In [1]:

```
# classification - decision tree implemetaiton
# aim : to classify the iris plant species given in the dataset using the decision tree alg

import numpy as np                  # linear algebra
import pandas as pd                 # data processing, CSV file I/O (e.g. pd.read_csv)
```

In [2]:

```
# importing the dataset and seeing it's shape
df = pd.read_csv('Iris.csv')
df.shape
```

Out[2]:

```
(150, 6)
```

In [3]:

```
df.head()
```

Out[3]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa

In [4]:

```
X = df.drop(['Species','Id'], axis=1)
y = df['Species']
X.head()
```

Out[4]:

	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
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

In [5]:

```
from category_encoders import OrdinalEncoder

encoder = OrdinalEncoder()
encoder.fit(X)
X_enc = encoder.transform(X)
X_enc.head()
```

Out[5]:

	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
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

In [6]:

```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X_enc, y, train_size = .66)
X_train.shape
```

Out[6]:

```
(99, 4)
```

In [7]:

```
from sklearn.tree import DecisionTreeClassifier

classifier = DecisionTreeClassifier(criterion='gini', max_depth=3)
model = classifier.fit(X_train, y_train)
classifier.score(X_train, y_train)
```

Out[7]:

```
0.9595959595959596
```

In [8]:

```
classifier.score(X_test, y_test)
```

Out[8]:

```
1.0
```

In [9]:

```
model.classes_
```

Out[9]:

```
array(['Iris-setosa', 'Iris-versicolor', 'Iris-virginica'], dtype=object)
```

In [10]:

```
model.feature_importances_
```

Out[10]:

```
array([0.        , 0.        , 0.07655111, 0.92344889])
```

In [11]:

```
list(zip(X.columns, model.feature_importances_))
```

Out[11]:

```
[('SepalLengthCm', 0.0),
 ('SepalWidthCm', 0.0),
 ('PetalLengthCm', 0.07655110809475572),
 ('PetalWidthCm', 0.9234488919052444)]
```

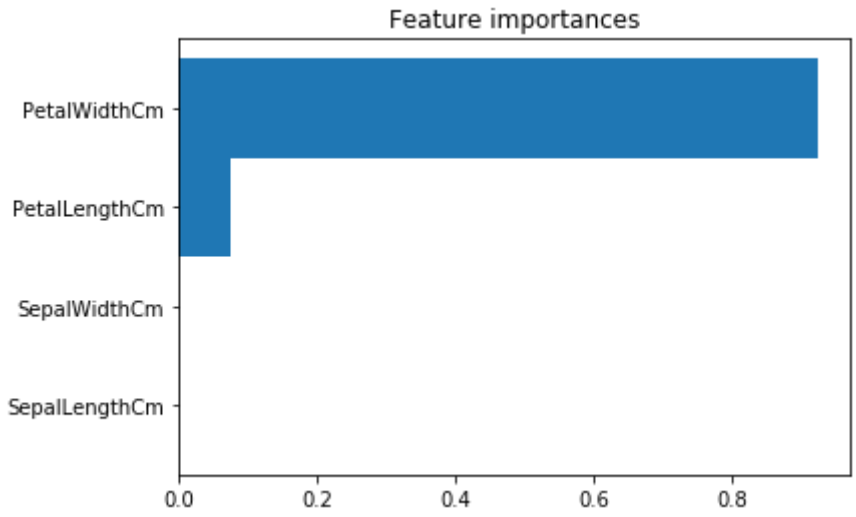
In [16]:

```
import matplotlib.pyplot as plt # data visualization

plt.figure()
plt.title("Feature importances")
plt.barh(X.columns, model.feature_importances_, 1)
```

Out[16]:

```
<BarContainer object of 4 artists>
```



In [17]:

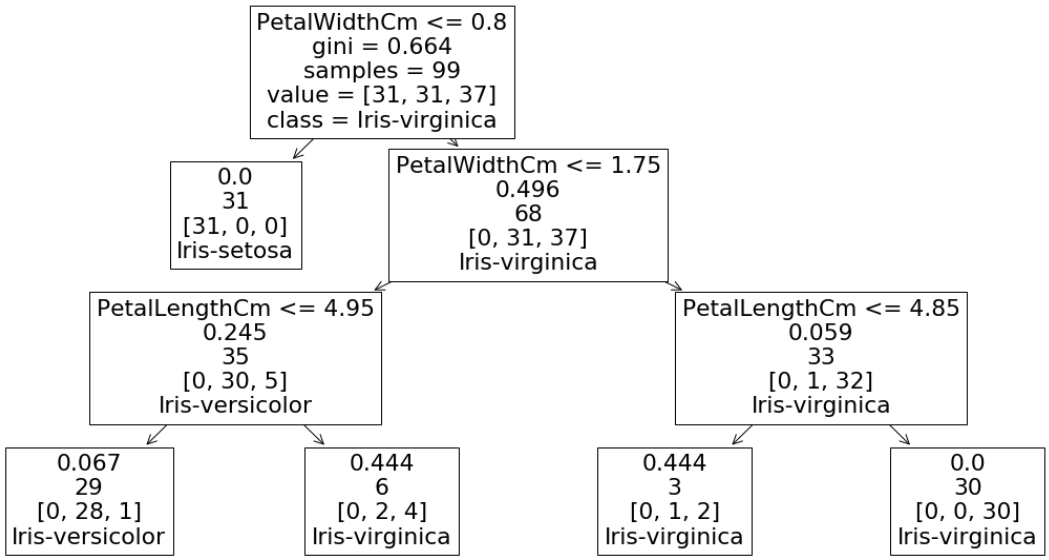
```
from sklearn import tree
import matplotlib.pyplot as plt # data visualization

plt.figure(figsize=(20,10))

tree.plot_tree(model, feature_names = X.columns, class_names = model.classes_, label='root'
```

Out[17]:

```
[Text(418.5, 475.65000000000003, 'PetalWidthCm <= 0.8\ngini = 0.664\nsamples
= 99\nvalue = [31, 31, 37]\nclass = Iris-virginica'),
 Text(279.0, 339.75, '0.0\n31\n[31, 0, 0]\nIris-setosa'),
 Text(558.0, 339.75, 'PetalWidthCm <= 1.75\n0.496\n68\n[0, 31, 37]\nIris-vir
ginica'),
 Text(279.0, 203.85000000000002, 'PetalLengthCm <= 4.95\n0.245\n35\n[0, 30,
5]\nIris-versicolor'),
 Text(139.5, 67.94999999999999, '0.067\n29\n[0, 28, 1]\nIris-versicolor'),
 Text(418.5, 67.94999999999999, '0.444\n6\n[0, 2, 4]\nIris-virginica'),
 Text(837.0, 203.85000000000002, 'PetalLengthCm <= 4.85\n0.059\n33\n[0, 1, 3
2]\nIris-virginica'),
 Text(697.5, 67.94999999999999, '0.444\n3\n[0, 1, 2]\nIris-virginica'),
 Text(976.5, 67.94999999999999, '0.0\n30\n[0, 0, 30]\nIris-virginica')]
```



In [18]:

```
from sklearn.metrics import confusion_matrix

y_predict_test = classifier.predict(X_test)
confusion_matrix(y_test, y_predict_test)
```

Out[18]:

```
array([[19,  0,  0],
       [ 0, 19,  0],
       [ 0,  0, 13]], dtype=int64)
```

In [19]:

```
from sklearn.metrics import classification_report

print(classification_report(y_test, y_predict_test))
```

```
                precision    recall  f1-score   support

    Iris-setosa       1.00      1.00      1.00        19
Iris-versicolor       1.00      1.00      1.00        19
 Iris-virginica       1.00      1.00      1.00        13

       accuracy                           1.00        51
      macro avg       1.00      1.00      1.00        51
   weighted avg       1.00      1.00      1.00        51
```

In [ ]: