In [31]:
```
import numpy as np
import pandas as pd
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
import seaborn as sns
```

In [34]:
```
df = pd.read_csv("C:/Users/deepa/Downloads/archive (2)/IRIS.csv")
df.head()
```

Out[34]:

	sepal_length	sepal_width	petal_length	petal_width	species
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 [35]:
```
df['species'] , categories = pd.factorize(df['species'])
df.head()
```

Out[35]:

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

In [36]:
```
df.describe
```

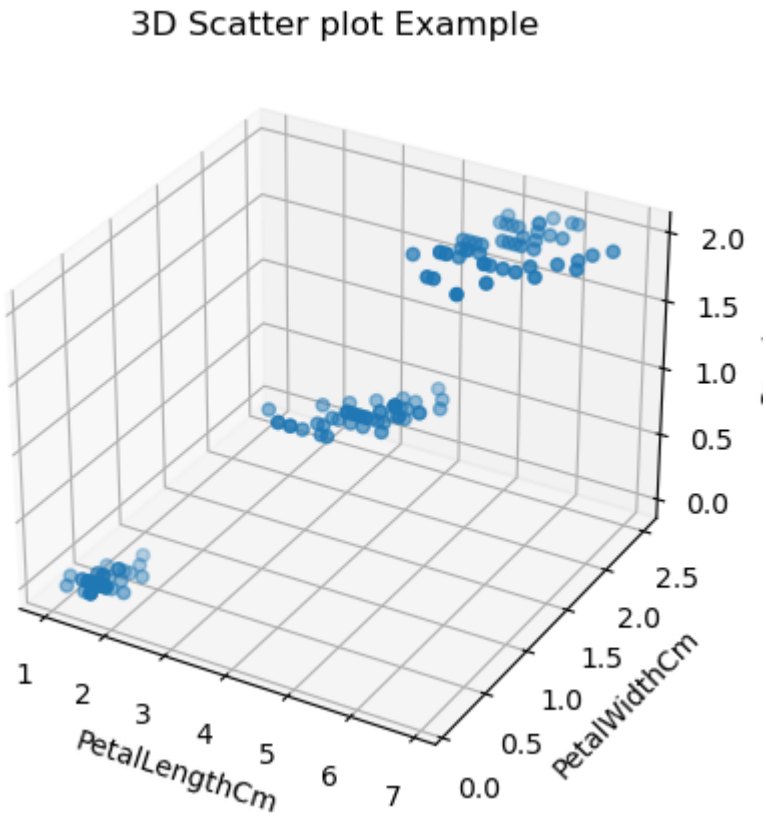
Out[36]:
```
<bound method NDFrame.describe of      sepal_length  sepal_width  petal_l
ength  petal_width  species
0             5.1          3.5           1.4          0.2        0
1             4.9          3.0           1.4          0.2        0
2             4.7          3.2           1.3          0.2        0
3             4.6          3.1           1.5          0.2        0
4             5.0          3.6           1.4          0.2        0
..            ...          ...           ...          ...      ...
145           6.7          3.0           5.2          2.3        2
146           6.3          2.5           5.0          1.9        2
147           6.5          3.0           5.2          2.0        2
148           6.2          3.4           5.4          2.3        2
149           5.9          3.0           5.1          1.8        2

[150 rows x 5 columns]>
```

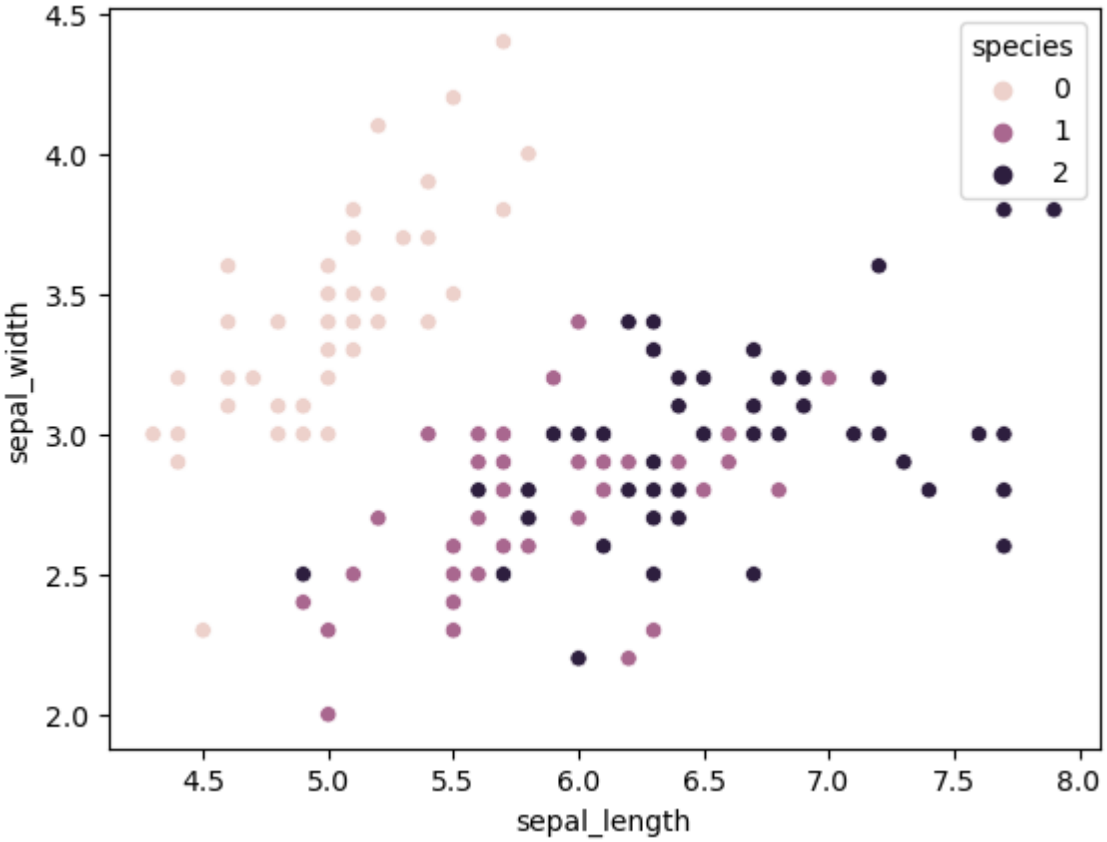
In [37]:
```
df.isna().sum()
```

Out[37]:
```
sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

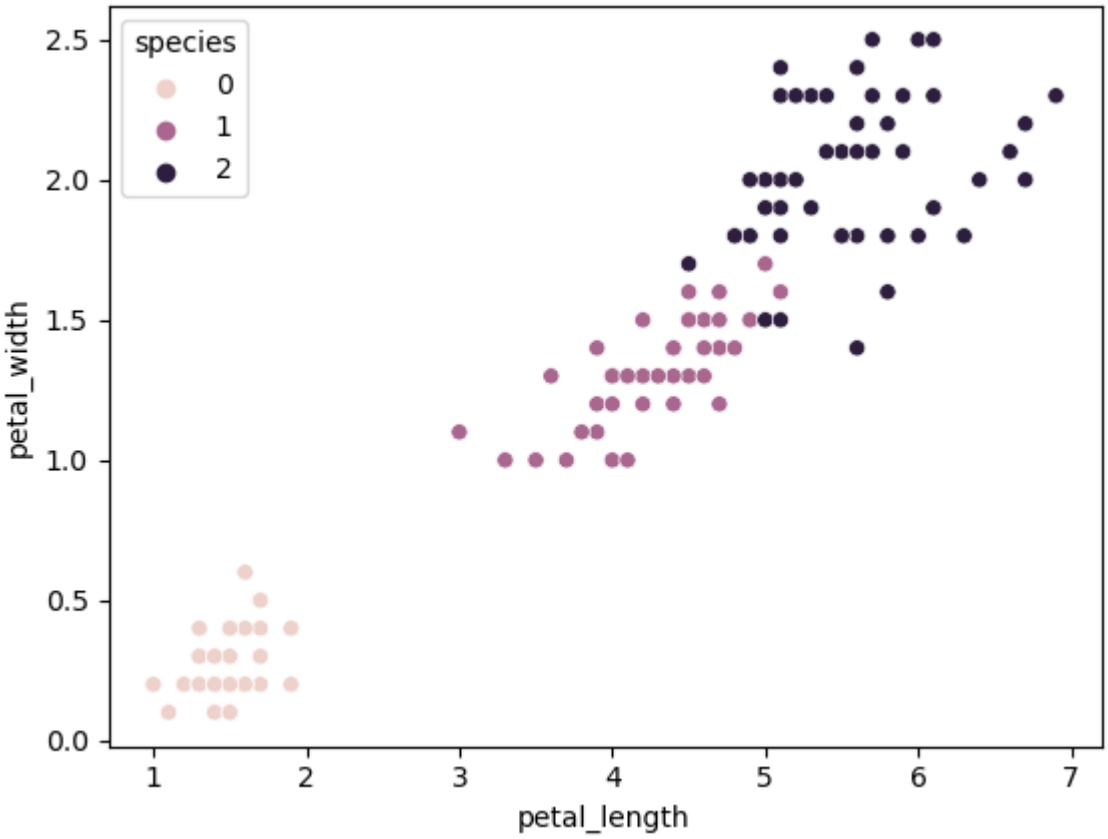
In [38]:
```
from mpl_toolkits.mplot3d import Axes3D
fig = plt.figure()
ax = fig.add_subplot(111,projection = '3d')
ax.scatter(df.petal_length ,df.petal_width , df.species)
ax.set_xlabel('PetalLengthCm')
ax.set_ylabel('PetalWidthCm')
ax.set_zlabel('Species')
plt.title('3D Scatter plot Example')
plt.show()
```



In [39]:
```
sns.scatterplot(data = df, x="sepal_length" ,y ="sepal_width",hue ="species
```



In [40]:
```
sns.scatterplot(data= df , x="petal_length", y="petal_width",hue="species")
```



In [46]:

