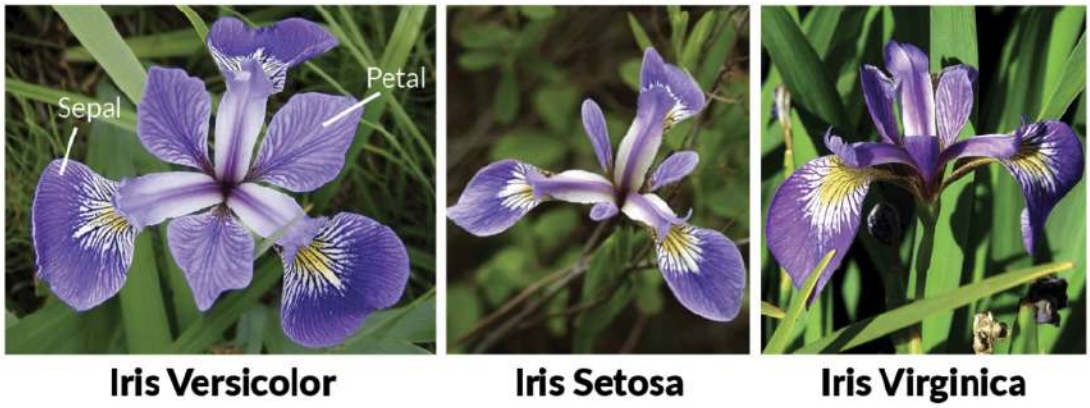
Aula 7

March 27, 2025

[1]:
```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

[2]:
```
from IPython.display import Image
Image('2018-10-17-classificacao-iris-01.png')
```

[2]:



[3]:
```
df = pd.read_csv('iris.csv')
```

[4]:
```
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  150 non-null    float64
 1   sepal.width   150 non-null    float64
 2   petal.length  150 non-null    float64
 3   petal.width   150 non-null    float64
 4   species       150 non-null    object
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

[5]:
```
df.head(10)
```

[5]:

	sepal.length	sepal.width	petal.length	petal.width	species
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa
5	5.4	3.9	1.7	0.4	Setosa
6	4.6	3.4	1.4	0.3	Setosa
7	5.0	3.4	1.5	0.2	Setosa
8	4.4	2.9	1.4	0.2	Setosa
9	4.9	3.1	1.5	0.1	Setosa

[6]:
```
df.tail(10)
```

[6]:

	sepal.length	sepal.width	petal.length	petal.width	species
140	6.7	3.1	5.6	2.4	Virginica
141	6.9	3.1	5.1	2.3	Virginica
142	5.8	2.7	5.1	1.9	Virginica
143	6.8	3.2	5.9	2.3	Virginica
144	6.7	3.3	5.7	2.5	Virginica
145	6.7	3.0	5.2	2.3	Virginica
146	6.3	2.5	5.0	1.9	Virginica
147	6.5	3.0	5.2	2.0	Virginica
148	6.2	3.4	5.4	2.3	Virginica
149	5.9	3.0	5.1	1.8	Virginica

[7]:
```
df['species'].unique()
```

[7]:
```
array(['Setosa', 'Versicolor', 'Virginica'], dtype=object)
```

[8]:
```
df.describe()
```

[8]:

	sepal.length	sepal.width	petal.length	petal.width
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.057333	3.758000	1.199333
std	0.828066	0.435866	1.765298	0.762238
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

[9]:
```
df.isnull()
```

[9]:

	sepal.length	sepal.width	petal.length	petal.width	species
0	False	False	False	False	False

```
1           False        False         False        False    False
2           False        False         False        False    False
3           False        False         False        False    False
4           False        False         False        False    False
..            …            …             …            …        …
145         False        False         False        False    False
146         False        False         False        False    False
147         False        False         False        False    False
148         False        False         False        False    False
149         False        False         False        False    False

[150 rows x 5 columns]
```

[10]:
```
df.isnull().sum()
```

[10]:
```
sepal.length    0
sepal.width     0
petal.length    0
petal.width     0
species         0
dtype: int64
```

[11]:
```
data = df.drop_duplicates(subset='species')
```

[12]:
```
data
```

[12]:

	sepal.length	sepal.width	petal.length	petal.width	species
0	5.1	3.5	1.4	0.2	Setosa
50	7.0	3.2	4.7	1.4	Versicolor
100	6.3	3.3	6.0	2.5	Virginica

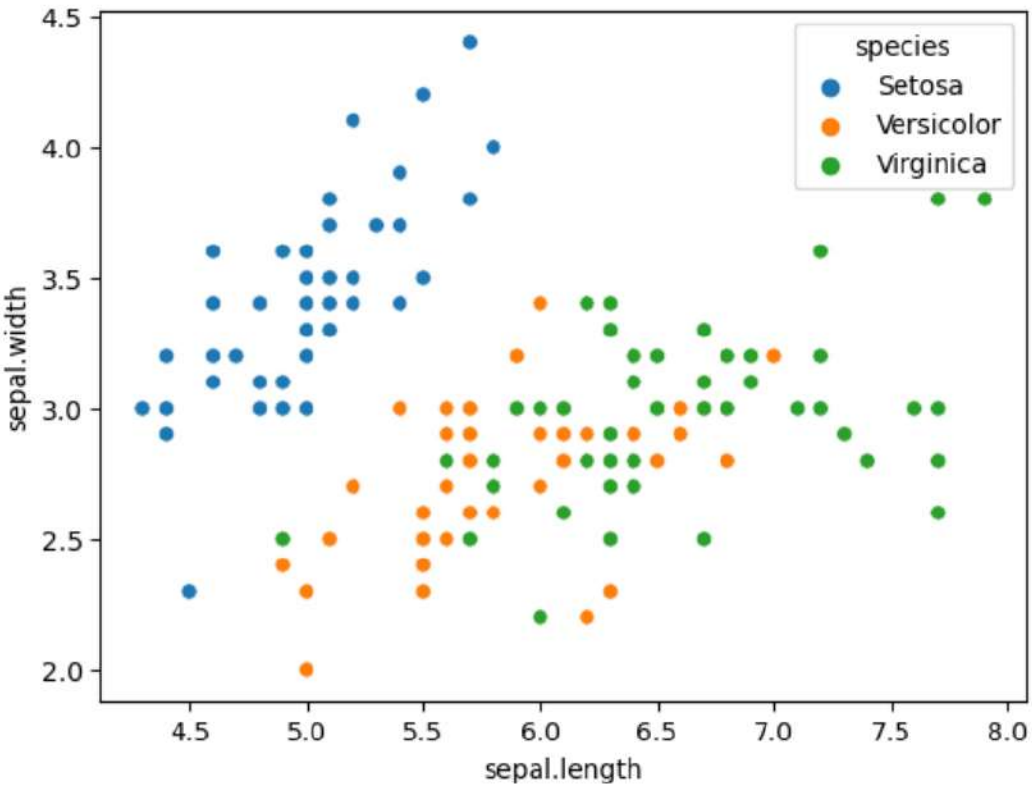
[13]:
```
df.value_counts('species')
```

[13]:
```
species
Setosa        50
Versicolor    50
Virginica     50
dtype: int64
```

[14]:
```
import seaborn as sns
```

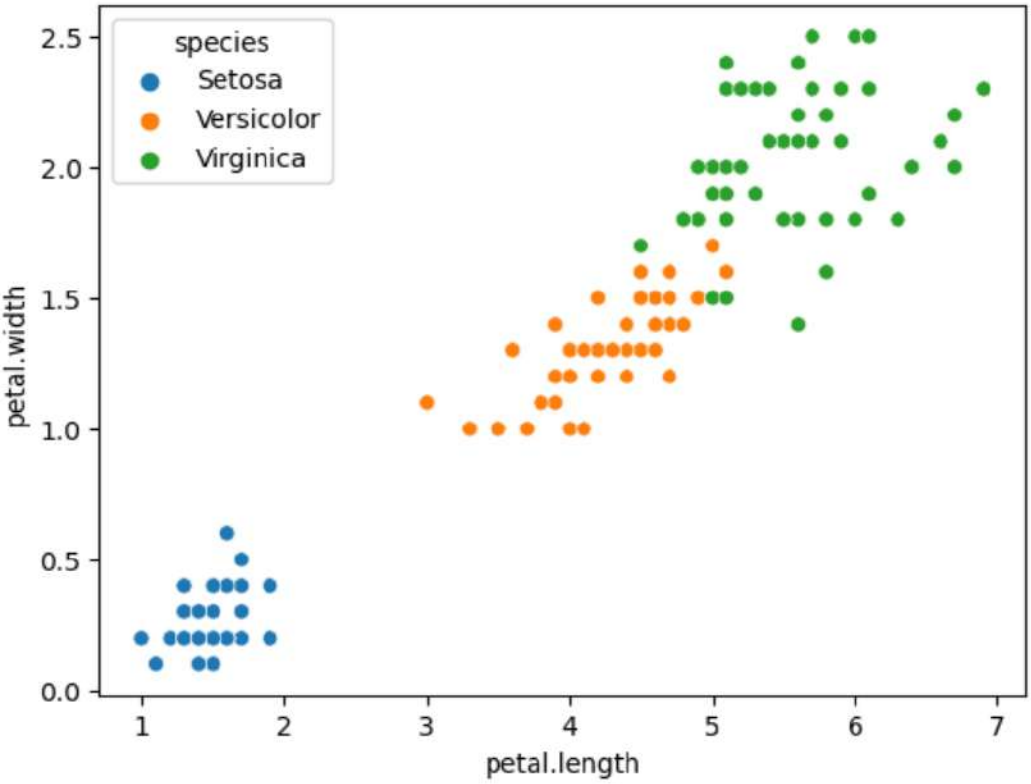
[15]:
```
sns.scatterplot(x='sepal.length', y='sepal.width',
                hue='species', data=df)
```

[15]:
```
<AxesSubplot: xlabel='sepal.length', ylabel='sepal.width'>
```



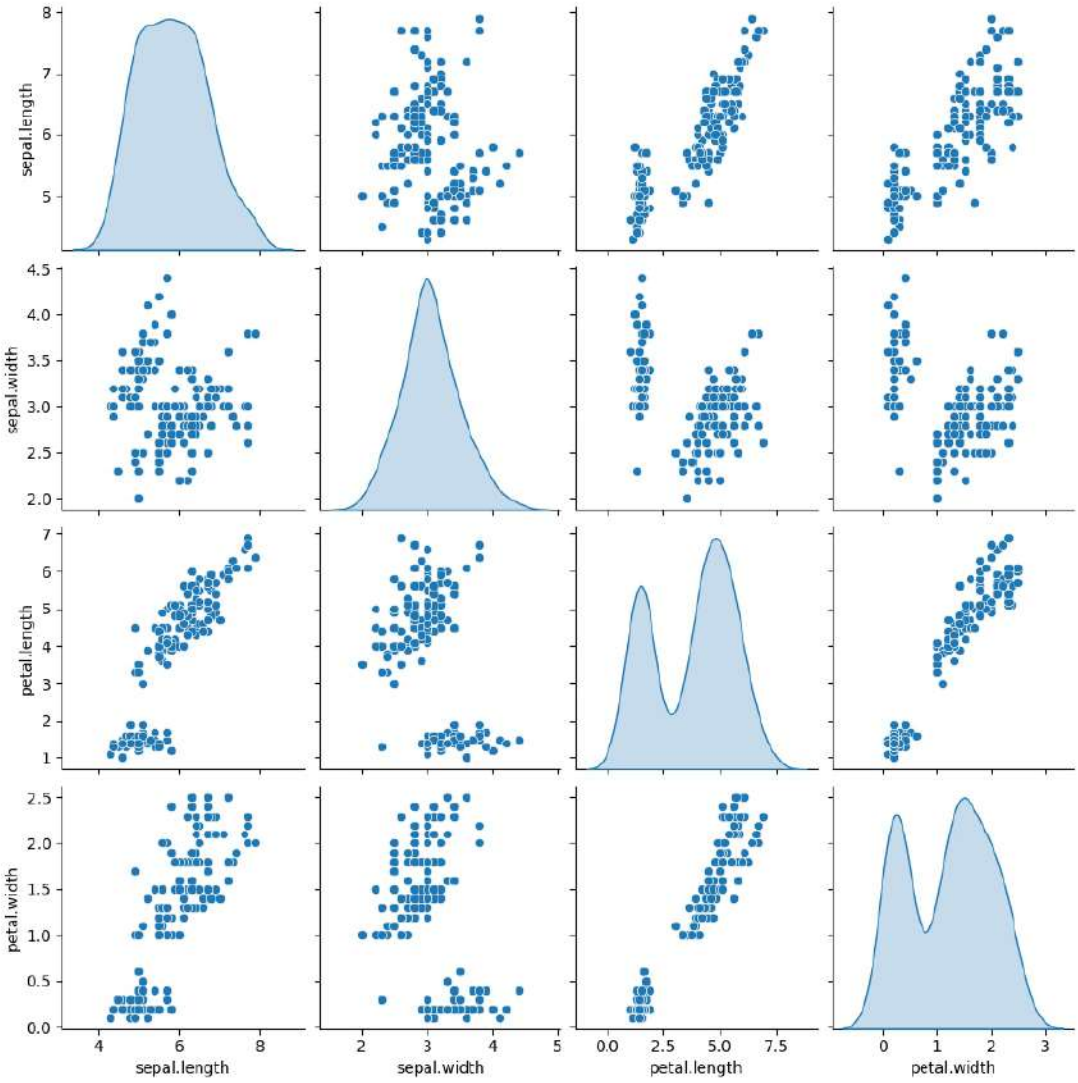
[16]:
```
sns.scatterplot(x='petal.length', y='petal.width',
                hue='species', data=df)
```

[16]: <AxesSubplot: xlabel='petal.length', ylabel='petal.width'>



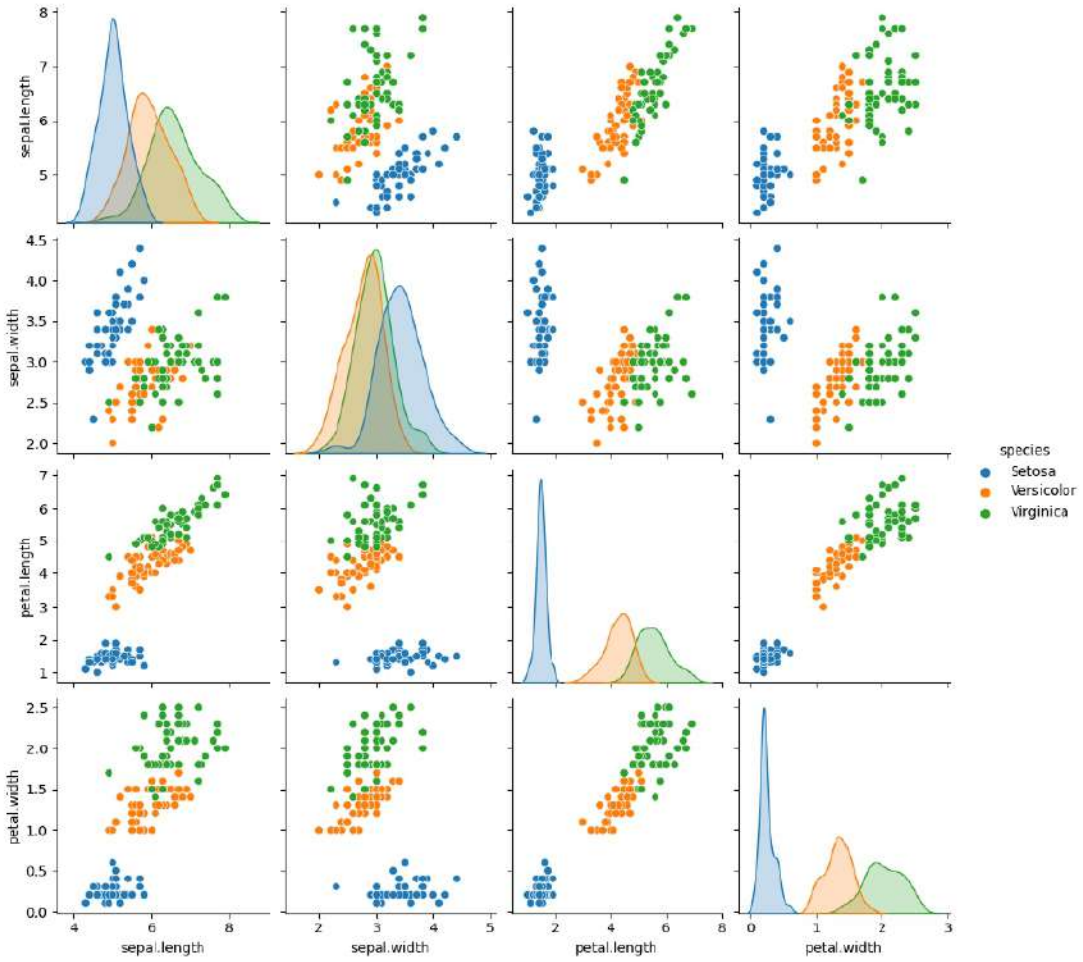
[17]:
```
sns.pairplot(df, diag_kind='kde')
```

[17]: <seaborn.axisgrid.PairGrid at 0x7f8ce0ce3c10>



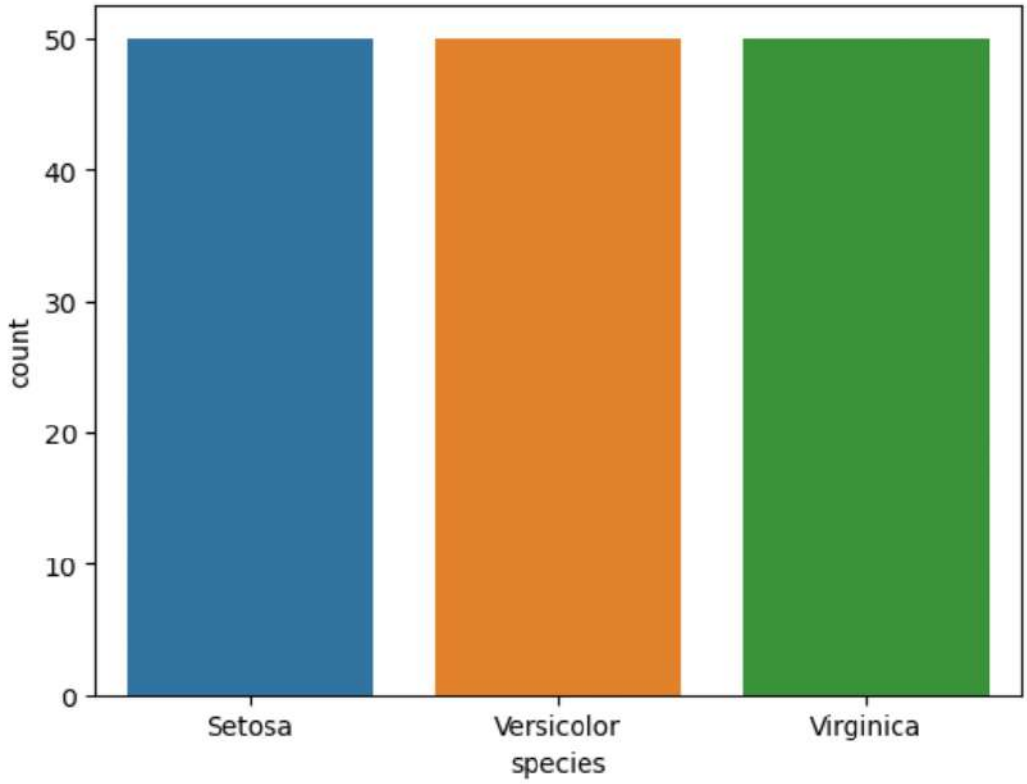
[18]:
```
sns.pairplot(df, hue='species')
```

[18]: <seaborn.axisgrid.PairGrid at 0x7f8ce0459950>



[19]:
```
sns.countplot(x='species', data=df)
```

[19]:
```
<AxesSubplot: xlabel='species', ylabel='count'>
```



[20]:
```
df
```

[20]:

	sepal.length	sepal.width	petal.length	petal.width	species
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa
..	…	…	…	…	…
145	6.7	3.0	5.2	2.3	Virginica
146	6.3	2.5	5.0	1.9	Virginica
147	6.5	3.0	5.2	2.0	Virginica
148	6.2	3.4	5.4	2.3	Virginica
149	5.9	3.0	5.1	1.8	Virginica

[150 rows x 5 columns]

[21]:
```
fig, axes = plt.subplots(2,2, figsize=(8,8))
#titulo
axes[0,0].set_title('Sepal Length')
#elemento
```

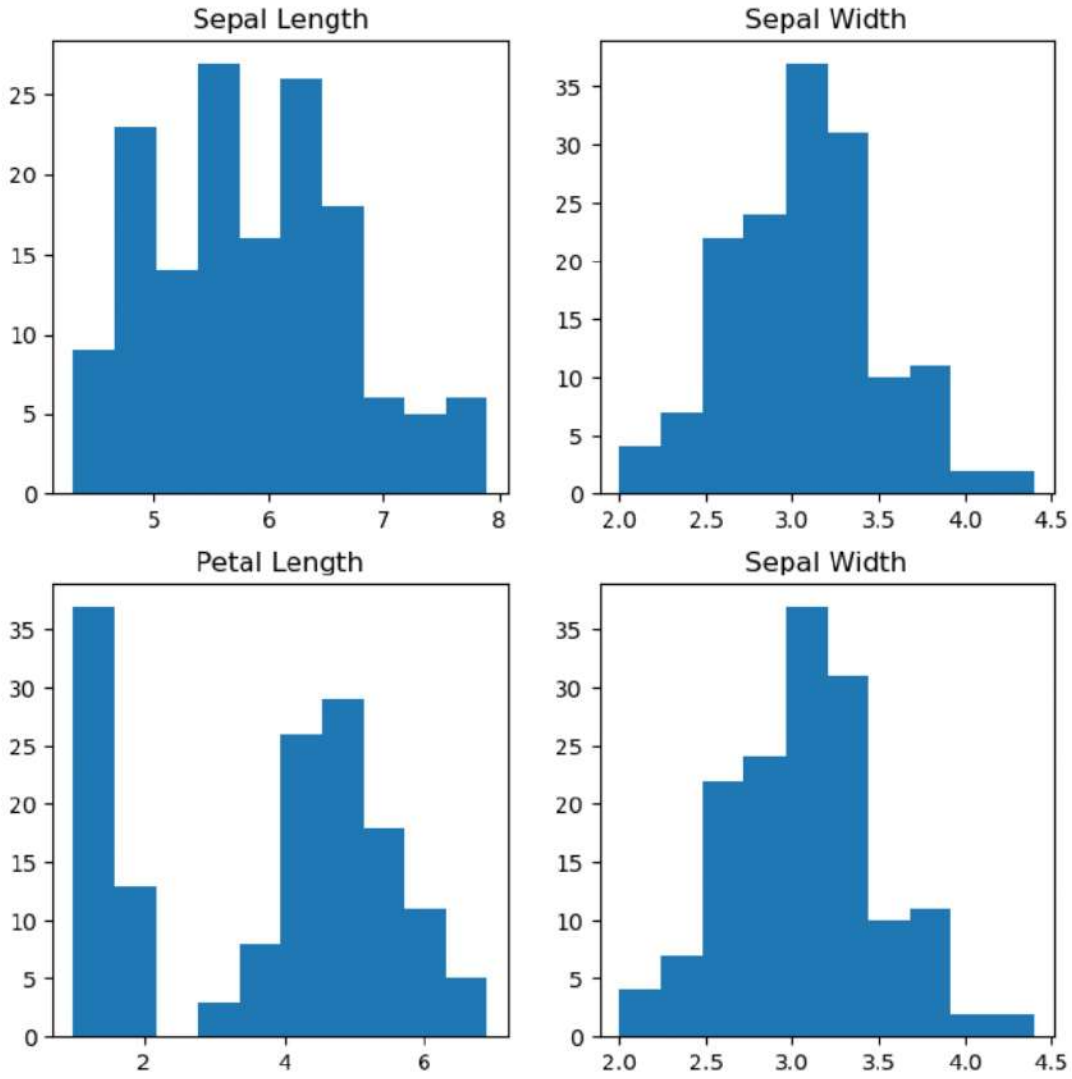
```
axes[0,0].hist(df['sepal.length'])

axes[0,1].set_title('Sepal Width')
axes[0,1].hist(df['sepal.width'])

axes[1,0].set_title('Petal Length')
axes[1,0].hist(df['petal.length'])

axes[1,1].set_title('Sepal Width')
axes[1,1].hist(df['sepal.width'])
```

[21]:
```
(array([ 4.,  7., 22., 24., 37., 31., 10., 11.,  2.,  2.]),
 array([2.  , 2.24, 2.48, 2.72, 2.96, 3.2 , 3.44, 3.68, 3.92, 4.16, 4.4 ]),
 <BarContainer object of 10 artists>)
```



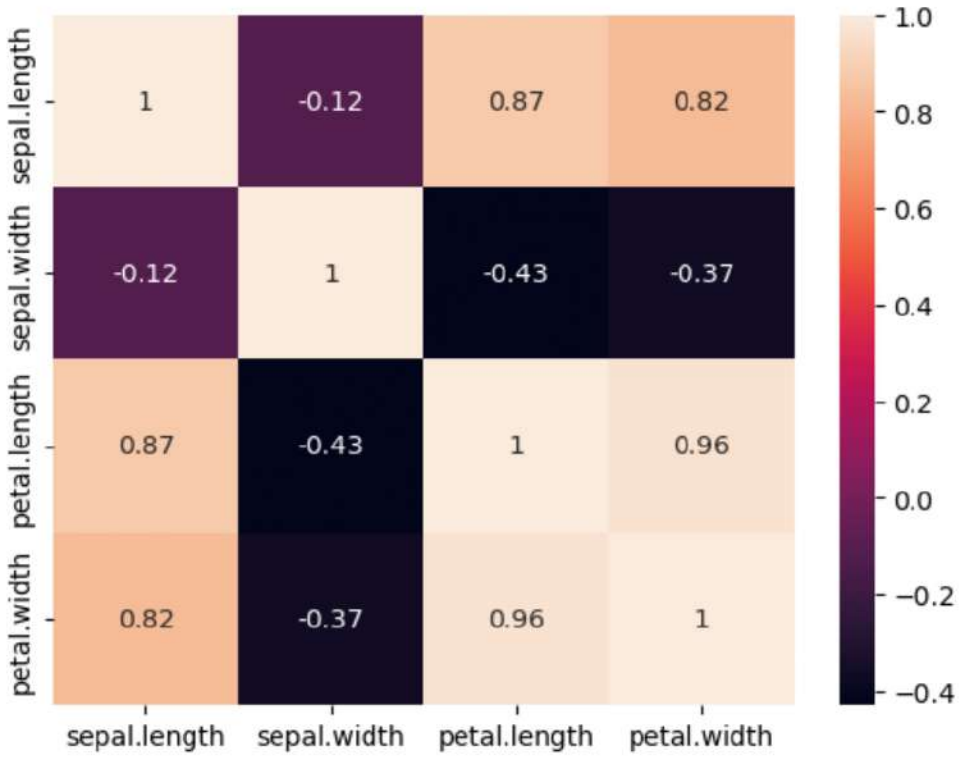
[22]:
```
df.corr(method='pearson', numeric_only=True)
```

[22]:

	sepal.length	sepal.width	petal.length	petal.width
sepal.length	1.000000	-0.117570	0.871754	0.817941
sepal.width	-0.117570	1.000000	-0.428440	-0.366126
petal.length	0.871754	-0.428440	1.000000	0.962865
petal.width	0.817941	-0.366126	0.962865	1.000000

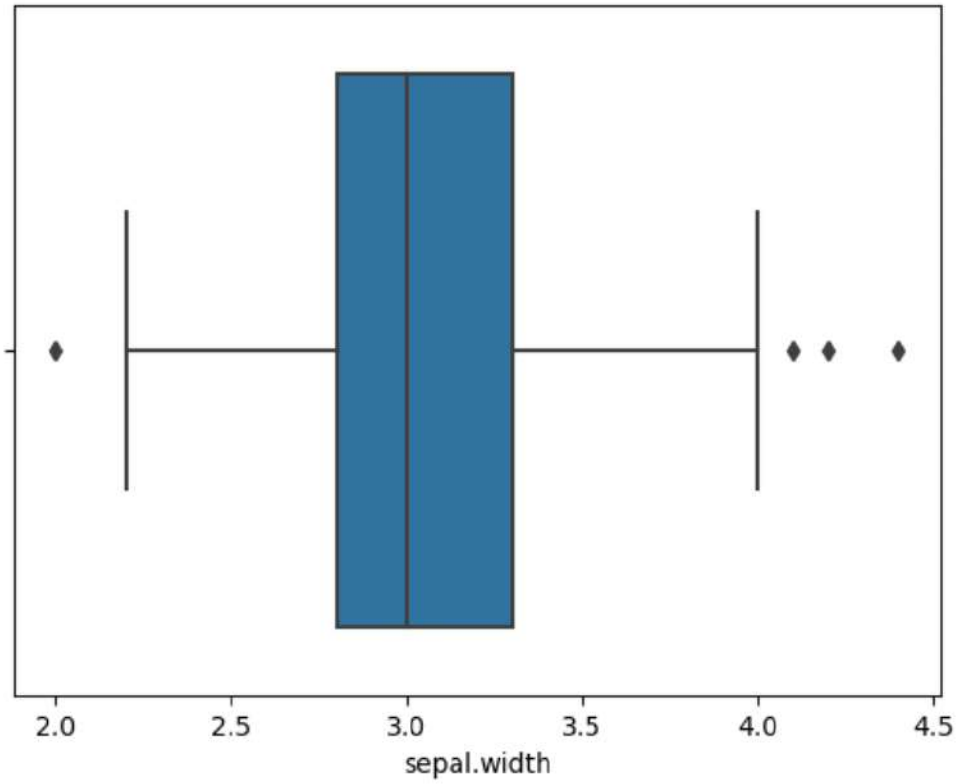
[23]:
```
sns.heatmap(df.corr(method='pearson', numeric_only=True), annot=True)
```

[23]: <AxesSubplot: >



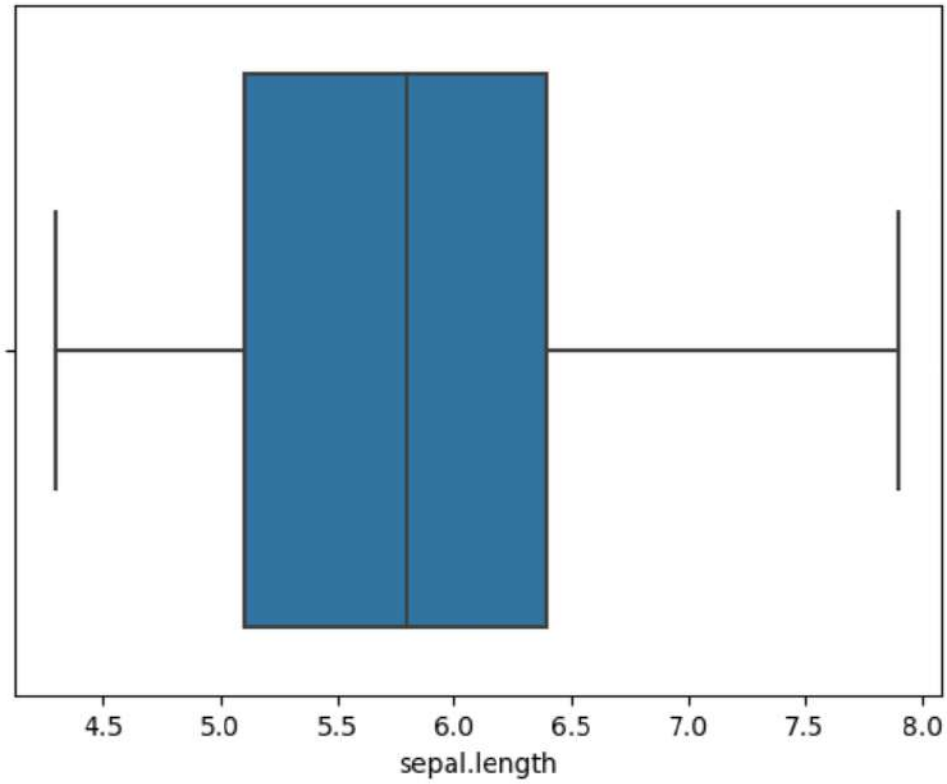
[24]:
```
sns.boxplot(x='sepal.width', data=df)
```

[24]: <AxesSubplot: xlabel='sepal.width'>



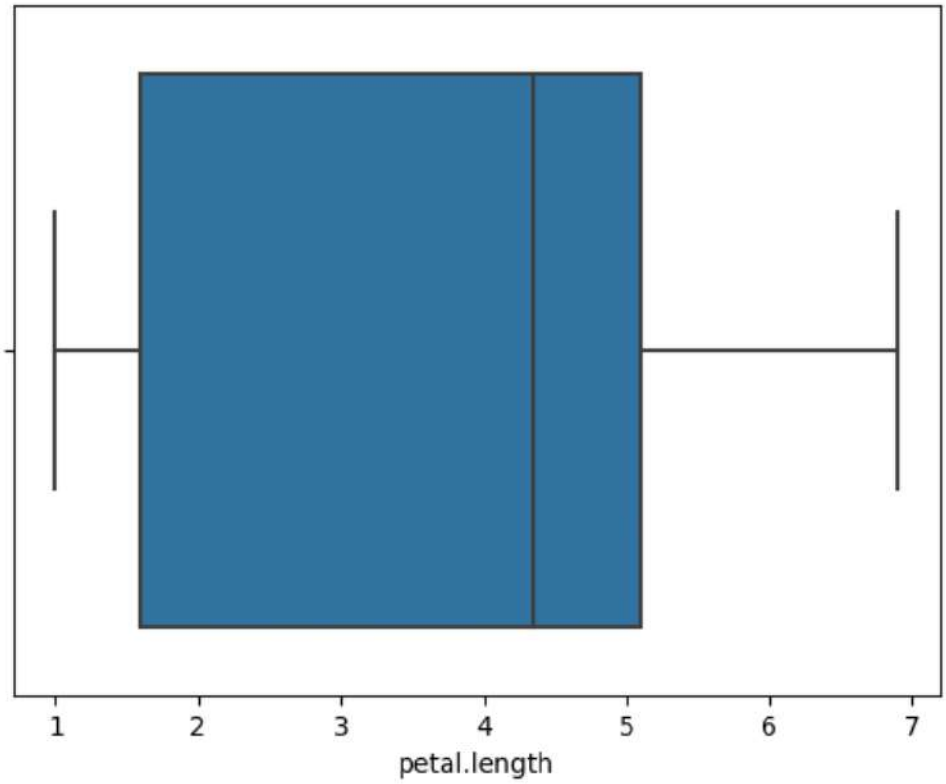
[25]:
```
sns.boxplot(x='sepal.length', data=df)
```

[25]:
```
<AxesSubplot: xlabel='sepal.length'>
```



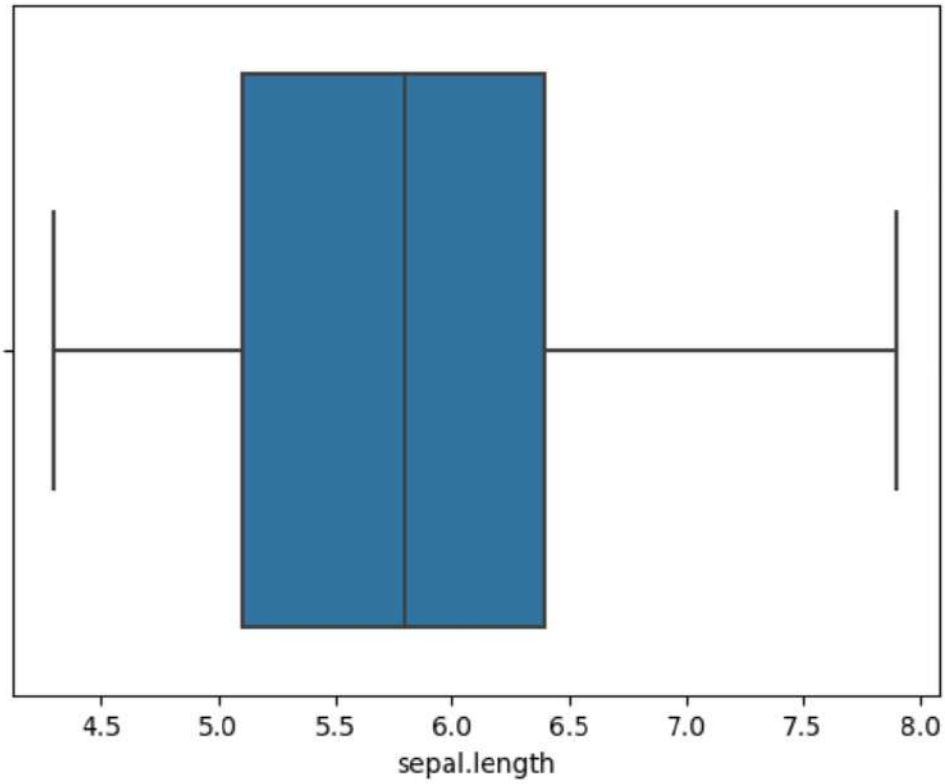
[26]:
```
sns.boxplot(x='petal.length', data=df)
```

[26]:
```
<AxesSubplot: xlabel='petal.length'>
```



[27]:
```
sns.boxplot(x='sepal.length', data=df)
```

[27]:
```
<AxesSubplot: xlabel='sepal.length'>
```



[29]:
```
df
```

[29]:

	sepal.length	sepal.width	petal.length	petal.width	species
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa
..	…	…	…	…	…
145	6.7	3.0	5.2	2.3	Virginica
146	6.3	2.5	5.0	1.9	Virginica
147	6.5	3.0	5.2	2.0	Virginica
148	6.2	3.4	5.4	2.3	Virginica
149	5.9	3.0	5.1	1.8	Virginica

[150 rows x 5 columns]

[30]:
```
## calculando intervalo interquartil

Q1=np.percentile(df['sepal.width'],25, interpolation='midpoint')
```

```
Q3=np.percentile(df['sepal.width'],75, interpolation='midpoint')
```

```
/tmp/ipykernel_43689/1525703056.py:3: DeprecationWarning: the `interpolation=`
argument to percentile was renamed to `method=`, which has additional options.
Users of the modes 'nearest', 'lower', 'higher', or 'midpoint' are encouraged to
review the method they used. (Deprecated NumPy 1.22)
  Q1=np.percentile(df['sepal.width'],25, interpolation='midpoint')
/tmp/ipykernel_43689/1525703056.py:5: DeprecationWarning: the `interpolation=`
argument to percentile was renamed to `method=`, which has additional options.
Users of the modes 'nearest', 'lower', 'higher', or 'midpoint' are encouraged to
review the method they used. (Deprecated NumPy 1.22)
  Q3=np.percentile(df['sepal.width'],75, interpolation='midpoint')
```

[31]:
```
Q1
```

[31]:
```
2.8
```

[32]:
```
Q3
```

[32]:
```
3.3
```

[33]:
```
IRQ=Q3-Q1
```

[34]:
```
IRQ
```

[34]:
```
0.5
```

[36]:
```
superior = np.where(df['sepal.width']>=(Q3+1.5*IRQ))

inferior = np.where(df['sepal.width']<=(Q1-1.5*IRQ))
```

[37]:
```
superior
```

[37]:
```
(array([15, 32, 33]),)
```

[38]:
```
inferior
```

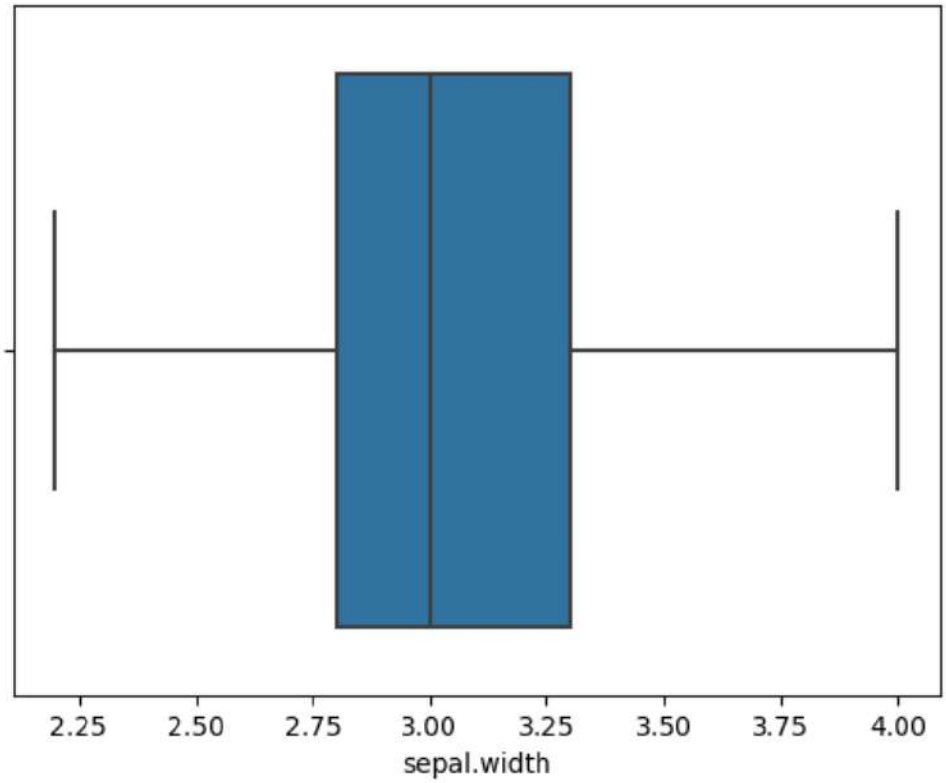
[38]:
```
(array([60]),)
```

[40]:
```
df.drop(superior[0], inplace=True)
```

[41]:
```
df.drop(inferior[0], inplace=True)
```

[42]:
```
sns.boxplot(x='sepal.width', data=df)
```

[42]:
```
<AxesSubplot: xlabel='sepal.width'>
```



[43]:
```
df
```

[43]:

	sepal.length	sepal.width	petal.length	petal.width	species
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa
..	…	…	…	…	…
145	6.7	3.0	5.2	2.3	Virginica
146	6.3	2.5	5.0	1.9	Virginica
147	6.5	3.0	5.2	2.0	Virginica
148	6.2	3.4	5.4	2.3	Virginica
149	5.9	3.0	5.1	1.8	Virginica

[146 rows x 5 columns]

[45]:
```
df['species'].unique()
```

[45]:
```
array(['Setosa', 'Versicolor', 'Virginica'], dtype=object)
```

[46]:
```
from sklearn import preprocessing
```

[48]:
```
label_encoder=preprocessing.LabelEncoder()
```

[49]:
```
#label_encoder.fit

#label_encoder.transform

df['species']=label_encoder.fit_transform(df['species'])
```

[50]:
```
df['species'].unique()
```

[50]:
```
array([0, 1, 2])
```

[51]:
```
data = {'Employee id': [10, 20, 15, 25, 30, 45, 78, 56, 12, 7, 8, 57, 14, 27,␣
↪35],
       'Gender': ['M', 'F', 'F', 'M', 'F','M', 'F', 'F', 'M', 'F','M', 'F',␣
↪'F', 'M', 'F'],
       'Remarks': ['Good', 'Nice', 'Good', 'Great', 'Nice','Good', 'Nice',␣
↪'Good', 'Great', 'Nice','Good', 'Nice', 'Good', 'Great', 'Nice'],
       }
```

[52]:
```
data
```

[52]:
```
{'Employee id': [10, 20, 15, 25, 30, 45, 78, 56, 12, 7, 8, 57, 14, 27, 35],
 'Gender': ['M',
  'F',
  'F',
  'M',
  'F',
  'M',
  'F',
  'F',
  'M',
  'F',
  'M',
  'F',
  'F',
  'M',
  'F'],
 'Remarks': ['Good',
  'Nice',
  'Good',
  'Great',
  'Nice',
  'Good',
  'Nice',
```

```
  'Good',
  'Great',
  'Nice',
  'Good',
  'Nice',
  'Good',
  'Great',
  'Nice']}
```

[53]:
```
df=pd.DataFrame(data)
```

[54]:
```
df
```

[54]:

	Employee id	Gender	Remarks
0	10	M	Good
1	20	F	Nice
2	15	F	Good
3	25	M	Great
4	30	F	Nice
5	45	M	Good
6	78	F	Nice
7	56	F	Good
8	12	M	Great
9	7	F	Nice
10	8	M	Good
11	57	F	Nice
12	14	F	Good
13	27	M	Great
14	35	F	Nice

[55]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15 entries, 0 to 14
Data columns (total 3 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Employee id  15 non-null     int64
 1   Gender       15 non-null     object
 2   Remarks      15 non-null     object
dtypes: int64(1), object(2)
memory usage: 492.0+ bytes
```

[56]:
```
df['Gender'].unique()
```

[56]:
```
array(['M', 'F'], dtype=object)
```

[57]:
```
df['Remarks'].unique()
```

[57]:
```
array(['Good', 'Nice', 'Great'], dtype=object)
```

[58]:
```
df['Gender'].value_counts()
```

[58]:
```
F    9
M    6
Name: Gender, dtype: int64
```

[59]:
```
df['Remarks'].value_counts()
```

[59]:
```
Good     6
Nice     6
Great    3
Name: Remarks, dtype: int64
```

[60]:
```
one_hot_encoded_data = pd.get_dummies(df, columns=['Remarks', 'Gender'])
```

[61]:
```
one_hot_encoded_data
```

[61]:

	Employee id	Remarks_Good	Remarks_Great	Remarks_Nice	Gender_F	Gender_M
0	10	1	0	0	0	1
1	20	0	0	1	1	0
2	15	1	0	0	1	0
3	25	0	1	0	0	1
4	30	0	0	1	1	0
5	45	1	0	0	0	1
6	78	0	0	1	1	0
7	56	1	0	0	1	0
8	12	0	1	0	0	1
9	7	0	0	1	1	0
10	8	1	0	0	0	1
11	57	0	0	1	1	0
12	14	1	0	0	1	0
13	27	0	1	0	0	1
14	35	0	0	1	1	0

[ ]:
```

```