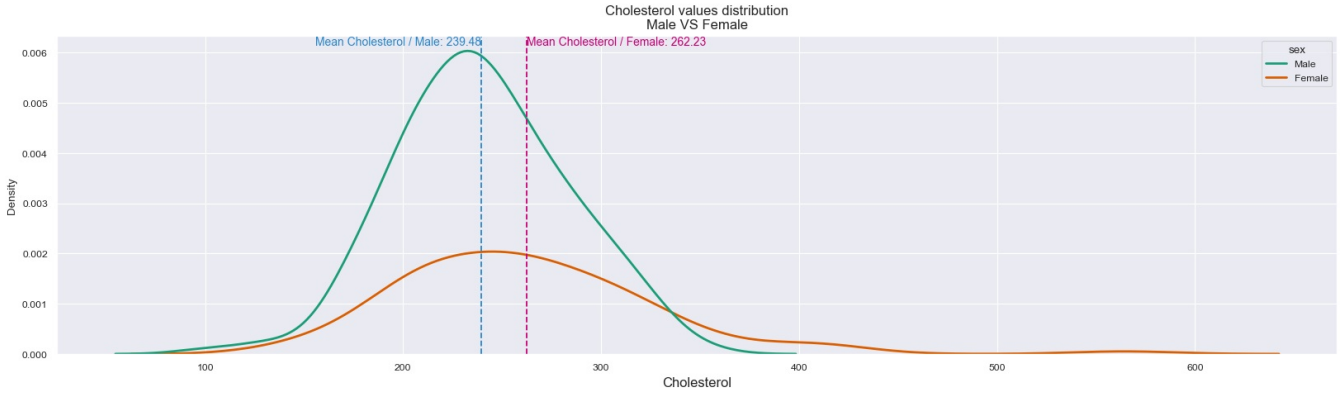


In [96]:
```
df = df.drop('id',axis=1)
df.head(2)
```

Out[96]:

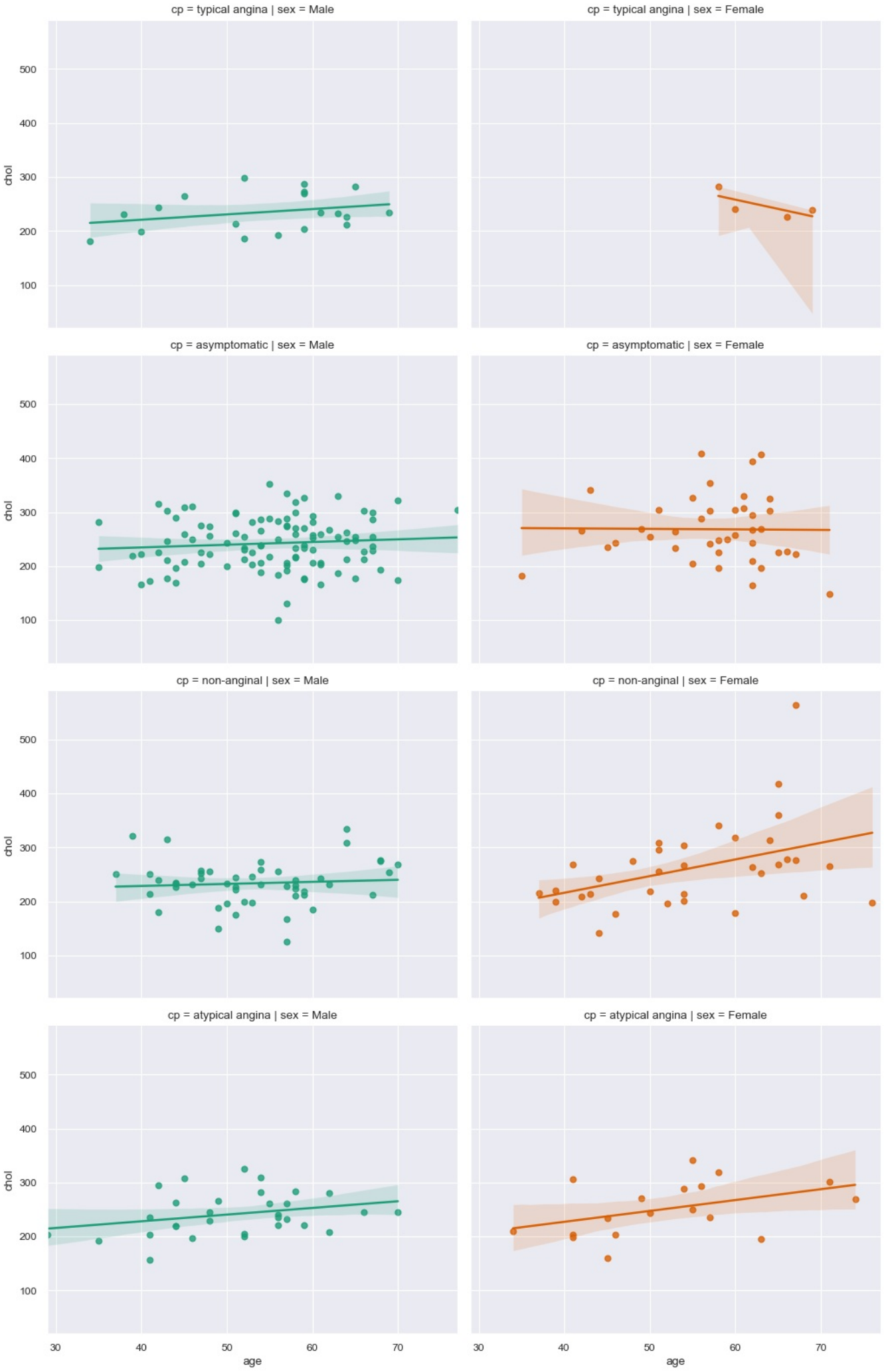
	age	sex	dataset	cp	trestbps	chol	fbs	restecg	thalch	exang	oldpeak	slope	ca	thal	num
0	63	Male	Cleveland	typical angina	145.0	233.0	True	lv hypertrophy	150.0	False	2.3	downsloping	0.0	fixed defect	0
1	67	Male	Cleveland	asymptomatic	160.0	286.0	False	lv hypertrophy	108.0	True	1.5	flat	3.0	normal	2

In [97]:
```
plt.figure(figsize=(20, 5))
sns.set_context("paper")

kdeplt = sns.kdeplot(
    data=df,
    x="chol",
    hue="sex",
    palette='Dark2',
    alpha=0.7,
    lw=2,
)

kdeplt.set_title("Cholesterol values distribution\nMale VS Female", fontsize=12)
kdeplt.set_xlabel("Cholesterol", fontsize=12)

# Calculate mean cholesterol for each sex
mean_male = df[df['sex'] == 'Male']['chol'].mean()
mean_female = df[df['sex'] == 'Female']['chol'].mean()

# Add vertical lines for mean cholesterol
plt.axvline(x=mean_male, color="#2986cc", ls="--", lw=1.3)
plt.axvline(x=mean_female, color="#c90076", ls="--", lw=1.3)

# Add text annotations
plt.text(mean_male, plt.gca().get_ylim()[1], f"Mean Cholesterol / Male: {mean_male:.2f}",
         fontsize=10, color="#2986cc", ha='right', va='top')
plt.text(mean_female, plt.gca().get_ylim()[1], f"Mean Cholesterol / Female: {mean_female:.2f}",
         fontsize=10, color="#c90076", ha='left', va='top')

plt.show()
```



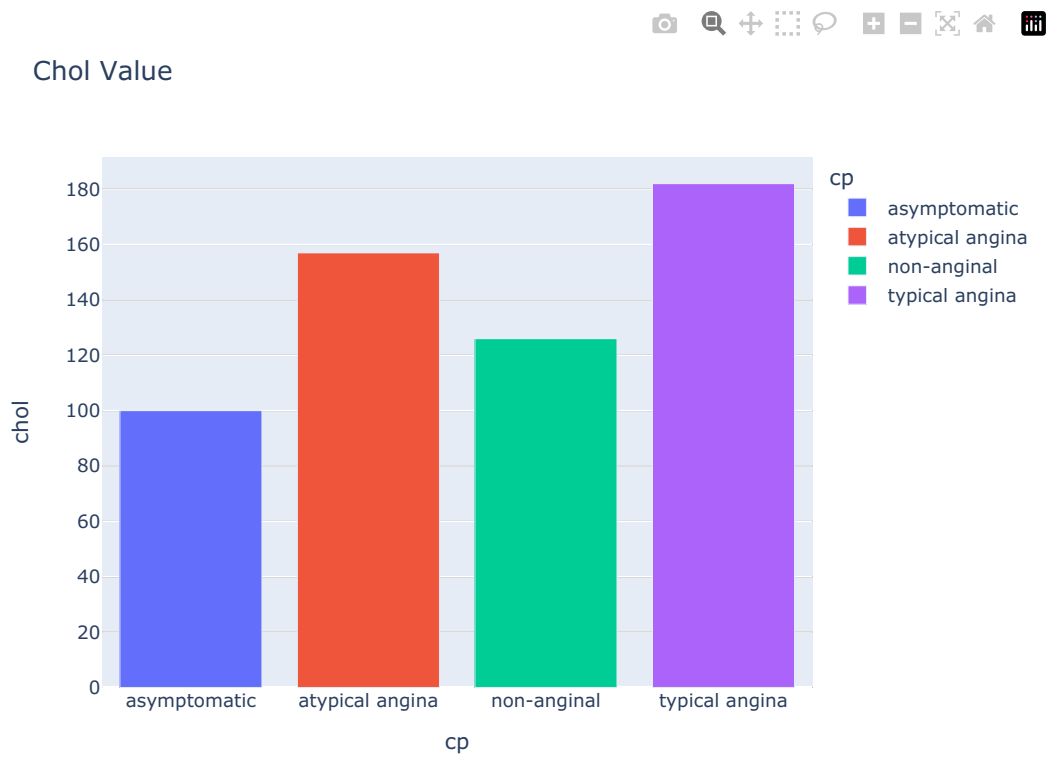
In [98]:

```
heart_df_fg = sns.FacetGrid(
    data=df,
    col="sex",
    hue="sex",
    row="cp",
    height=4,
    aspect=1.3,
    palette='Dark2',
    col_order=["Male", "Female"],
)
heart_df_fg.map_dataframe(sns.regplot, "age", "chol")
plt.show()
```



In [99]:
```
x = df.groupby("cp")["chol"].min().index
y = df.groupby("cp")["chol"].min().values
```

```
df = pd.DataFrame({'cp':x,
                   'chol':y })

fig = px.bar(df,
             x='cp',
             y='chol',
             color='cp', #color represents brand
             title='Chol Value'
            )
fig.show()
```

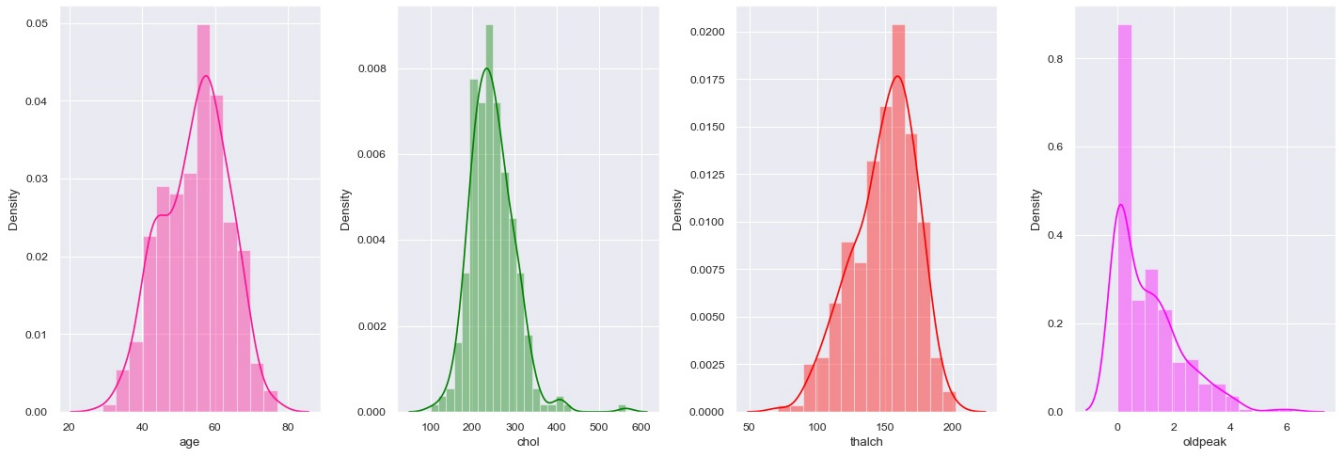


In [100…
```
df =  pd.read_csv("heart_disease_uci.csv")
df = df.dropna()
df = df.drop('id',axis =1 )
df.head(2)
```

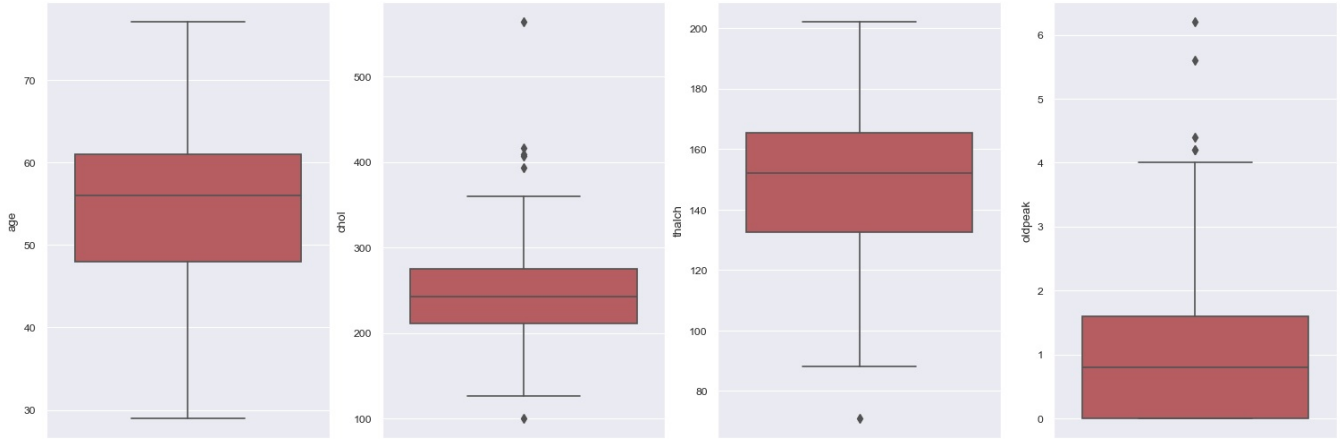
Out[100]:

	age	sex	dataset	cp	trestbps	chol	fbs	restecg	thalch	exang	oldpeak	slope	ca	thal	num
0	63	Male	Cleveland	typical angina	145.0	233.0	True	lv hypertrophy	150.0	False	2.3	downsloping	0.0	fixed defect	0
1	67	Male	Cleveland	asymptomatic	160.0	286.0	False	lv hypertrophy	108.0	True	1.5	flat	3.0	normal	2

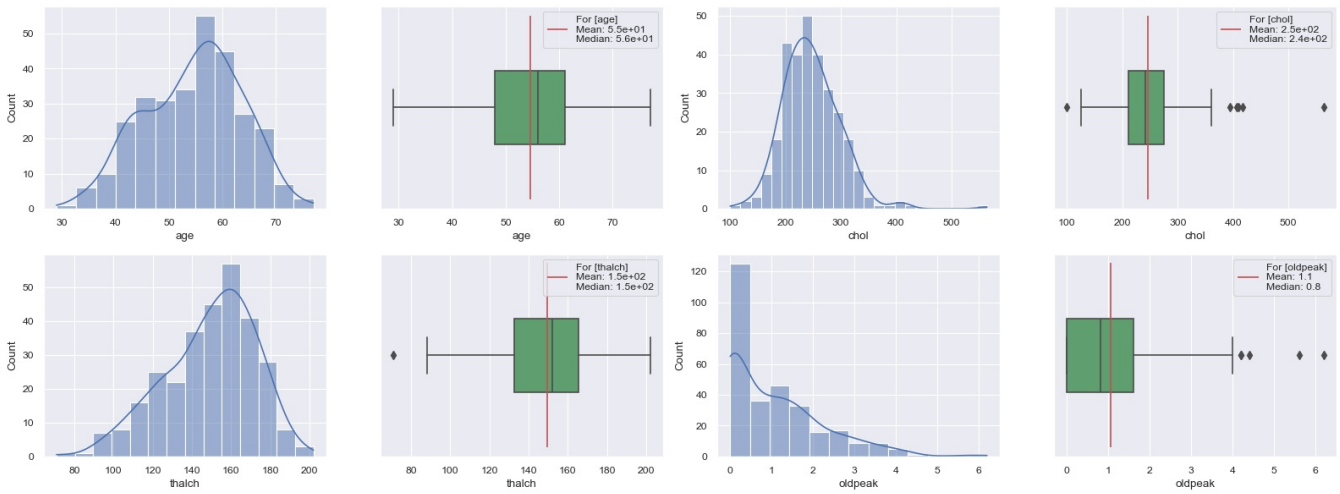
In [101…
```
plt.figure(figsize=(18,5))

plt.subplot(1,5,1)
sns.distplot(df['age'],color='DeepPink')
plt.subplot(1,5,2)
sns.distplot(df['chol'],color='Green')
plt.subplot(1,5,3)
sns.distplot(df['thalch'],color='Red')
plt.subplot(1,5,4)
sns.distplot(df['oldpeak'],color='Magenta')

plt.tight_layout()
plt.show()
```



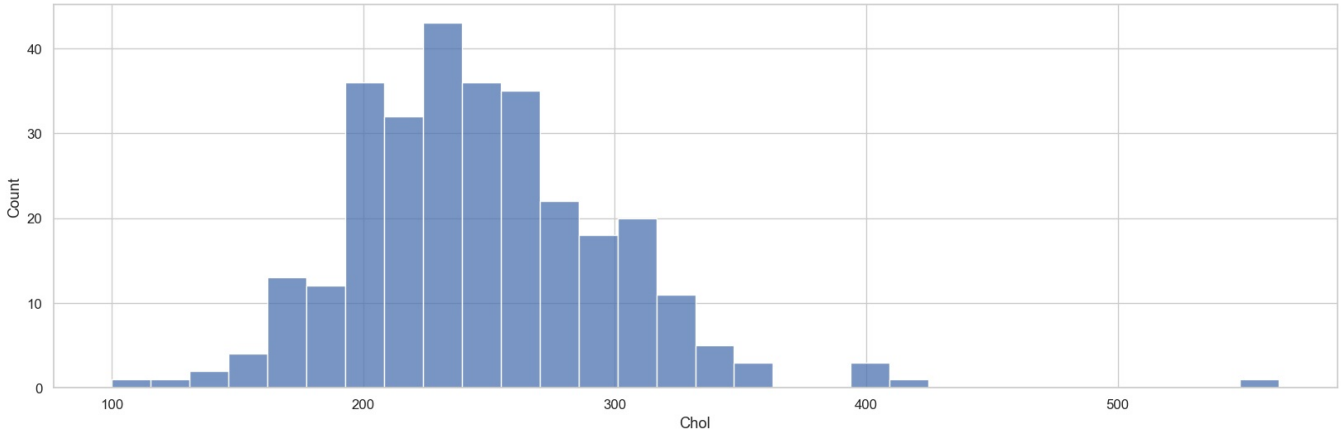
In [102…
```
df_cpy = df.copy("Deep")
df_cpy = df_cpy.select_dtypes("number")
df_cpy = df_cpy[['age','chol','thalch','oldpeak']]

fig,axis=plt.subplots(ncols=4,nrows=1,figsize=(15,5))
index=0
axis=axis.flatten()

for col,values in df_cpy.items():
    sns.boxplot(y=col,data=df_cpy,color='r',ax=axis[index])
    index+=1
plt.tight_layout(pad=0.5,w_pad=0.7,h_pad=5.0)
```



In [103…
```
df_cpy = df.copy("Deep")
df_cpy = df_cpy.select_dtypes("number")
df_cpy = df_cpy[['age','chol','thalch','oldpeak']]

flierprops = dict(markerfacecolor='g', color='g', alpha=0.5)

n_cols = 4
n_rows = int(np.ceil(df_cpy.shape[-1]*2 / n_cols))
fig, axes = plt.subplots(n_rows, n_cols, figsize=(4 * n_cols, 3 * n_rows))
for i, (col) in enumerate(list(df_cpy.columns)):
    mean = df_cpy[col].mean()
    median = df_cpy[col].median()
    sns.histplot(df_cpy[col], ax=axes.flatten()[2*i], kde=True)
    sns.boxplot(x=df_cpy[col], orient='h', ax=axes.flatten()[2*i+1], color='g')
    axes.flatten()[2*i+1].vlines(mean, ymin = -1, ymax = 1, color='r', label=f"For [{col}]\nMean: {mean:.2}\nMe
    axes.flatten()[2*i+1].legend()

    if i % n_cols == 0:
        ax.set_ylabel('Frequency')
    else:
        ax.set_ylabel('')
plt.tight_layout()
```

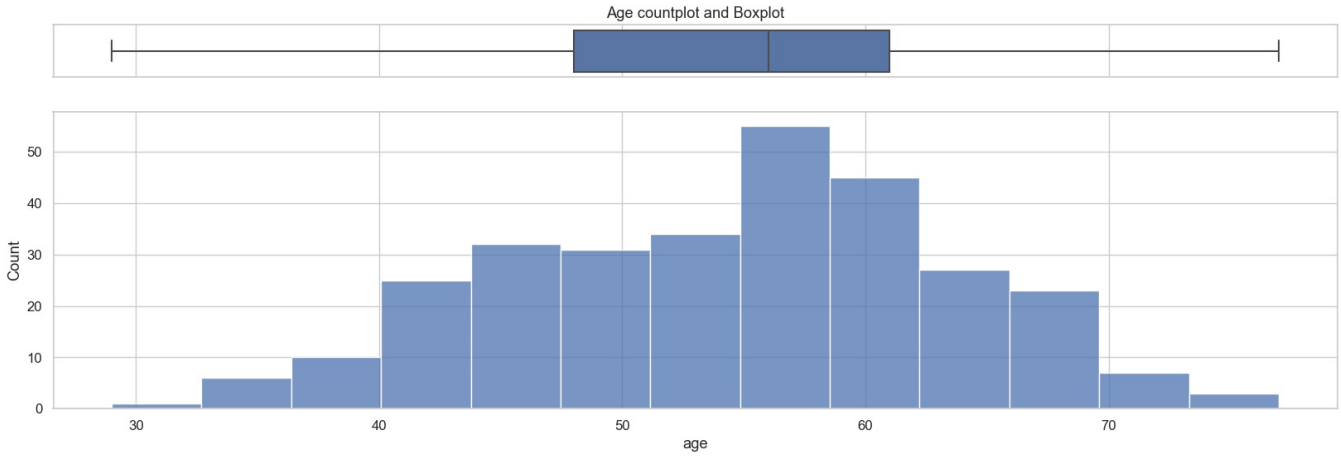


In [104…
```
sns.set(style='whitegrid', palette="deep", font_scale=1.1, rc={"figure.figsize": [20, 6]})

sns.histplot(df['chol'], bins = 30).set(xlabel = "Chol");
```



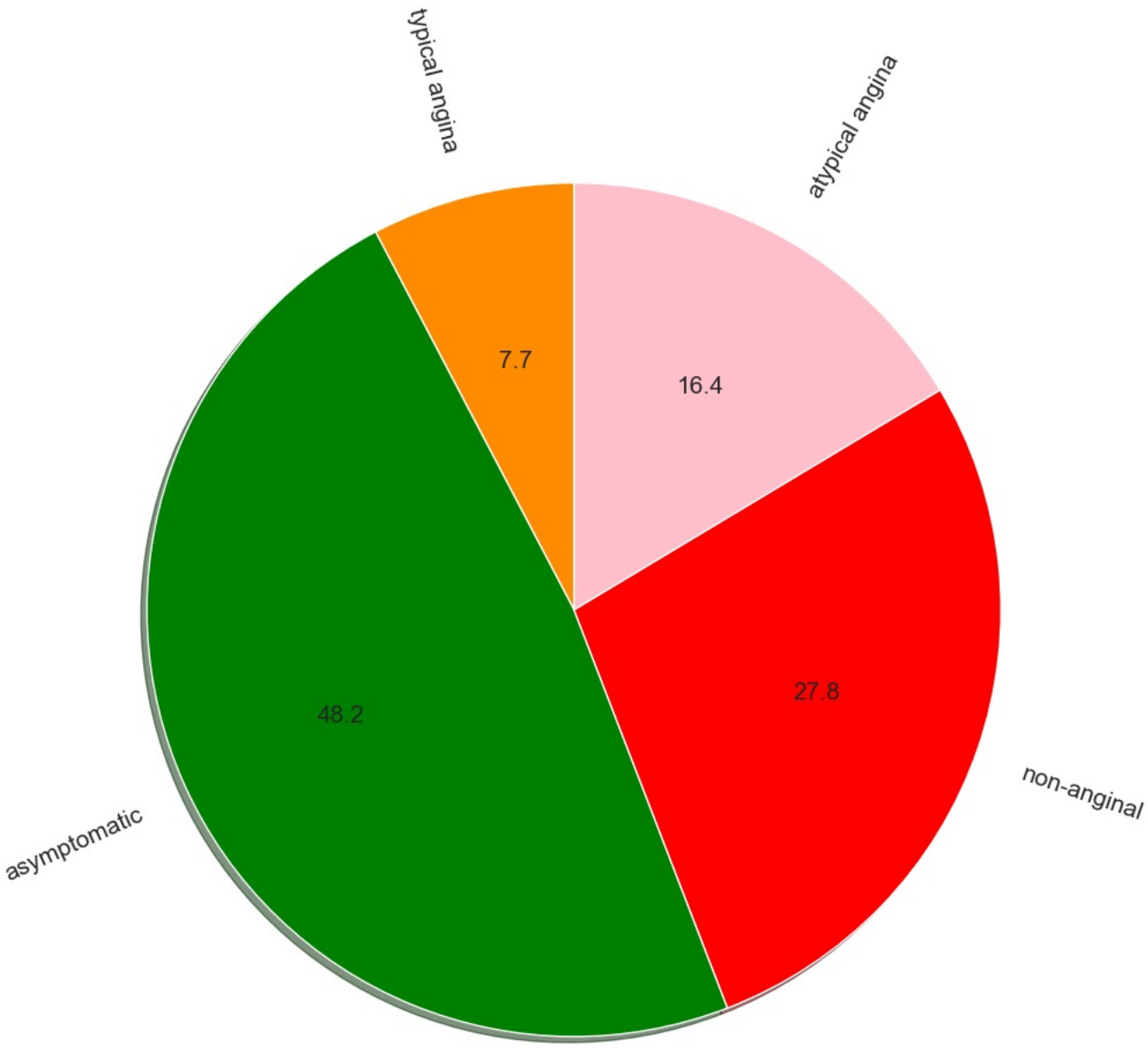
In [105…

```
df2 = df[['age','sex','chol']]

f, (ax_box, ax_hist) = plt.subplots(2, sharex=True, gridspec_kw={"height_ratios": (.15, .85)})

ax_box.title.set_text('Age countplot and Boxplot')
sns.boxplot(df2["age"], orient="h" ,ax=ax_box)
sns.histplot(data=df2, x="age", ax=ax_hist)
ax_box.set(xlabel='')
plt.show()
```



In [106…

```
#is online delivery available?
colors  = ("darkorange", "green",'Red','Pink')
explodes = [0.5, 0.5,0.75, .50]
df["cp"].value_counts(sort=False).plot.pie(colors=colors,
                                           textprops={'fontsize': 15},
                                           autopct = '%4.1f',
                                           startangle= 90,
                                           radius =2,
                                           rotatelabels=True,
                                           shadow = True) ;
```

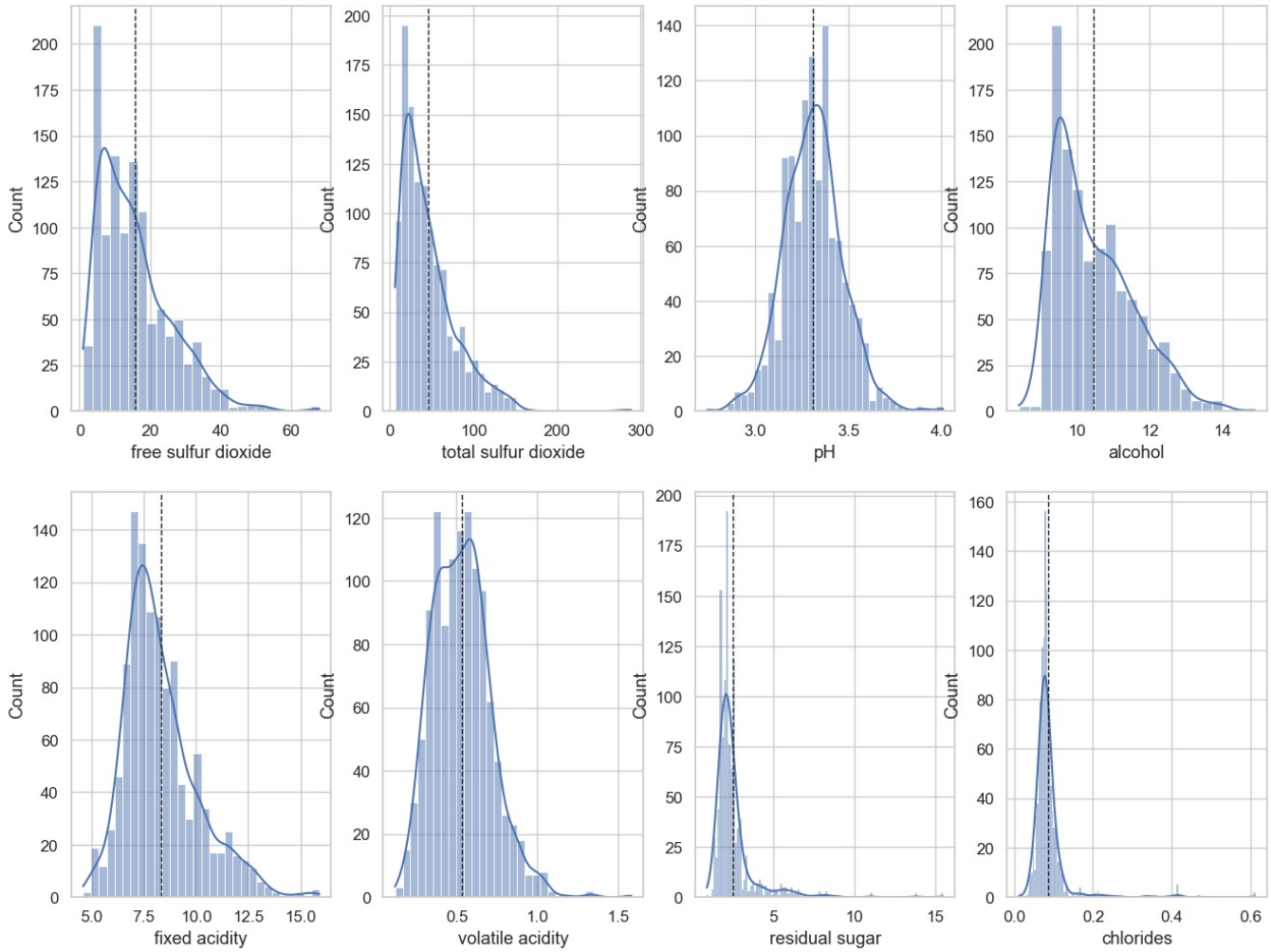


In [107…
```
wine = pd.read_csv("WineQT.csv")
wine.head(2)
```

Out[107]:

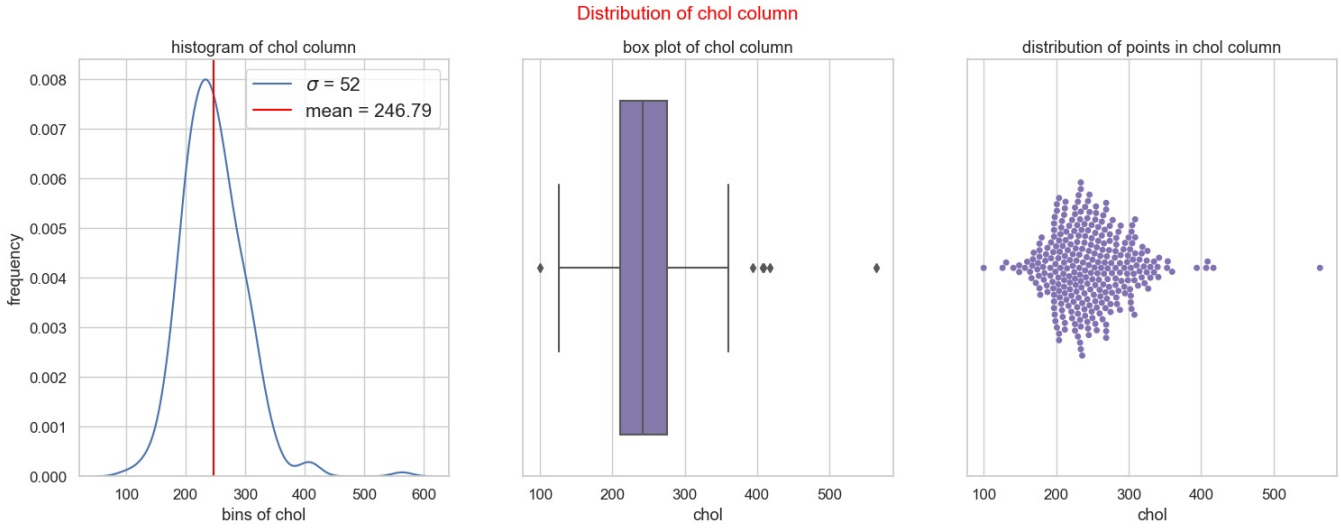
	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality	Id
0	7.4	0.70	0.0	1.9	0.08	11.0	34.0	1.0	3.51	0.56	9.4	5	0
1	7.8	0.88	0.0	2.6	0.10	25.0	67.0	1.0	3.20	0.68	9.8	5	1

In [108…
```
NUMERICAL = wine[['fixed acidity', 'volatile acidity', 'residual sugar',
       'chlorides', 'free sulfur dioxide', 'total sulfur dioxide',
       'pH', 'alcohol']]
fig, axes = plt.subplots(2, 4)
fig.set_figheight(12)
fig.set_figwidth(16)
for i,col in enumerate(NUMERICAL):
    sns.histplot(wine[col],ax=axes[(i // 4) -1 ,(i % 4)], kde = True)
    axes[(i // 4) -1 ,(i % 4)].axvline(wine[col].mean(), color='k', linestyle='dashed', linewidth=1)
```

