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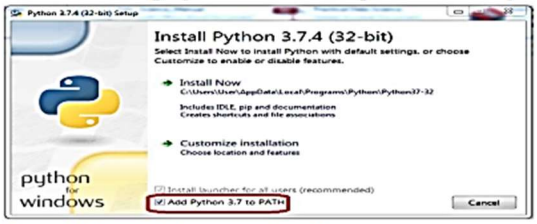
Prerequisite for Data Science Practical

Vermeulen-Krennwallner-Hillman-Clark Group (VKHCG) is a hypothetical medium-size international company. It consists of four subcompanies: Vermeulen PLC, Krennwallner AG, Hillman Ltd, and Clark Ltd. VKHCG uses the R processing engine to perform data processing in 80% of the company business activities, and the other 20% is done by Python. Therefore, we will prepare an R and a Python environment to perform the examples. I will quickly advise you on how to obtain these additional environments, if you require them for your own specific business requirements.

- While installing Python check the option to Add Python to PATH Variable



- Open CMD in Administrative Mode

- Similarly install the following packages using pip

1.	matplotlib	**8.**	datetime	**15.**	sqlalchemy
2.	numpy	**9.**	json	**16.**	sql.connector
3.	opencv-python	**10.**	msgpack	**17.**	geopandas
4.	networkx	**11.**	scipy	**18.**	quandl
5.	sys	**12.**	geopy	**19.**	mlxtend
6.	uuid	**13.**	pysqlite3	**20.**	folium
7.	pyspark	**14.**	openpyxl		

Sample Data

The following data is for the examples in
Type of file: Comma-separated values (CSV)

1. IP Addresses Data Sets

Location:VKHCG\01-Vermeulen\00-RawData
Data file: IP_DATA_C_VKHCG.csv — No. of Record: 255
Data file: IP_DATA_ALL.csv — No. of Records: 1,247,502
Data file: IP_DATA_CORE.csv — No. of Records: 3,562

2. Customer Data Sets

Location: VKHCG\ 02-Krennwallner\00-RawData
Data file: DE_Billboard_Locations.csv — No. of Records: 8,873

3. Logistics Data Sets

Location: VKHCG\03-Hillman\00-RawData
Data file: GB_Postcode_Full.csv — No. of Records: 1,714,591
Data file: GB_Postcode_Warehouse.csv — No. of Records: 3,005
Data file: GB_Postcodes_Shops.csv — No. of Records: 1,048,575

4. Exchange Rate Data Set

Location: VKHCG\04-Clark\00-RawData
Data file: Euro_ExchangeRates.csv — No. of Records: 4,697

5. Profit-and-Loss Statement Data Set

Location: VKHCG\04-Clark\00-RawData
Data file: Profit_And_Loss.csv — No. of Records: 2,442

Practical No. 1

Creating and using database in Cassandra

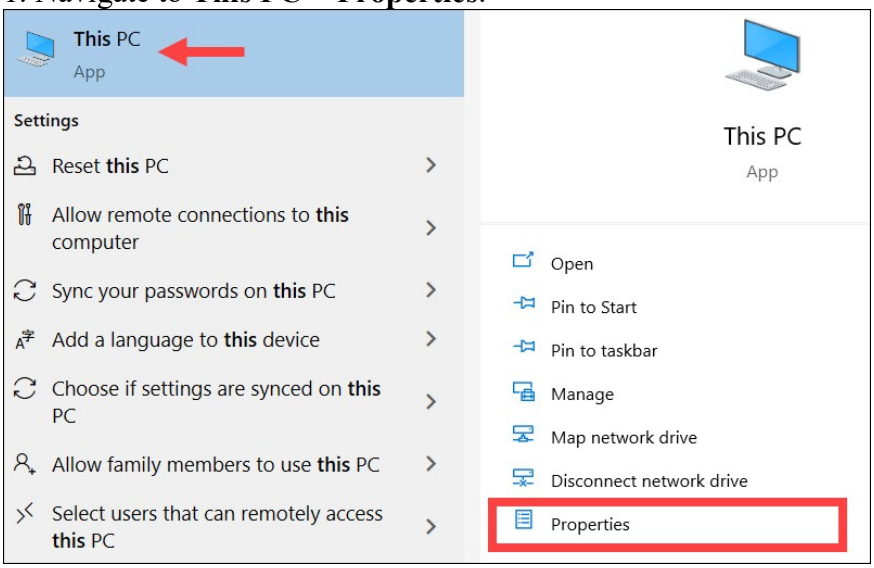
Apache Cassandra requires Java 8 to run on a Windows system. Additionally, the Cassandra command-line shell (**cqlsh**) is dependent on Python 2.7 to work correctly.
To be able to install Cassandra on Windows, first you need to:

1. Download and Install **Java 8** and set environment variables.
2. Download and install **Python 2.7** and set environment variables.

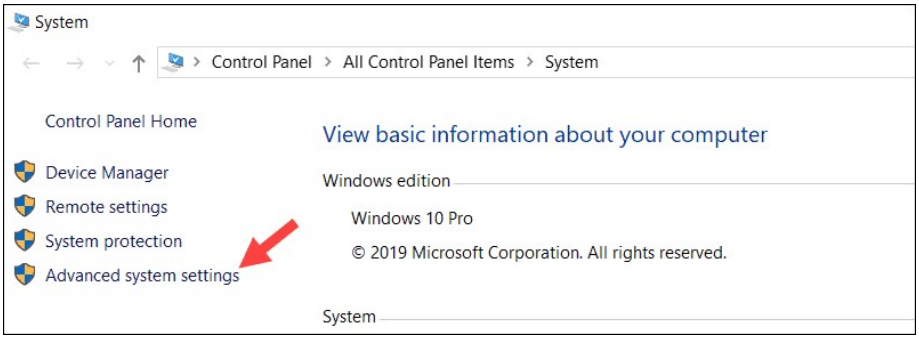
Step 1: Install Java 8 on Windows
The Java development kit contains all the tools and software you need to run applications written in Java. It is a prerequisite for software solutions such as Apache Cassandra.

Step 2: Configure Environment Variables for Java 8
It is vital to configure the environment variables in Windows and define the correct path to the Java 8 installation folder.

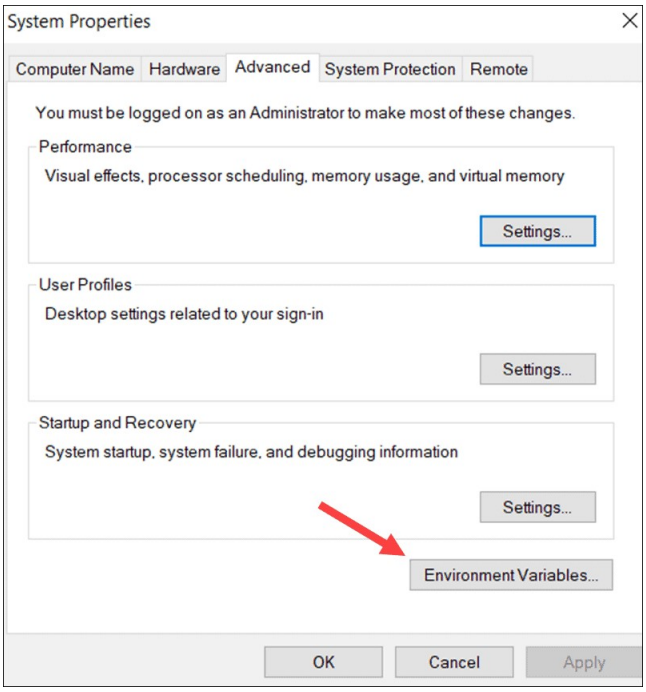
1. Navigate to **This PC > Properties**.



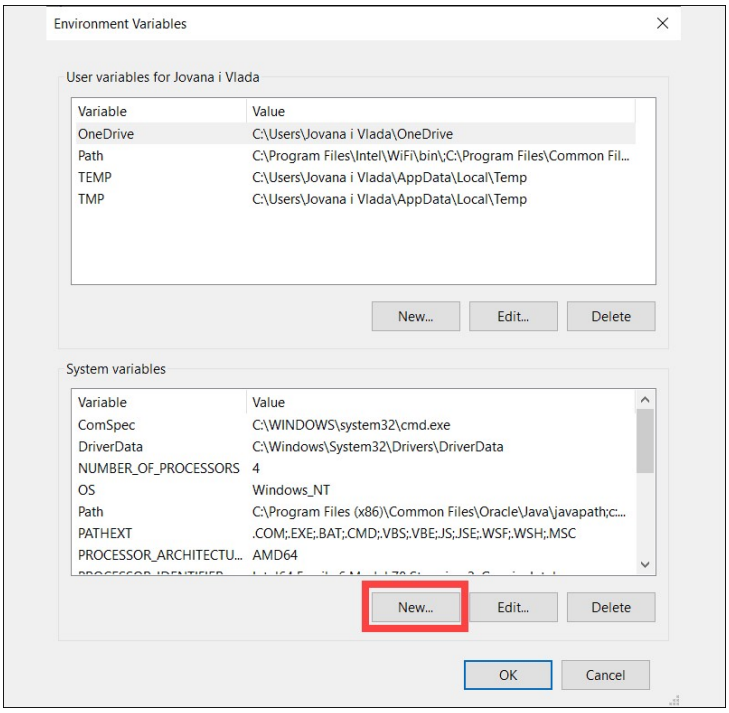
3. Select **Advanced system settings**.



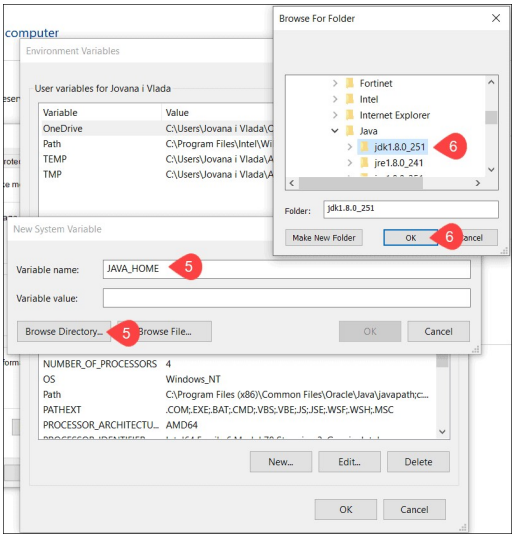
3. Click the **Environment Variables…** button.



4. Select **New** in the System Variable section.

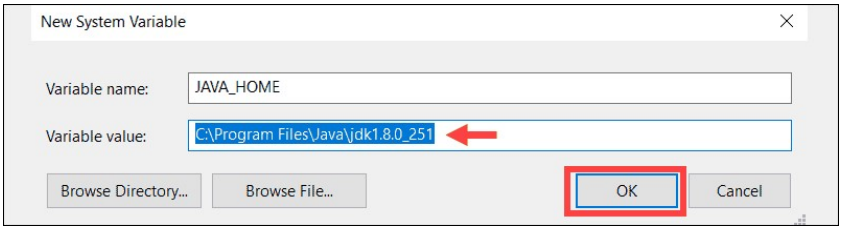


Enter **JAVA_HOME** for the new variable name. Select the Variable value field and then the **Browse Directory** option.

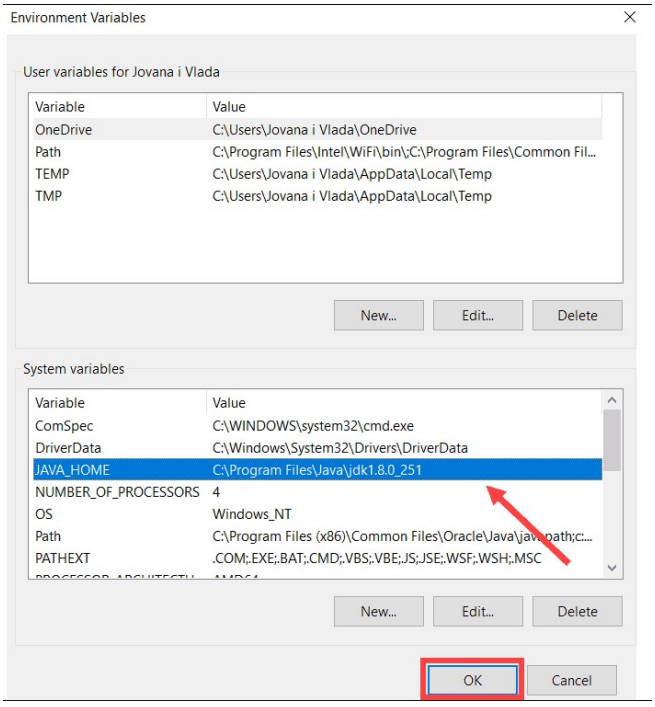


5. Navigate to **This PC > Local Disk C: > Program Files > Java > jdk1.8.0_251** and select **OK**.

6. Once the correct path to the JDK 8 installation folder has been added to the **JAVA_HOME** system variable, click **OK**.



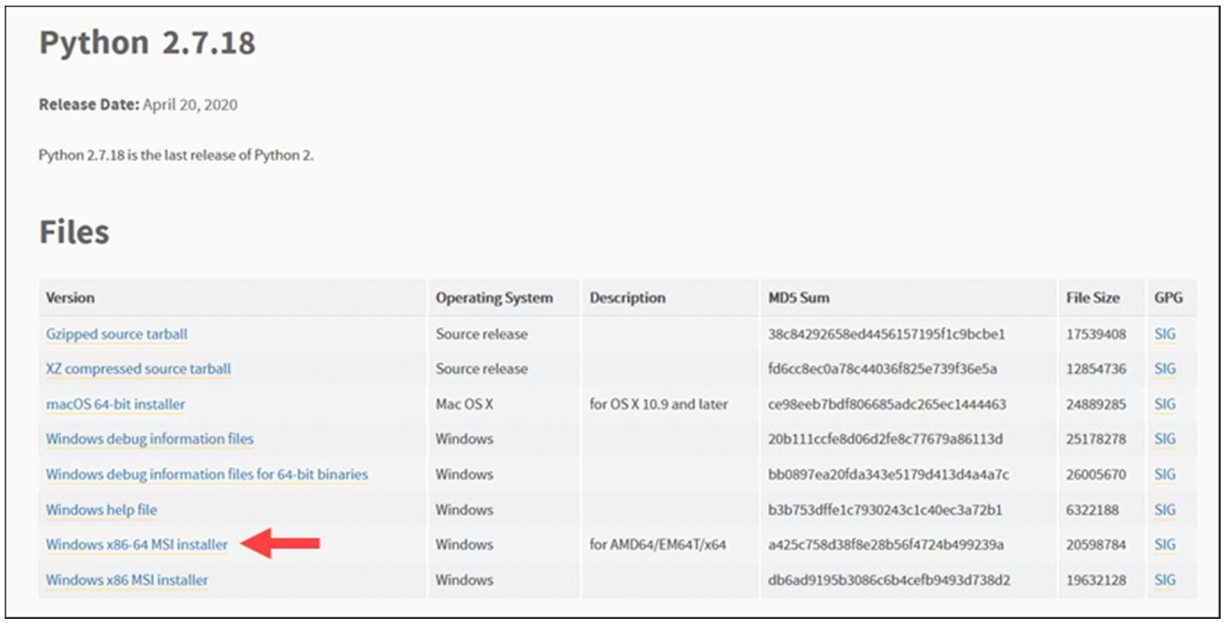
8. You have successfully added the **JAVA_HOME** system variable with the correct JDK 8 path to the variable list. Select **OK** in the main Environment Variables window to complete the process.



Step 3: Install and Configure Python 2.7 on Windows

Users interact with the Cassandra database by utilizing the **cqlsh** bash shell. You need to install Python 2.7 for **cqlsh** to handle user requests properly.
Install Python 2.7 on Windows

1. Visit the Python official download page and select the Windows x64 version link.



Python 2.7.18

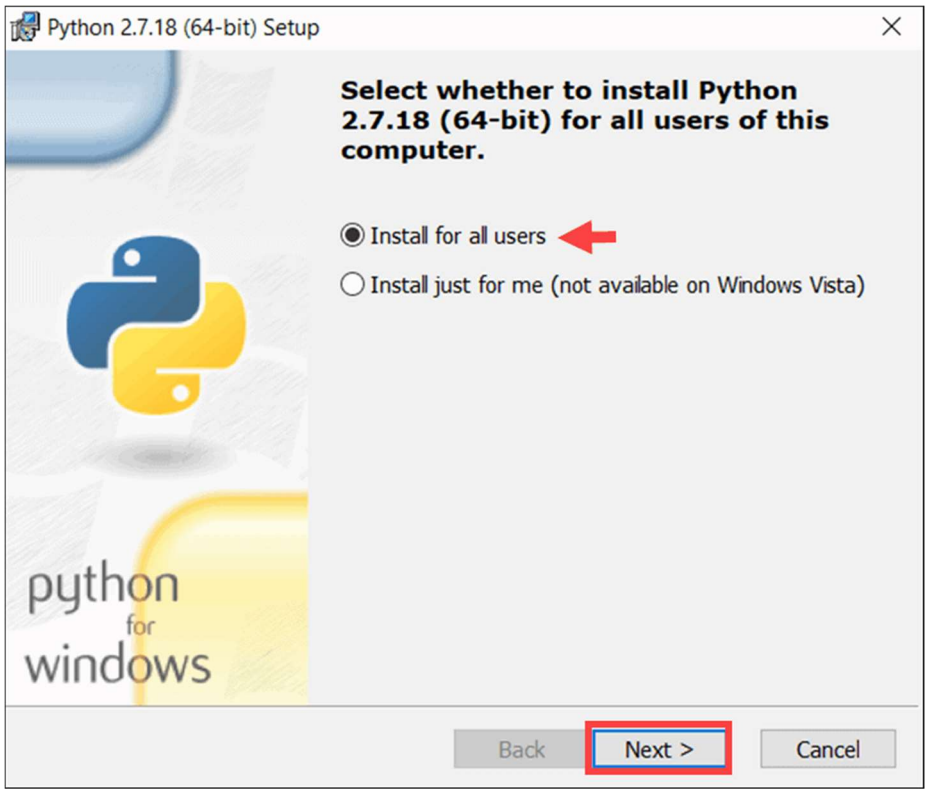
Release Date: April 20, 2020

Python 2.7.18 is the last release of Python 2.

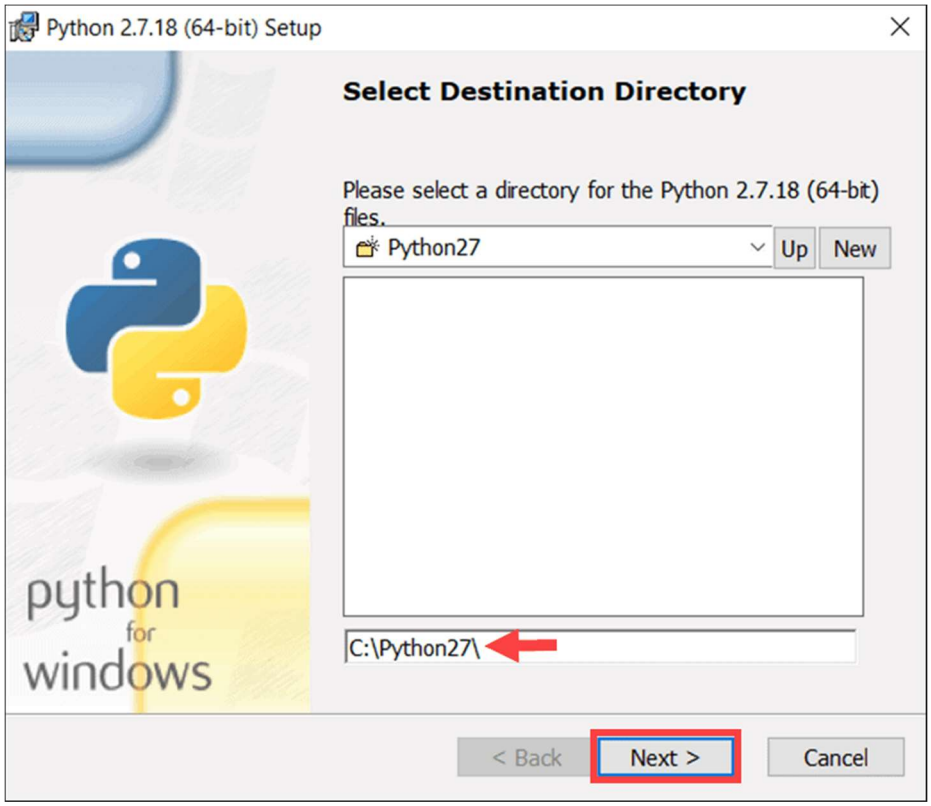
Files

Version	Operating System	Description	MD5 Sum	File Size	GPG
Gzipped source tarball	Source release		38c84292658ed4456157195f1c9bcbe1	17539408	SIG
XZ compressed source tarball	Source release		fd6cc8ec0a78c44036f825e739f36e5a	12854736	SIG
macOS 64-bit installer	Mac OS X	for OS X 10.9 and later	ce98eeb7bdf806685adc265ec1444463	24889285	SIG
Windows debug information files	Windows		20b111ccfe8d06d2fe8c77679a86113d	25178278	SIG
Windows debug information files for 64-bit binaries	Windows		bb0897ea20fda343e5179d413d4a4a7c	26005670	SIG
Windows help file	Windows		b3b753dffe1c7930243c1c40ec3a72b1	6322188	SIG
Windows x86-64 MSI installer	Windows	for AMD64/EM64T/x64	a425c758d38f8e28b56f4724b499239a	20598784	SIG
Windows x86 MSI installer	Windows		db6ad9195b3086c6b4cefb9493d738d2	19632128	SIG

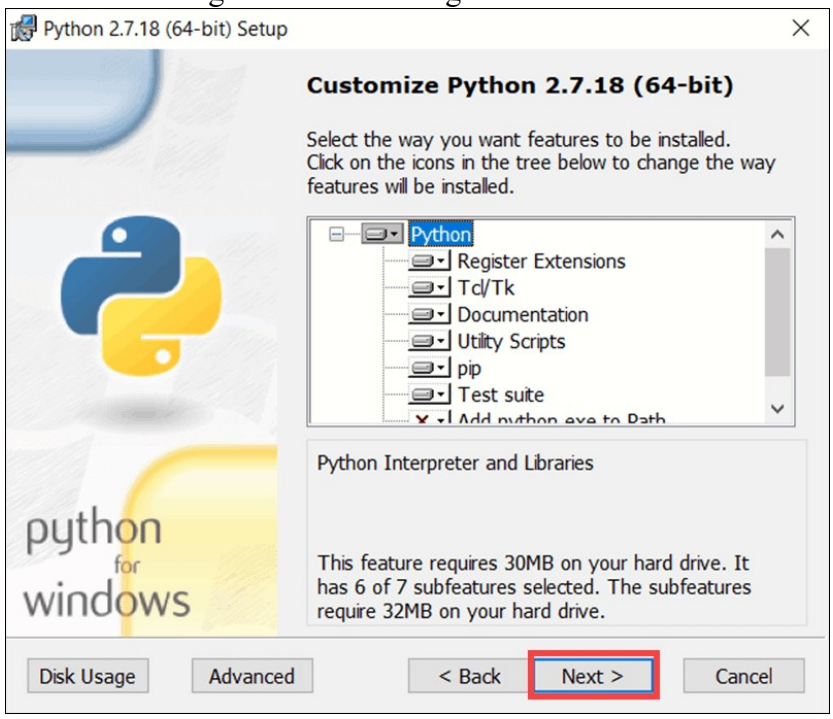
2. Define if you would like Python to be available to all users on this machine or just for your user account and select **Next**.



Specify and take note of the Python installation folder location. Feel free to leave the default location **C:Python27** by clicking **Next.**



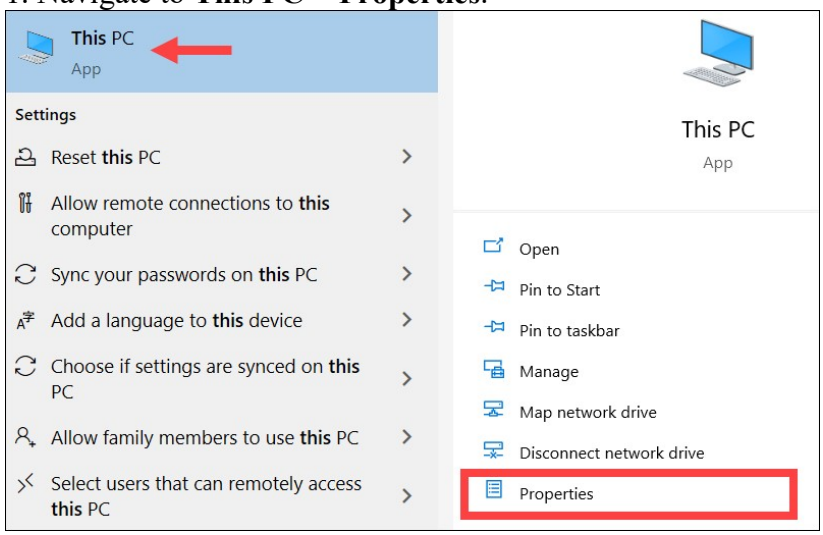
The following step allows you to customize the Python installation package. Select **Next** to continue the installation using the default settings.



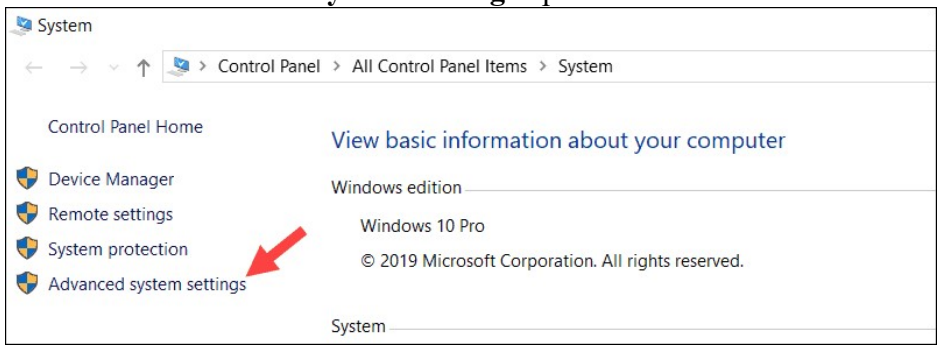
The installation process takes a few moments. Once it is complete, select **Finish** to conclude the installation process.

Edit Environment Variable for Python 2.7

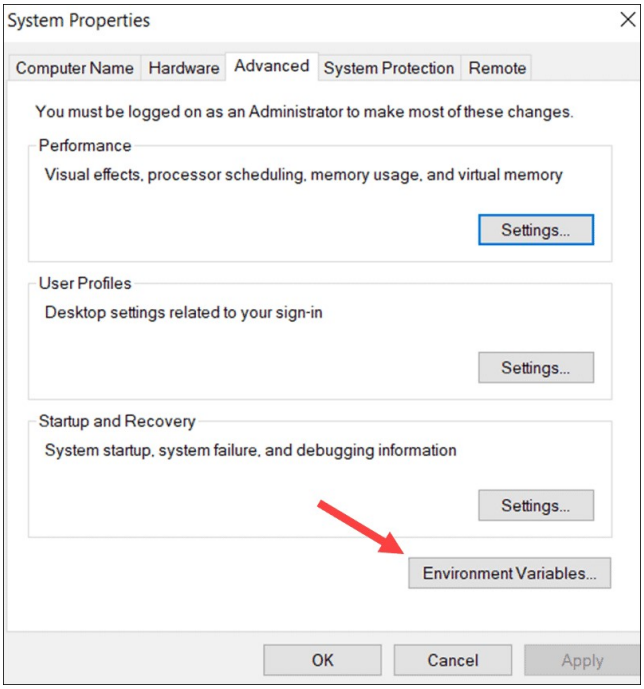
1. Navigate to **This PC** > **Properties**.



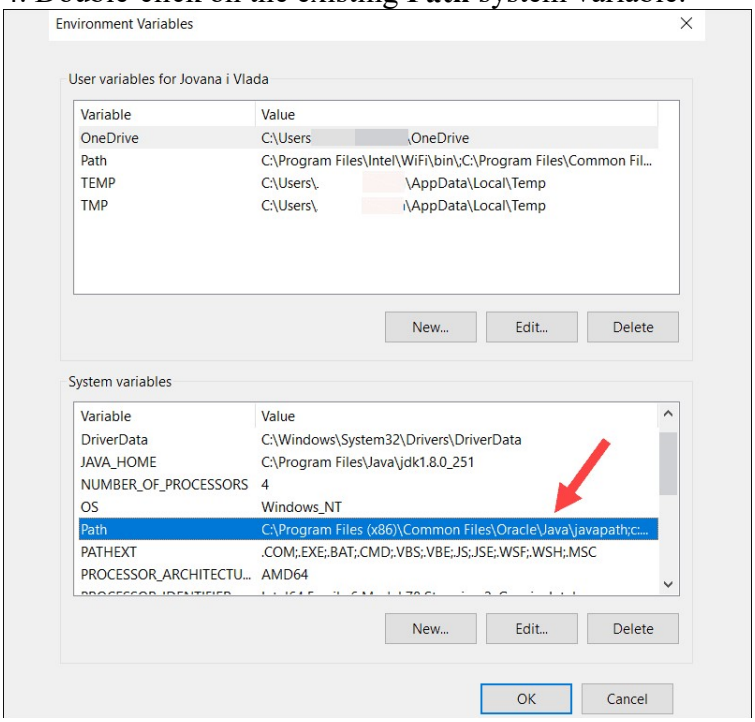
2. Select the **Advanced system settings** option.



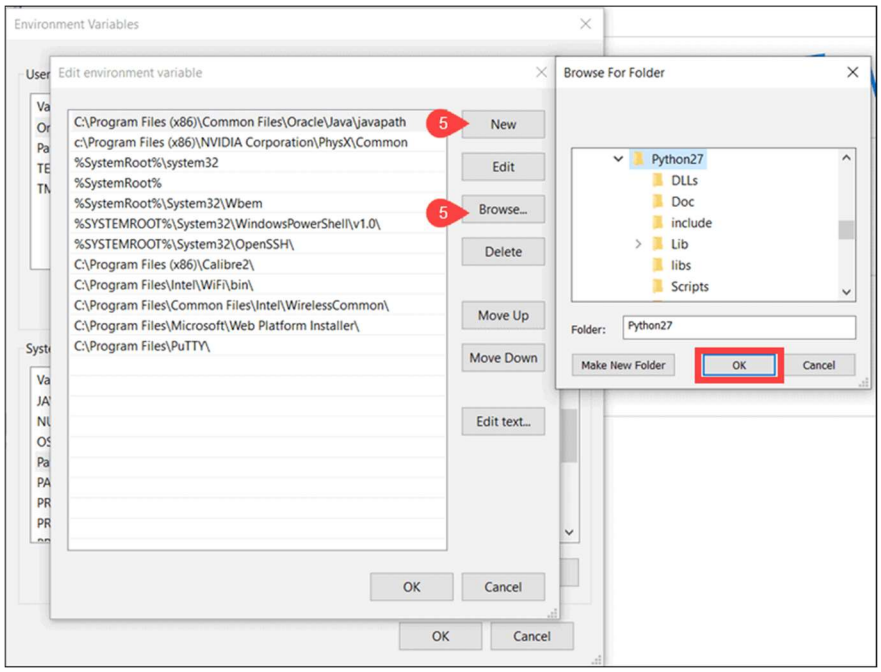
3. Click **Environment Variables…**



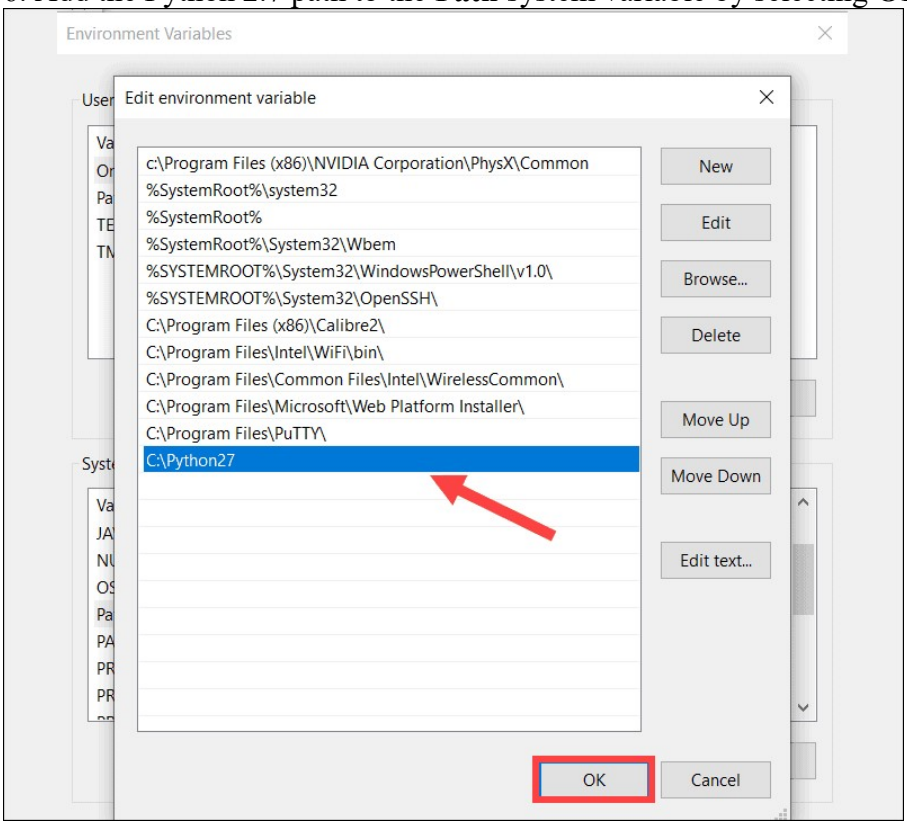
4. Double-click on the existing **Path** system variable.



5. Select **New** and then **Browse** to locate the Python installation folder quickly. Once you have confirmed that the path is correct, click **OK**.



