Create a machine learning model that can classify the species of an iris flower based on its sepal and petal length and width.

Preprocessing

In [1]:
```
import pandas as pd
```

In [2]:
```
df = pd.read_csv('iris.csv')
df.head()
```

Out[2]:

	sepal_length	sepal_width	petal_length	petal_width	flower
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

In [3]:
```
# preprocessing data for duplicates, empty numbers,

df.duplicated().sum()
```

Out[3]: 3

In [4]:
```
df = df.drop_duplicates()
df
```

Out[4]:

	sepal_length	sepal_width	petal_length	petal_width	flower
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	Iris-virginica
146	6.3	2.5	5.0	1.9	Iris-virginica
147	6.5	3.0	5.2	2.0	Iris-virginica
148	6.2	3.4	5.4	2.3	Iris-virginica
149	5.9	3.0	5.1	1.8	Iris-virginica

147 rows × 5 columns

In [5]:
```
df.duplicated().sum()
```

Out[5]: 0

In [6]:
```
#   preprocessing for empty entries in a column

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

Out[6]:
```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
flower          0
dtype: int64
```

In [7]:
```
df.head()
```

Out[7]:

	sepal_length	sepal_width	petal_length	petal_width	flower
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

Feature and Label Separation

In [8]:
```
X = df.drop('flower', axis=1)
X
```

Out[8]:

	sepal_length	sepal_width	petal_length	petal_width
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
...	...	...	...	...
145	6.7	3.0	5.2	2.3
146	6.3	2.5	5.0	1.9
147	6.5	3.0	5.2	2.0
148	6.2	3.4	5.4	2.3
149	5.9	3.0	5.1	1.8

147 rows × 4 columns

In [14]:
```
#Normalization

from sklearn.preprocessing import MinMaxScaler, LabelEncoder
s = MinMaxScaler()

X_scaled = s.fit_transform(X)
X_scaled
X_scaled_df = pd.DataFrame(X_scaled)
X_scaled_df.head()
```

Out[14]:

	0	1	2	3
0	0.222222	0.625000	0.067797	0.041667
1	0.166667	0.416667	0.067797	0.041667
2	0.111111	0.500000	0.050847	0.041667
3	0.083333	0.458333	0.084746	0.041667
4	0.194444	0.666667	0.067797	0.041667

In [17]:

```
d = LabelEncoder()
d
y_Encoded = d.fit_transform(y)
y_Encoded
y_Encoded_df = pd.DataFrame(y_Encoded)
y_Encoded_df.tail()
```

Out[17]:

	0
142	2
143	2
144	2
145	2
146	2

In [18]:

```
y = df['flower']
y
```

Out[18]:

```
0         Iris-setosa
1         Iris-setosa
2         Iris-setosa
3         Iris-setosa
4         Iris-setosa
             ...
145    Iris-virginica
146    Iris-virginica
147    Iris-virginica
148    Iris-virginica
149    Iris-virginica
Name: flower, Length: 147, dtype: object
```

Training and Testing split

In [19]:

```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X_scaled, y_Encoded, test_s
```

In [20]:
```
X_train
```

Out[20]:
```
array([[0.66666667, 0.54166667, 0.79661017, 1.        ],
       [0.11111111, 0.5       , 0.05084746, 0.04166667],
       [0.94444444, 0.25      , 1.        , 0.91666667],
       [0.08333333, 0.58333333, 0.06779661, 0.08333333],
       [0.5       , 0.41666667, 0.66101695, 0.70833333],
       [0.41666667, 0.33333333, 0.69491525, 0.95833333],
       [0.38888889, 1.        , 0.08474576, 0.125     ],
       [0.08333333, 0.45833333, 0.08474576, 0.04166667],
       [0.47222222, 0.08333333, 0.6779661 , 0.58333333],
       [0.38888889, 0.33333333, 0.59322034, 0.5       ],
       [0.22222222, 0.75      , 0.15254237, 0.125     ],
       [0.05555556, 0.125     , 0.05084746, 0.08333333],
       [0.80555556, 0.66666667, 0.86440678, 1.        ],
       [0.72222222, 0.5       , 0.79661017, 0.91666667],
       [0.55555556, 0.375     , 0.77966102, 0.70833333],
       [0.55555556, 0.29166667, 0.66101695, 0.70833333],
       [0.91666667, 0.41666667, 0.94915254, 0.83333333],
       [0.58333333, 0.45833333, 0.76271186, 0.70833333],
       [0.36111111, 0.375     , 0.44067797, 0.5       ],
```

In [21]:
```
y_train
```

Out[21]:
```
array([2, 0, 2, 0, 2, 2, 0, 0, 2, 1, 0, 0, 2, 2, 2, 2, 2, 2, 1, 0, 0, 1,
       2, 0, 2, 0, 2, 0, 0, 1, 2, 2, 2, 0, 2, 2, 0, 2, 1, 0, 0, 1, 0, 2,
       2, 1, 2, 2, 0, 1, 1, 1, 0, 0, 0, 2, 1, 0, 1, 1, 2, 1, 2, 1, 2, 0,
       1, 1, 1, 2, 0, 2, 2, 1, 1, 0, 2, 0, 2, 2, 0, 0, 1, 0, 0, 1, 0, 1,
       1, 2, 1, 0, 0, 0, 1, 2, 2, 2, 2, 0, 2, 1, 0, 0, 2, 1, 1, 1, 1, 1,