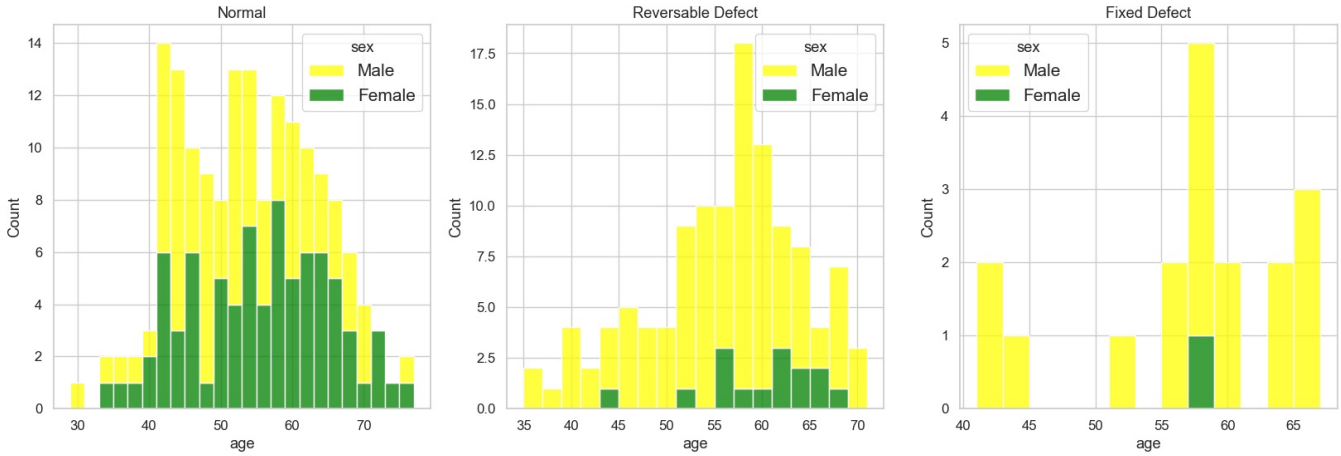


In [110…

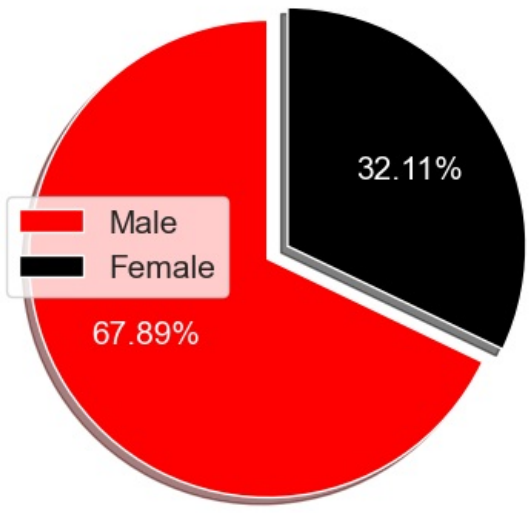
```
#set configuration for charts
plt.rcParams["figure.figsize"]=[18 , 6]
plt.rcParams["font.size"]=15
plt.rcParams["legend.fontsize"]="medium"
plt.rcParams["figure.titlesize"]="medium"

def plot_disribution(data , x ,color,bins ):
    mean = data[x].mean()
    std = data[x].std()
    info=dict(data = data , x = x , color = color)
    plt.subplot(1 , 3 , 1 , title =f"Ditstribution of {x} column")
    sns.distplot(a=data[x] , bins = bins)
    plt.xlabel(f"bins of {x}")
    plt.axvline(mean , label ="mean" , color ="red")
    plt.ylabel("frequency")
    plt.legend(["${\sigma}$ = %d"%std , f"mean = {mean:.2f}"])
    plt.title(f"histogram of {x} column")
    plt.subplot(1 , 3 , 2)
    sns.boxplot(**info)
    plt.xlabel(f"{x}")
    plt.title(f"box plot of {x} column")
    plt.subplot(1 , 3 , 3)
    sns.swarmplot(**info)
    plt.xlabel(f"{x}")
    plt.title(f"distribution of points in {x} column")
    plt.suptitle(f"Distribution of {x} column" , fontsize =15 , color="red")
plt.show()

age_bins = np.arange(29 , 77+5 , 5)
base_color = sns.color_palette()[4]
plot_disribution(data = df , x ="chol" , color = base_color , bins=age_bins)
```



In [111…
```
plot , ax = plt.subplots(1 , 3 , figsize=(20,6))
sns.histplot(data = df.loc[df["thal"]== 'normal'] , x = "age" , hue = "sex",binwidth=2,ax = ax[0],palette = sns
sns.histplot(data = df.loc[df["thal"]== 'reversable defect'] , x = "age" , hue = "sex",binwidth=2,ax = ax[1],pa
sns.histplot(data = df.loc[df["thal"]== 'fixed defect'] , x = "age" , hue = "sex",binwidth=2,ax = ax[2],palette
plt.show()
```

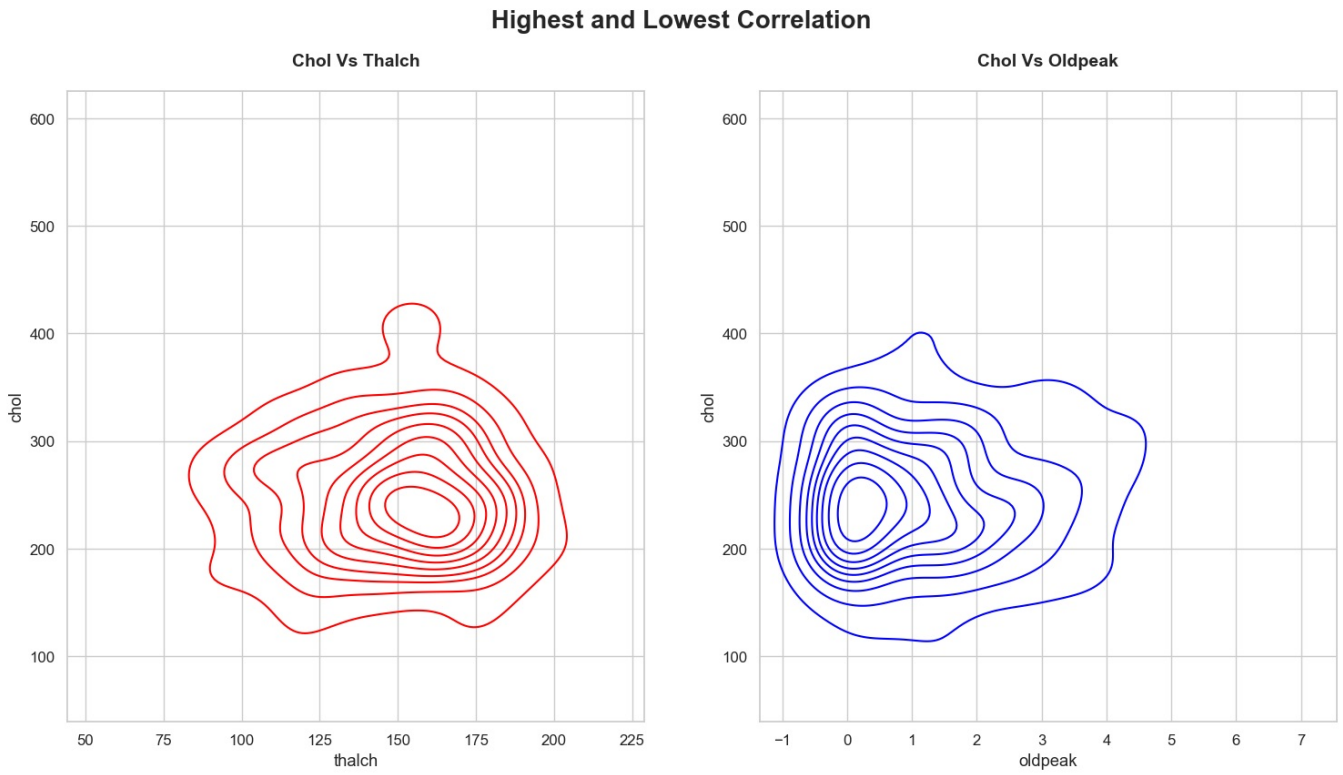


In [112…
```
sex = ["Male", "Female"]
values = df["sex"].value_counts()
color = ["#FF0000", "#000000"]

plt.figure(figsize = (5, 7))
plt.pie(values, labels = sex, colors = color, explode = (0.1, 0), textprops = {"color":"w"}, autopct = "%.2f%%"

plt.legend();
```



In [113…
```
#plotting
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(18, 9))
fig.suptitle(' Highest and Lowest Correlation ', size = 20, weight='bold')
axs = [ax1, ax2]
```

```
#kdeplot
sns.kdeplot(data=df, y='chol', x='thalch', ax=ax1, color="red")
ax1.set_title('Chol Vs Thalch', size = 14, weight='bold', pad=20)

#kdeplot
sns.kdeplot(data=df, y='chol', x='oldpeak', ax=ax2, color='Blue')
ax2.set_title('Chol Vs Oldpeak', size = 14, weight='bold', pad=20);
```

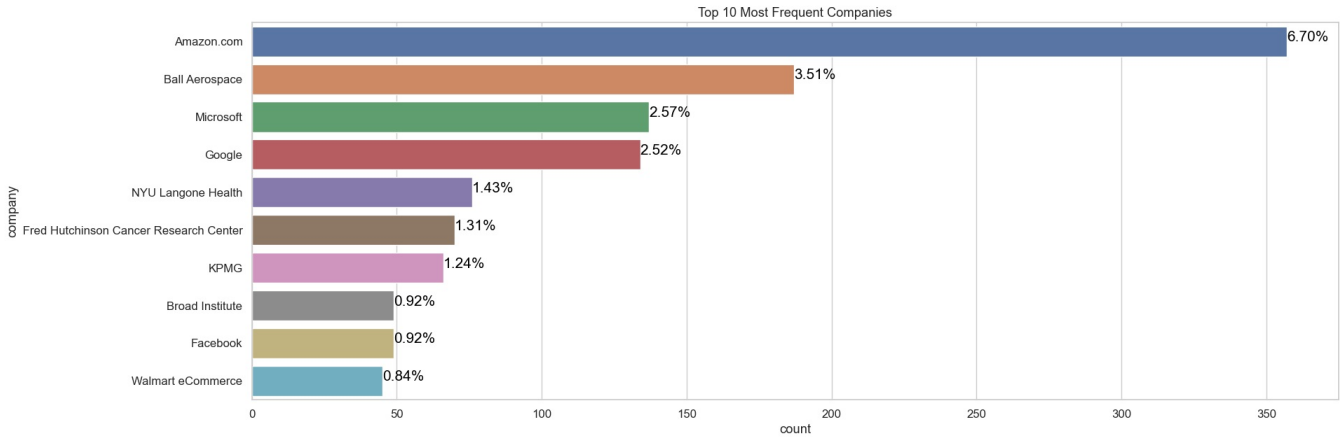


In [114…
```
df1 = pd.read_csv('US_Job_Market.csv')
df1 = df1.dropna().reset_index()
df1 = df1.drop('index',axis=1)
df1.head(2)
```

Out[114]:

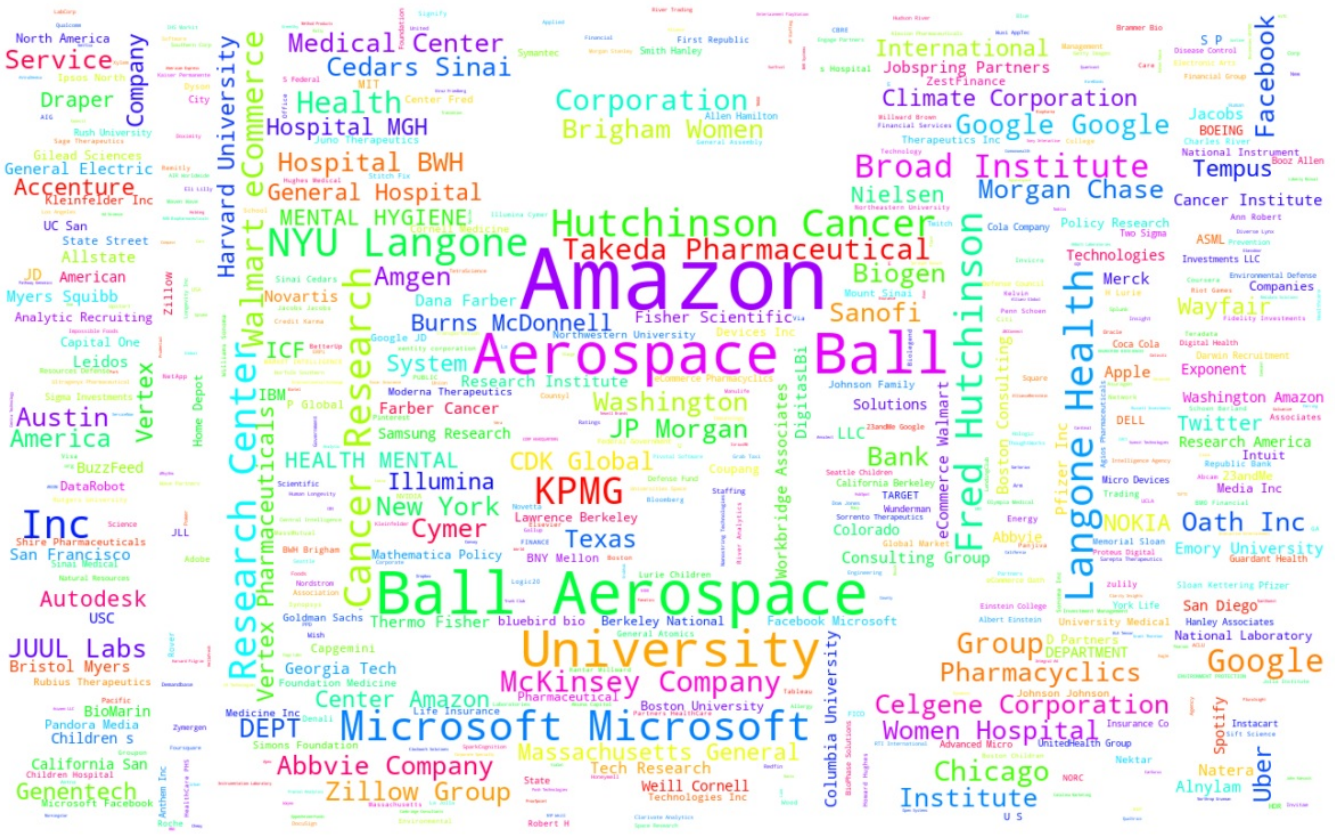
	position	company	description	reviews	location
0	Data Analyst	Operation HOPE	DEPARTMENT: Program OperationsPOSITION LOCATIO...	44.0	Atlanta, GA 30303
1	Assistant Professor -TT - Signal Processing & ...	Emory University	DESCRIPTION\nThe Emory University Department o...	550.0	Atlanta, GA

In [115…
```
plt.figure(figsize=(20, 7))

# Filter for the top 10 most frequent companies
df_v = df1['company'].value_counts().head(10).reset_index()
df_v.columns = ['company', 'count']

# Calculate the percentage
total = df1['company'].value_counts().sum()
df_v['percentage'] = (df_v['count'] / total) * 100

# Create the bar plot
plot = sns.barplot(y='company', x='count', data=df_v)

# Annotate the bars with the percentage
for index, row in df_v.iterrows():
    plot.text(row['count'], index, f"{row['percentage']:.2f}%", color='black', ha="left")

plt.xticks(rotation=0)
plt.title('Top 10 Most Frequent Companies')
plt.show()
```



In [116…

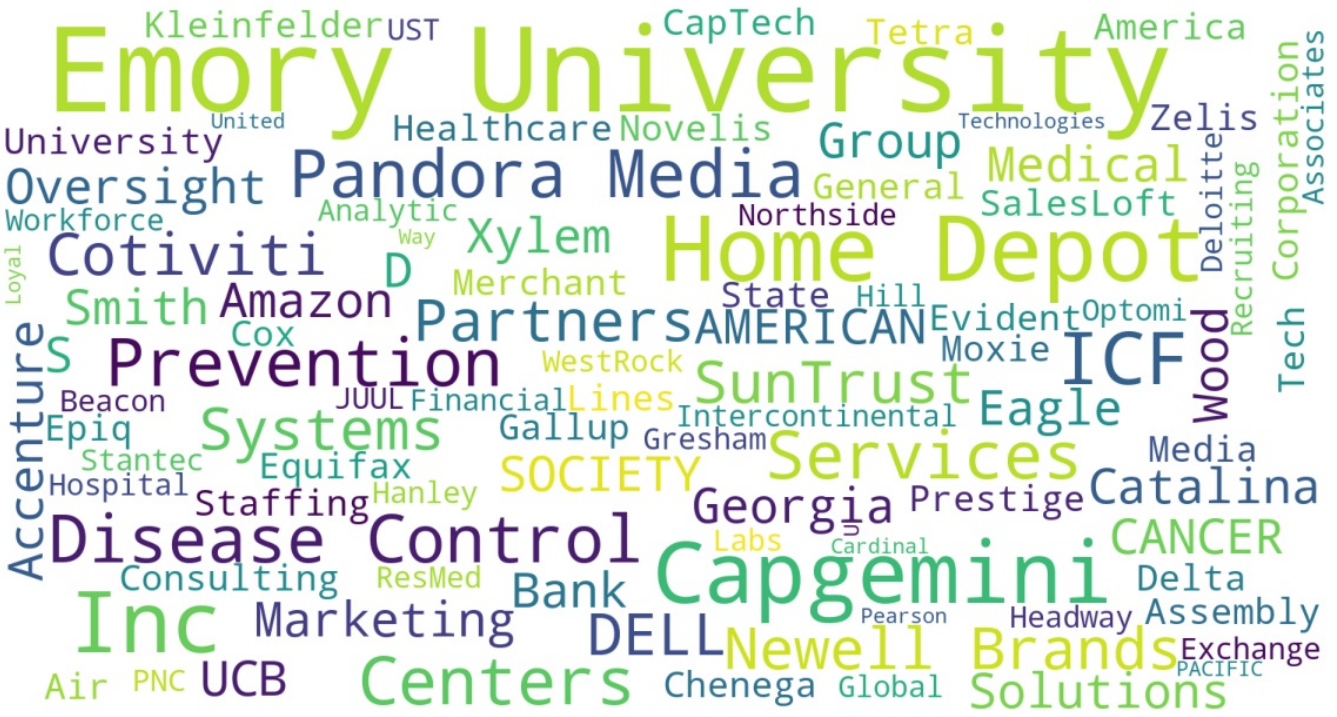
```
from PIL import Image
import matplotlib.pyplot as plt
import numpy as np
from wordcloud import WordCloud, STOPWORDS
import pandas as pd
import requests
from io import BytesIO

# Download mask image
mask_url = "https://cdn.pixabay.com/photo/2013/07/12/17/47/test-pattern-152459_1280.png"
response = requests.get(mask_url)
mask_image = Image.open(BytesIO(response.content))
wordcloud_mask = np.array(mask_image)

# Generate word cloud
plt.figure(figsize=(15,15))
all_text = " ".join(df1['company'].values.tolist())
wordcloud = WordCloud(width=800,
                      height=800,
                      stopwords=STOPWORDS,
                      background_color='white',
                      max_words=800,
                      colormap="hsv",
                      mask=wordcloud_mask).generate(all_text)

# Display the word cloud
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.show()
```



In [117…

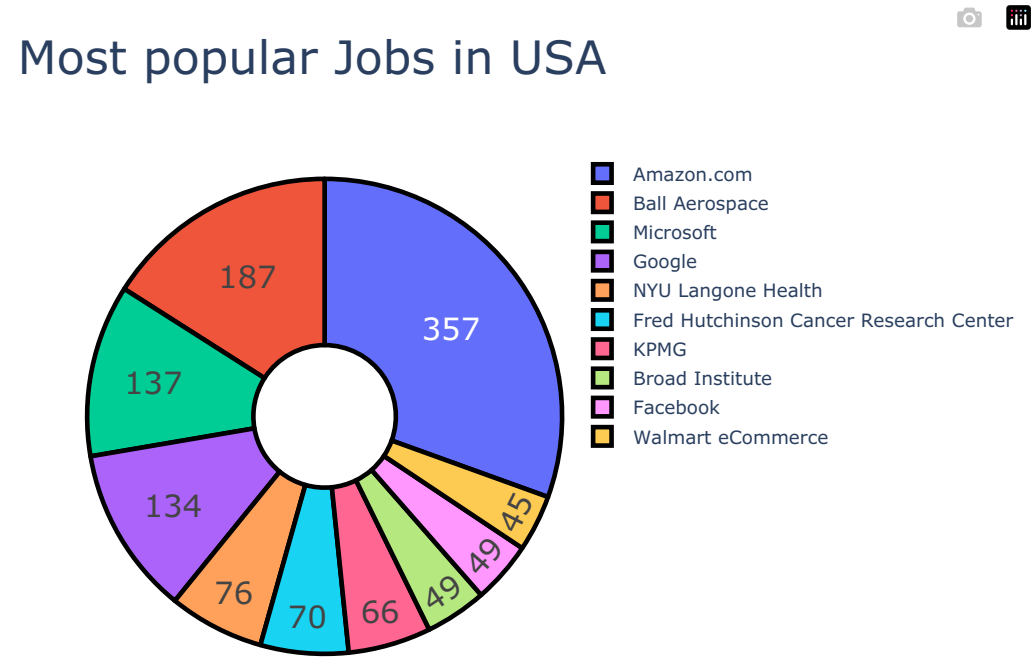
```
from wordcloud import WordCloud

# create a word cloud for positive reviews
positive_reviews = df1[df1['location'] == 'Atlanta, GA']['company'].str.cat(sep=' ')
```

```
positive_cloud = WordCloud(width=1500, height=800, max_words=100, background_color='white').generate(positive_r

plt.figure(figsize=(20, 6), facecolor=None)
plt.imshow(positive_cloud)
plt.axis("off")
plt.tight_layout(pad=0)
plt.show()
```



In [118…

```
import plotly.graph_objs as go
values = df1['company'].value_counts()[:10]
labels=values.index
text=values.index
fig = go.Figure(data=[go.Pie(values=values,labels=labels,hole=.3)])
fig.update_traces(hoverinfo='label+percent', textinfo='value', textfont_size=20,
                  marker=dict(line=dict(color='#000000', width=3)))
fig.update_layout(title="Most popular Jobs in USA",
                  titlefont={'size': 30},
                  )
fig.show()
```

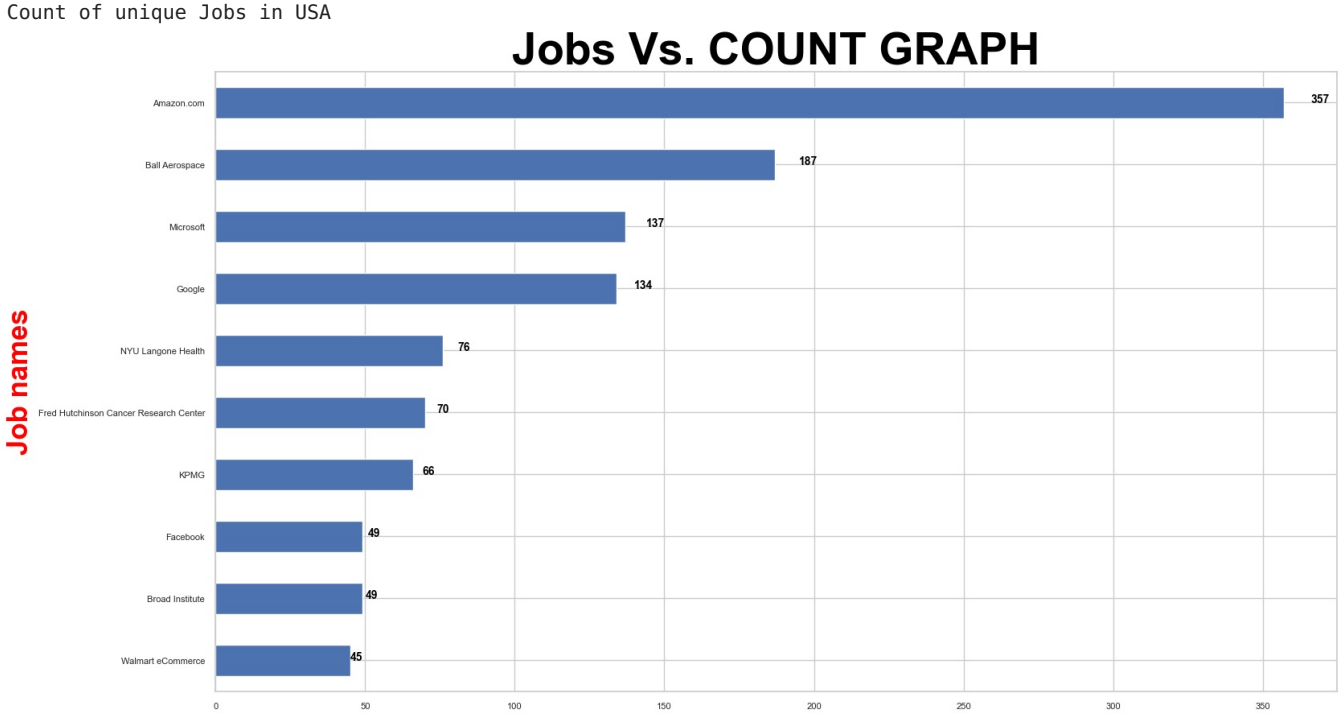


In [119…

```
print("Count of unique Jobs in USA")
locationCount=df1['company'].value_counts().head(10).sort_values(ascending=True)
locationCount
```

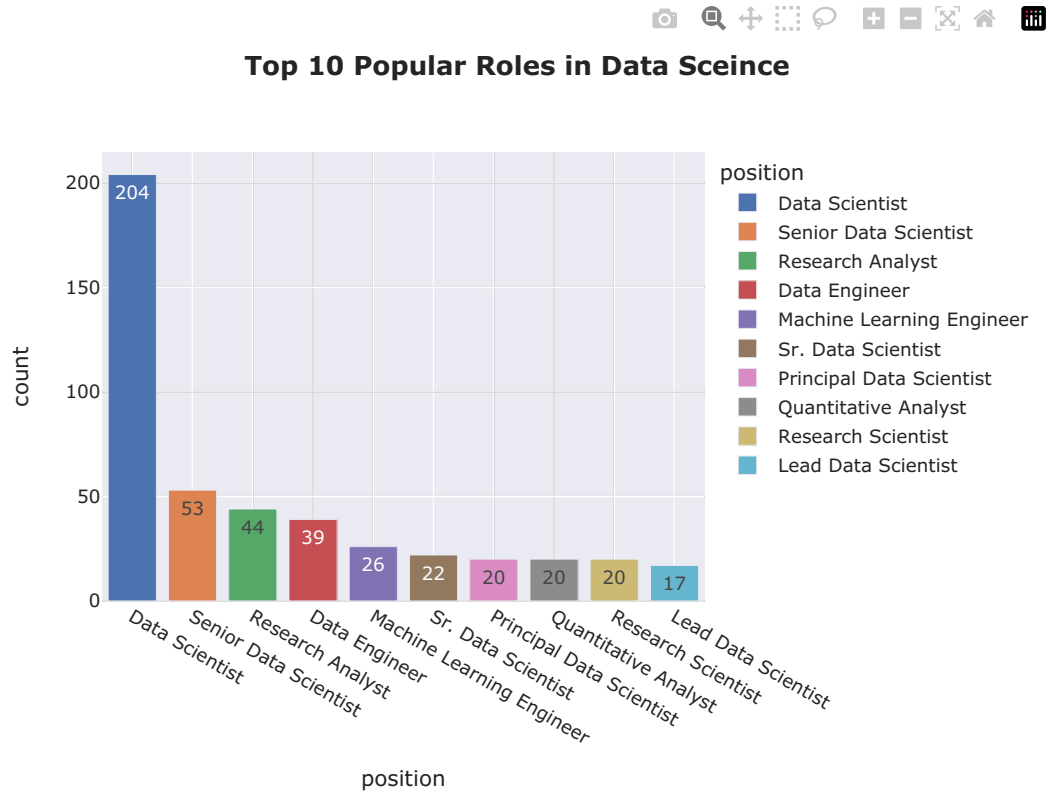
```
fig=plt.figure(figsize=(18,10))
locationCount.plot(kind="barh",fontsize=8)
plt.ylabel("Job names",fontsize=25,color="red",fontweight='bold')
plt.title("Jobs Vs. COUNT GRAPH",fontsize=40,color="BLACK",fontweight='bold')
for v in range(len(locationCount)):
    plt.text(v+locationCount[v],v,locationCount[v],fontsize=10,color="BLACK",fontweight='bold')
```

```
Count of unique Jobs in USA
```



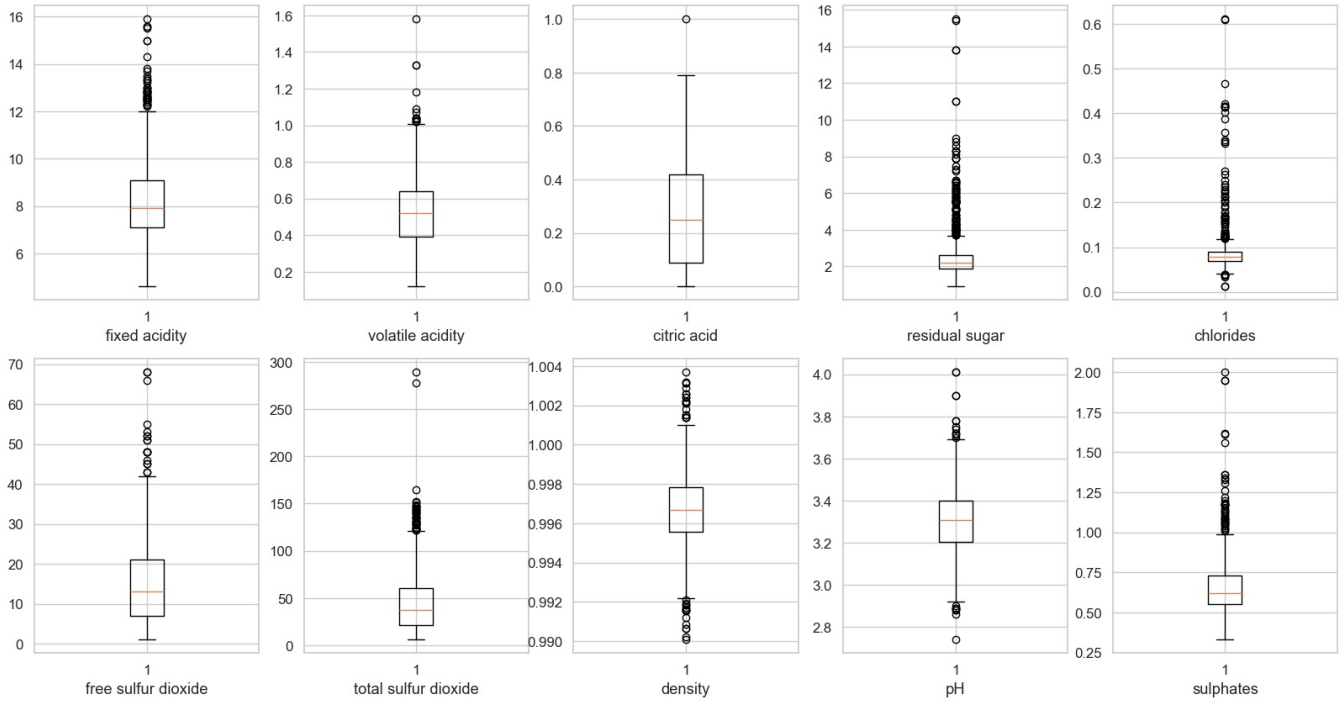
In [120…

```
z=df1['position'].value_counts().head(10)
fig=px.bar(z,x=z.index,y=z.values,color=z.index,text=z.values,labels={'index':'job title','y':'count','text':'c
fig.show()
```