6. Add the Python 2.7 path to the **Path** system variable by selecting **OK**.



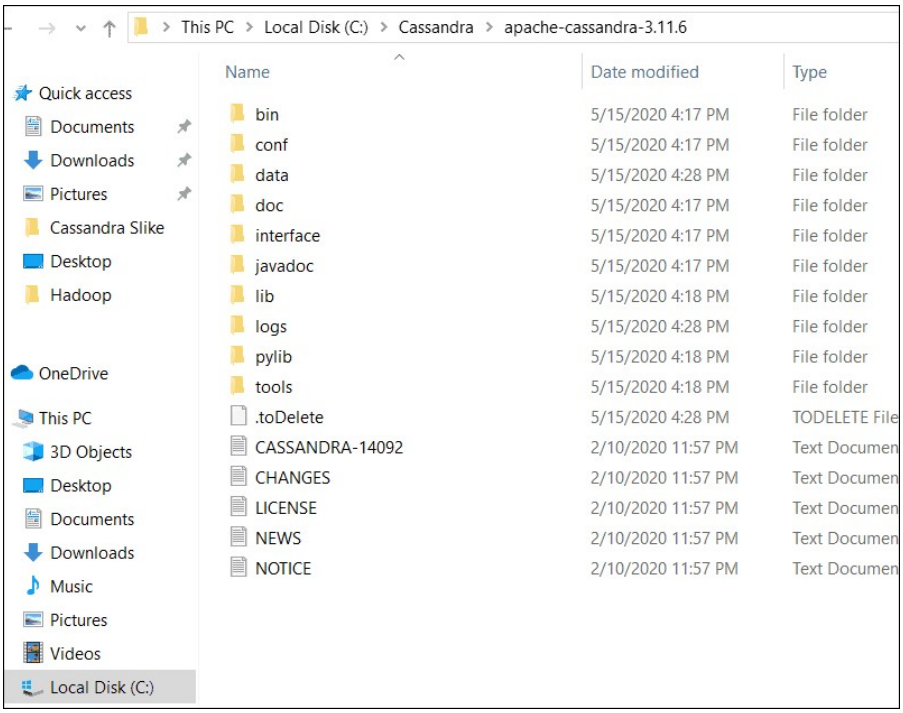
Step 4: Download and Set Up Apache Cassandra

Download and Extract Cassandra tar.gz Folder

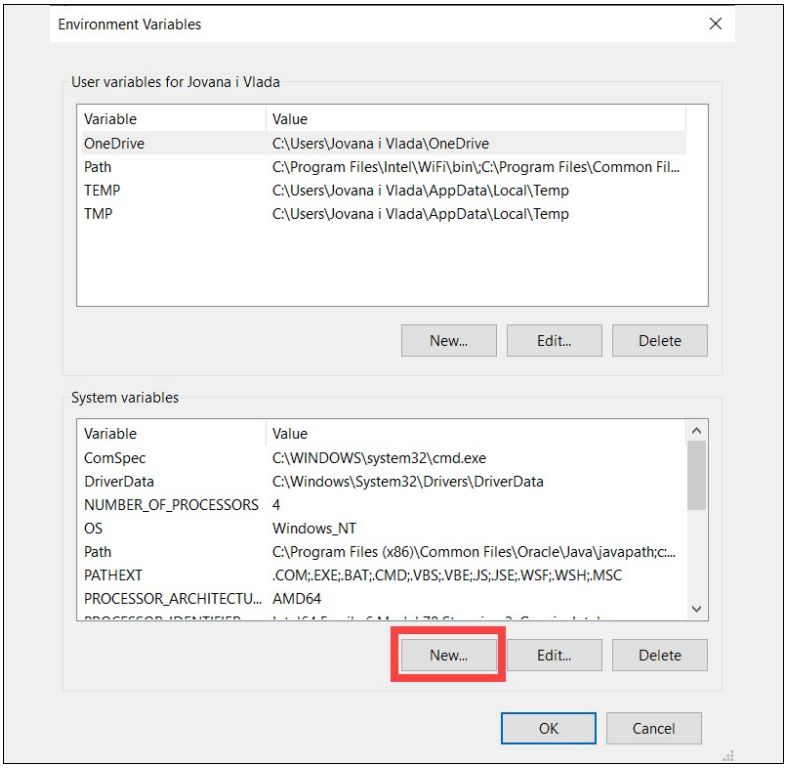
1. Visit the official Apache Cassandra Download page and select the version you would prefer to download. Currently, the latest available version is 3.11.6.

2. Click the suggested **Mirror download link** to start the download process.

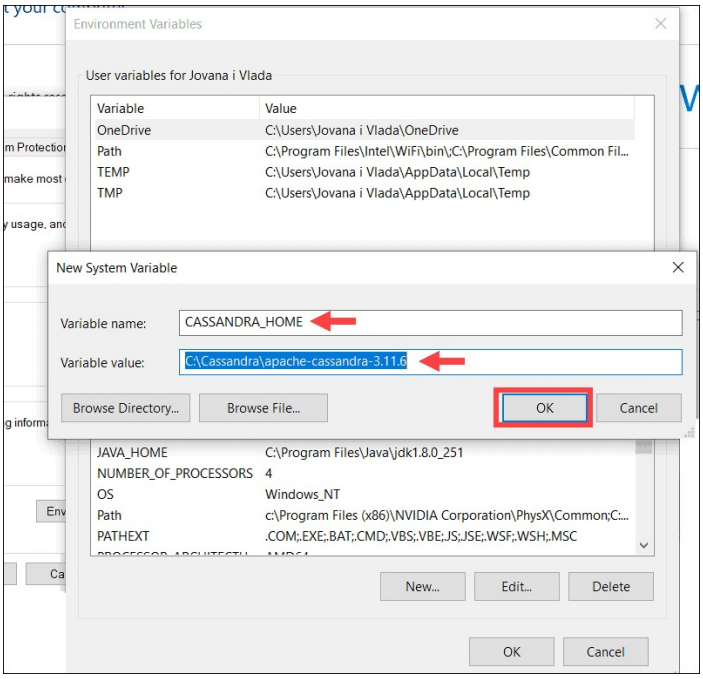
Unzip the compressed tar.gz folder using a compression tool such as 7-Zip or WinZip. In this example, the compressed folder was unzipped, and the content placed in the **C:Cassandraapache-cassandra-3.11.6** folder.



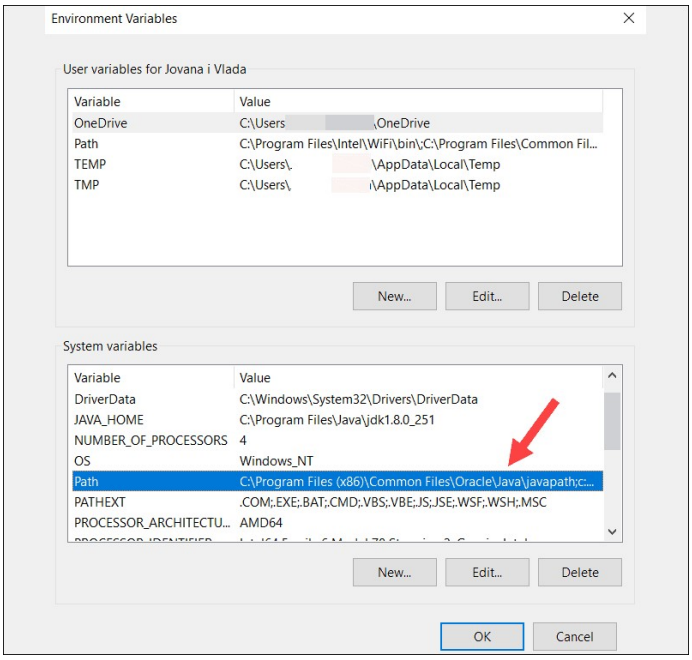
Configure Environment Variables for Cassandra
Add a completely new entry by selecting the **New** option.



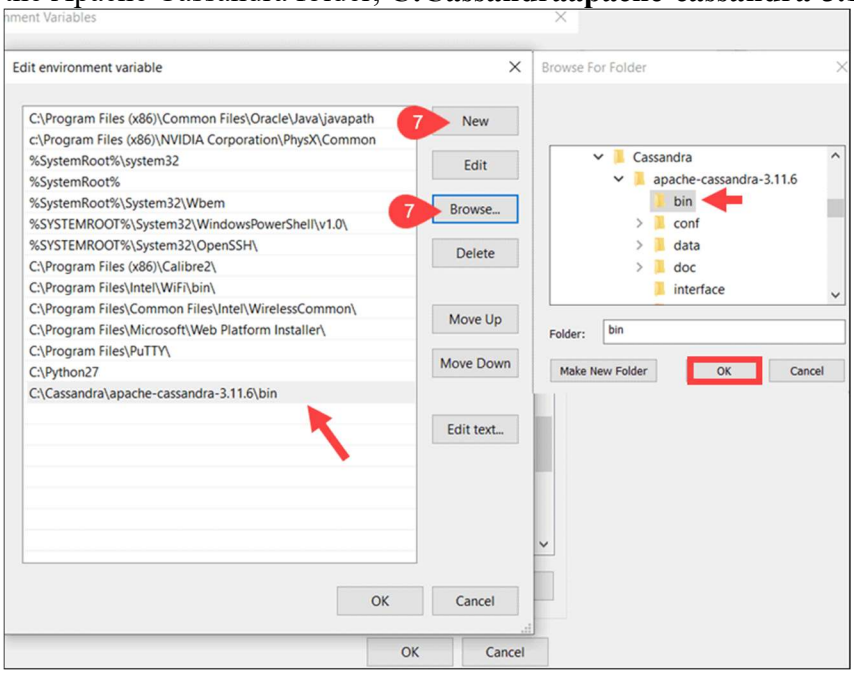
Type **CASSANDRA_HOME** for Variable name**,** then for theVariable value column select the location of the unzipped **Apache Cassandra** folder.
Based on the previous steps, the location is **C:Cassandraapache-cassandra-3.11.6.** Once you have confirmed that the location is correct, click **OK.**



Double click on the **Path** variable.



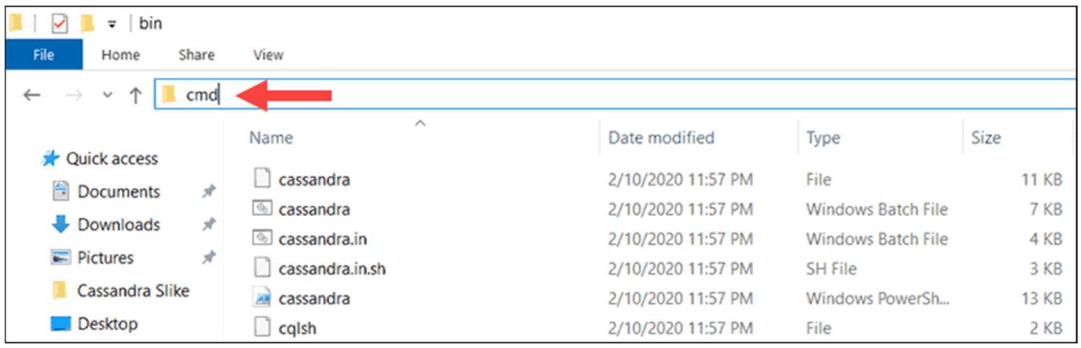
Select **New** and then **Browse**. In this instance, you need to add the full path to the **bin** folder located within the Apache Cassandra folder, **C:Cassandraapache-cassandra-3.11.6bin**.



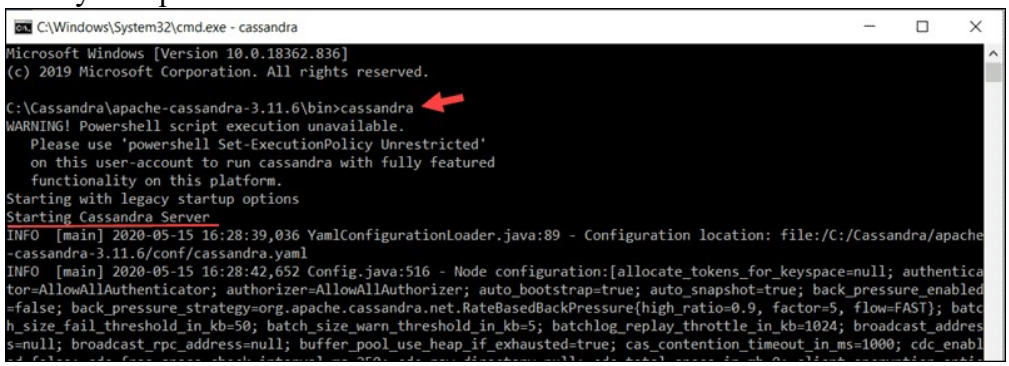
Hit the **OK** button and then again **OK** to save the edited variables.

Step 5: Start Cassandra from Windows CMD

Navigate to the Cassandra bin folder. Start the Windows Command Prompt directly from within the bin folder by typing **cmd** in the address bar and pressing **Enter**.



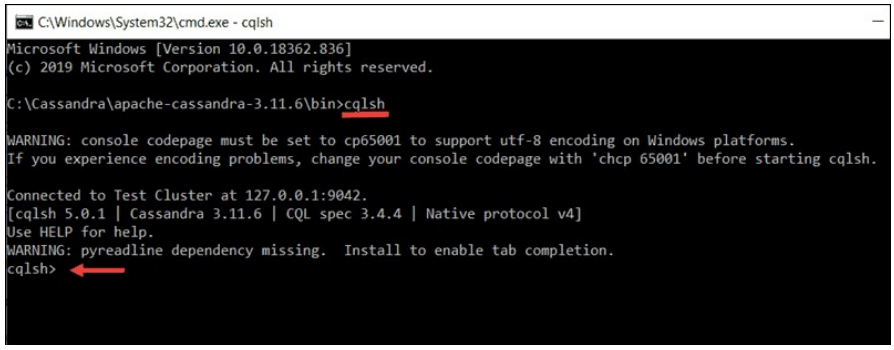
Type the following command to start the Cassandra server:
The system proceeds to start the Cassandra Server.



Do not close the current **cmd** session.

Step 6: Access Cassandra cqlsh from Windows CMD

While the initial command prompt is still running open a new command line prompt from the same bin folder. Enter the following command to access the Cassandra **cqlsh** bash shell:
You now have access to the Cassandra shell and can proceed to issue basic database commands to your Cassandra server.



You have successfully installed Cassandra on Windows.

Selecting Keyspace for Cassandra Table

Before you start adding a table, you need to determine the keyspace where you want to create your table. There are two options to do this.

Option 1: The USE Command

Run the USE command to select a keyspace to which all your commands will apply. To do that, in the cqlsh shell type:

USE keyspace_name;

Then, you can start adding tables.

Option 2: Specify the Keyspace Name in the Query

The second option is to specify the keyspace name in the query for table creation. The first part of the command, before column names and options, looks like this:

CREATE TABLE keyspace_name.table_name

This way, you immediately create a table in the keyspace you defined.

Basic Syntax for Creating Cassandra Tables

Creating tables using CQL looks similar to SQL queries. In this section, we will show you the basic syntax for creating tables in Cassandra.The basic syntax for creating a table looks like this:

```
CREATE TABLE tableName (
columnName1 dataType,
columnName2 dataType,
columnName2 datatype
PRIMARY KEY (columnName)
);
```

The following sections explain how to create tables with different types of primary keys. First, select a keyspace where you want to create a table. In our case:

USE businesinfo;

Create Table with Simple Primary Key

The first example is a basic table with suppliers. The ID is unique for every supplier, and it will serve as the primary key. The CQL query looks like this:

```
CREATE TABLE suppliers (
supp_id int PRIMARY KEY,
supp_city text,
supp_email text,
supp_fee int,
supp_name text,
supp_phone int
);
```

To see if the table is in the keyspace, type in:

DESCRIBE TABLES;

To show the contents of the tables, enter:

SELECT * FROM suppliers;

Practical No. 2

Write the programs for Text Delimited CSV to HORUS format.

```
# Utility Start CSV to HORUS ==================================
import pandas as pd
# Input Agreement =============================================
sInputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.csv'
InputData=pd.read_csv(sInputFileName,encoding="latin-1")
print('Input Data Values ===================================')
print(InputData)
print('=====================================================')
# Processing Rules ============================================
ProcessData=InputData
# Remove columns ISO-2-Code and ISO-3-CODE
ProcessData.drop('ISO-2-CODE', axis=1,inplace=True)
ProcessData.drop('ISO-3-Code', axis=1,inplace=True)
# Rename Country and ISO-M49
ProcessData.rename(columns={'Country': 'CountryName'}, inplace=True)
ProcessData.rename(columns={'ISO-M49': 'CountryNumber'}, inplace=True)
# Set new Index
ProcessData.set_index('CountryNumber', inplace=True)
# Sort data by CurrencyNumber
ProcessData.sort_values('CountryName', axis=0, ascending=False,
inplace=True)
print('Process Data Values ================================')
print(ProcessData)
print('=====================================================')
# Output Agreement ============================================
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-CSV-Country.csv'
OutputData.to_csv(sOutputFileName, index = False)
print('CSV to HORUS - Done')
# Utility done ================================================
```

Practical No. 3

Write the programs for XML to HORUS format

```
# Utility Start XML to HORUS ==================================
# Standard Tools
#=============================================================
import pandas as pd
import xml.etree.ElementTree as ET
header = data.columns
root = ET.Element('root')
for row in range(data.shape[0]):
entry = ET.SubElement(root,'entry')
for index in range(data.shape[1]):
schild=str(header[index])
child = ET.SubElement(entry, schild)
if str(data[schild][row]) != 'nan':
child.text = str(data[schild][row])
else:
child.text = 'n/a'
entry.append(child)
result = ET.tostring(root)
return result
def xml2df(xml:data):
root = ET.XML(xml:data)
all_records = []
for i, child in enumerate(root):
record = {}
for subchild in child:
record[subchild.tag] = subchild.text
all_records.append(record)
return pd.DataFrame(all_records)
# Input Agreement ============================================
sInputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.xml'
InputData = open(sInputFileName).read()
print('=========================================================')
print('Input Data Values ===================================')
print('=========================================================')
print(InputData)
print('=========================================================')
# Processing Rules ============================================
ProcessDataXML=InputData
# XML to Data Frame
ProcessData=xml2df(ProcessDataXML)
# Remove columns ISO-2-Code and ISO-3-CODE
```

```
ProcessData.drop('ISO-2-CODE', axis=1,inplace=True)
ProcessData.drop('ISO-3-Code', axis=1,inplace=True)
# Rename Country and ISO-M49
ProcessData.rename(columns={'Country': 'CountryName'}, inplace=True)
ProcessData.rename(columns={'ISO-M49': 'CountryNumber'}, inplace=True)
# Set new Index
ProcessData.set_index('CountryNumber', inplace=True)
# Sort data by CurrencyNumber
ProcessData.sort_values('CountryName', axis=0, ascending=False,
inplace=True)
print('====================================================')
print('Process Data Values ================================')
print('====================================================')
print(ProcessData)
print('====================================================')
# Output Agreement ===========================================
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-XML-Country.csv'
OutputData.to_csv(sOutputFileName, index = False)
print('====================================================')
print('XML to HORUS - Done')
print('====================================================')
# Utility done ===============================================
```

Output:

```
================ RESTART: C:\VKHCG\05-DS\9999-Data\XML2HORUS.py ================
====================================================
Input Data Values ==================================
====================================================
Squeezed text (707 lines).
====================================================
====================================================
Process Data Values ================================
====================================================
                           CountryName
CountryNumber
716                           Zimbabwe
894                             Zambia
887                              Yemen
732                     Western Sahara
876          Wallis and Futuna Islands
...                                ...
16                      American Samoa
12                             Algeria
8                              Albania
248                      Aland Islands
4                          Afghanistan

[247 rows x 1 columns]
====================================================
====================================================
XML to HORUS - Done
====================================================
```

Practical No. 4

Write the programs for Video to HORUS format.

```
# Utility Start Movie to HORUS (Part 1) ======================
# Standard Tools
#=============================================================
import os
import shutil
import cv2
#=============================================================
sInputFileName='C:/VKHCG/05-DS/9999-Data/dog.mp4'
sDataBaseDir='C:/VKHCG/05-DS/9999-Data/temp'
if os.path.exists(sDataBaseDir):
    shutil.rmtree(sDataBaseDir)
if not os.path.exists(sDataBaseDir):
    os.makedirs(sDataBaseDir)
print('=============================================================')
print('Start Movie to Frames')
print('=============================================================')
vidcap = cv2.VideoCapture(sInputFileName)
success,image = vidcap.read()
count = 0
while success:
    success,image = vidcap.read()
    sFrame=sDataBaseDir + str('/dog-frame-' + str(format(count, '04d')) + '.jpg')
    print('Extracted: ', sFrame)
    cv2.imwrite(sFrame, image)
    if os.path.getsize(sFrame) == 0:
        count += -1
        os.remove(sFrame)
        print('Removed: ', sFrame)
    if cv2.waitKey(10) == 27: # exit if Escape is hit
        break
    if count > 15: # exit
        break
    count += 1
print('=============================================================')
print('Generated : ', count, ' Frames')
print('=============================================================')
print('Movie to Frames HORUS - Done')
print('=============================================================')
# Utility done ===============================================
```

```
>>>
= RESTART: C:\VKHCG\05-DS\9999-Data\MOVIE2HORUSFrame.py
=====================================================
Start Movie to Frames
=====================================================
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0000.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0001.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0002.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0003.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0004.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0005.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0006.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0007.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0008.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0009.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0010.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0011.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0012.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0013.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0014.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0015.jpg
Extracted:  C:/VKHCG/05-DS/9999-Data/temp/dog-frame-0016.jpg
=====================================================
Generated :  16  Frames
=====================================================
Movie to Frames HORUS - Done
=====================================================
>>>
```

Practical No. 5

Write the programs for Audio to HORUS format.

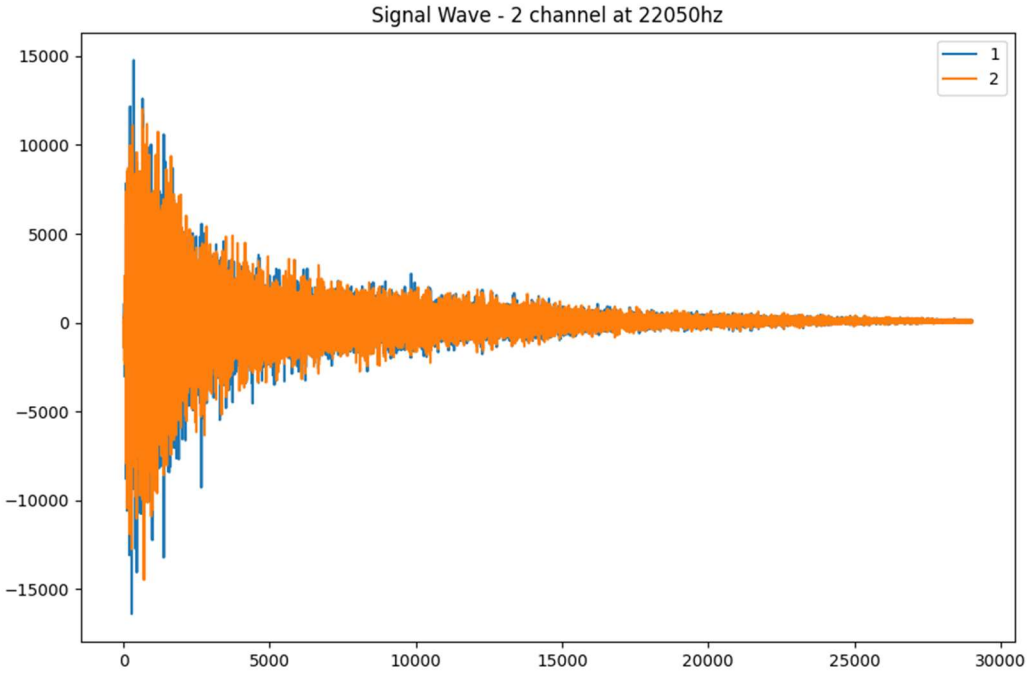
```
# Utility Start Audio to HORUS ================================
# Standard Tools
from scipy.io import wavfile
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
def show_info(aname, a,r):
print ('----------------')
print ("Audio:", aname)
print ('----------------')
print ("Rate:", r)
print ('----------------')
print ("shape:", a.shape)
print ("dtype:", a.dtype)
print ("min, max:", a.min(), a.max())
print ('----------------')
plot_info(aname, a,r)
def plot_info(aname, a,r):
sTitle= 'Signal Wave - '+ aname + ' at ' + str(r) + 'hz'
plt.title(sTitle)
sLegend=[]
for c in range(a.shape[1]):
sLabel = 'Ch' + str(c+1)
sLegend=sLegend+[str(c+1)]
plt.plot(a[:,c], label=sLabel)
plt.legend(sLegend)
plt.show()
```

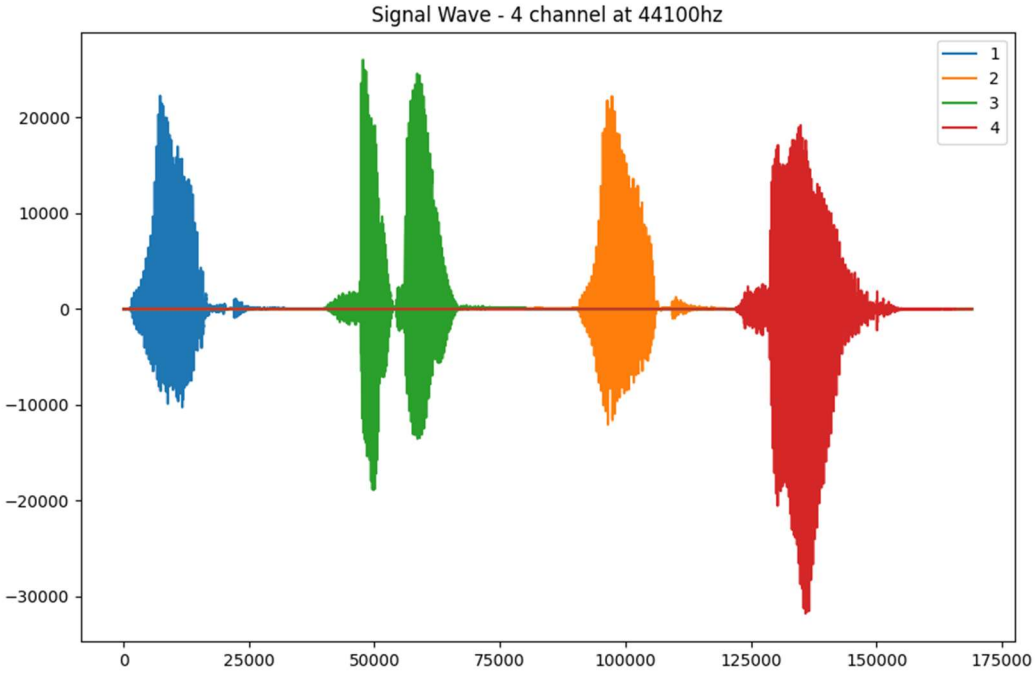
```
sInputFileName='C:/VKHCG/05-DS/9999-Data/2ch-sound.wav'
print('=============================================================')
print('Processing : ', sInputFileName)
print('=============================================================')
InputRate, InputData = wavfile.read(sInputFileName)
show_info("2 channel", InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-Audio-2ch.csv'
OutputData.to_csv(sOutputFileName, index = False)
sInputFileName='C:/VKHCG/05-DS/9999-Data/4ch-sound.wav'
print('=============================================================')
print('Processing : ', sInputFileName)
print('=============================================================')
InputRate, InputData = wavfile.read(sInputFileName)
show_info("4 channel", InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2','Ch3', 'Ch4']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-Audio-4ch.csv'
OutputData.to_csv(sOutputFileName, index = False)
sInputFileName='C:/VKHCG/05-DS/9999-Data/6ch-sound.wav'
print('=============================================================')
print('Processing : ', sInputFileName)
print('=============================================================')
InputRate, InputData = wavfile.read(sInputFileName)
show_info("6 channel", InputData,InputRate)
```

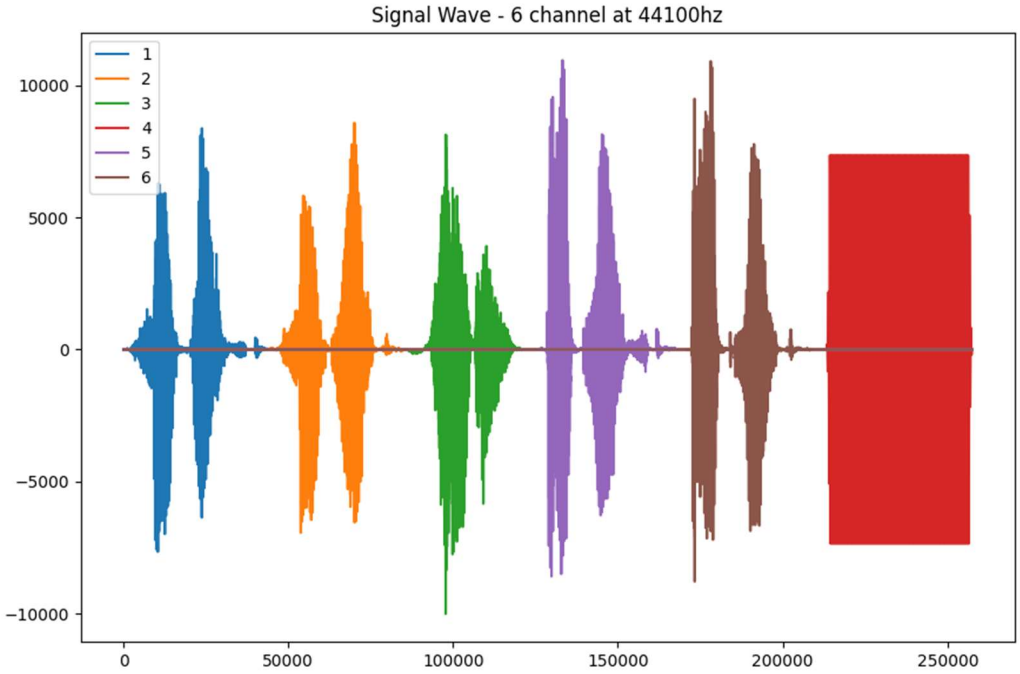
```
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2','Ch3', 'Ch4', 'Ch5','Ch6']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-Audio-6ch.csv'
OutputData.to_csv(sOutputFileName, index = False)
sInputFileName='C:/VKHCG/05-DS/9999-Data/8ch-sound.wav'
print('==========================================================')
print('Processing : ', sInputFileName)
print('==========================================================')
InputRate, InputData = wavfile.read(sInputFileName)
show_info("8 channel", InputData,InputRate)
ProcessData=pd.DataFrame(InputData)
sColumns= ['Ch1','Ch2','Ch3', 'Ch4', 'Ch5','Ch6','Ch7','Ch8']
ProcessData.columns=sColumns
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/HORUS-Audio-8ch.csv'
OutputData.to_csv(sOutputFileName, index = False)
print('==========================================================')
print('Audio to HORUS - Done')
print('==========================================================')
# Utility done ================================================
```

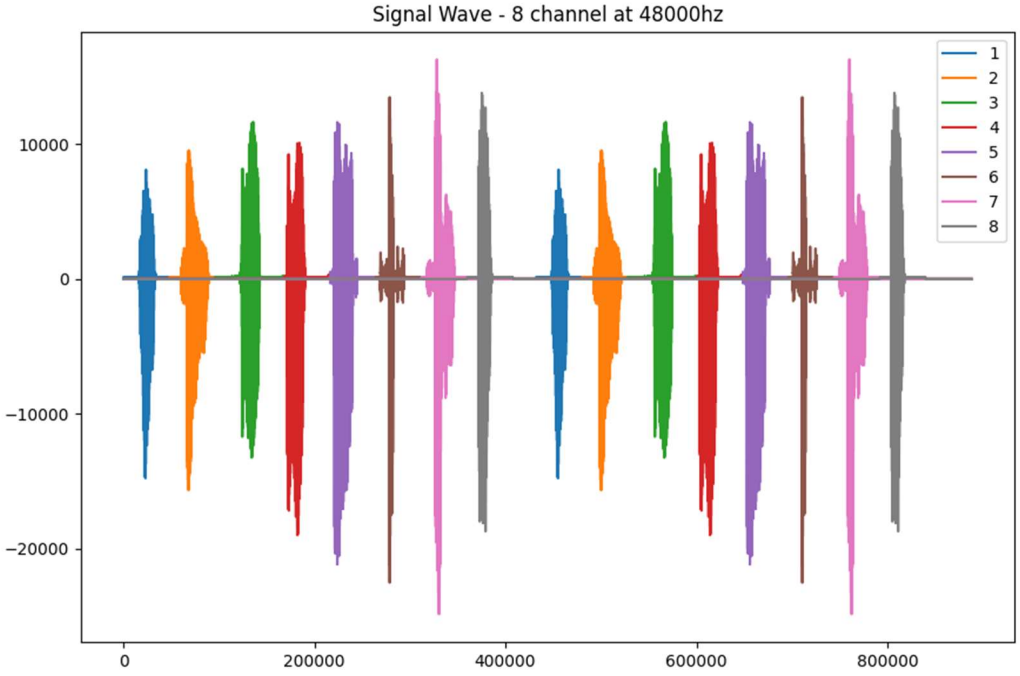
Output:


IDLE Shell 3.12.2
File Edit Shell Debug Options Window Help
>>>
>>>
RESTART: Shell
RESTART: C:\VKHCG\05-DS\9999-Data\AUDIO2HORUS.py
Processing : C:/VKHCG/05-DS/9999-Data/2ch-sound.wav
Audio: 2 channel
Rate: 22050
shape: (29016, 2)
dtype: int16
min, max: -16384 14767
Processing : C:/VKHCG/05-DS/9999-Data/4ch-sound.wav
Audio: 4 channel
Rate: 44100
shape: (169031, 4)
dtype: int16
min, max: -31783 26018
Processing : C:/VKHCG/05-DS/9999-Data/6ch-sound.wav
Audio: 6 channel
Rate: 44100
shape: (257411, 6)
dtype: int16
min, max: -10018 10957
Processing : C:/VKHCG/05-DS/9999-Data/8ch-sound.wav
Audio: 8 channel
Rate: 48000
shape: (888000, 8)
dtype: int16
min, max: -24859 16303
Audio to HORUS - Done


Signal Wave - 2 channel at 22050hz
1
2
15000
10000
5000
0
−5000
−10000
−15000
0
5000
10000
15000
20000
25000
30000


Signal Wave - 4 channel at 44100hz
1
2
3
4
20000
10000
0
−10000
−20000
−30000
0
25000
50000
75000
100000
125000
150000
175000


Signal Wave - 6 channel at 44100hz
1
2
3
4
5
6
10000
5000
0
−5000
−10000
0
50000
100000
150000
200000
250000


Signal Wave - 8 channel at 48000hz
1
2
3
4
5
6
7
8
10000
0
−10000
−20000
0
200000
400000
600000
800000

Practical No. 6

Write the programs for CSV to JSON format.

```
# Utility Start CSV to JSON  ==================================
# Standard Tools
import pandas as pd
# Input Agreement ============================================
sInputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.csv'
InputData=pd.read_csv(sInputFileName,encoding="latin-1")
print('Input Data Values ===================================')
print(InputData)
print('=====================================================')
# Processing Rules ===========================================
ProcessData=InputData
print('Process Data Values ===================================')
print(ProcessData)
print('=====================================================')
# Output Agreement ===========================================
OutputData=ProcessData
sOutputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.json'
OutputData.to_json(sOutputFileName,orient='index')
print('CSV to JSON - Done')
# Utility done ===============================================
```

Output:

```
==================================== RESTART: C:\VKHCG\05-DS\9999-Data\CSV2JSON.py =======
Input Data Values ===================================
          version https://git-lfs.github.com/spec/v1
0  oid sha256:b6bd794425c441ce48592e5931110771156...
1                                          size 5901
=====================================================
Process Data Values ================================
          version https://git-lfs.github.com/spec/v1
0  oid sha256:b6bd794425c441ce48592e5931110771156...
1                                          size 5901
=====================================================
CSV to JSON - Done
```

