Assignment - 30 - MACHINE LEARNING - 10

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Problem Statement: Transform iris data into 3 dimensions and plot a 3d ¶

- Chart with transformed dimensions and color each data point with specific class.
- Hint:
- import numpy as np
- import matplotlib.pyplot as plt
- from mpl_toolkits.mplot3d import Axes3D
- from sklearn import decomposition
- from sklearn import datasets

In [1]:
```
# Loading Libraries
import numpy as np
import pandas as pd

import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
from sklearn import decomposition, datasets

from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
```

Load Data

In [2]:
```
# Load IRIS Dataset
URL = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
df = pd.read_csv(URL)
```

In [5]:
```
df.head(10)
```

Out[5]:

	sepal_length	sepal_width	petal_length	petal_width	target
0	4.9	3.0	1.4	0.2	Iris-setosa
1	4.7	3.2	1.3	0.2	Iris-setosa
2	4.6	3.1	1.5	0.2	Iris-setosa
3	5.0	3.6	1.4	0.2	Iris-setosa
4	5.4	3.9	1.7	0.4	Iris-setosa
5	4.6	3.4	1.4	0.3	Iris-setosa
6	5.0	3.4	1.5	0.2	Iris-setosa
7	4.4	2.9	1.4	0.2	Iris-setosa
8	4.9	3.1	1.5	0.1	Iris-setosa
9	5.4	3.7	1.5	0.2	Iris-setosa

In [6]:
```
col_names=['sepal_length','sepal_width','petal_length','petal_width','target']
df.columns=col_names
df.head(10)
```

Out[6]:

	sepal_length	sepal_width	petal_length	petal_width	target
0	4.9	3.0	1.4	0.2	Iris-setosa
1	4.7	3.2	1.3	0.2	Iris-setosa
2	4.6	3.1	1.5	0.2	Iris-setosa
3	5.0	3.6	1.4	0.2	Iris-setosa
4	5.4	3.9	1.7	0.4	Iris-setosa
5	4.6	3.4	1.4	0.3	Iris-setosa
6	5.0	3.4	1.5	0.2	Iris-setosa
7	4.4	2.9	1.4	0.2	Iris-setosa
8	4.9	3.1	1.5	0.1	Iris-setosa
9	5.4	3.7	1.5	0.2	Iris-setosa

Analyze Data

In [8]:
```
df.describe()
```

Out[8]:

	sepal_length	sepal_width	petal_length	petal_width
count	149.000000	149.000000	149.000000	149.000000
mean	5.848322	3.051007	3.774497	1.205369
std	0.828594	0.433499	1.759651	0.761292
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.400000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

3-D Analysis

In [9]:
```
features = ['sepal_length', 'sepal_width', 'petal_length', 'petal_width']
```

In [14]:
```
# Separating out the target and Standardizing
x = df.loc[:, features].values
y = df.loc[:,['target']].values
x = StandardScaler().fit_transform(x)
```

In [18]:
```
# PCA Analysis
pca = PCA(n_components=3)
pc = pca.fit_transform(x)
pc_Df = pd.DataFrame(data = pc, columns = ['PC_1', 'PC_2','PC_3'])
pc_Df.head(10)
```

Out[18]:

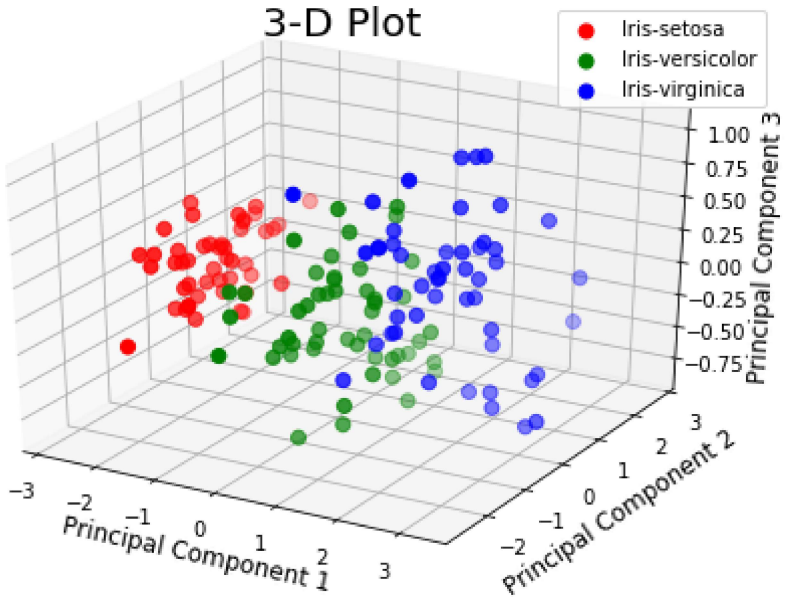
	PC_1	PC_2	PC_3
0	-2.107950	-0.644276	-0.228768
1	-2.387971	-0.305833	0.049672
2	-2.324879	-0.562923	0.097142
3	-2.405086	0.687591	0.018819
4	-2.083204	1.530252	0.027757
5	-2.463685	0.087954	0.340195
6	-2.251750	0.259644	-0.084873
7	-2.364581	-1.082557	0.152275
8	-2.209463	-0.437077	-0.248514
9	-2.178620	1.082210	-0.266889

In [20]:
```
# target df adding target variable
target_df = pd.concat([pc_Df, df[['target']]], axis = 1)
target_df.head(5)
```

Out[20]:

	PC_1	PC_2	PC_3	target
0	-2.107950	-0.644276	-0.228768	Iris-setosa
1	-2.387971	-0.305833	0.049672	Iris-setosa
2	-2.324879	-0.562923	0.097142	Iris-setosa
3	-2.405086	0.687591	0.018819	Iris-setosa
4	-2.083204	1.530252	0.027757	Iris-setosa

In [23]:
```
# 3D Data with Plot

#Set the 3d Plot
fig = plt.figure()
ax = fig.add_subplot(211, projection='3d')
fig.add_subplot(211, projection='3d')
ax = Axes3D(fig)

#Set the Label
ax.set_xlabel('Principal Component 1', fontsize = 12)
ax.set_ylabel('Principal Component 2', fontsize = 12)
ax.set_zlabel('Principal Component 3', fontsize = 12)
ax.set_title('3-D Plot', fontsize = 20)

#Set the Color of 3D
targets = ['Iris-setosa', 'Iris-versicolor', 'Iris-virginica']
colors = ['r', 'g', 'b']

#Loop through and Plot 3D
for target, color in zip(targets,colors):
    indicesToKeep = target_df['target'] == target
    ax.scatter3D(target_df.loc[indicesToKeep, 'PC_1']
                ,target_df.loc[indicesToKeep, 'PC_2']
                ,target_df.loc[indicesToKeep, 'PC_3']
                , c = color
                , s = 50)

ax.legend(targets)  # Legend
ax.grid()           # Grid
```


3-D Plot
Iris-setosa
Iris-versicolor
Iris-virginica
Principal Component 1
Principal Component 2
Principal Component 3