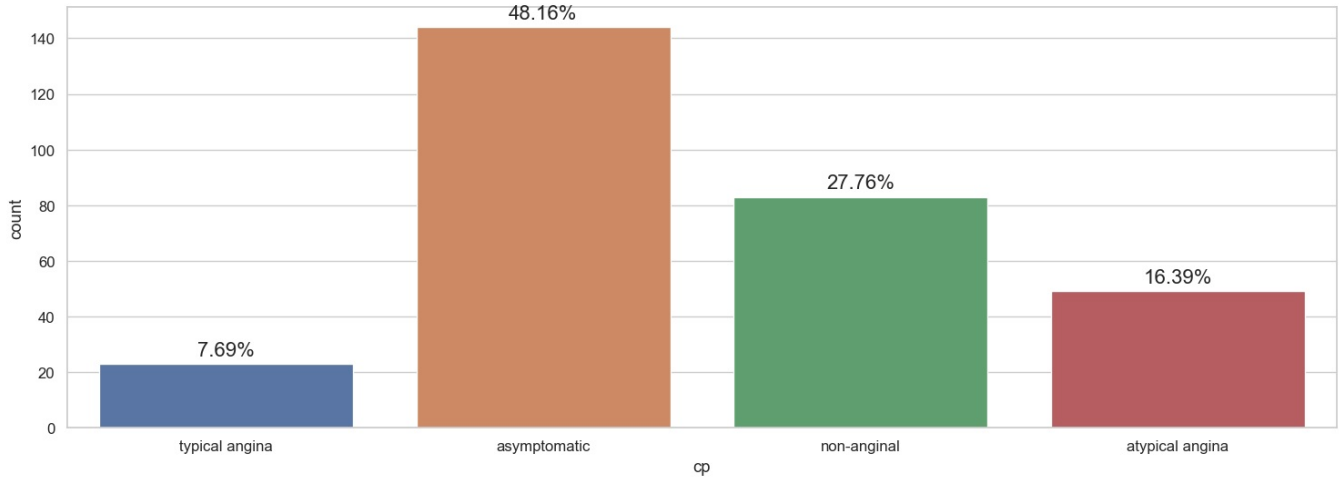


In [121…

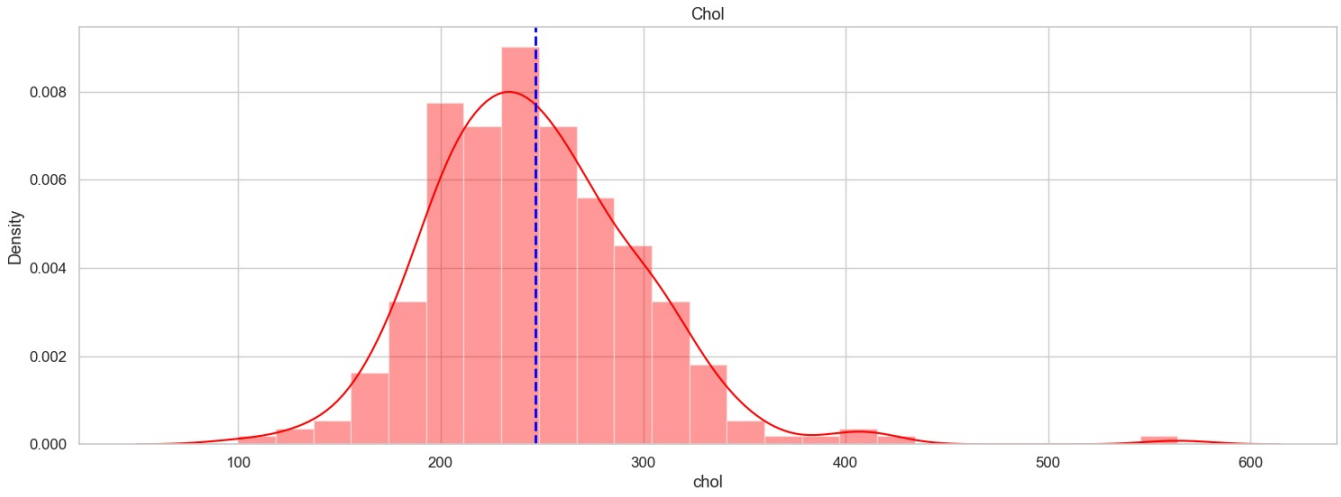
```
# Plotting Outliers
col = 1
plt.figure(figsize = (20, 10))
for i in wine.columns:
    if col < 11:
        plt.subplot(2, 5, col)
        plt.boxplot(wine[i])
        plt.xlabel(i)
    col = col + 1
```



In [122…
```
s = sns.countplot(x = 'cp',data = df)
sizes=[]
for p in s.patches:
    height = p.get_height()
    sizes.append(height)
    s.text(p.get_x()+p.get_width()/2.,
           height + 3,
           '{:1.2f}%'.format(height/len(df)*100),
           ha="center", fontsize=16)
```



In [123…
```
#checking the target variables for distribution
sns.distplot(df['chol'],color='Red')
plt.axvline(x=df['chol'].mean(), color='Blue', linestyle='--', linewidth=2)
plt.title('Chol');
```



In [124…
```
wine.iloc[:, :-1].describe().T.sort_values(by='std' , ascending = False)\
                    .style.background_gradient(cmap='GnBu')\
```

```
                .bar(subset=["max"], color='#BB0000')\
                .bar(subset=["mean",], color='green')
```

Out[124]:

	count	mean	std	min	25%	50%	75%	max
total sulfur dioxide	1143.000000	45.914698	32.782130	6.000000	21.000000	37.000000	61.000000	289.000000
free sulfur dioxide	1143.000000		10.250486	1.000000	7.000000	13.000000	21.000000	
fixed acidity	1143.000000		1.747595	4.600000	7.100000	7.900000	9.100000	
residual sugar	1143.000000		1.355917	0.900000	1.900000	2.200000	2.600000	
alcohol	1143.000000		1.082196	8.400000	9.500000	10.200000	11.100000	
quality	1143.000000		0.805824	3.000000	5.000000	6.000000	6.000000	
citric acid	1143.000000		0.196686	0.000000	0.090000	0.250000	0.420000	
volatile acidity	1143.000000		0.179633	0.120000	0.392500	0.520000	0.640000	
sulphates	1143.000000		0.170399	0.330000	0.550000	0.620000	0.730000	
pH	1143.000000		0.156664	2.740000	3.205000	3.310000	3.400000	
chlorides	1143.000000		0.047267	0.012000	0.070000	0.079000	0.090000	
density	1143.000000		0.001925	0.990070	0.995570	0.996680	0.997845	

In [125…

```
df[df["age"] >= 50].describe().style.background_gradient(cmap='RdPu')
```

Out[125]:

	age	trestbps	chol	thalch	oldpeak	ca	num
count	213.000000	213.000000	213.000000	213.000000	213.000000	213.000000	213.000000
mean	59.159624	134.793427	252.220657	144.708920	1.214085	0.835681	1.103286
std	5.731645	18.575307	54.953695	22.377966	1.197004	0.969460	1.280713
min	50.000000	94.000000	100.000000	71.000000	0.000000	0.000000	0.000000
25%	55.000000	120.000000	214.000000	130.000000	0.100000	0.000000	0.000000
50%	58.000000	132.000000	246.000000	148.000000	1.000000	1.000000	1.000000
75%	63.000000	145.000000	283.000000	161.000000	1.800000	1.000000	2.000000
max	77.000000	200.000000	564.000000	195.000000	6.200000	3.000000	4.000000

In [126…

```
def highlight_min(s, props=''):
    return np.where(s == np.nanmin(s.values), props, '')
df.describe().style.apply(highlight_min, props='color:yellow;background-color:Grey', axis=0)
```

Out[126]:

	age	trestbps	chol	thalch	oldpeak	ca	num
count	299.000000	299.000000	299.000000	299.000000	299.000000	299.000000	299.000000
mean	54.521739	131.715719	246.785953	149.327759	1.058528	0.672241	0.946488
std	9.030264	17.747751	52.532582	23.121062	1.162769	0.937438	1.230409
min	29.000000	94.000000	100.000000	71.000000	0.000000	0.000000	0.000000
25%	48.000000	120.000000	211.000000	132.500000	0.000000	0.000000	0.000000
50%	56.000000	130.000000	242.000000	152.000000	0.800000	0.000000	0.000000
75%	61.000000	140.000000	275.500000	165.500000	1.600000	1.000000	2.000000
max	77.000000	200.000000	564.000000	202.000000	6.200000	3.000000	4.000000

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