Practical No. 7

Write the programs for CSV to XML format.

```
# Utility Start XML to HORUS ==================================
# Standard Tools
import pandas as pd
import xml.etree.ElementTree as ET
def df2xml(data):
    header = data.columns
    root = ET.Element('root')
    for row in range(data.shape[0]):
        entry = ET.SubElement(root,'entry')
        for index in range(data.shape[1]):
            schild=str(header[index])
            child = ET.SubElement(entry, schild)
            if str(data[schild][row]) != 'nan':
                child.text = str(data[schild][row])
            else:
                child.text = 'n/a'
            entry.append(child)
    result = ET.tostring(root)
    return result
def xml2df(xml_data):
    root = ET.XML(xml_data)
    all_records = []
    for i, child in enumerate(root):
        record = {}
        for subchild in child:
            record[subchild.tag] = subchild.text
        all_records.append(record)
    return pd.DataFrame(all_records)

# Input Agreement ============================================
sInputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.csv'
InputData=pd.read_csv(sInputFileName,encoding="latin-1")
print('Input Data Values ===================================')
print(InputData)
print('=====================================================')
# Processing Rules ===========================================
ProcessData=InputData
print('Process Data Values ===================================')
print(ProcessData)
print('=====================================================')
# Output Agreement ===========================================
```

```
sOutputFileName='C:/VKHCG/05-DS/9999-Data/Country_Code.xml'
sXML=df2xml(OutputData)
file_out = open(sOutputFileName, 'wb')
file_out.write(sXML)
file_out.close()
print('CSV to XML - Done')
# Utility done ================================================
```

Output:

```
==================================== RESTART: C:\VKHCG\05-DS\9999-Data\CSV2XML.py ======
Input Data Values ===================================
          version https://git-lfs.github.com/spec/v1
0  oid sha256:b6bd794425c441ce48592e5931110771156...
1                                          size 5901
=====================================================
Process Data Values =================================
          version https://git-lfs.github.com/spec/v1
0  oid sha256:b6bd794425c441ce48592e5931110771156...
1                                          size 5901
=====================================================
CSV to XML - Done
```

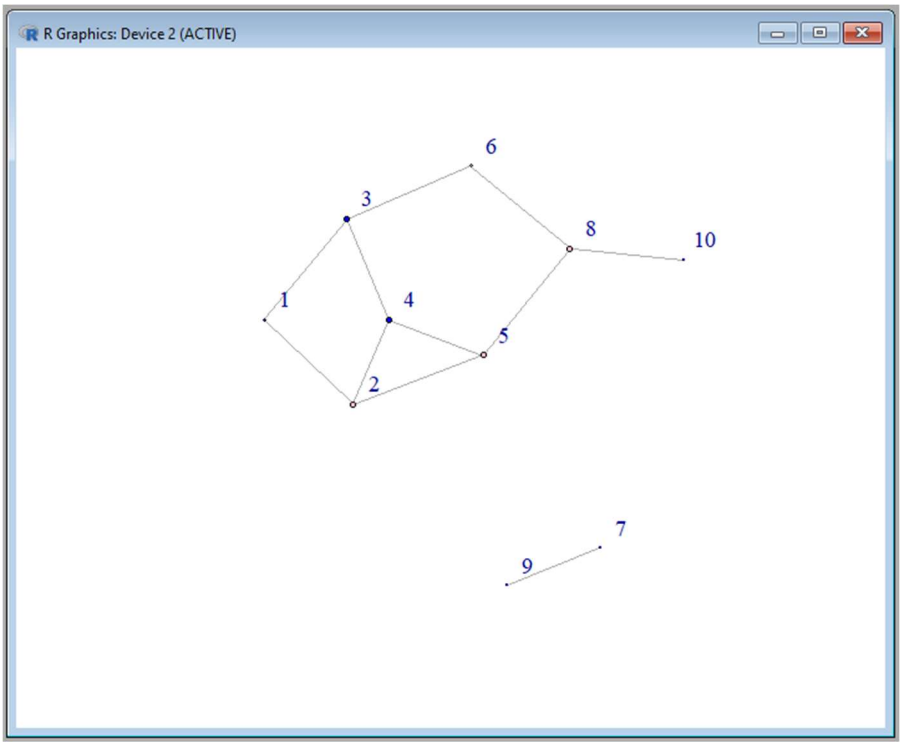
Practical No. 8

Write R program to create the network routing diagram from the given data on routers.

Solution:

igraph package: igraph is a library collection for creating and manipulating graphs and analyzing networks

```
install.packages('igraph')

library(igraph)

users <- data.frame(UserID = 1:10, Name = c("User1", "User2", "User3", "User4", "User5", "User6", "User7", "User8", "User9", "User10"), Gender = c("M", "F", "M", "M", "F", "F", "M", "F", "M", "M"))

friendships <- data.frame(UserID1 = c(1, 1, 2, 2, 3, 3, 4, 5, 6, 7,8), UserID2 = c(2, 3, 4, 5, 4, 6, 5, 8, 8, 9,10))

graph <- graph.data.frame(friendships, directed = FALSE, vertices = users)

V(graph)$color <- ifelse(V(graph)$Gender == "M", "blue", "pink")

node_sizes <- degree(graph, mode = "all")

layout <- layout_with_fr(graph)

plot(graph, layout = layout, vertex.label.dist = 2, vertex.label.cex = 1.2, vertex.size = node_sizes)
```



Practical No.9

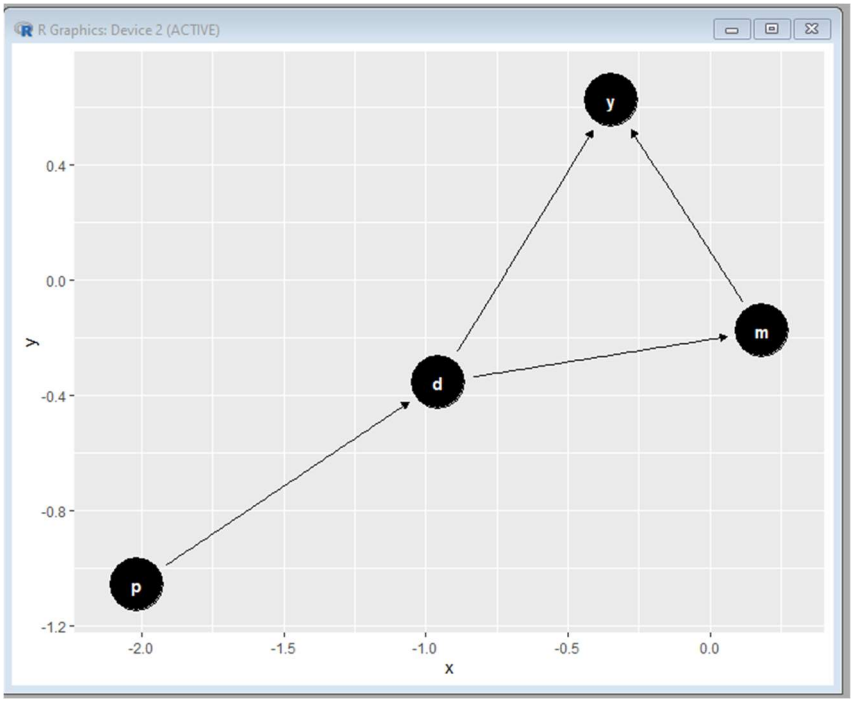
Write R program to build acyclic graph.

>install.packages("ggdag")

Script 1:

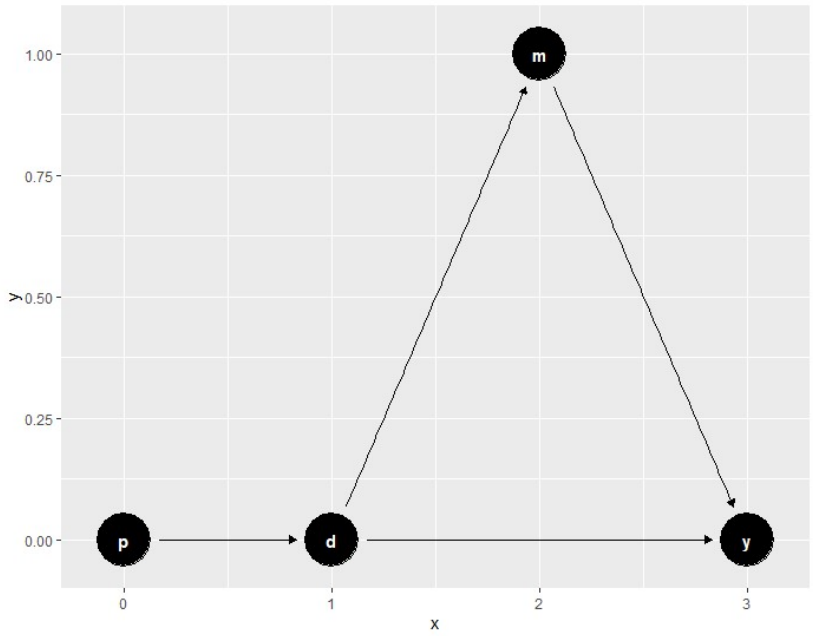
```
library(GGDAG)
our_dag <- ggdag::dagify(d ~ p,m ~ d,y ~ d,y ~ m)
ggdag::ggdag(our_dag)
```

Output:



Script 2:

```
library(GGDAG)
coord_dag <- list( x = c(p = 0, d = 1, m = 2, y = 3), y = c(p = 0, d = 0, m = 1, y = 0))
our_dag <- ggdag::dagify(d ~ p, m ~ d, y ~ d, y ~ m, coords = coord_dag)
ggdag::ggdag(our_dag)
theme_void()
```

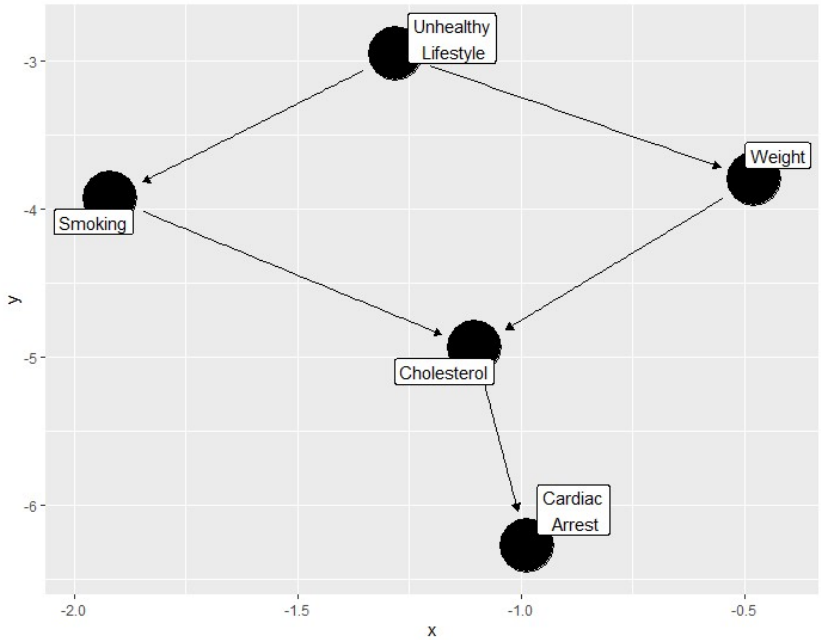


Script 3:

smoking_ca_dag <- ggdag::dagify(cardiacarrest ~ cholesterol,cholesterol ~ smoking + weight,smoking ~ unhealthy, weight ~ unhealthy,labels = c("cardiacarrest" = "Cardiac\n Arrest","smoking" = "Smoking","cholesterol" = "Cholesterol", "unhealthy" = "Unhealthy\n Lifestyle","weight" = "Weight"))

ggdag::ggdag(smoking_ca_dag, text = FALSE,use_labels = "label")

theme_void()



Practical No. 10

Write R program to generate payroll from the given data.

```
# Define Employee details
employees <- data.frame(
  Name = c("Ajay", "Vijay"),
  Basic_Salary = c(30000, 35000),
  HRA_Percentage = c(30, 40),
  PF_Percentage = c(12, 10)
)
# Calculate HRA for each employee
employees$HRA <- (employees$HRA_Percentage / 100) * employees$Basic_Salary
# Calculate PF for each employee
employees$PF <- (employees$PF_Percentage / 100) * employees$Basic_Salary
# Calculate Total Salary for each employee
employees$Total_Salary <- employees$Basic_Salary + employees$HRA - employees$PF
# Print Payroll
print("Payroll for Employees:")
print(employees)
```

```
> print(employees)
        Name Basic_Salary HRA_Percentage PF_Percentage   HRA   PF Total_Salary
1   John Doe        30000             30            12  9000 3600        35400
2 Jane Smith        35000             40            10 14000 3500        45500
```

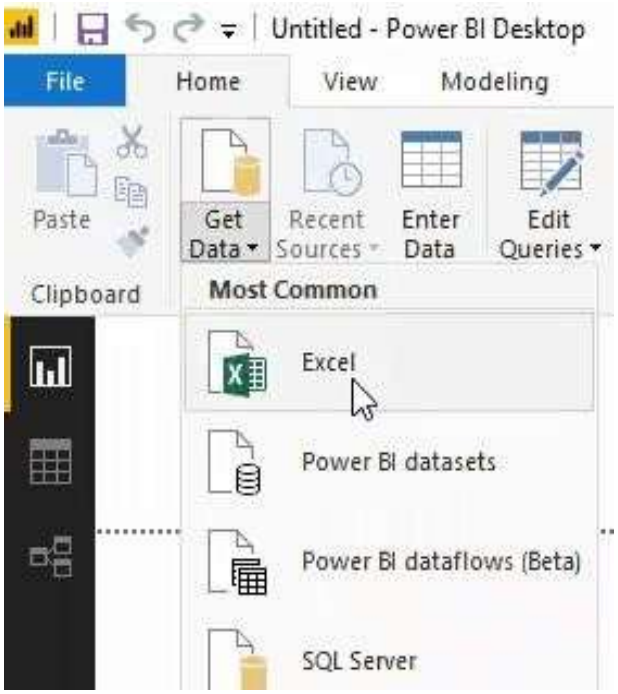
Practical No 11

Import data from MS-Excel/ MS-Access in Power BI Desktop Show data Visualization

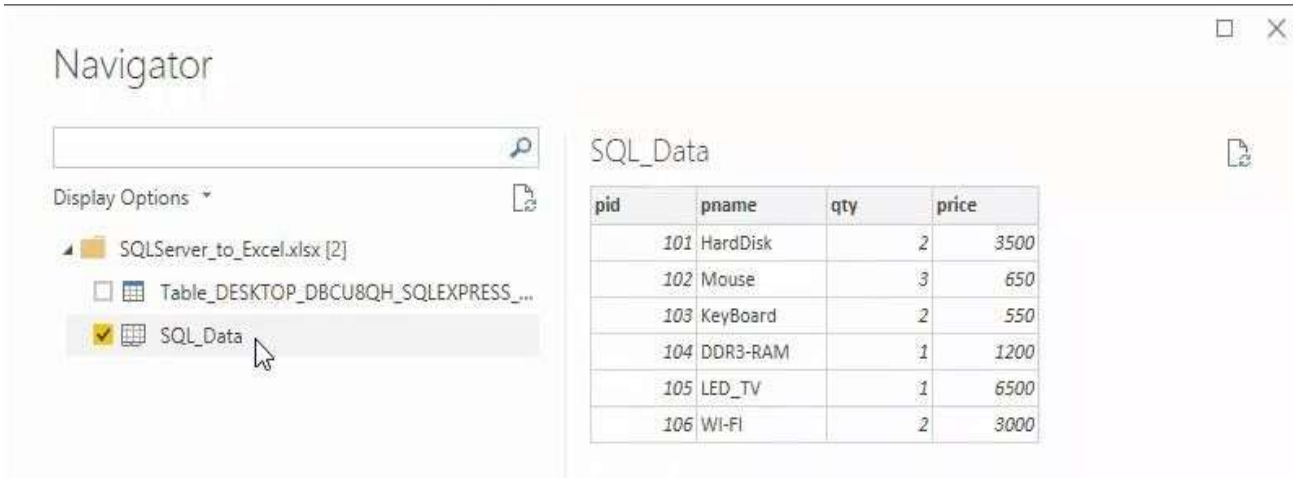
Open MS-Excel and create sample data as given.

pid	pname	qty	price
101	HardDisk	2	3500
102	Mouse	3	650
103	KeyBoard	2	550
104	DDR3-RAM	1	1200
105	LED_TV	1	6500
106	WI-FI	2	3000

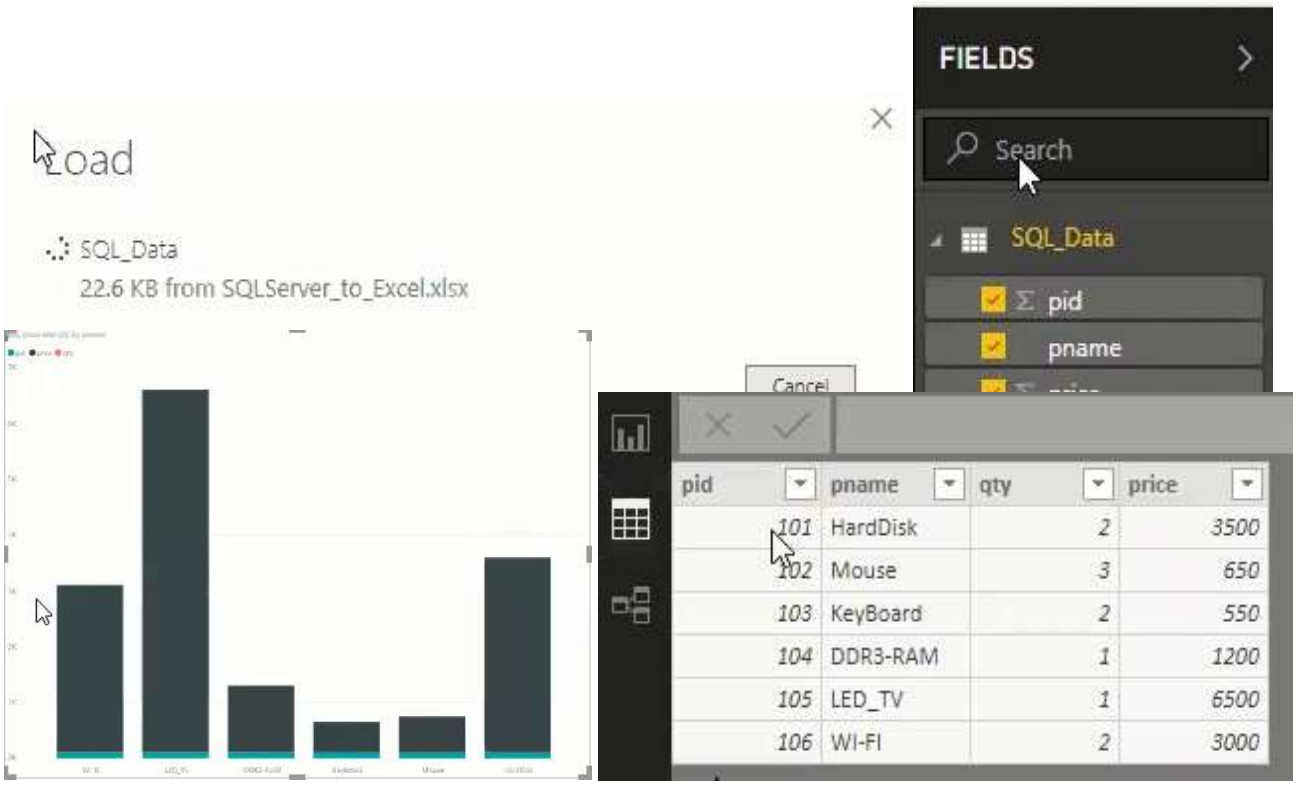
Now open Powe BI. Click on**" Get Data"** from "Home" Tab. Select "**Excel**" from menu.



Browse sample data file and click on open button. Connecting and loading procced. Availabe spreadsheet will appeared select datasheet which we want to load.



Select Filels name requied to load or appeare in visualization.



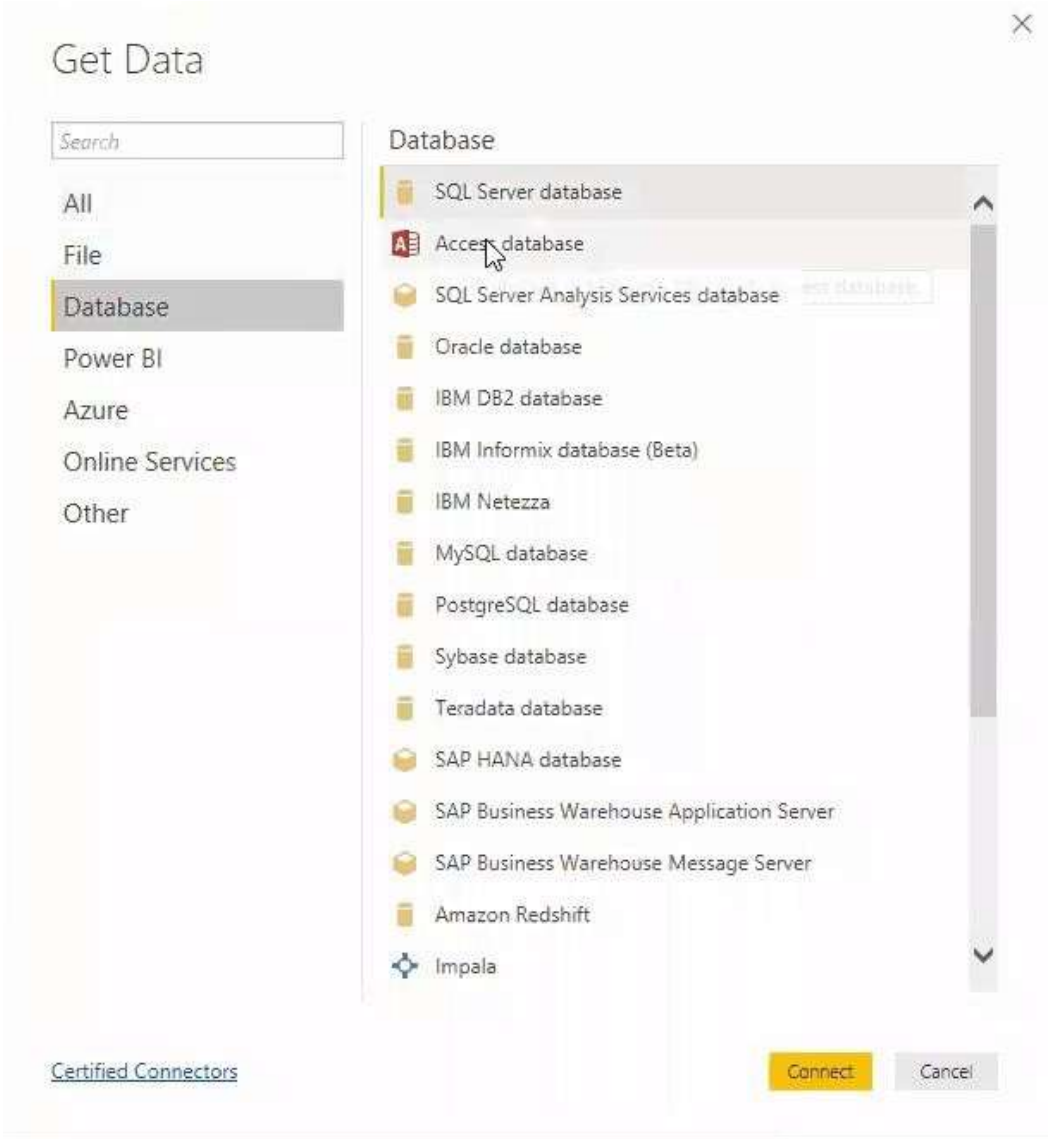
Import data from MS-Access in Power BI Desktop Show data Visualization.

Open MS-Access, Create emp table in database with sample data as

emp

empid	ename	salary	dept
101	Shravan	35000	1
102	Mokshada	32000	1
103	Komal	25000	3
104	Manoj	22000	2
105	Gopal	21500	3
0		0	

Now open Power BI, Click on Get Data and select Access Database Option from list



Browse MS-Access Database and open it. Choose table name and load it.