this problem is a multi class classification task of predicting the species of the plant based on 4 features (sepal len,wid and petal len,wid)

LOADING DATASET

```
import pandas as pd

#loading the dataset as a pandas dataframe
df = pd.read_csv("iris.csv")

#prints first 5 cols of the dataset
df.head()
```

```
   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
```

```
#shows no of rows and cols in the dataset
df.shape
```

```
(150, 5)
```

```
#summary statistics of the dataset(only the numerical columns)
df.describe()
```

```
       sepal_length  sepal_width  petal_length  petal_width
count    150.000000   150.000000    150.000000   150.000000
mean       5.843333     3.054000      3.758667     1.198667
std        0.828066     0.433594      1.764420     0.763161
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
```

To know how many classes are present in the target variable and also what is the induvidual no of examples for each class, we can use group by method

```
df.groupby('species').size()
```

```
species
setosa        50
versicolor    50
virginica     50
dtype: int64
```

DATA PREPROCESSING:

```
#checking if dataset has null values
df.isnull().sum()

sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species         0
dtype: int64
```

as there is no null values in the dataset, we can go for further preprocessing steps

```
#splitting dataset into features(x) and target col(y)

X = df.drop(['species'],axis=1).values
y = df['species'].values
```

as y has 3 classes, we need to encode it using label encoder

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
y = le.fit_transform(y)
y

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, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 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, 2, 2, 2, 2,
2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2])
```

next the dataset is split into train and test sets

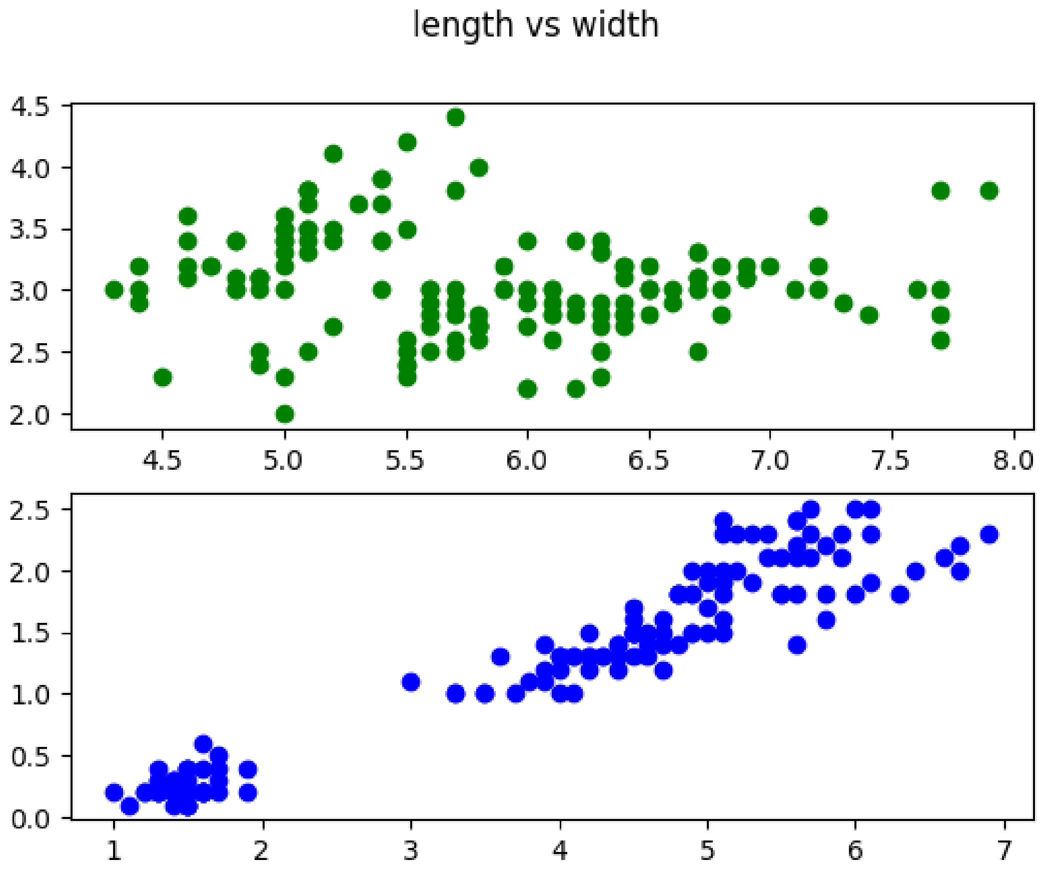
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size =
0.3, random_state = 0)
```

DATA VISUALISATION

```
#subplots for sepal len vs width and petal len vs width
import matplotlib.pyplot as plt
```

```
fig, axs = plt.subplots(2)
fig.suptitle('length vs width')
axs[0].plot(df.sepal_length,
df.sepal_width,ls='',marker='o',color='g',label='Sepal')
axs[1].plot(df.petal_length,
df.petal_width,ls='',marker='o',color='b',label='Petal')

[<matplotlib.lines.Line2D at 0x7fa9f522e4c0>]
```



MODEL TRAINING

```
#Fitting clasifier to the Training set

from sklearn.neighbors import KNeighborsClassifier

from sklearn.model_selection import cross_val_score

#Instantiate model (k = 3)
classifier = KNeighborsClassifier(n_neighbors=3)

#Fitting the model
classifier.fit(X_train, y_train)
```

```
#Predicting the Test set results
y_pred = classifier.predict(X_test)
```

MODEL EVALUATION

```
#confusion matrix

from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
cm
```

```
array([[16,  0,  0],
       [ 0, 17,  1],
       [ 0,  0, 11]])
```

```
#classification report, it shows the precision, recall and F1 score of all the 3 classes separately and also the overall accuracy
from sklearn.metrics import classification_report
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00        16
           1       1.00      0.94      0.97        18
           2       0.92      1.00      0.96        11

    accuracy                           0.98        45
   macro avg       0.97      0.98      0.98        45
weighted avg       0.98      0.98      0.98        45
```

MODEL INTERPRETATION

=> In class 0, all the exaples in the test set belonging to this class has been correctly predicted

=> In class 1, only 94% of the samples actually belonging to this class have been perdicted correctly (recall=0.94)

=> In class 2, only 92% of the samples predicted as this class actually belong to class 2 (precision=0.92) y

=> In 98% of the cases, the model has predicted the class correctl