```
k_rng = range(1,10)
sse=[]

for k in k_rng:
 km = KMeans(n_clusters=k)
 km.fit(df[['petal_length' ,'petal_width']])
 sse.append(km.inertia_)
```

```
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
0: FutureWarning: The default value of `n_init` will change from 10 to 'a
uto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
2: UserWarning: KMeans is known to have a memory leak on Windows with MK
L, when there are less chunks than available threads. You can avoid it by
setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
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C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
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setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
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C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
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  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
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setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
0: FutureWarning: The default value of `n_init` will change from 10 to 'a
uto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
```

```
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
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  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
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  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
2: UserWarning: KMeans is known to have a memory leak on Windows with MK
L, when there are less chunks than available threads. You can avoid it by
setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
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uto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
2: UserWarning: KMeans is known to have a memory leak on Windows with MK
L, when there are less chunks than available threads. You can avoid it by
setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```
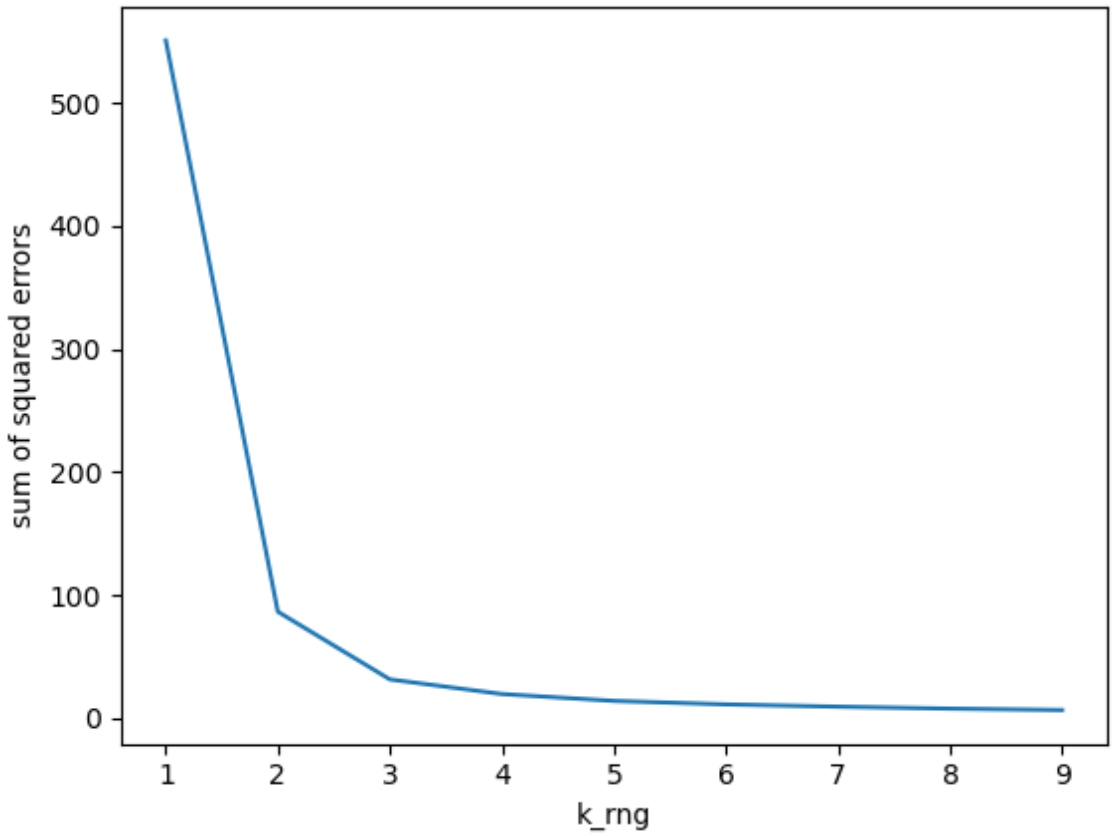

In [47]:
```
sse
```

Out[47]:
```
[550.6434666666668,
 86.40394533571002,
 31.387758974358984,
 19.499400899685114,
 13.93330875790876,
 11.089449150654417,
 9.228504827285606,
 7.631802244955955,
 6.496659206692712]
```

In [48]:
```
plt.xlabel('k_rng')
plt.ylabel("sum of squared errors")
plt.plot(k_rng,sse)
```

Out[48]:
```
[<matplotlib.lines.Line2D at 0x255a88e8eb0>]
```



In [49]:
```
km = KMeans(n_clusters = 3 , random_state=0,)
y_predicted = km.fit_predict(df[['petal_length','petal_width']])
y_predicted
```

```
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:87
0: FutureWarning: The default value of `n_init` will change from 10 to 'a
uto' in 1.4. Set the value of `n_init` explicitly to suppress the warning
  warnings.warn(
C:\Users\deepa\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:138
2: UserWarning: KMeans is known to have a memory leak on Windows with MK
L, when there are less chunks than available threads. You can avoid it by
setting the environment variable OMP_NUM_THREADS=1.
  warnings.warn(
```

Out[49]:
```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 2, 2, 2, 2, 2, 1, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1])
```

In [50]:
```
df['cluster'] = y_predicted
df.head(150)
```

Out[50]:

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

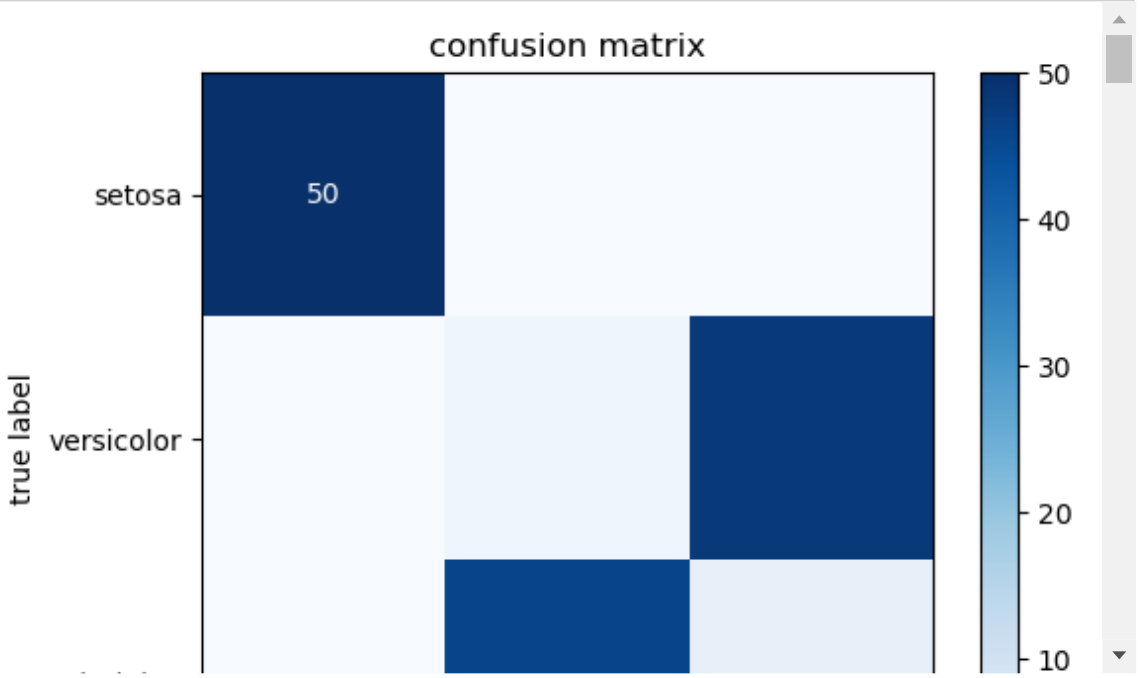
150 rows × 6 columns

In [51]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(df.species , df.cluster)
cm
```

Out[51]:
```
array([[50,  0,  0],
       [ 0,  2, 48],
       [ 0, 46,  4]], dtype=int64)
```

In [53]:

```
true_labels = df.species
predicted_labels = df.cluster
cm = confusion_matrix(true_labels , predicted_labels)
class_labels = ['setosa','versicolor','virginica']

plt.imshow(cm,interpolation = 'nearest' , cmap=plt.cm.Blues)
plt.title('confusion matrix')
plt.colorbar()
tick_marks = np.arange(len(class_labels))
plt.xticks(tick_marks , class_labels)
plt.yticks(tick_marks , class_labels)

for i in range(len(class_labels)):
    for j in range(len(class_labels)):
        plt.text(j,i,str(cm[i][j]) , ha='center', va='center',color='white'

        plt.xlabel('predicted label')
        plt.ylabel('true label')
        plt.show()
```



In [ ]: