Homework 1

Instructions

- Insert the code and generate the figures you need to solve the problems using this notebook.

Problem - Analysis of heart disease data set

Cardiovascular diseases (CVDs), commonly known as heart disease, are the leading cause of death worldwide, accounting for 17.9 million deaths annually. Contributing factors to CVDs include hypertension, diabetes, overweight, and unhealthy lifestyles.

The dataset contains 14 features or attributes from 900 patients; however, published studies chose only 14 features that are relevant in predicting heart disease.

Below you can see the description of each column (this is often called meta data)

Medical Data Dictionary (Metadata)

Age

Sex

- Male: `1`
- Female: `0`

Chest Pain Type

- Value 1: Typical angina
- Value 2: Atypical angina
- Value 3: Non-anginal pain
- Value 4: Asymptomatic

Resting Blood Pressure

- In mm Hg on admission to the hospital

Serum Cholesterol

- In mg/dl

Fasting Blood Sugar

- (Fasting blood sugar > 120 mg/dl): `1` = True, `0` = False

Resting Electrocardiographic Results

- Value 0: Normal

- Value 1: Having ST-T wave abnormality (T wave inversions and/or ST elevation or depression of > 0.05 mV)
- Value 2: Showing probable or definite left ventricular hypertrophy by Estes' criteria

Thalach

- Maximum heart rate achieved

Exercise Induced Angina

- `1` = Yes
- `0` = No

Angina is chest pain or discomfort caused when your heart muscle doesn't get enough oxygen-rich blood. It may feel like pressure or squeezing in your chest.

Oldpeak

- ST depression induced by exercise relative to rest

Slope

- The slope of the peak exercise ST segment
  - Value 1: Upsloping
  - Value 2: Flat
  - Value 3: Downsloping

Vessels Colored by Flouroscopy

- Number of major vessels (0-3) colored by flouroscopy

Thalassemia

- A blood disorder called thalassemia
  - Value 3: Normal
  - Value 6: Fixed defect
  - Value 7: Reversable defect

Target

- `0` = No Heart Disease
- `1` = Heart Disease

1. Read the data into a pandas dataframe and assign it to a variable named `df`

```
## Place your code here

import pandas as pd
df = pd.read_csv("heart_disease_uci.csv")
```

2. Print the first five rows of the data set.

```
## Place your code here
```

```
df.head(5)
```

	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
2	3	67	Male	Cleveland	asymptomatic	120.0	229.0	False	lv hypertrophy	129.0	True	2.6	flat	2.0	reversable defect	1
3	4	37	Male	Cleveland	non-anginal	130.0	250.0	False	normal	187.0	False	3.5	downsloping	0.0	normal	0
4	5	41	Female	Cleveland	atypical angina	130.0	204.0	False	lv hypertrophy	172.0	False	1.4	upsloping	0.0	normal	0

3. Print the last five rows of the data set. (Hint: There's a function similar to `pd.head` for it)

```
## Place your code here

df.tail(5)
```

	id	age	sex	dataset	cp	trestbps	chol	fbs	restecg	thalch	exang	oldpeak	slope	ca	thal	num
915	916	54	Female	VA Long Beach	asymptomatic	127.0	333.0	True	st-t abnormality	154.0	False	0.0	NaN	NaN	NaN	1
916	917	62	Male	VA Long Beach	typical angina	NaN	139.0	False	st-t abnormality	NaN	NaN	NaN	NaN	NaN	NaN	0
917	918	55	Male	VA Long Beach	asymptomatic	122.0	223.0	True	st-t abnormality	100.0	False	0.0	NaN	NaN	fixed defect	2
918	919	58	Male	VA Long Beach	asymptomatic	NaN	385.0	True	lv hypertrophy	NaN	NaN	NaN	NaN	NaN	NaN	0
919	920	62	Male	VA Long Beach	atypical angina	120.0	254.0	False	lv hypertrophy	93.0	True	0.0	NaN	NaN	NaN	1