       0, 2, 1, 0, 1, 0, 1])
```

In [22]:
```
y_test
```

Out[22]:
```
array([1, 1, 0, 1, 2, 1, 1, 2, 1, 0, 1, 2, 2, 1, 1, 1, 1, 2, 1, 0, 1, 0,
       2, 2, 0, 0, 1, 0, 0, 1])
```

In [ ]:

In [ ]:

In [ ]:

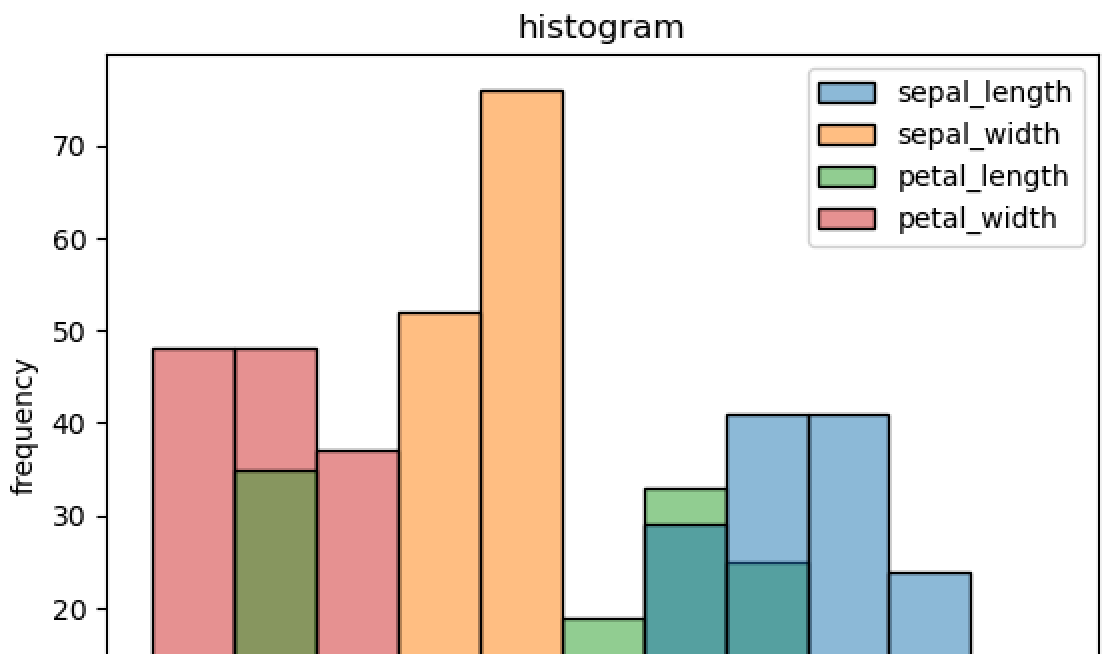
In [ ]:

In [ ]:

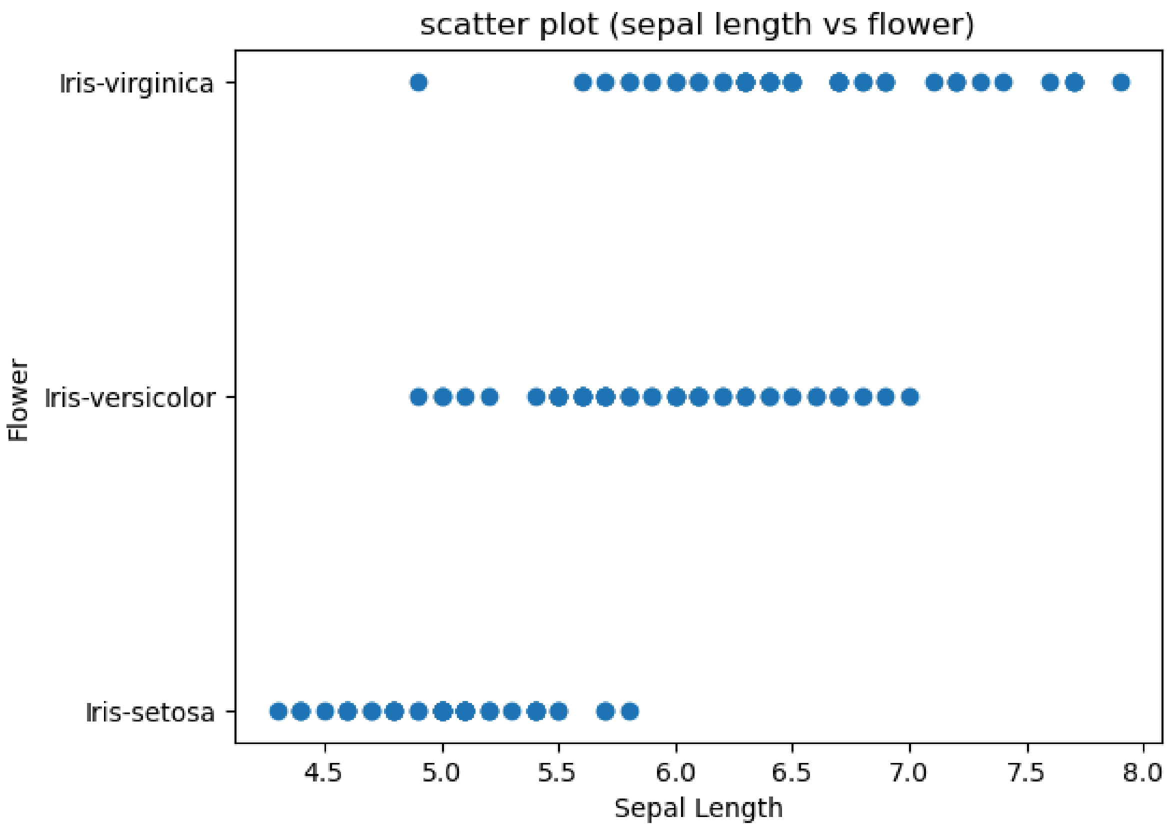
Explore the dataset by visualizing the data using scatterplots or histograms.

In [ ]:

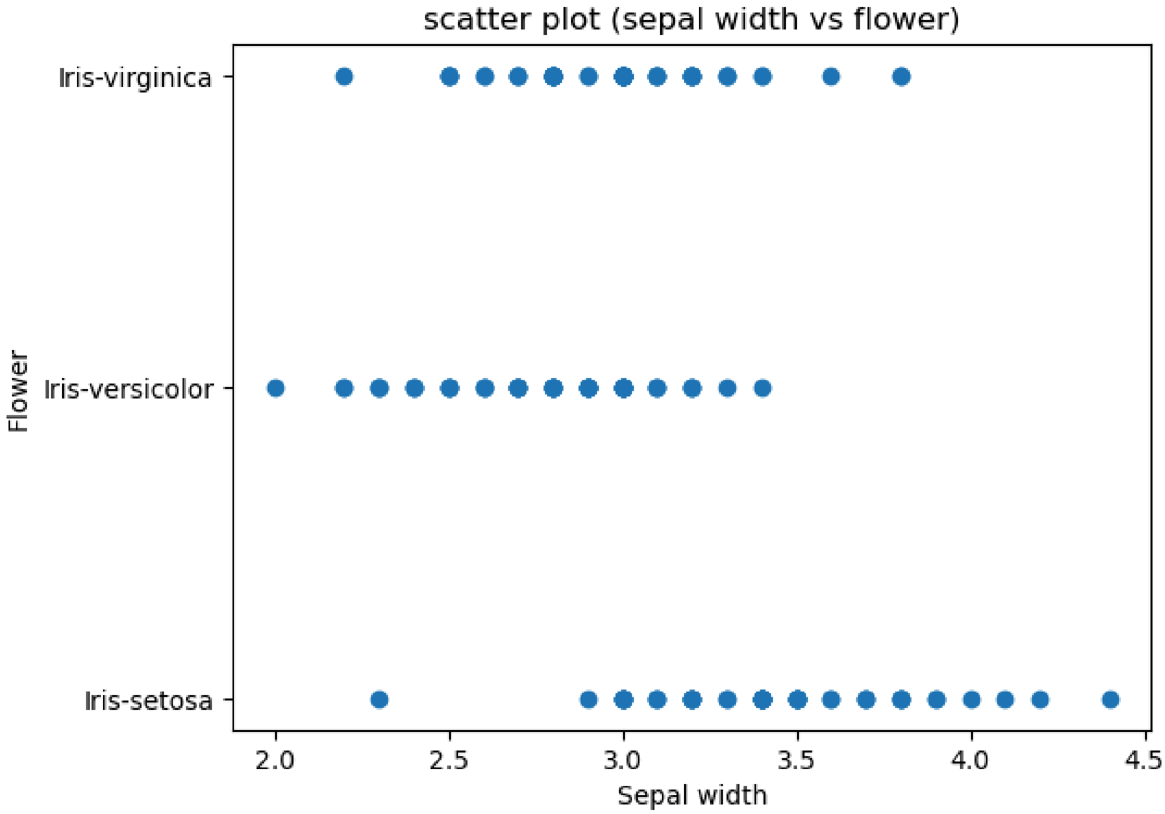
In [22]:
```
import matplotlib.pyplot as plt
import seaborn as sns
sns.histplot(df.drop('flower', axis=1))
plt.xlabel("flowers")
plt.ylabel("frequency")
plt.title("histogram")
plt.show()
```



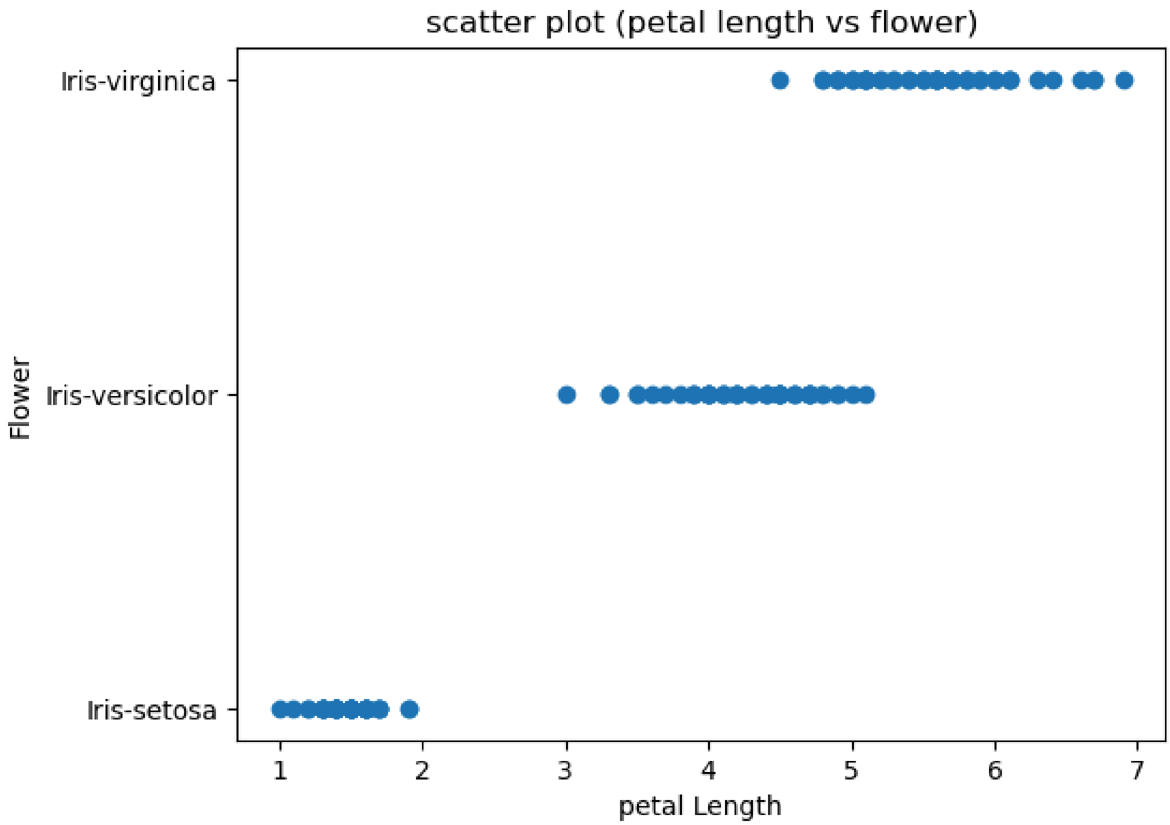
In [23]:
```
plt.scatter(df['sepal_length'],y)
plt.xlabel('Sepal Length')
plt.ylabel('Flower')
