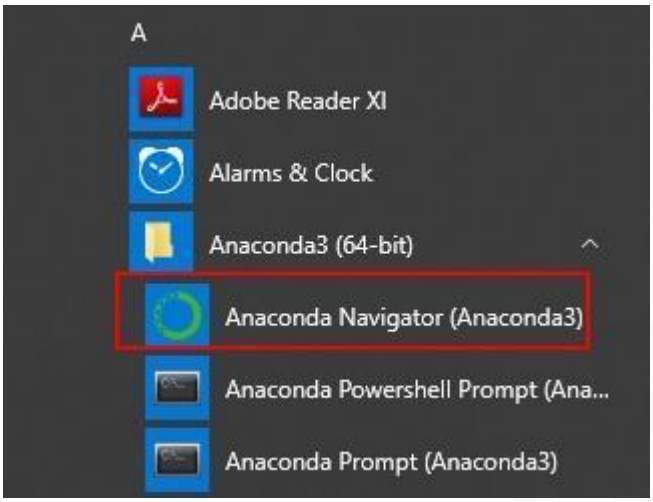
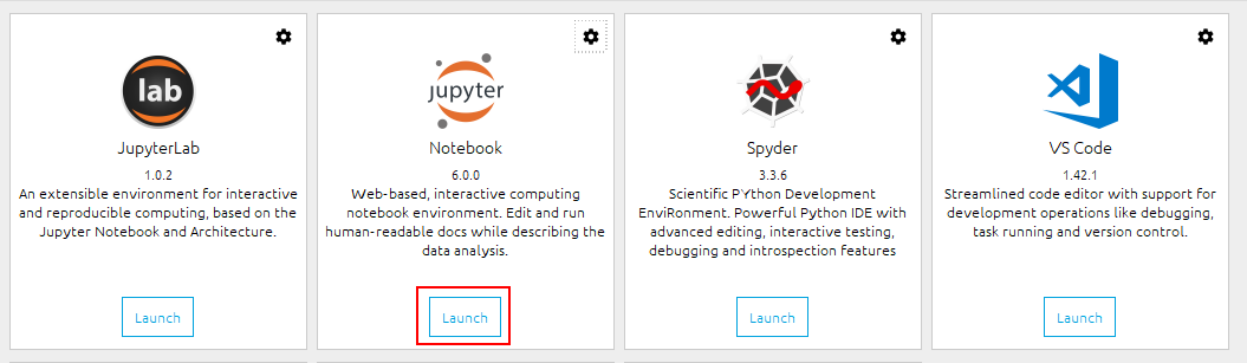
Module 11: Hands-On: 1

Principal Component Analysis:

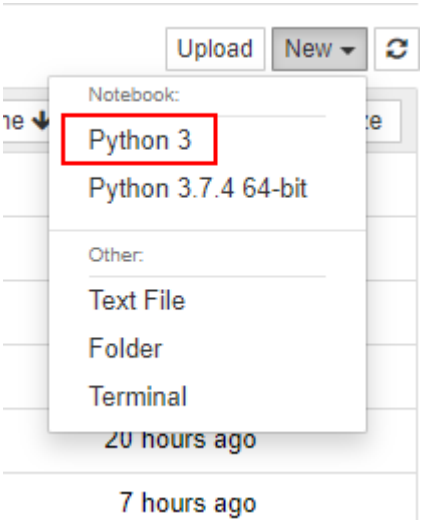
Step 1: Open Anaconda Navigator



Step 2: Click on Launch button under Jupyter Notebook



Step 3: After the notebook opens click on New and Python 3



Step 4: Import all the required modules by typing the following code in the notebook and run it by pressing shift + enter

```
In [1]: import numpy as np
        import pandas as pd
        from sklearn.model_selection import train_test_split
        from sklearn.preprocessing import StandardScaler
        from sklearn.decomposition import PCA
        from sklearn.ensemble import RandomForestClassifier
        from sklearn.metrics import confusion_matrix
        from sklearn.metrics import accuracy_score
```

Step 5: Load the iris dataset

```
In [2]: url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
        names = ['sepal-length', 'sepal-width', 'petal-length', 'petal-width', 'Class']
        dataset = pd.read_csv(url, names=names)
```

Step 6: Analyze the head of the data

```
In [3]: dataset.head()
```

Out[3]:

	sepal-length	sepal-width	petal-length	petal-width	Class
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

Step 7: Extract data from dataframe into X and Y variables

```
In [34]: X = dataset.drop('Class', 1)
         y = dataset['Class']
```

Step 8: Split the data into 70 percent for training and 30 percent testing

```
In [47]: X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=0)
```

Step 9: Scale the data

```
In [48]: sc = StandardScaler()
         X_train = sc.fit_transform(X_train)
         X_test = sc.transform(X_test)
```


Step 9: Create a PCA object and transform x_train and x_test

```
In [49]: pca = PCA()
         X_train = pca.fit_transform(X_train)
         X_test = pca.transform(X_test)
```

Step 10: Take a look at variance explained by each principal component

```
In [53]: explained_variance = pca.explained_variance_ratio_
         explained_variance
Out[53]: array([0.71803699, 0.24442718, 0.03337158, 0.00416425])
```

Step 11: Define a function called perform_pca that takes number of components for PCA to find and creates a RandomForestClassifier and calculates its accuracy

```
In [54]: def perfrom_pca(n):
             X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=0)
             pca = PCA(n_components=n)
             pca_x_train = pca.fit_transform(X_train)
             pca_x_test = pca.transform(X_test)
             classifier = RandomForestClassifier(max_depth=2, random_state=0)
             classifier.fit(pca_x_train, y_train)
             y_pred = classifier.predict(pca_x_test)
             cm = confusion_matrix(y_test, y_pred)
             print(cm)
             print('Accuracy {0}\n\n'.format(accuracy_score(y_test, y_pred)))
```

Step 12: Call the perform_pca method with n_components set to a number from 1 to 4 and print their confusion matrix and accuracy scores

```
In [55]: for x in range(1, 5): perfrom_pca(x)
```

```
[[16  0  0]
 [ 0 15  3]
 [ 0  1 10]]
Accuracy 0.9111111111111111


[[15  1  0]
 [ 0  7 11]
 [ 0  1 10]]
Accuracy 0.7111111111111111


[[14  0  2]
 [ 0 13  5]
 [ 0  1 10]]
Accuracy 0.8222222222222222


[[16  0  0]
 [ 0 15  3]
 [ 0  0 11]]
Accuracy 0.9333333333333333
```