1 Import libraries

[3]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
from sklearn.datasets import load_iris
%matplotlib inline
```

[13]:

```
df = pd.read_csv("loan_data_set.csv")
```

[14]:

```
df.head()
```

[14]:

```
    Loan_ID Gender Married Dependents     Education Self_Employed  \
0  LP001002   Male      No          0      Graduate            No
1  LP001003   Male     Yes          1      Graduate            No
2  LP001005   Male     Yes          0      Graduate           Yes
3  LP001006   Male     Yes          0  Not Graduate            No
4  LP001008   Male      No          0      Graduate            No

   ApplicantIncome  CoapplicantIncome  LoanAmount  Loan_Amount_Term  \
0             5849                0.0         NaN             360.0
1             4583             1508.0       128.0             360.0
2             3000                0.0        66.0             360.0
3             2583             2358.0       120.0             360.0
4             6000                0.0       141.0             360.0

   Credit_History Property_Area Loan_Status
0             1.0         Urban           Y
1             1.0         Rural           N
2             1.0         Urban           Y
3             1.0         Urban           Y
4             1.0         Urban           Y
```

2 Basic stats

[15]:

```
df.shape
```

[15]:

```
(614, 13)
```

[16]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 614 entries, 0 to 613
Data columns (total 13 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Loan_ID            614 non-null    object 
 1   Gender             601 non-null    object 
 2   Married            611 non-null    object 
 3   Dependents         599 non-null    object 
 4   Education          614 non-null    object 
 5   Self_Employed      582 non-null    object 
 6   ApplicantIncome    614 non-null    int64  
 7   CoapplicantIncome  614 non-null    float64
 8   LoanAmount         592 non-null    float64
 9   Loan_Amount_Term   600 non-null    float64
 10  Credit_History     564 non-null    float64
 11  Property_Area      614 non-null    object 
 12  Loan_Status        614 non-null    object 
dtypes: float64(4), int64(1), object(8)
memory usage: 62.5+ KB
```

[17]:

```
df.describe()
```

[17]:

```
       ApplicantIncome  CoapplicantIncome  LoanAmount  Loan_Amount_Term  \
count       614.000000         614.000000  592.000000         600.00000   
mean       5403.459283        1621.245798  146.412162         342.00000   
std        6109.041673        2926.248369   85.587325          65.12041   
min         150.000000           0.000000    9.000000          12.00000   
25%        2877.500000           0.000000  100.000000         360.00000   
50%        3812.500000        1188.500000  128.000000         360.00000   
75%        5795.000000        2297.250000  168.000000         360.00000   
max       81000.000000       41667.000000  700.000000         480.00000   

       Credit_History  
count      564.000000  
mean         0.842199  
std          0.364878  
min          0.000000  
25%          1.000000  
```

```
50%           1.000000
75%           1.000000
max           1.000000
```

[18]:

```python
df.isna().sum()
```

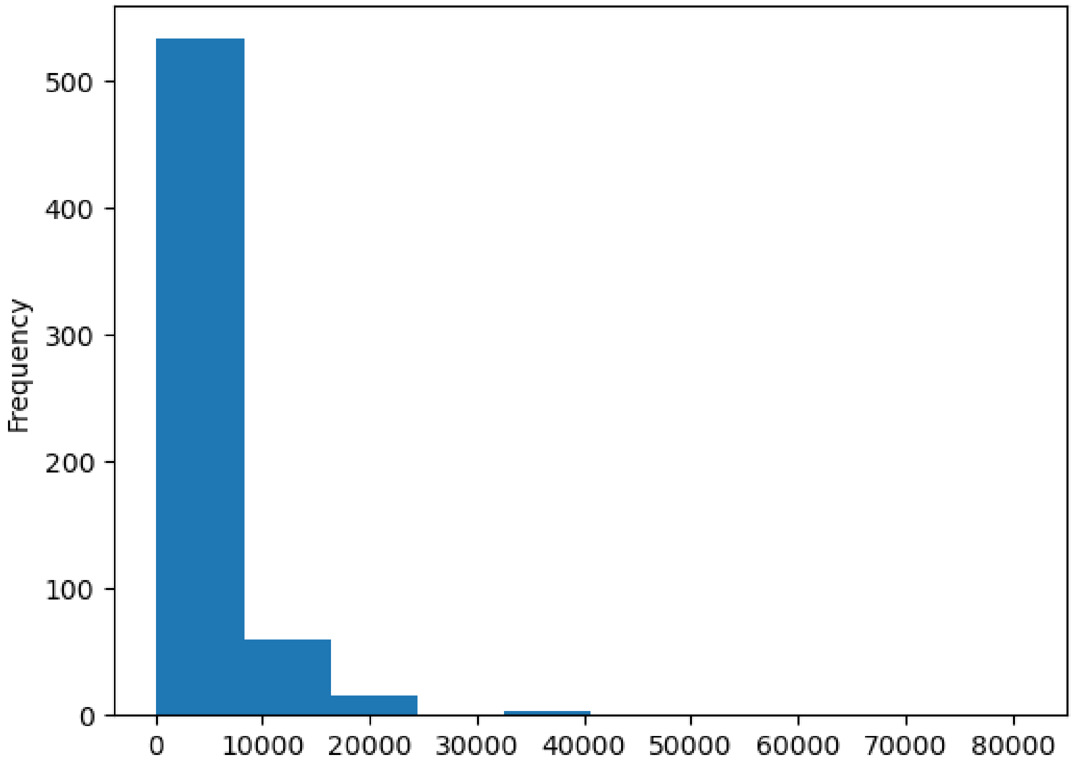
[18]:

```
Loan_ID              0
Gender              13
Married              3
Dependents          15
Education            0
Self_Employed       32
ApplicantIncome      0
CoapplicantIncome    0
LoanAmount          22
Loan_Amount_Term    14
Credit_History      50
Property_Area        0
Loan_Status          0
dtype: int64
```

Let us group the quantitative variables ‘ApplicantIncome’, ‘Coapplicant Income’, ‘LoanAmount’, ‘Loan_Amount_Term’, ‘Credit_History’ by ‘Loan_Status’ categorical variable

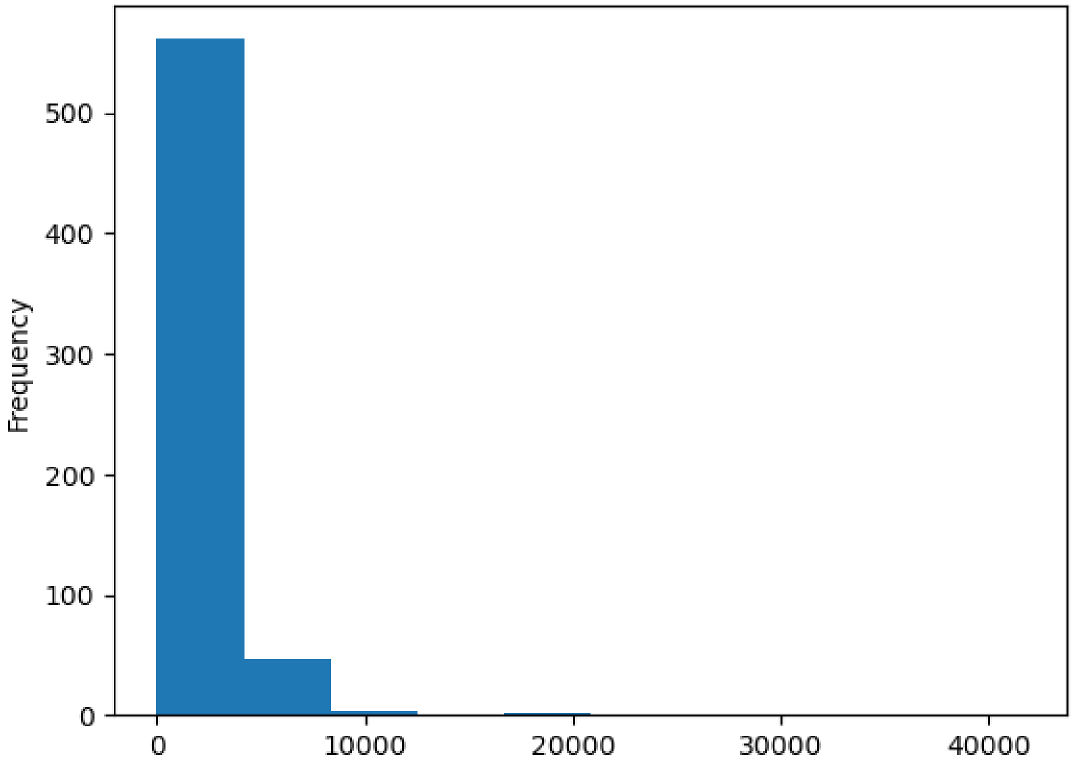
[28]:

```python
df["ApplicantIncome"].plot(kind="hist")
plt.show()
```



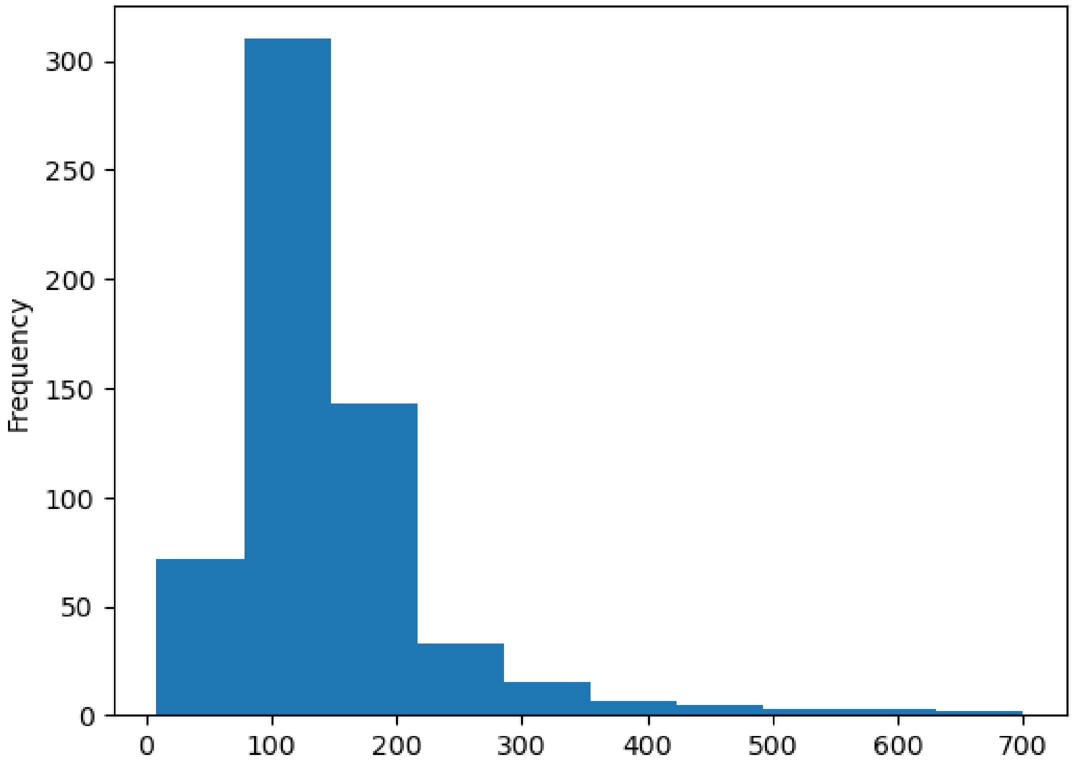
```
[29]: df["ApplicantIncome"].fillna(df["ApplicantIncome"].mean(), inplace=True)
```

```
[30]: df["CoapplicantIncome"].plot(kind="hist")
      plt.show()
```



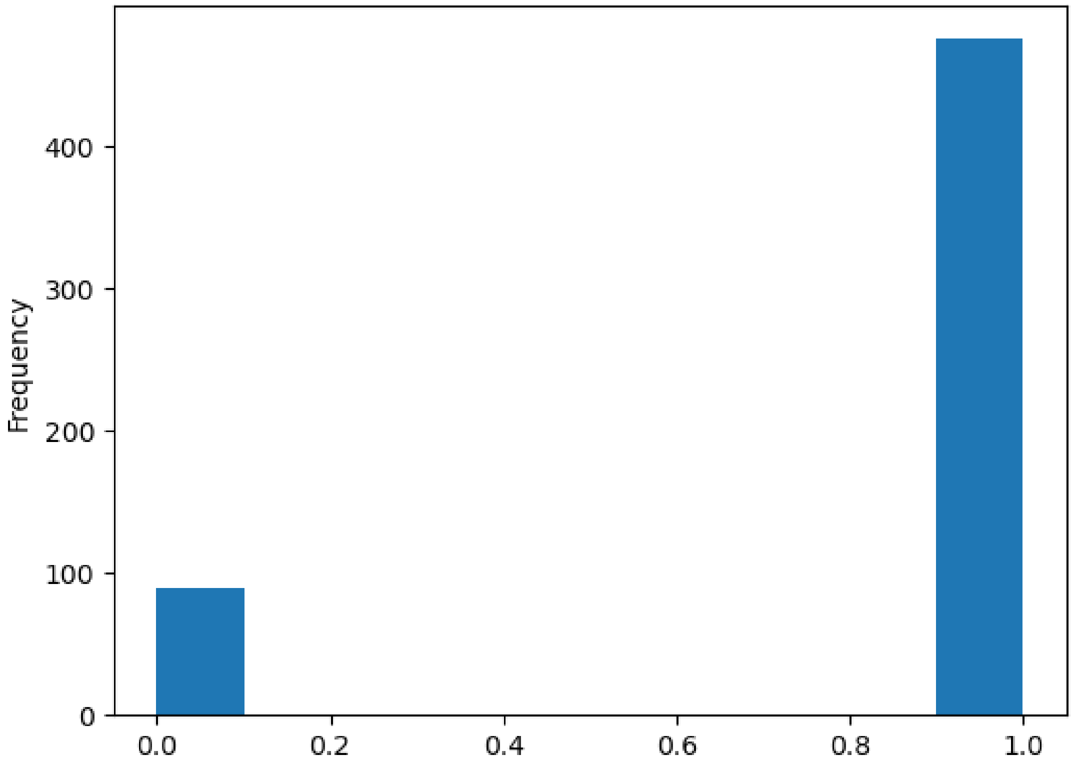
```
[31]: df["CoapplicantIncome"].fillna(df["CoapplicantIncome"].mean(), inplace=True)
```

```
[32]: df["LoanAmount"].plot(kind="hist")
      plt.show()
```



```
[33]: df["LoanAmount"].fillna(df["LoanAmount"].mean(), inplace=True)
```

```
[34]: df["Credit_History"].plot(kind="hist")
      plt.show()
```



```
[35]: df["Credit_History"].fillna(np.random.randint(0,2), inplace=True)
```

```
[36]: grouped_df = df[["ApplicantIncome", "CoapplicantIncome", "LoanAmount",␣
       ↪"Credit_History"]].groupby(df["Loan_Status"])
```

3 Stats of the grouped data

```
[42]: mean = grouped_df.mean()
      mean
```

```
[42]:              ApplicantIncome  CoapplicantIncome  LoanAmount  Credit_History
      Loan_Status
      N                5446.078125        1877.807292  150.945488        0.572917
      Y                5384.068720        1504.516398  144.349606        0.983412
```

```
[43]: median = grouped_df.median()
      median
```

```
[43]:              ApplicantIncome  CoapplicantIncome  LoanAmount  Credit_History
      Loan_Status
      N                     3833.5              268.0       133.5             1.0
```

```
Y                        3812.5              1239.5       128.0             1.0
```

```
[44]: min = grouped_df.min()
      min
```

```
[44]:              ApplicantIncome  CoapplicantIncome  LoanAmount  Credit_History
      Loan_Status
      N                        150                0.0         9.0             0.0
      Y                        210                0.0        17.0             0.0
```

```
[45]: max = grouped_df.max()
      max
```

```
[45]:              ApplicantIncome  CoapplicantIncome  LoanAmount  Credit_History
      Loan_Status
      N                      81000            41667.0       570.0             1.0
      Y                      63337            20000.0       700.0             1.0
```

```
[46]: std = grouped_df.std()
      std
```

```
[46]:              ApplicantIncome  CoapplicantIncome  LoanAmount  Credit_History
      Loan_Status
      N                6819.558528        4384.060103   83.361163        0.495948
      Y                5765.441615        1924.754855   84.361109        0.127872
```

4 Iris dataset

```
[57]: iris = load_iris()
      iris.keys()
```

```
[57]: dict_keys(['data', 'target', 'frame', 'target_names', 'DESCR', 'feature_names',
      'filename', 'data_module'])
```

```
[61]: iris_df = pd.DataFrame(iris.data, columns = iris.feature_names)
      iris_df["label"] = iris.target
```

```
[62]: iris.target_names
```

```
[62]: array(['setosa', 'versicolor', 'virginica'], dtype='<U10')
```

0 -> setosa 1 -> versicolor 2 -> virginica

```
[63]: iris_df.shape
```

```
[63]: (150, 5)
```

[64]:
```
iris_df.head()
```

[64]:
```
   sepal length (cm)  sepal width (cm)  petal length (cm)  petal width (cm)  \
0                5.1               3.5                1.4               0.2
1                4.9               3.0                1.4               0.2
2                4.7               3.2                1.3               0.2
3                4.6               3.1                1.5               0.2
4                5.0               3.6                1.4               0.2

   label
0      0
1      0
2      0
3      0
4      0
```

5 Basic stats

[65]:
```
iris_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   sepal length (cm)  150 non-null    float64
 1   sepal width (cm)   150 non-null    float64
 2   petal length (cm)  150 non-null    float64
 3   petal width (cm)   150 non-null    float64
 4   label              150 non-null    int32
dtypes: float64(4), int32(1)
memory usage: 5.4 KB
```

[66]:
```
iris_df.describe()
```

[66]:
```
       sepal length (cm)  sepal width (cm)  petal length (cm)  \
count         150.000000        150.000000         150.000000
mean            5.843333          3.057333           3.758000
std             0.828066          0.435866           1.765298
min             4.300000          2.000000           1.000000
25%             5.100000          2.800000           1.600000
50%             5.800000          3.000000           4.350000
75%             6.400000          3.300000           5.100000
max             7.900000          4.400000           6.900000

       petal width (cm)       label
```

```
count       150.000000  150.000000
mean          1.199333    1.000000
std           0.762238    0.819232
min           0.100000    0.000000
25%           0.300000    0.000000
50%           1.300000    1.000000
75%           1.800000    2.000000
max           2.500000    2.000000
```

6 Setosa stats

[80]:

```
setosa = iris_df[iris_df["label"] == 0].drop("label", axis=1)
```

[81]:

```
setosa.describe()
```

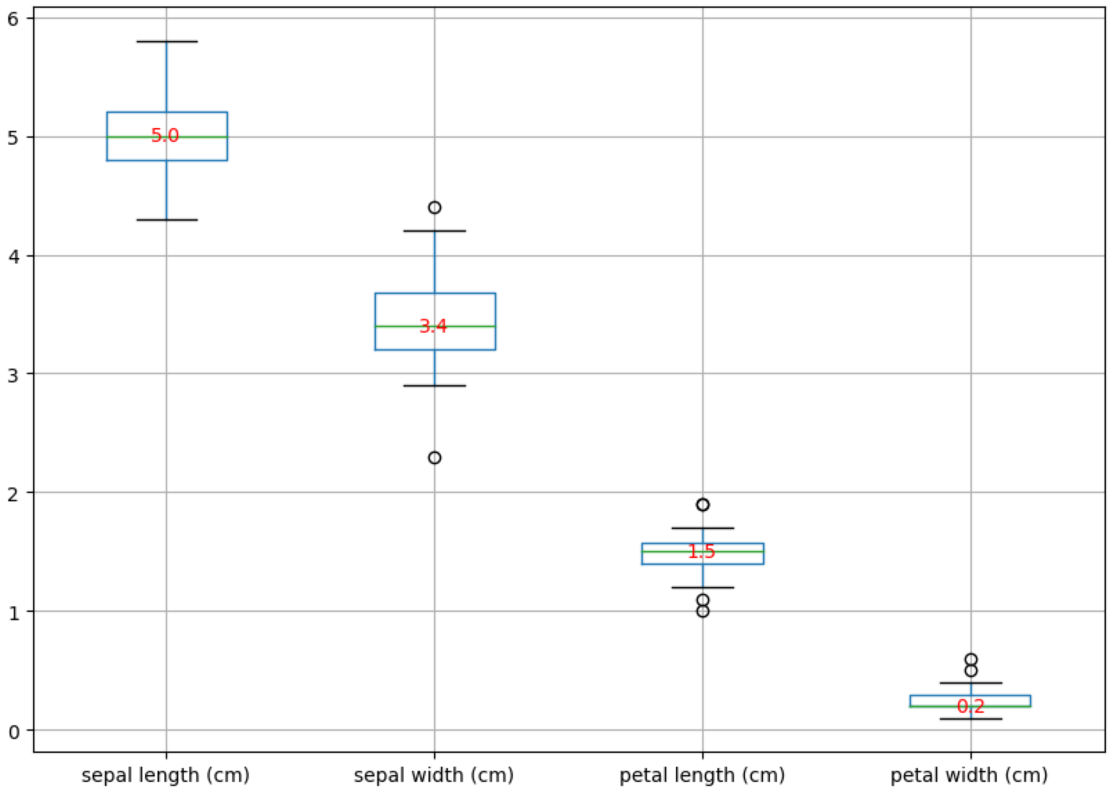
[81]:

```
       sepal length (cm)  sepal width (cm)  petal length (cm)  \
count           50.00000         50.000000          50.000000
mean             5.00600          3.428000           1.462000
std              0.35249          0.379064           0.173664
min              4.30000          2.300000           1.000000
25%              4.80000          3.200000           1.400000
50%              5.00000          3.400000           1.500000
75%              5.20000          3.675000           1.575000
max              5.80000          4.400000           1.900000

       petal width (cm)
count         50.000000
mean           0.246000
std            0.105386
min            0.100000
25%            0.200000
50%            0.200000
75%            0.300000
max            0.600000
```

[82]:

```
plt.figure(figsize=(10,7))
box = setosa.boxplot()
medians = setosa.median()
for i in range(len(medians)):
    box.annotate(medians[i], (i+1, medians[i]), ha="center", va="center",␣
 ↪color="red", size=10)
plt.show()
```



7 Versicolor stats

[83]:
```
versicolor = iris_df[iris_df["label"] == 1].drop("label", axis=1)
```

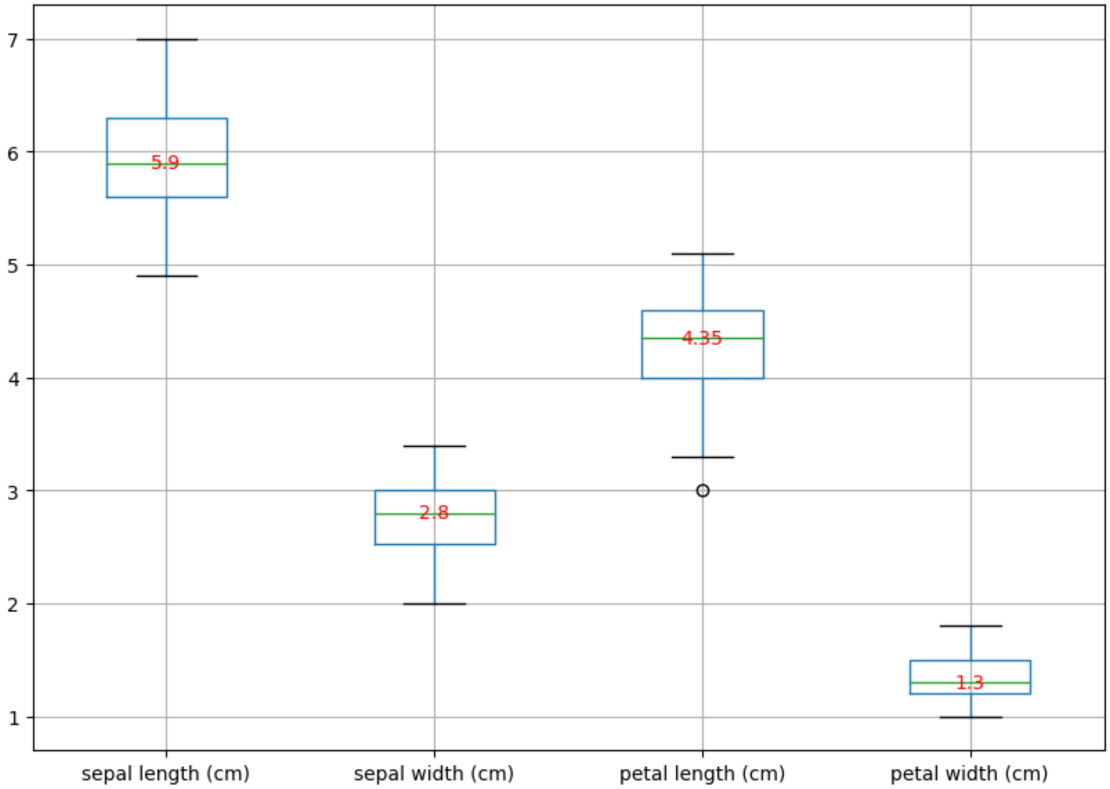
[85]:
```
versicolor.describe()
```

[85]:
```
       sepal length (cm)  sepal width (cm)  petal length (cm)  \
count          50.000000         50.000000          50.000000
mean            5.936000          2.770000           4.260000
std             0.516171          0.313798           0.469911
min             4.900000          2.000000           3.000000
25%             5.600000          2.525000           4.000000
50%             5.900000          2.800000           4.350000
75%             6.300000          3.000000           4.600000
max             7.000000          3.400000           5.100000

       petal width (cm)
count         50.000000
mean           1.326000
std            0.197753
min            1.000000
```

```
25%              1.200000
50%              1.300000
75%              1.500000
max              1.800000
```

[87]:
```
plt.figure(figsize=(10,7))
box = versicolor.boxplot()
medians = versicolor.median()
for i in range(len(medians)):
    box.annotate(medians[i], (i+1, medians[i]), ha="center", va="center",␣
 ↪color="red", size=10)
plt.show()
```



8 Virginica stats

[88]:
```
virginica = iris_df[iris_df["label"] == 2].drop("label", axis=1)
```

[89]:
```
virginica.describe()
```

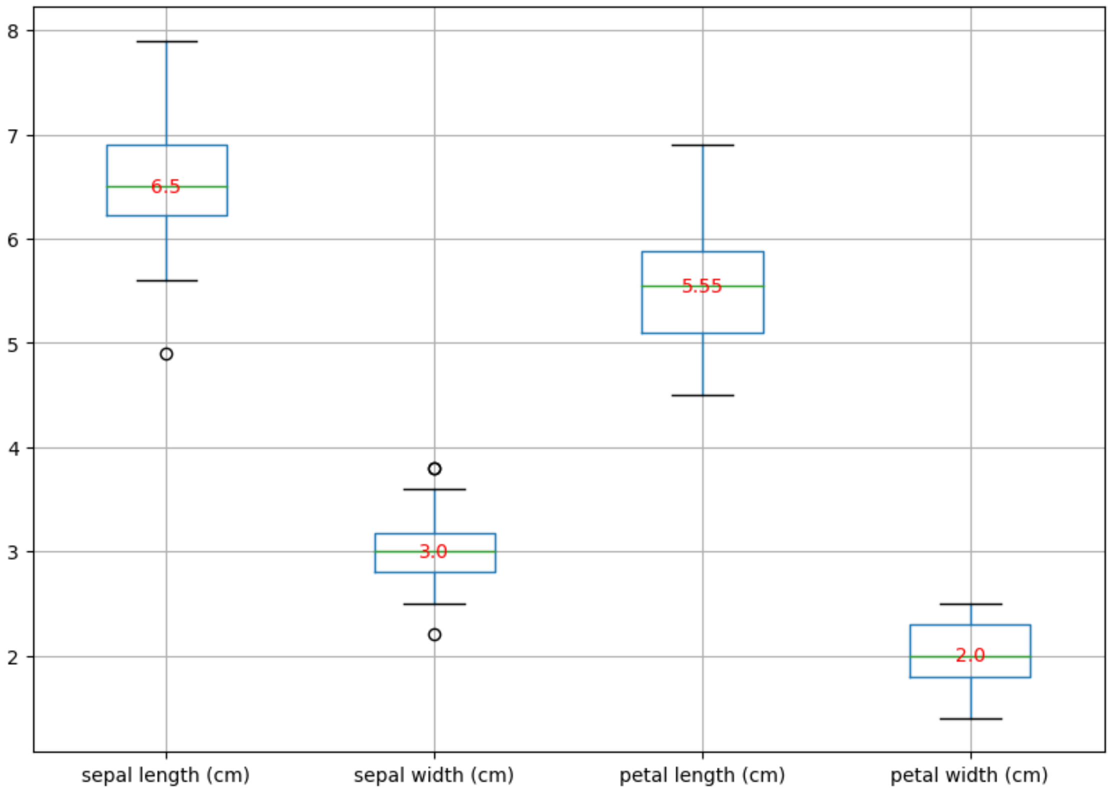
[89]:

```
       sepal length (cm)  sepal width (cm)  petal length (cm)  \
count           50.00000         50.000000          50.000000
mean             6.58800          2.974000           5.552000
std              0.63588          0.322497           0.551895
min              4.90000          2.200000           4.500000
25%              6.22500          2.800000           5.100000
50%              6.50000          3.000000           5.550000
75%              6.90000          3.175000           5.875000
max              7.90000          3.800000           6.900000

       petal width (cm)
count          50.00000
mean            2.02600
std             0.27465
min             1.40000
25%             1.80000
50%             2.00000
75%             2.30000
max             2.50000
```

[90]:

```
plt.figure(figsize=(10,7))
box = virginica.boxplot()
medians = virginica.median()
for i in range(len(medians)):
    box.annotate(medians[i], (i+1, medians[i]), ha="center", va="center",␣
 ↪color="red", size=10)
plt.show()
```


8
7
6
5
4
3
2
6.5
3.0
5.55
2.0
sepal length (cm)
sepal width (cm)
petal length (cm)
petal width (cm)