4. Count the number of rows in the data and assign it to `n_rows` variable and print.

```
## Place your code here

n_rows = df.shape[0]
print(n_rows)
```

```
920
```

5. Count the number of missing values in each variable of the data frame. Assing it the variable `missing_count` and print

```
## Place your code here
```

```
missing_count = df.isna().sum()
print(missing_count)
```

```
id            0
age           0
sex           0
dataset       0
cp            0
trestbps     59
chol         30
fbs          90
restecg       2
thalch       55
exang        55
oldpeak      62
slope       309
ca          611
thal        486
num           0
dtype: int64
```

6. Calulculate the percentage of missing data in each variable and save it to the variable `missing_percentage`. Print it

```
## Place your code here

missing_percentage = missing_count/n_rows*100.0
print(missing_percentage)
```

```
id           0.000000
age          0.000000
sex          0.000000
dataset      0.000000
cp           0.000000
trestbps     6.413043
chol         3.260870
fbs          9.782609
restecg      0.217391
thalch       5.978261
exang        5.978261
oldpeak      6.739130
slope       33.586957
ca          66.413043
thal        52.826087
```

```
num          0.000000
dtype: float64
```

7. What are the two variables with the highest percentage of missing entries? What do you recommending doing about it?

Place your answer here as plain text

8. Calculate the percentage of men and women in the data set. Save it the to the variable `m_w_fraction` and print. Are the number of men and women in the experiment balanced?

```
## Place your code here
valid_rows = df["sex"].count()
m_w_fraction = df["sex"].value_counts()/valid_rows*100.0
print(m_w_fraction)
```

```
sex
Male      78.913043
Female    21.086957
Name: count, dtype: float64
```

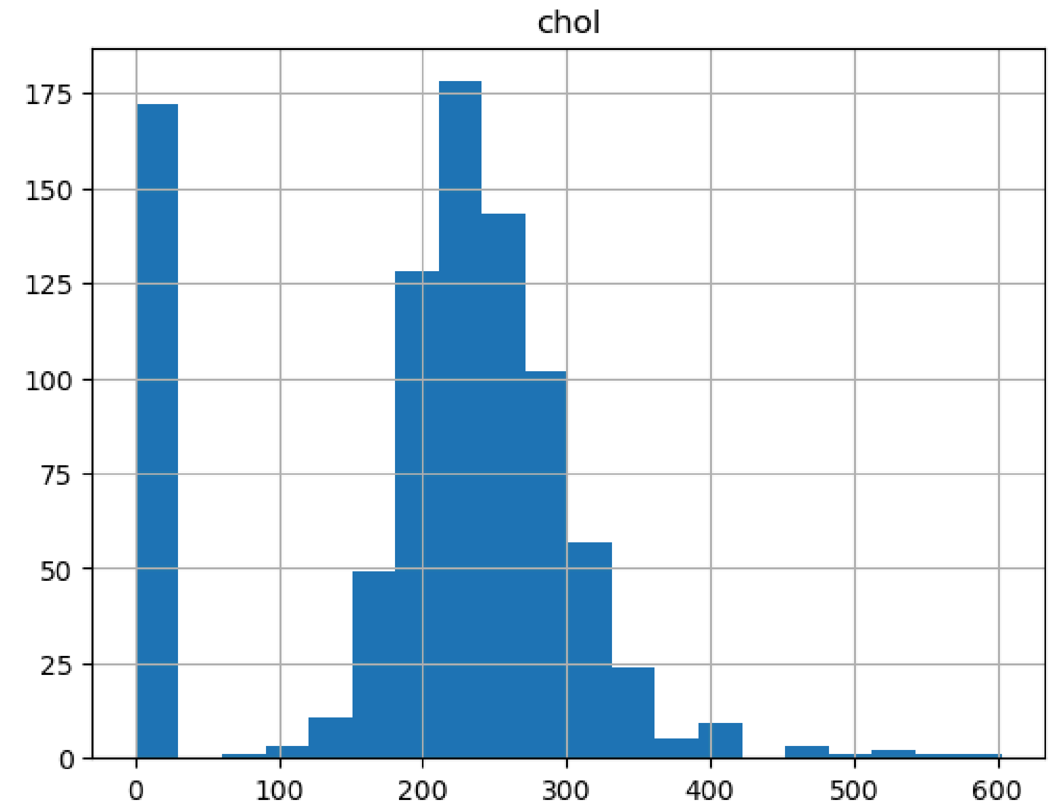
Discuss it here:

9. Plot the histogram of the colesterol variable(`chol`) variable using pandas with 20 bins. What can you observe from the histogram?

```
## Place your code here

df.hist("chol", bins = 20)
```

```
array([[<Axes: title={'center': 'chol'}>]], dtype=object)
```

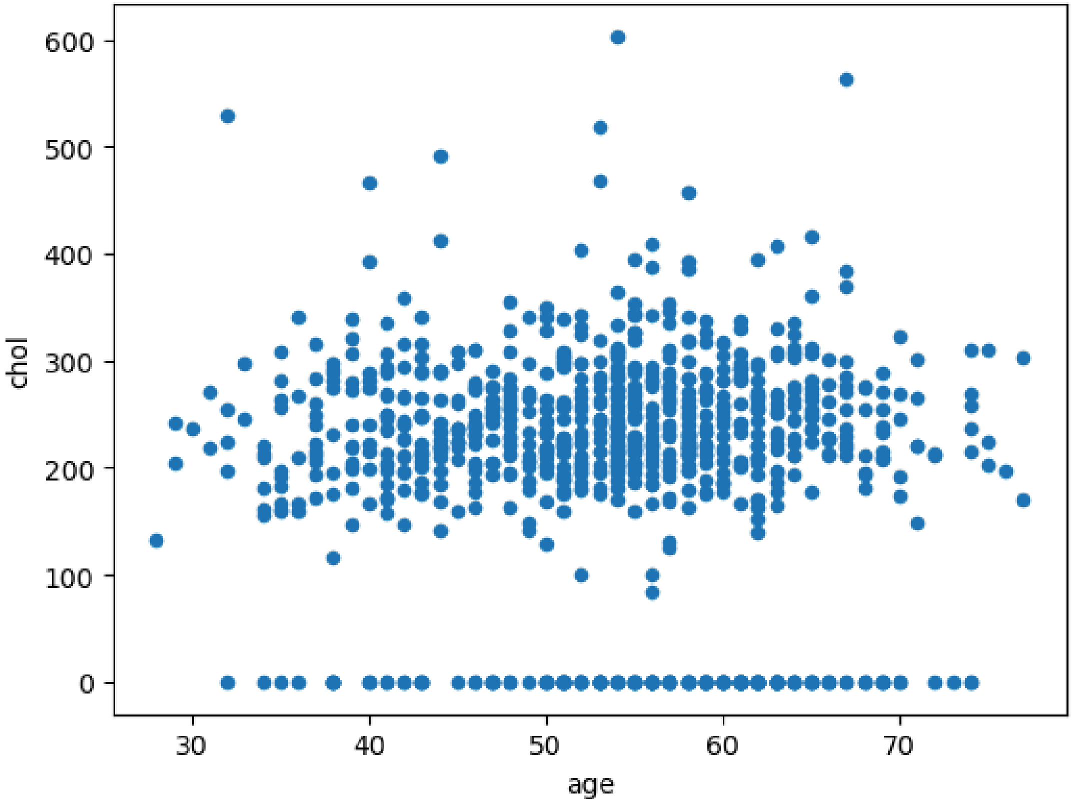


Place your answer here as plain text

10. Make a scatter plot of the `age` with `chol` using pandas. What do you observe - Are there any visible patterns?

```
## Place your code here

df.plot(x = "age", y = "chol", kind = "scatter")
```



Place your answer here as plain text