plt.title('scatter plot (sepal length vs flower)')
plt.show()
```



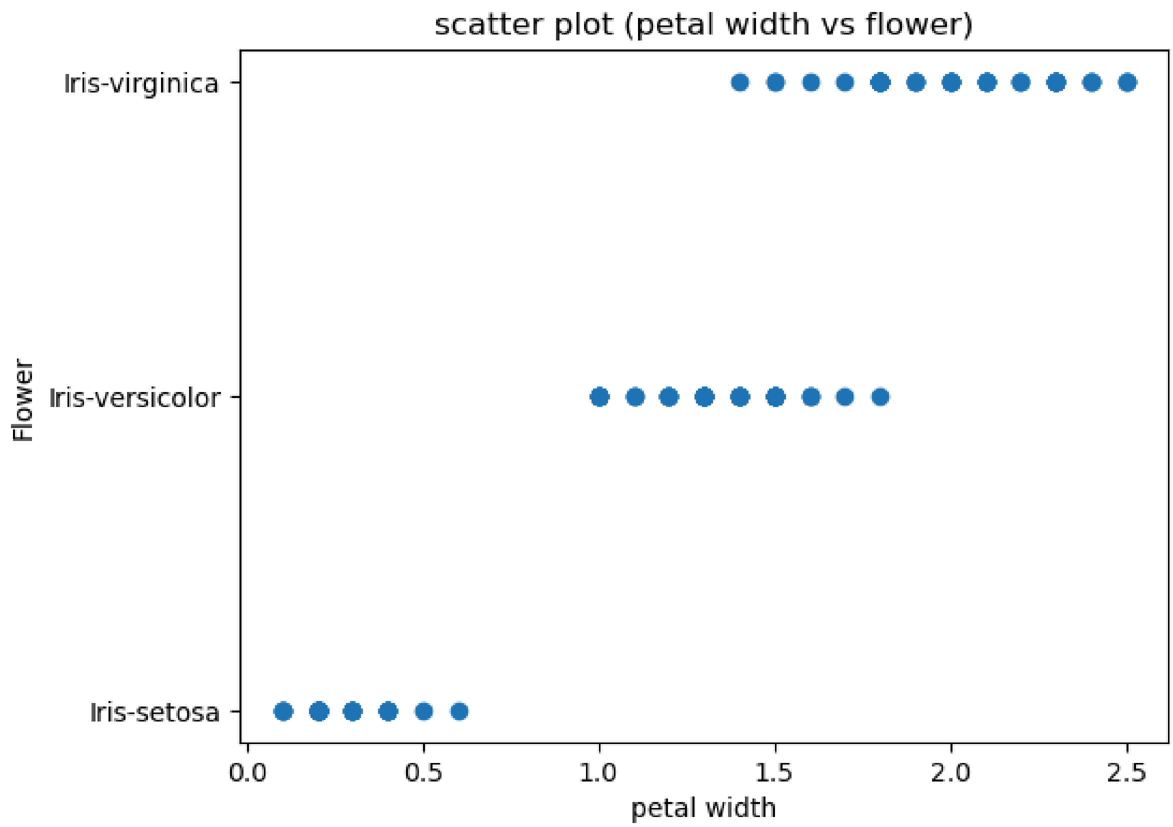
In [24]:
```
plt.scatter(df['sepal_width'],y)
plt.xlabel('Sepal width')
plt.ylabel('Flower')
plt.title('scatter plot (sepal width vs flower)')
plt.show()
```



In [25]:
```
plt.scatter(df['petal_length'],y)
plt.xlabel('petal Length')
plt.ylabel('Flower')
plt.title('scatter plot (petal length vs flower)')
plt.show()
```



In [26]:
```
plt.scatter(df['petal_width'],y)
plt.xlabel('petal width')
plt.ylabel('Flower')
plt.title('scatter plot (petal width vs flower)')
plt.show()
```



Select a machine learning algorithm to train your model. You can start with a simple algorithm like K-Nearest Neighbours or Decision Trees.

In [23]:
```
from sklearn.neighbors import KNeighborsClassifier

m = KNeighborsClassifier()
m.fit(X_train,y_train)
```

Out[23]:
```
▾ KNeighborsClassifier
KNeighborsClassifier()
```

In [24]:
```
y_pred = m.predict(X_test)
y_pred
```

Out[24]:
```
array([1, 2, 0, 1, 2, 1, 1, 2, 1, 0, 1, 2, 2, 1, 1, 2, 1, 2, 1, 0, 2, 0,
       2, 2, 0, 0, 1, 0, 0, 1])
```

In [30]:
```
from sklearn.metrics import accuracy_score , confusion_matrix
acc = accuracy_score(y_test, y_pred)
acc
```

Out[30]:
```
0.9
```

In [31]:
```
cm = confusion_matrix(y_test, y_pred)
cm
```

Out[31]:
```
array([[ 8,  0,  0],
       [ 0, 12,  3],
       [ 0,  0,  7]], dtype=int64)
```

In [ ]:

Use your model to make predictions on new data.

In [32]:
```
import joblib
```

In [33]:
```
joblib.dump(m, 'knn_model.pkl')
```

Out[33]:
```
['knn_model.pkl']
```

In [35]:
```
loaded_model = joblib.load('knn_model.pkl')
loaded_model
```

Out[35]:
```
▾ KNeighborsClassifier
KNeighborsClassifier()
```

In [39]:
```
X_new = X_test
#X_new
```

In [40]:
```
predictions = loaded_model.predict(X_new)
predictions
```

Out[40]:
```
array([1, 2, 0, 1, 2, 1, 1, 2, 1, 0, 1, 2, 2, 1, 1, 2, 1, 2, 1, 0, 2, 0,
       2, 2, 0, 0, 1, 0, 0, 1])
```

In [44]:
```
acc_new = accuracy_score(y_pred , y_test)
acc_new
```

Out[44]:
```
0.9
```

In [ ]:

In [46]:

```
# Ask users to input sepal length, sepal width, petal length, and petal width
sepal_length = float(input("Enter sepal length (cm): "))
sepal_width = float(input("Enter sepal width (cm): "))
petal_length = float(input("Enter petal length (cm): "))
petal_width = float(input("Enter petal width (cm): "))

# Input new data
new_data = [[sepal_length, sepal_width, petal_length, petal_width]]

# Make predictions
prediction = loaded_model.predict(new_data)

# Display prediction
print("Predicted specie:", prediction[0])
```

```
Enter sepal length (cm): 2.2
Enter sepal width (cm): 2.1
Enter petal length (cm): 2.3
Enter petal width (cm): 2.4
Predicted species: 2
```

In [49]:

```
species_mapping = {0: 'setosa', 1: 'versicolor', 2: 'virginica'}
predicted_species = species_mapping[prediction[0]]
```

In [50]:

```
predicted_species
```

Out[50]:

```
'virginica'
```

In [ ]: