Sk learn version(2.1)

Plotting a decision Tree

In [1]:
```python
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

```
/Users/abhilashavadhanula/opt/anaconda3/lib/python3.7/importlib/_bootstrap.py:219: RuntimeWar
ning: numpy.ufunc size changed, may indicate binary incompatibility. Expected 192 from C head
er, got 216 from PyObject
  return f(*args, **kwds)
```

In [4]:
```python
from sklearn.datasets import load_iris
from sklearn import tree
```

```
/Users/abhilashavadhanula/opt/anaconda3/lib/python3.7/importlib/_bootstrap.py:219: RuntimeWar
ning: numpy.ufunc size changed, may indicate binary incompatibility. Expected 192 from C head
er, got 216 from PyObject
  return f(*args, **kwds)
/Users/abhilashavadhanula/opt/anaconda3/lib/python3.7/importlib/_bootstrap.py:219: RuntimeWar
ning: numpy.ufunc size changed, may indicate binary incompatibility. Expected 192 from C head
er, got 216 from PyObject
  return f(*args, **kwds)
/Users/abhilashavadhanula/opt/anaconda3/lib/python3.7/importlib/_bootstrap.py:219: RuntimeWar
ning: numpy.ufunc size changed, may indicate binary incompatibility. Expected 192 from C head
er, got 216 from PyObject
  return f(*args, **kwds)
```

In [5]:
```python
cls=tree.DecisionTreeClassifier()
iris=load_iris()
```

In [6]:
```python
iris
```

Out[6]:
```
{'data': array([[5.1, 3.5, 1.4, 0.2],
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        [6.4, 3.2, 5.3, 2.3],
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        [6.4, 3.1, 5.5, 1.8],
        [6. , 3. , 4.8, 1.8],
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        [6.3, 2.5, 5. , 1.9],
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 'target_names': array(['setosa', 'versicolor', 'virginica'], dtype='<U10'),
 'DESCR': '.. _iris_dataset:\n\nIris plants dataset\n--------------------\n\n**Data Set Chara
cteristics:**\n\n    :Number of Instances: 150 (50 in each of three classes)\n    :Number of
Attributes: 4 numeric, predictive attributes and the class\n    :Attribute Information:\n
- sepal length in cm\n        - sepal width in cm\n        - petal length in cm\n        - pe
tal width in cm\n        - class:\n                - Iris-Setosa\n                - Iris-Vers
icolour\n                - Iris-Virginica\n                \n    :Summary Statistics:\n\n
============== ==== ==== ======= ===== ====================\n                    Min  Max   M
ean    SD   Class Correlation\n    ============== ==== ==== ======= ===== ==================
=\n    sepal length:   4.3  7.9   5.84   0.83    0.7826\n    sepal width:    2.0  4.4   3.05
0.43   -0.4194\n    petal length:   1.0  6.9   3.76   1.76    0.9490  (high!)\n    petal widt
h:    0.1  2.5   1.20   0.76    0.9565  (high!)\n    ============== ==== ==== ======= ===== =
===================\n\n    :Missing Attribute Values: None\n    :Class Distribution: 33.3% fo
r each of 3 classes.\n    :Creator: R.A. Fisher\n    :Donor: Michael Marshall (MARSHALL%PLU@i
o.arc.nasa.gov)\n    :Date: July, 1988\n\nThe famous Iris database, first used by Sir R.A. Fi
sher. The dataset is taken\nfrom Fisher\'s paper. Note that it\'s the same as in R, but not a
s in the UCI\nMachine Learning Repository, which has two wrong data points.\n\nThis is perhap
s the best known database to be found in the\npattern recognition literature.  Fisher\'s pape
r is a classic in the field and\nis referenced frequently to this day.  (See Duda & Hart, for
example.)  The\ndata set contains 3 classes of 50 instances each, where each class refers to
a\ntype of iris plant.  One class is linearly separable from the other 2; the\nlatter are NOT
linearly separable from each other.\n\n.. topic:: References\n\n   - Fisher, R.A. "The use of
multiple measurements in taxonomic problems"\n     Annual Eugenics, 7, Part II, 179-188 (193
6); also in "Contributions to\n     Mathematical Statistics" (John Wiley, NY, 1950).\n   - Du
da, R.O., & Hart, P.E. (1973) Pattern Classification and Scene Analysis.\n     (Q327.D83) Joh
n Wiley & Sons.  ISBN 0-471-22361-1.  See page 218.\n   - Dasarathy, B.V. (1980) "Nosing Arou
nd the Neighborhood: A New System\n     Structure and Classification Rule for Recognition in
Partially Exposed\n     Environments".  IEEE Transactions on Pattern Analysis and Machine\n
Intelligence, Vol. PAMI-2, No. 1, 67-71.\n   - Gates, G.W. (1972) "The Reduced Nearest Neighb
or Rule".  IEEE Transactions\n     on Information Theory, May 1972, 431-433.\n   - See also:
1988 MLC Proceedings, 54-64.  Cheeseman et al"s AUTOCLASS II\n     conceptual clustering syst
em finds 3 classes in the data.\n   - Many, many more ...',
 'feature_names': ['sepal length (cm)',
  'sepal width (cm)',
  'petal length (cm)',
  'petal width (cm)'],
 'filename': '/Users/abhilashavadhanula/opt/anaconda3/lib/python3.7/site-packages/sklearn/dat
asets/data/iris.csv'}
```

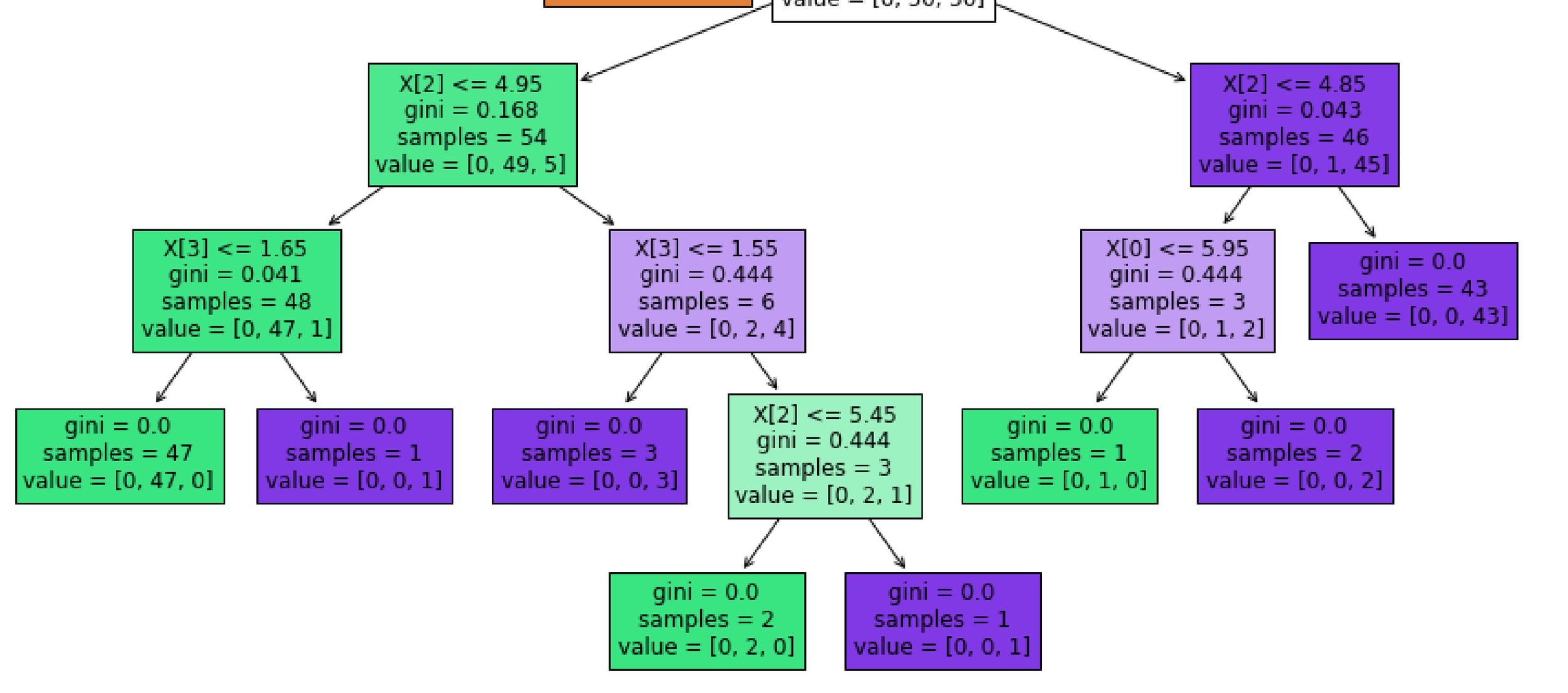
In [8]:
```python
clf=cls.fit(iris.data,iris.target)
```

In [9]:
```python
clf
```

Out[9]:
```
DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini',
                       max_depth=None, max_features=None, max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, presort='deprecated',
                       random_state=None, splitter='best')
```

In [11]:
```python
plt.figure(figsize=(15,10))
tree.plot_tree(clf,filled=True)
```

Out[11]:
```
[Text(418.5, 498.3, 'X[2] <= 2.45\ngini = 0.667\nsamples = 150\nvalue = [50, 50, 50]'),
 Text(354.11538461538464, 407.70000000000005, 'gini = 0.0\nsamples = 50\nvalue = [50, 0,
0]'),
 Text(482.8846153846154, 407.70000000000005, 'X[3] <= 1.75\ngini = 0.5\nsamples = 100\nvalue
= [0, 50, 50]'),
 Text(257.53846153846155, 317.1, 'X[2] <= 4.95\ngini = 0.168\nsamples = 54\nvalue = [0, 49,
5]'),
 Text(128.76923076923077, 226.5, 'X[3] <= 1.65\ngini = 0.041\nsamples = 48\nvalue = [0, 47,
1]'),
 Text(64.38461538461539, 135.89999999999998, 'gini = 0.0\nsamples = 47\nvalue = [0, 47, 0]'),
 Text(193.15384615384616, 135.89999999999998, 'gini = 0.0\nsamples = 1\nvalue = [0, 0, 1]'),
 Text(386.3076923076923, 226.5, 'X[3] <= 1.55\ngini = 0.444\nsamples = 6\nvalue = [0, 2,
4]'),
 Text(321.9230769230769, 135.89999999999998, 'gini = 0.0\nsamples = 3\nvalue = [0, 0, 3]'),
 Text(450.69230769230774, 135.89999999999998, 'X[2] <= 5.45\ngini = 0.444\nsamples = 3\nvalue
= [0, 2, 1]'),
 Text(386.3076923076923, 45.299999999999955, 'gini = 0.0\nsamples = 2\nvalue = [0, 2, 0]'),
 Text(515.0769230769231, 45.299999999999955, 'gini = 0.0\nsamples = 1\nvalue = [0, 0, 1]'),
 Text(708.2307692307693, 317.1, 'X[2] <= 4.85\ngini = 0.043\nsamples = 46\nvalue = [0, 1, 4
5]'),
 Text(643.8461538461538, 226.5, 'X[0] <= 5.95\ngini = 0.444\nsamples = 3\nvalue = [0, 1,
2]'),
 Text(579.4615384615385, 135.89999999999998, 'gini = 0.0\nsamples = 1\nvalue = [0, 1, 0]'),
 Text(708.2307692307693, 135.89999999999998, 'gini = 0.0\nsamples = 2\nvalue = [0, 0, 2]'),
 Text(772.6153846153846, 226.5, 'gini = 0.0\nsamples = 43\nvalue = [0, 0, 43]')]
```



In [12]:
```python
print(tree.export_text(clf))
```

```
|--- feature_2 <= 2.45
|   |--- class: 0
|--- feature_2 >  2.45
|   |--- feature_3 <= 1.75
|   |   |--- feature_2 <= 4.95
|   |   |   |--- feature_3 <= 1.65
|   |   |   |   |--- class: 1
|   |   |   |--- feature_3 >  1.65
|   |   |   |   |--- class: 2
|   |   |--- feature_2 >  4.95
|   |   |   |--- feature_3 <= 1.55
|   |   |   |   |--- class: 2
|   |   |   |--- feature_3 >  1.55
|   |   |   |   |--- feature_2 <= 5.45
```