Big Data Analytics

Certified Journal

Submitted in partial fulfilment of the

Requirements for the award of the Degree of

MASTER OF SCIENCE

(INFORMATION_TECHNOLOGY)

By

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DEPARTMENT OF INFORMATION TECHNOLOGY

KERALEEYA SAMAJAM (REGD.) DOMBIVLI'S

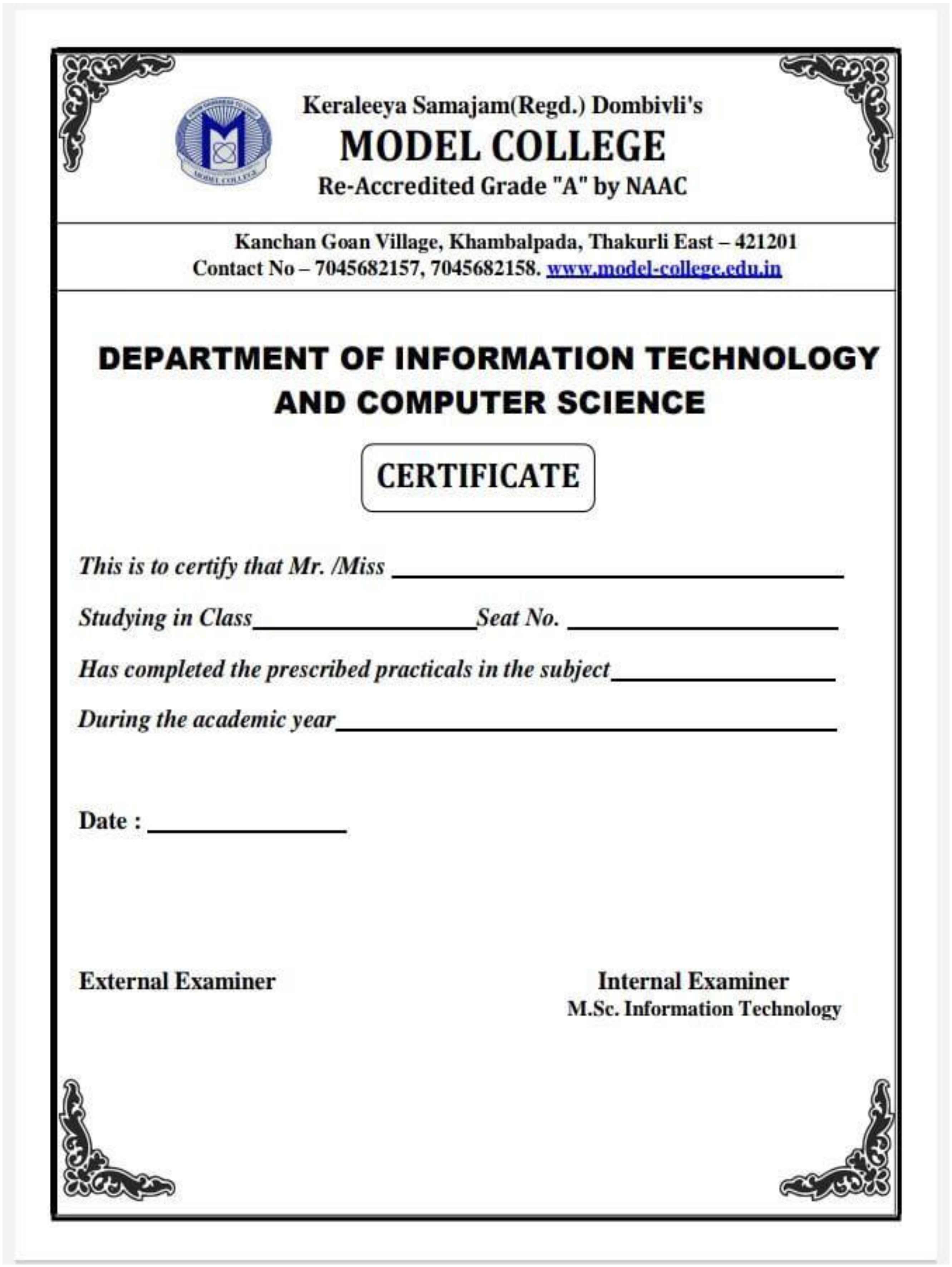
MODEL COLLEGE (AUTONOMOUS)

Re-Accredited 'A' Grade by NAAC

(Affiliated to University of Mumbai)

FOR THE YEAR

(2022-23)



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DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER SCIENCE

CERTIFICATE

This is to certify that Mr. /Miss ______________________________

*Studying in Class*_______________*Seat No.* ___________________

*Has completed the prescribed practicals in the subject*_______________

*During the academic year*__________________________________

Date : _____________

External Examiner

Internal Examiner
M.Sc. Information Technology

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	continuous independent variable. Apply on above dataset.		
8	Solve the Following:		
8A	CLASSIFICATION MODEL a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier.		
8B	CLUSTERING MODEL a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.		

PRACTICAL 1

Hadoop Installation

Aim:
Install, configure and run Hadoop and HDFS and explore HDFS on Windows

Code:

Steps to Install Hadoop

1. Install Java JDK 1.8
2. Download Hadoop and extract and place under C drive
3. Set Path in Environment Variables
4. Config files under Hadoop directory
5. Create folder datanode and namenode under data directory
6. Edit HDFS and YARN files
7. Set Java Home environment in Hadoop environment
8. Setup Complete. Test by executing start-all.cmd

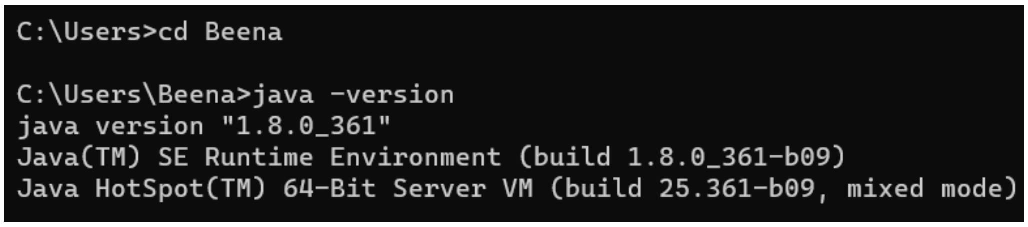
There are two ways to install Hadoop, i.e.

9. Single node
10. Multi node

Here, we use multi node cluster.

1. Install Java

11. – Java JDK Link to download https://www.oracle.com/java/technologies/javase-jdk8-downloads.html
12. – extract and install Java in C:\Java
13. – open cmd and type -> javac -version

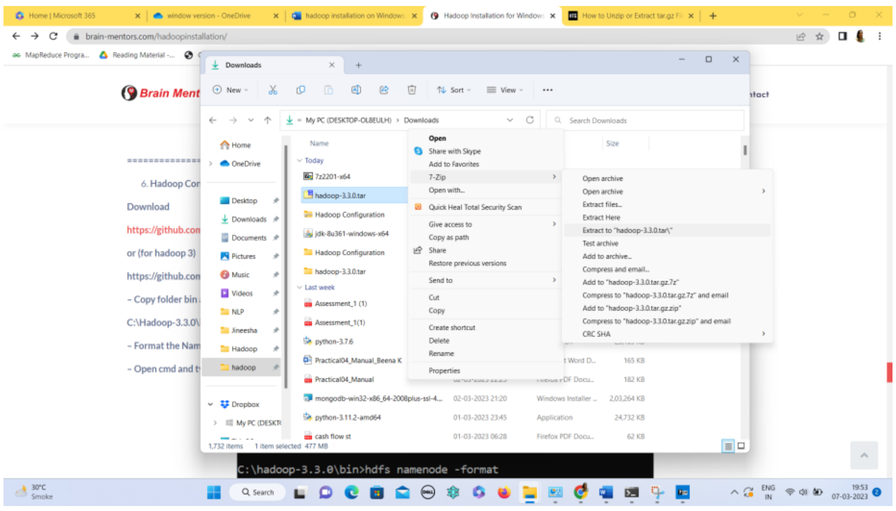


```
C:\Users>cd Beena

C:\Users\Beena>java -version
java version "1.8.0_361"
Java(TM) SE Runtime Environment (build 1.8.0_361-b09)
Java HotSpot(TM) 64-Bit Server VM (build 25.361-b09, mixed mode)
```

2. Download Hadoop

https://www.apache.org/dyn/closer.cgi/hadoop/common/hadoop-3.3.0/hadoop-3.3.0.tar.gz

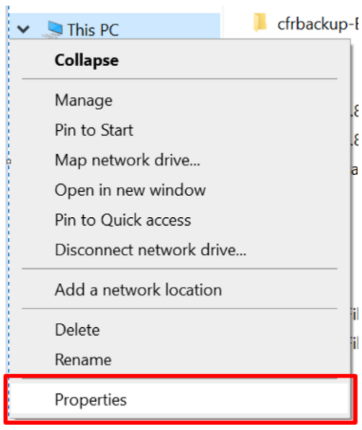
- right click .rar.gz file -> show more options -> 7-zip->and extract to C:\Hadoop-3.3.0\

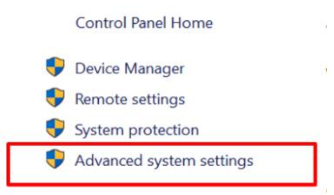


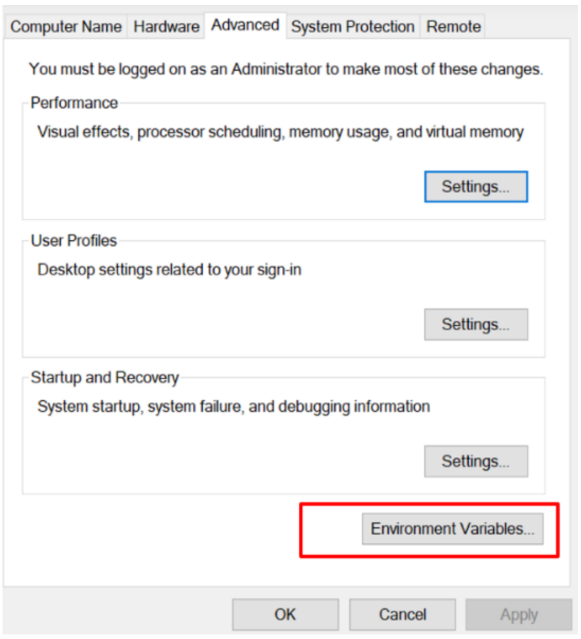
```
C:\hadoop-3.3.0\bin>hdfs namenode -format
```

3. **Set the path JAVA_HOME Environment variable**

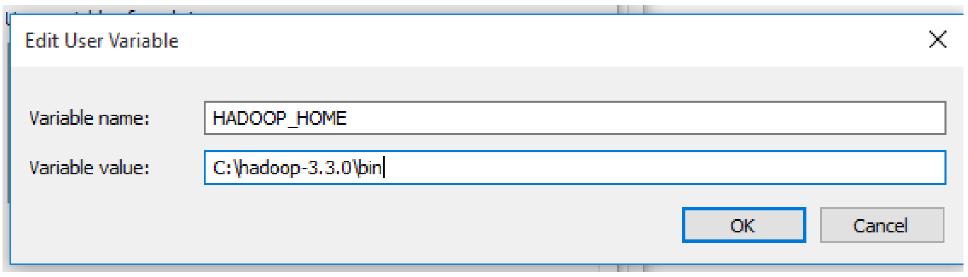
4. **Set the path HADOOP_HOME Environment variable**





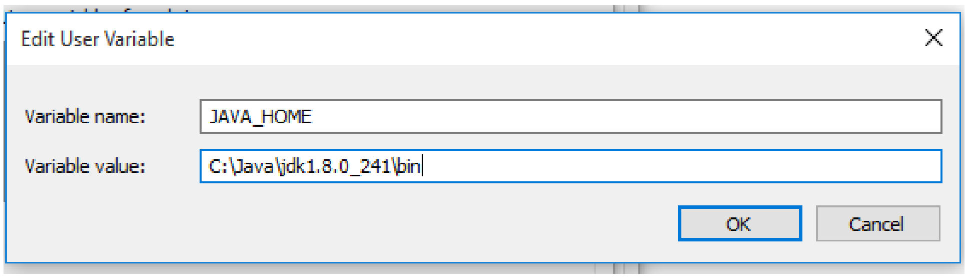

Computer Name
Hardware
Advanced
System Protection
Remote
You must be logged on as an Administrator to make most of these changes.
Performance
Visual effects, processor scheduling, memory usage, and virtual memory
Settings...
User Profiles
Desktop settings related to your sign-in
Settings...
Startup and Recovery
System startup, system failure, and debugging information
Settings...
Environment Variables...
OK
Cancel
Apply

Click on **New to both user variables and system variables.**


Edit User Variable

Variable name: HADOOP_HOME

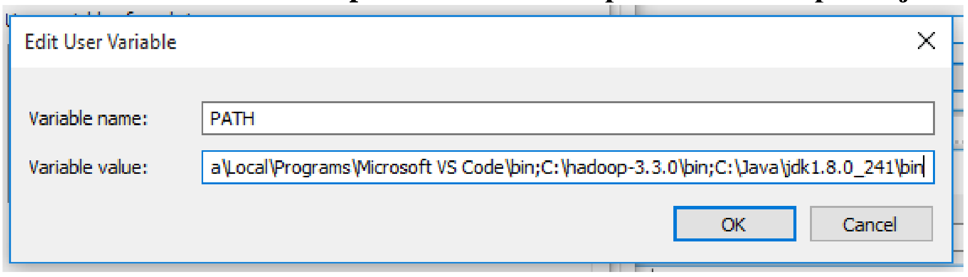
Variable value: C:\hadoop-3.3.0\bin


Edit User Variable

Variable name: JAVA_HOME

Variable value: C:\Java\jdk1.8.0_241\bin

Click on user variable -> path -> edit-> add path for Hadoop and java upto 'bin'


Edit User Variable

Variable name: PATH

Variable value: a\Local\Programs\Microsoft VS Code\bin;C:\hadoop-3.3.0\bin;C:\Java\jdk1.8.0_241\bin

Click Ok, Ok, Ok.

5. Configurations

Edit file C:/Hadoop-3.3.0/etc/hadoop/core-site.xml,

paste the xml code in folder and save

===

```
<configuration>
<property>
       <name>fs.defaultFS</name>
       <value>hdfs://localhost:9000</value>
 </property>
</configuration>
```

===

Rename "mapred-site.xml.template" to "mapred-site.xml" and edit this file C:/Hadoop-3.3.0/etc/hadoop/mapred-site.xml, paste xml code and save this file.

===

```
<configuration>
   <property>
       <name>mapreduce.framework.name</name>
       <value>yarn</value>
   </property>
</configuration>
```

 ===

Create folder "data" under "C:\Hadoop-3.3.0"

Create folder "datanode" under "C:\Hadoop-3.3.0\data"

Create folder "namenode" under "C:\Hadoop-3.3.0\data"

 ===

Edit file C:\Hadoop-3.3.0/etc/hadoop/hdfs-site.xml,

paste xml code and save this file.

```
<configuration>
<property>
       <name>dfs.replication</name>
       <value>1</value>
```

```
  </property>


  <property>
      <name>dfs.namenode.name.dir</name>
      <value>/hadoop-3.3.0/data/namenode</value>
  </property>
  <property>
      <name>dfs.datanode.data.dir</name>
      <value>/hadoop-3.3.0/data/datanode</value>
  </property>
 </configuration>
```

===

Edit file C:/Hadoop-3.3.0/etc/hadoop/yarn-site.xml,

paste xml code and save this file.

```
<configuration>
  <property>
            <name>yarn.nodemanager.aux-services</name>
            <value>mapreduce_shuffle</value>
  </property>


  <property>
           <name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</name>
            <value>org.apache.hadoop.mapred.ShuffleHandler</value>
  </property>
  <property>
                <name>yarn.resourcemanager.address</name>
                <value>127.0.0.1:8032</value>
  </property>
  <property>
                <name>yarn.resourcemanager.scheduler.address</name>
```

```
                  <value>127.0.0.1:8030</value>
    </property>
    <property>
                  <name>yarn.resourcemanager.resource-tracker.address</name>
                  <value>127.0.0.1:8031</value>
     </property>
</configuration>
```

===

6. **Edit file C:/Hadoop-3.3.0/etc/hadoop/hadoop-env.cmd**

Find “JAVA_HOME=%JAVA_HOME%” and replace it as

set JAVA_HOME="C:\Java\jdk1.8.0_361"

===

7. **Download “redistributable” package**

    Download and run VC_redist.x64.exe

This is a “redistributable” package of the Visual C runtime code for 64-bit applications, from Microsoft. It contains certain shared code that every application written with Visual C expects to have available on the Windows computer it runs on.

8. **Hadoop Configurations**

Download bin folder from

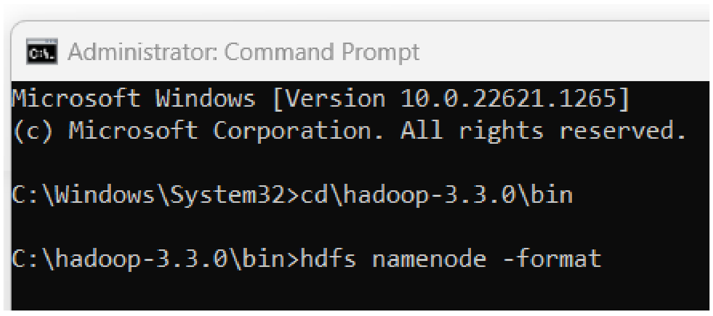
https://github.com/s911415/apache-hadoop-3.1.0-winutils

– Copy the bin folder to c:\hadoop-3.3.0. Replace the existing bin folder.

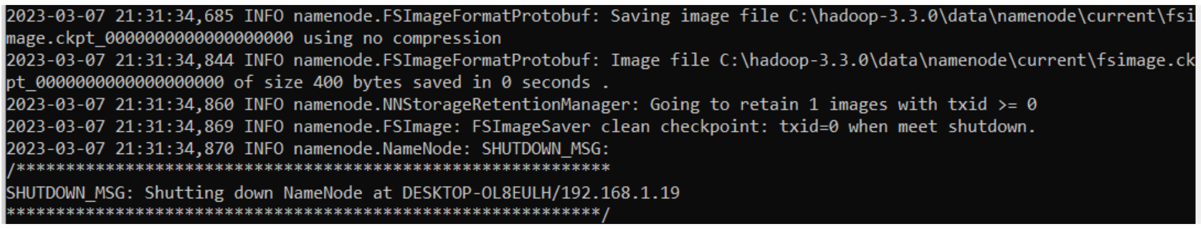
9. **copy "hadoop-yarn-server-timelineservice-3.0.3.jar" from ~\hadoop-3.0.3\share\hadoop\yarn\timelineservice to ~\hadoop-3.0.3\share\hadoop\yarn folder.**

10. **Format the NameNode**

– Open cmd ‘Run as Administrator’ and type command “hdfs namenode –format”



```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.22621.1265]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\System32>cd\hadoop-3.3.0\bin

C:\hadoop-3.3.0\bin>hdfs namenode -format
```



```
2023-03-07 21:31:34,685 INFO namenode.FSImageFormatProtobuf: Saving image file C:\hadoop-3.3.0\data\namenode\current\fsi
mage.ckpt_0000000000000000000 using no compression
2023-03-07 21:31:34,844 INFO namenode.FSImageFormatProtobuf: Image file C:\hadoop-3.3.0\data\namenode\current\fsimage.ck
pt_0000000000000000000 of size 400 bytes saved in 0 seconds .
2023-03-07 21:31:34,860 INFO namenode.NNStorageRetentionManager: Going to retain 1 images with txid >= 0
2023-03-07 21:31:34,869 INFO namenode.FSImage: FSImageSaver clean checkpoint: txid=0 when meet shutdown.
2023-03-07 21:31:34,870 INFO namenode.NameNode: SHUTDOWN_MSG:
/************************************************************
SHUTDOWN_MSG: Shutting down NameNode at DESKTOP-OL8EULH/192.168.1.19
************************************************************/
```

11. Testing

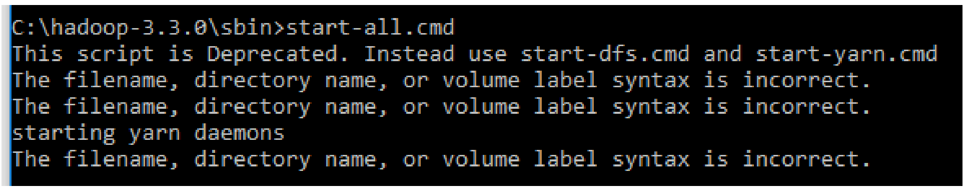
– Open cmd **'Run as Administrator'** and change directory to **C:\Hadoop-3.3.0\sbin**

– type **start-all.cmd**

OR

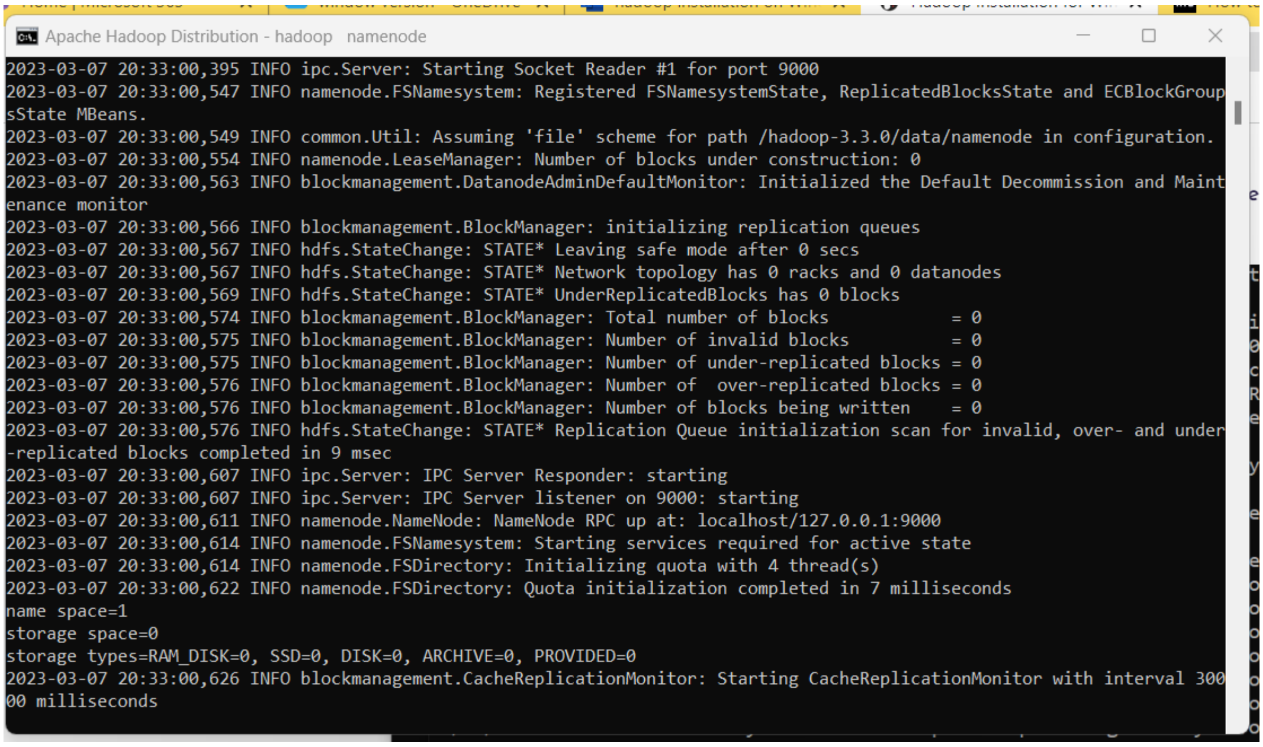
- type **start-dfs.cmd**

– type **start-yarn.cmd**



```
C:\hadoop-3.3.0\sbin>start-all.cmd
This script is Deprecated. Instead use start-dfs.cmd and start-yarn.cmd
The filename, directory name, or volume label syntax is incorrect.
The filename, directory name, or volume label syntax is incorrect.
starting yarn daemons
The filename, directory name, or volume label syntax is incorrect.
```

– You will get 4 more running threads for Datanode, namenode, resouce manager and node manager

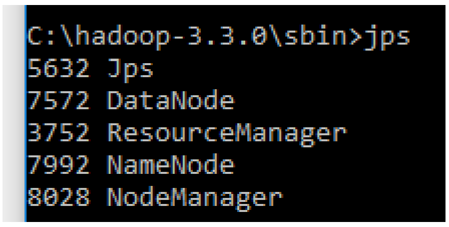


Apache Hadoop Distribution - hadoop   namenode

```
2023-03-07 20:33:00,395 INFO ipc.Server: Starting Socket Reader #1 for port 9000
2023-03-07 20:33:00,547 INFO namenode.FSNamesystem: Registered FSNamesystemState, ReplicatedBlocksState and ECBlockGroup
sState MBeans.
2023-03-07 20:33:00,549 INFO common.Util: Assuming 'file' scheme for path /hadoop-3.3.0/data/namenode in configuration.
2023-03-07 20:33:00,554 INFO namenode.LeaseManager: Number of blocks under construction: 0
2023-03-07 20:33:00,563 INFO blockmanagement.DatanodeAdminDefaultMonitor: Initialized the Default Decommission and Maint
enance monitor
2023-03-07 20:33:00,566 INFO blockmanagement.BlockManager: initializing replication queues
2023-03-07 20:33:00,567 INFO hdfs.StateChange: STATE* Leaving safe mode after 0 secs
2023-03-07 20:33:00,567 INFO hdfs.StateChange: STATE* Network topology has 0 racks and 0 datanodes
2023-03-07 20:33:00,569 INFO hdfs.StateChange: STATE* UnderReplicatedBlocks has 0 blocks
2023-03-07 20:33:00,574 INFO blockmanagement.BlockManager: Total number of blocks            = 0
2023-03-07 20:33:00,575 INFO blockmanagement.BlockManager: Number of invalid blocks          = 0
2023-03-07 20:33:00,575 INFO blockmanagement.BlockManager: Number of under-replicated blocks = 0
2023-03-07 20:33:00,576 INFO blockmanagement.BlockManager: Number of  over-replicated blocks = 0
2023-03-07 20:33:00,576 INFO blockmanagement.BlockManager: Number of blocks being written    = 0
2023-03-07 20:33:00,576 INFO hdfs.StateChange: STATE* Replication Queue initialization scan for invalid, over- and under
-replicated blocks completed in 9 msec
2023-03-07 20:33:00,607 INFO ipc.Server: IPC Server Responder: starting
2023-03-07 20:33:00,607 INFO ipc.Server: IPC Server listener on 9000: starting
2023-03-07 20:33:00,611 INFO namenode.NameNode: NameNode RPC up at: localhost/127.0.0.1:9000
2023-03-07 20:33:00,614 INFO namenode.FSNamesystem: Starting services required for active state
2023-03-07 20:33:00,614 INFO namenode.FSDirectory: Initializing quota with 4 thread(s)
2023-03-07 20:33:00,622 INFO namenode.FSDirectory: Quota initialization completed in 7 milliseconds
name space=1
storage space=0
storage types=RAM_DISK=0, SSD=0, DISK=0, ARCHIVE=0, PROVIDED=0
2023-03-07 20:33:00,626 INFO blockmanagement.CacheReplicationMonitor: Starting CacheReplicationMonitor with interval 300
00 milliseconds
```

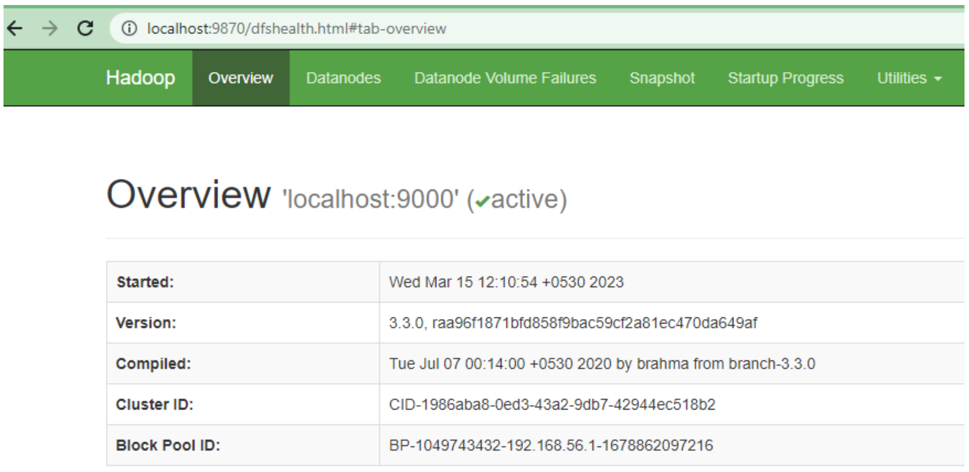
Output:

12. Type JPS command to start-all.cmd command prompt, you will get following output.



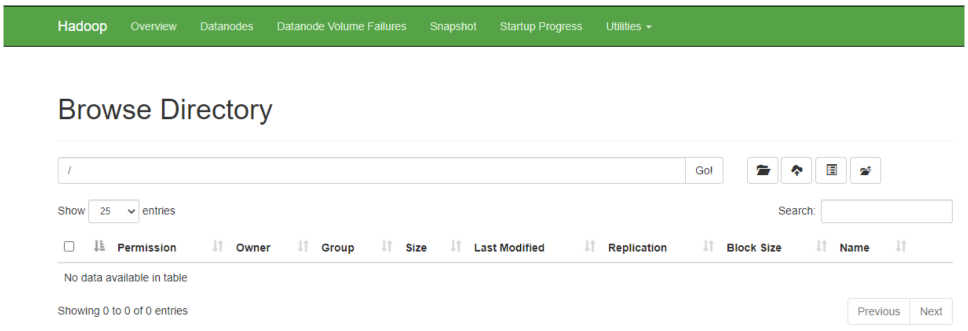
```
C:\hadoop-3.3.0\sbin>jps
5632 Jps
7572 DataNode
3752 ResourceManager
7992 NameNode
8028 NodeManager
```

13. Run http://localhost:9870/ from any browser



Overview 'localhost:9000' (✓active)

Started:	Wed Mar 15 12:10:54 +0530 2023
Version:	3.3.0, raa96f1871bfd858f9bac59cf2a81ec470da649af
Compiled:	Tue Jul 07 00:14:00 +0530 2020 by brahma from branch-3.3.0
Cluster ID:	CID-1986aba8-0ed3-43a2-9db7-42944ec518b2
Block Pool ID:	BP-1049743432-192.168.56.1-1678862097216



Browse Directory

/ Go!

Show 25 entries Search:

	Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
No data available in table								

Showing 0 to 0 of 0 entries

PRACTICAL 2

MapReduce Implementation

Aim:

Implement word count / frequency programs using MapReduce.

Steps:

```
C:\hadoop-3.3.0\sbin>start-dfs.cmd
C:\hadoop-3.3.0\sbin>start-yarn.cmd
```

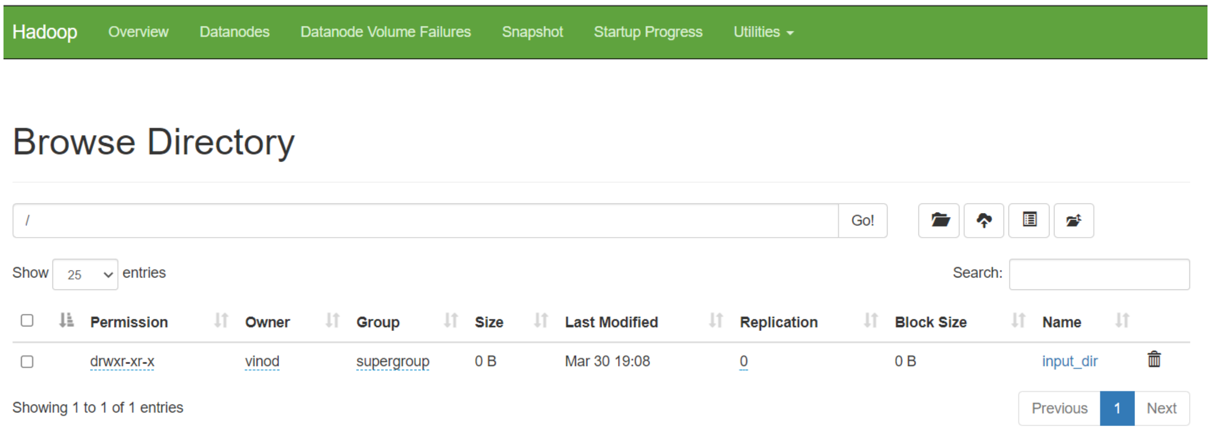
Open a command prompt as administrator and run the following command to create an input and output folder on the Hadoop file system, to which we will be moving the sample.txt file for our analysis.

```
C:\hadoop-3.3.0\bin>cd\
 C:\>hadoop dfsadmin -safemode leave
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.
Safe mode is OFF
C:\>hadoop fs -mkdir /input_dir
```

Check it by giving the following URL at browser

http://localhost:9870

Utilities -> browse the file system



Browse Directory

/

	Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
☐	drwxr-xr-x	vinod	supergroup	0 B	Mar 30 19:08	0	0 B	input_dir

Showing 1 to 1 of 1 entries

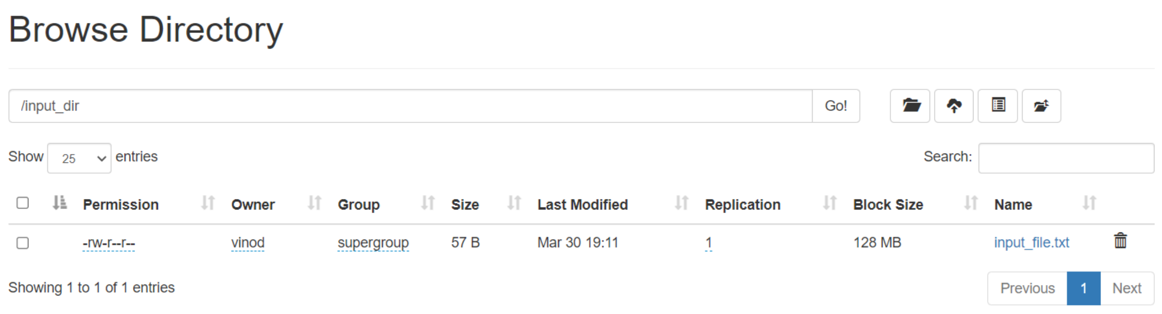
Copy the input text file named input_file.txt in the input directory (input_dir)of HDFS.

Make a file in c:\input_file.txt and write following content in it.

Hadoop Window version is easy compared to Ubuntu version

Now apply the following command at c:\>

```
C:\> hadoop fs -put C:/input_file.txt /input_dir
```



Browse Directory

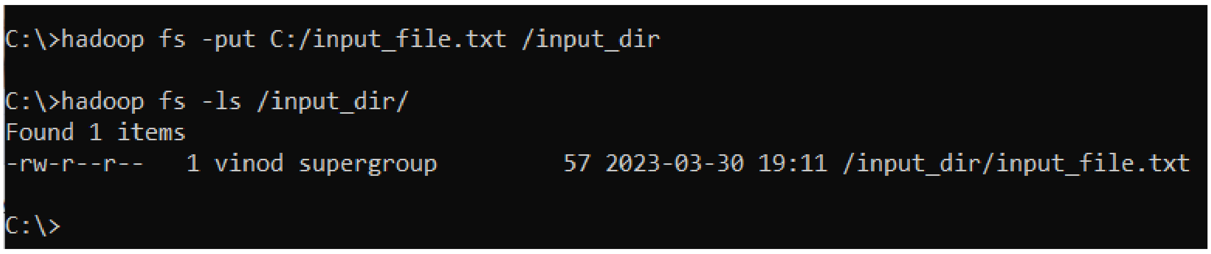
/input_dir Go!

Show 25 entries Search:

	Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
☐	-rw-r--r--	vinod	supergroup	57 B	Mar 30 19:11	1	128 MB	input_file.txt

Showing 1 to 1 of 1 entries Previous 1 Next

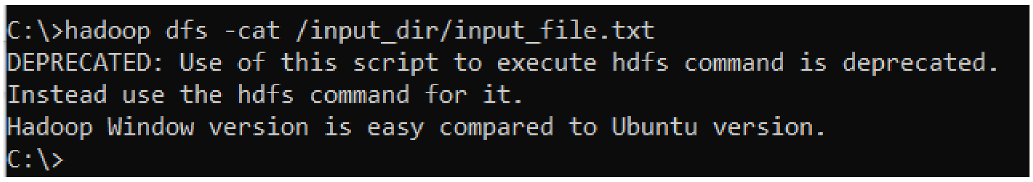
Verify input_file.txt available in HDFS input directory (input_dir).
C:\>Hadoop fs -ls /input_dir/



```
C:\>hadoop fs -put C:/input_file.txt /input_dir

C:\>hadoop fs -ls /input_dir/
Found 1 items
-rw-r--r--   1 vinod supergroup         57 2023-03-30 19:11 /input_dir/input_file.txt

C:\>
```

Verify content of the copied file
C:\>hadoop dfs -cat /input_dir/input_file.txt

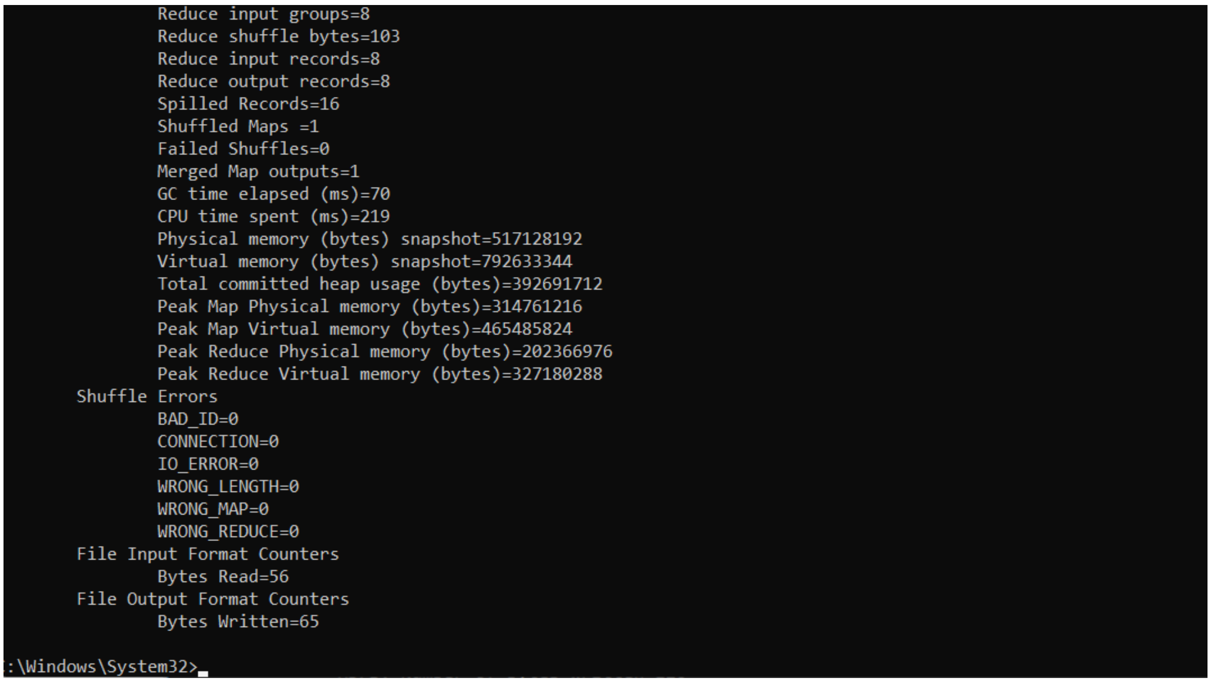
You can see the file content displayed on the CMD.



```
C:\>hadoop dfs -cat /input_dir/input_file.txt
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.
Hadoop Window version is easy compared to Ubuntu version.
C:\>
```

Run MapReduceClient.jar and also provide input and out directories.

C:\>hadoop jar C:/hadoop-3.3.0/share/hadoop/mapreduce/hadoop-mapreduce-examples-3.3.0.jar wordcount /input_dir /output_dir

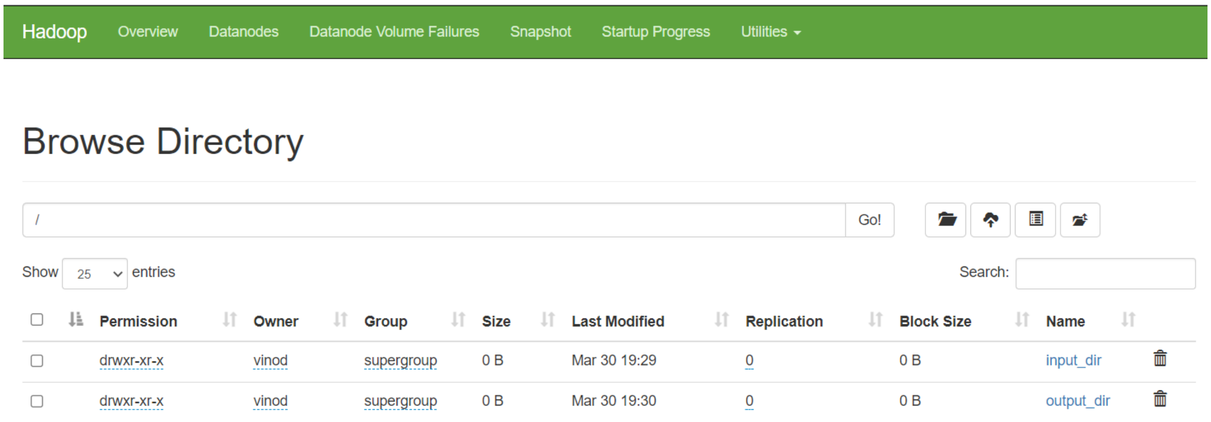


```
                Reduce input groups=8
                Reduce shuffle bytes=103
                Reduce input records=8
                Reduce output records=8
                Spilled Records=16
                Shuffled Maps =1
                Failed Shuffles=0
                Merged Map outputs=1
                GC time elapsed (ms)=70
                CPU time spent (ms)=219
                Physical memory (bytes) snapshot=517128192
                Virtual memory (bytes) snapshot=792633344
                Total committed heap usage (bytes)=392691712
                Peak Map Physical memory (bytes)=314761216
                Peak Map Virtual memory (bytes)=465485824
                Peak Reduce Physical memory (bytes)=202366976
                Peak Reduce Virtual memory (bytes)=327180288
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=56
        File Output Format Counters
                Bytes Written=65

:\Windows\System32>_
```

In case, there is some error in executing then copy the file MapReduceClient.jar in C:\ and run the program with the jar file using existing MapReduceClient.jar file as:

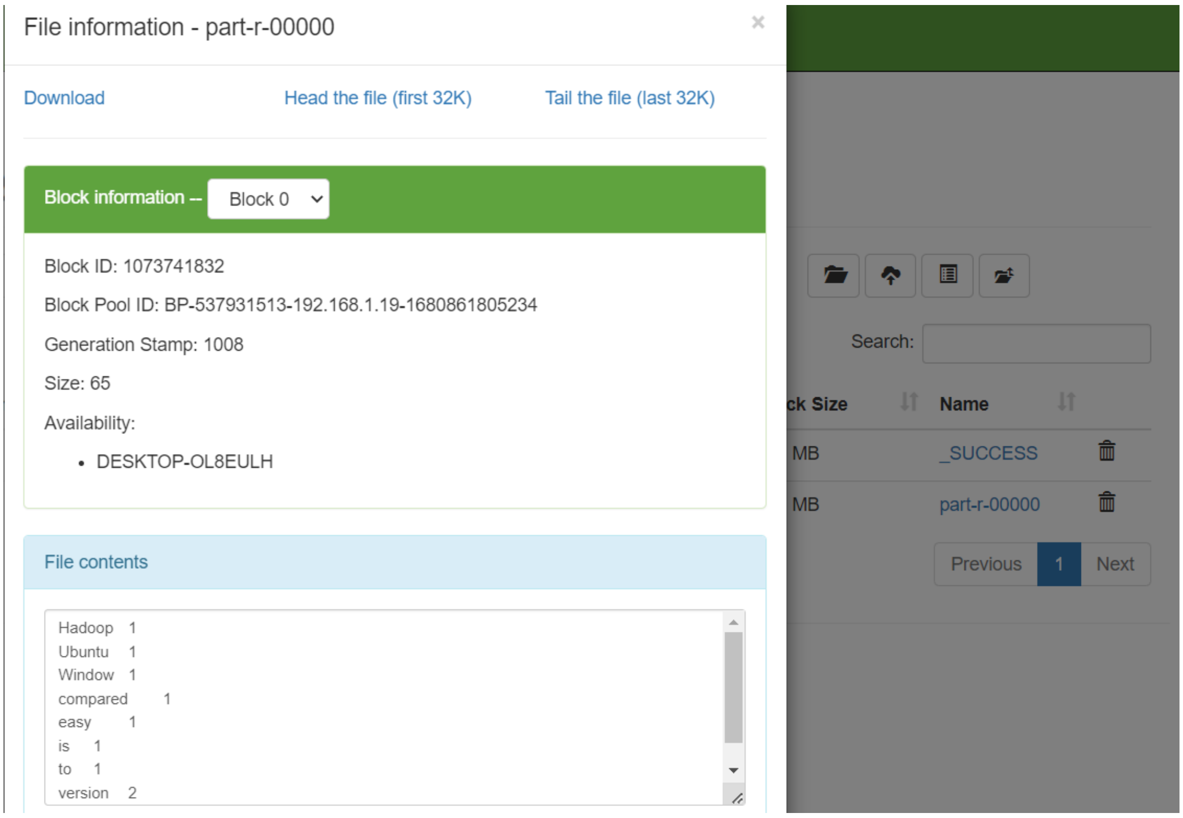
C:\> hadoop jar C:/MapReduceClient.jar wordcount /input_dir /output_dir

Now, check the output_dir on browser as follows:



	Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
☐	drwxr-xr-x	vinod	supergroup	0 B	Mar 30 19:29	0	0 B	input_dir
☐	drwxr-xr-x	vinod	supergroup	0 B	Mar 30 19:30	0	0 B	output_dir

Click on output_dir part-r-00000 Head the file (first 32 K) and check the file content as the output.


File information - part-r-00000

Download Head the file (first 32K) Tail the file (last 32K)

Block information -- Block 0

Block ID: 1073741832

Block Pool ID: BP-537931513-192.168.1.19-1680861805234

Generation Stamp: 1008

Size: 65

Availability:

- DESKTOP-OL8EULH

File contents

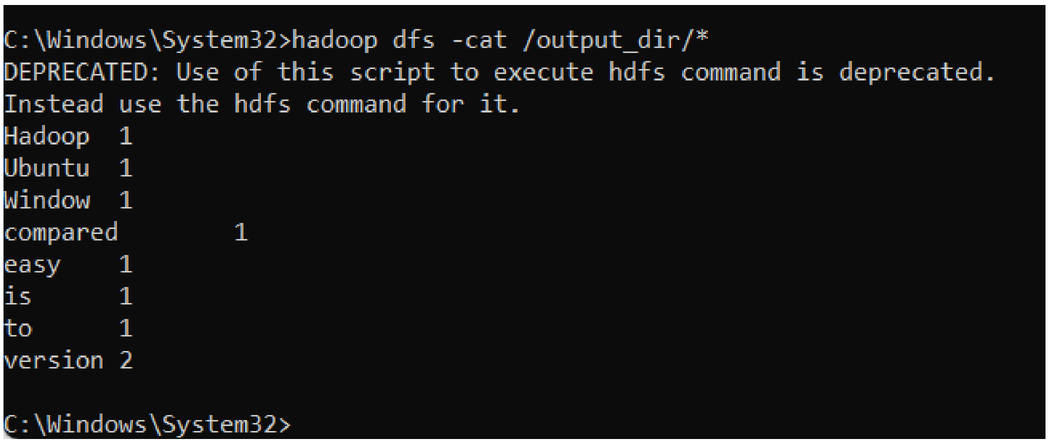
```
Hadoop	1
Ubuntu	1
Window	1
compared	1
easy	1
is	1
to	1
version	2
```

ck Size	Name
MB	_SUCCESS
MB	part-r-00000

Alternatively, you may type the following command on CMD window as:

C:\> hadoop dfs -cat /output_dir/*

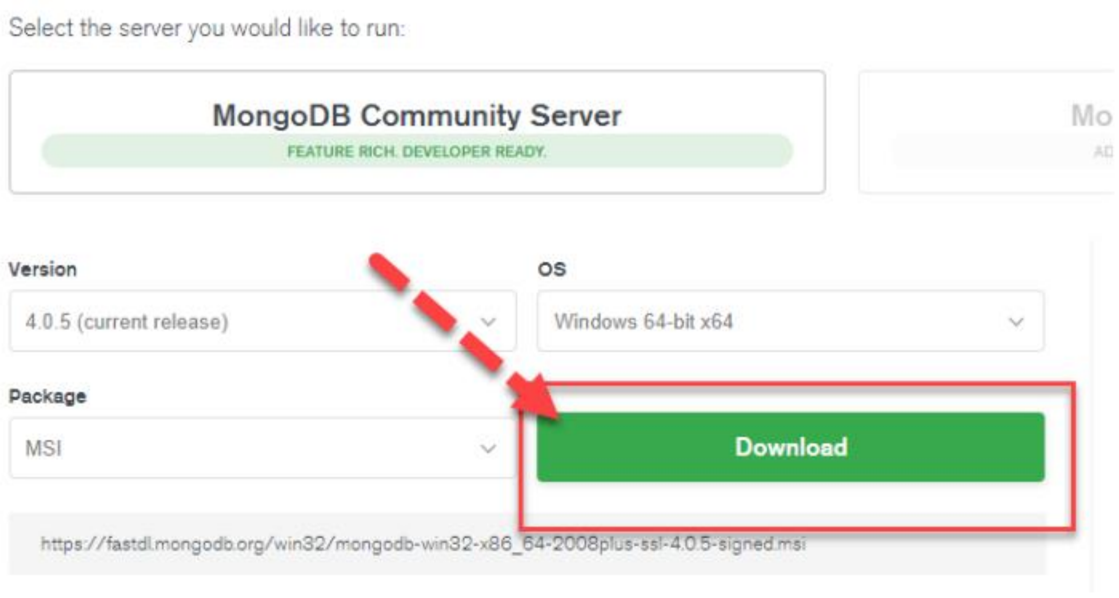
You can get the following output


```
C:\Windows\System32>hadoop dfs -cat /output_dir/*
DEPRECATED: Use of this script to execute hdfs command is deprecated.
Instead use the hdfs command for it.
Hadoop  1
Ubuntu  1
Window  1
compared        1
easy    1
is      1
to      1
version 2

C:\Windows\System32>
```

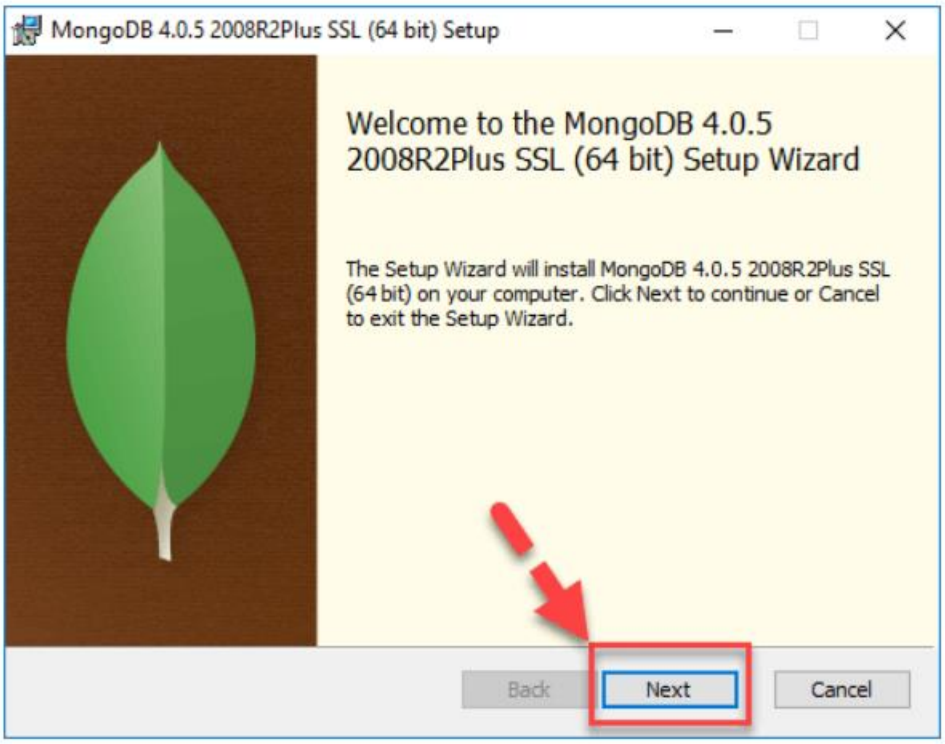
PRACTICAL 3

Aim:
Implement an application that stores big data in Hbase / MongoDB and manipulate it using R / Python

Requirements
a. PyMongo
b. Mongo Database
Step A: Install Mongo database
Step 1) Go to (https://www.mongodb.com/download-center/community) and Download MongoDB Community Server. We will install the 64-bit version for Windows.


Select the server you would like to run:
MongoDB Community Server
FEATURE RICH. DEVELOPER READY.
Version: 4.0.5 (current release)
OS: Windows 64-bit x64
Package: MSI
https://fastdl.mongodb.org/win32/mongodb-win32-x86_64-2008plus-ssl-4.0.5-signed.msi

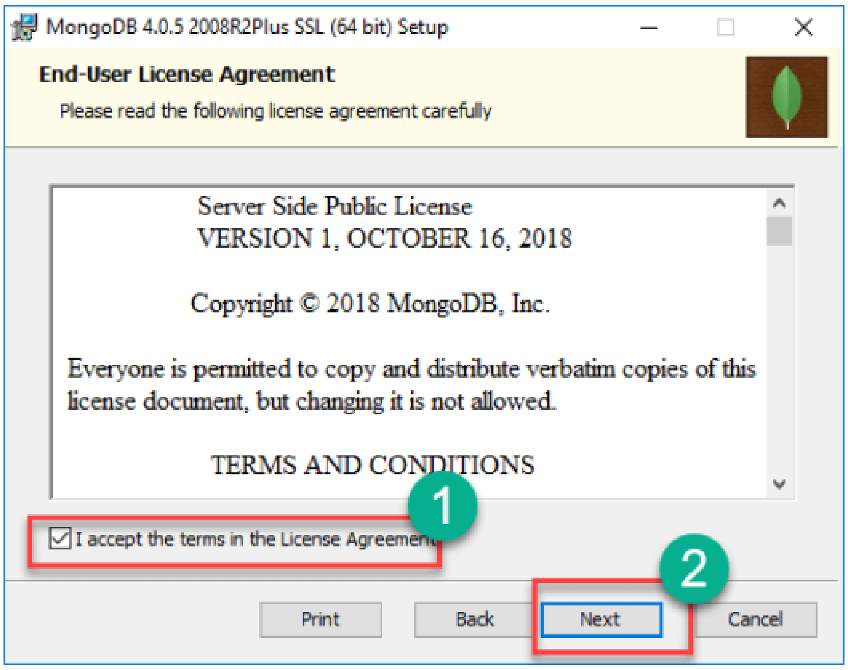
Step 2) Once download is complete open the msi file. Click Next in the start up screen


MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup

Welcome to the MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup Wizard

The Setup Wizard will install MongoDB 4.0.5 2008R2Plus SSL (64 bit) on your computer. Click Next to continue or Cancel to exit the Setup Wizard.

Step 3)
1. Accept the End-User License Agreement
2. Click Next


MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup

End-User License Agreement

Please read the following license agreement carefully

Server Side Public License
VERSION 1, OCTOBER 16, 2018

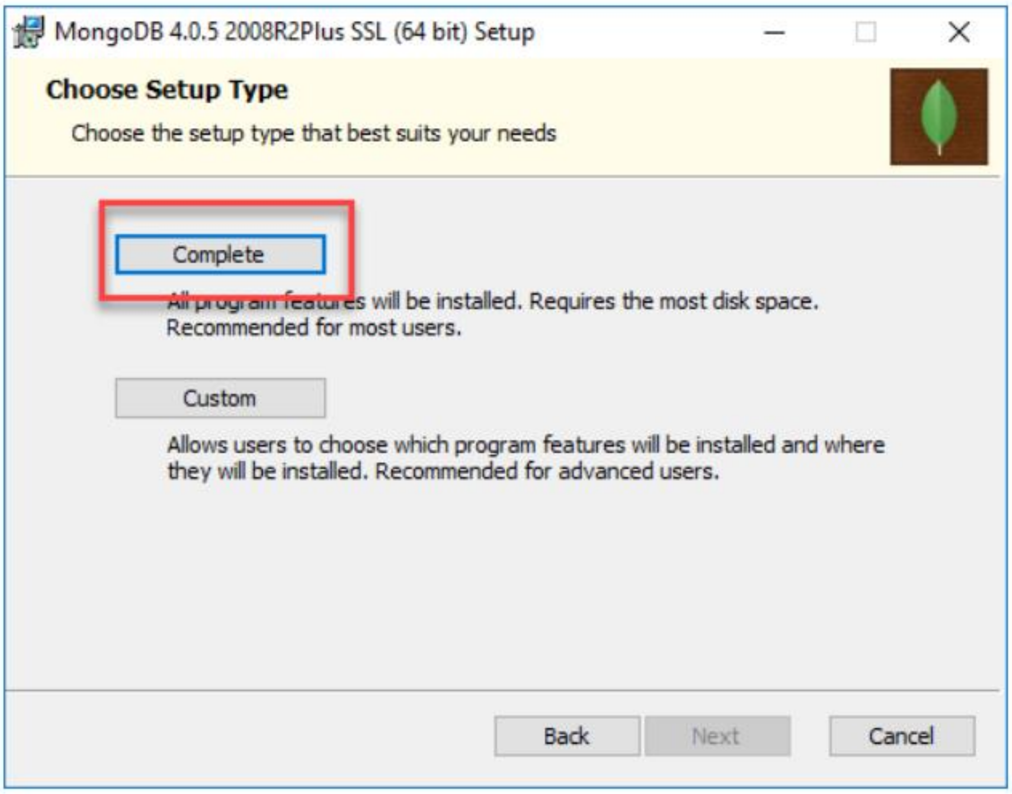
Copyright © 2018 MongoDB, Inc.

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

TERMS AND CONDITIONS

☑ I accept the terms in the License Agreement

Step 4) Click on the "complete" button to install all of the components. The custom option can be used to install selective components or if you want to change the location of the installation.



MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup

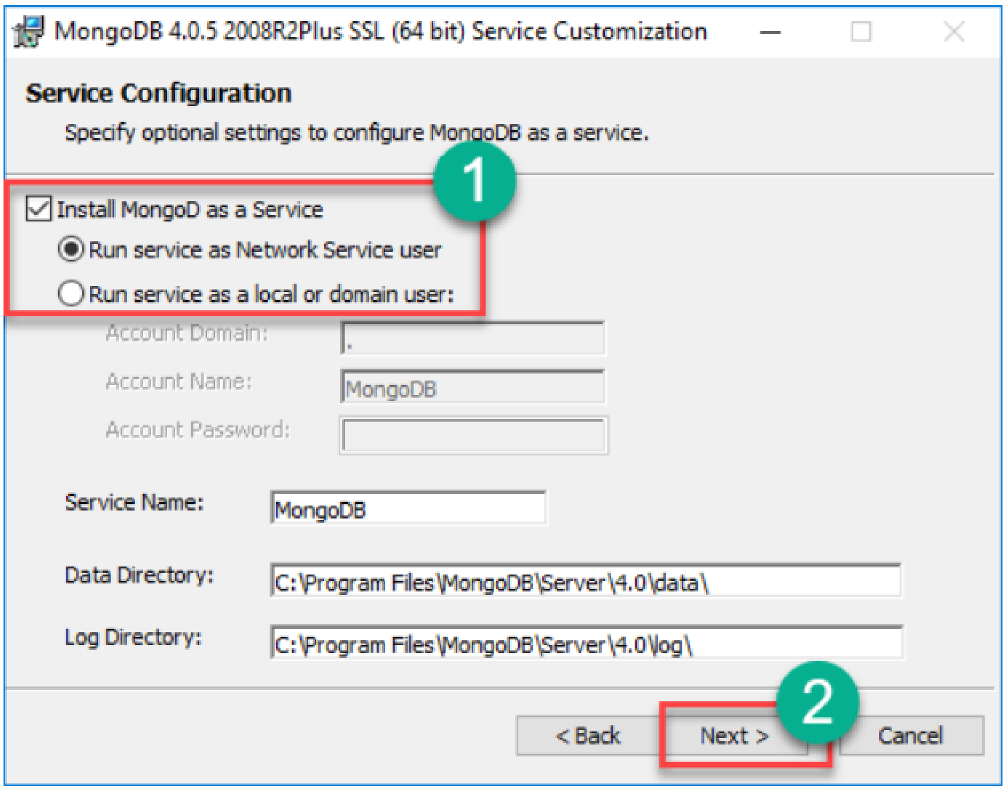
Choose Setup Type

Choose the setup type that best suits your needs

All program features will be installed. Requires the most disk space. Recommended for most users.

Allows users to choose which program features will be installed and where they will be installed. Recommended for advanced users.

Step 5)
1. Select “Run service as Network Service user”. make a note of the data directory, we”ll need this later.
2. Click Next



MongoDB 4.0.5 2008R2Plus SSL (64 bit) Service Customization

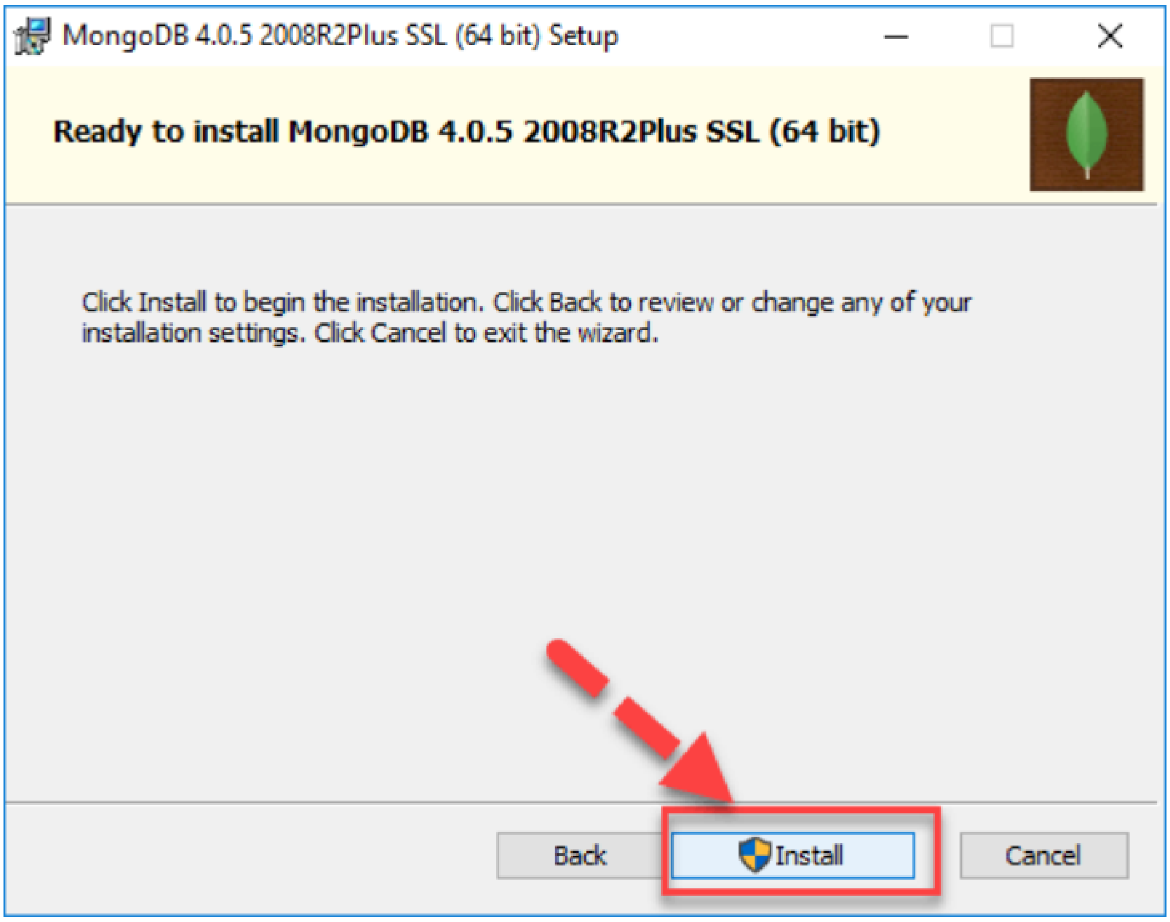
Service Configuration

Specify optional settings to configure MongoDB as a service.

- [✓] Install MongoD as a Service
  - [✓ Run service as Network Service user]
  - Run service as a local or domain user:

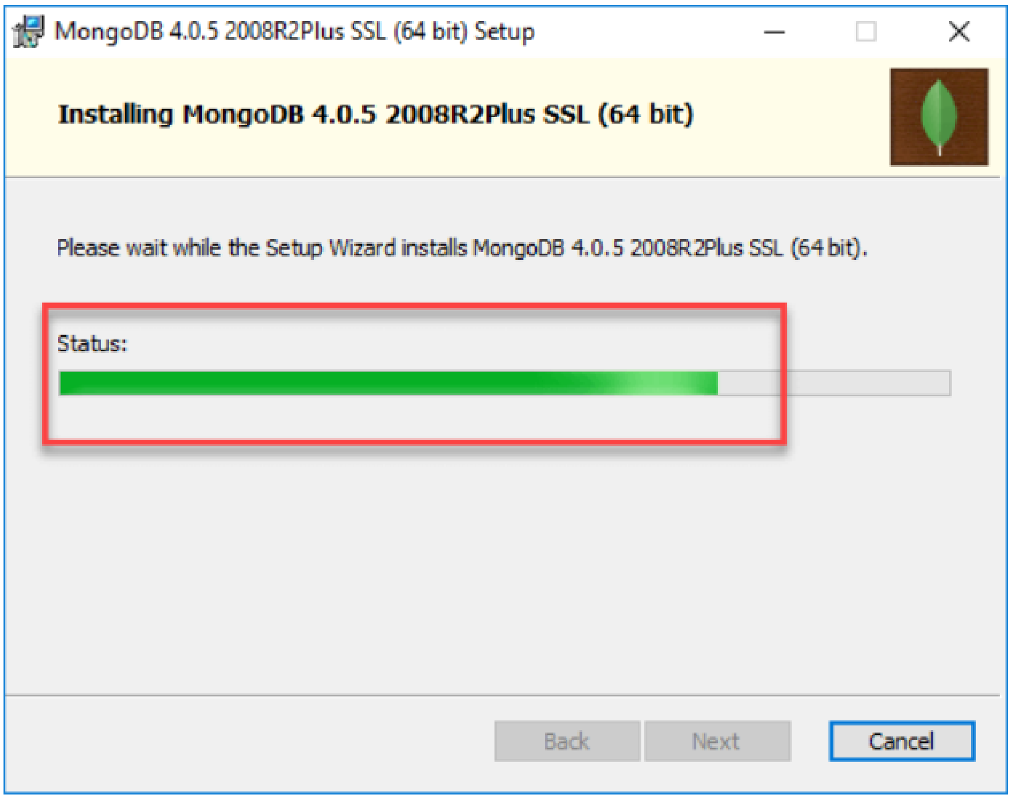
Account Domain:	.
Account Name:	MongoDB
Account Password:	
Service Name:	MongoDB
Data Directory:	C:\Program Files\MongoDB\Server\4.0\data\
Log Directory:	C:\Program Files\MongoDB\Server\4.0\log\

Step 6) Click on the Install button to start the installation.


MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup
Ready to install MongoDB 4.0.5 2008R2Plus SSL (64 bit)
Back
Install
Cancel

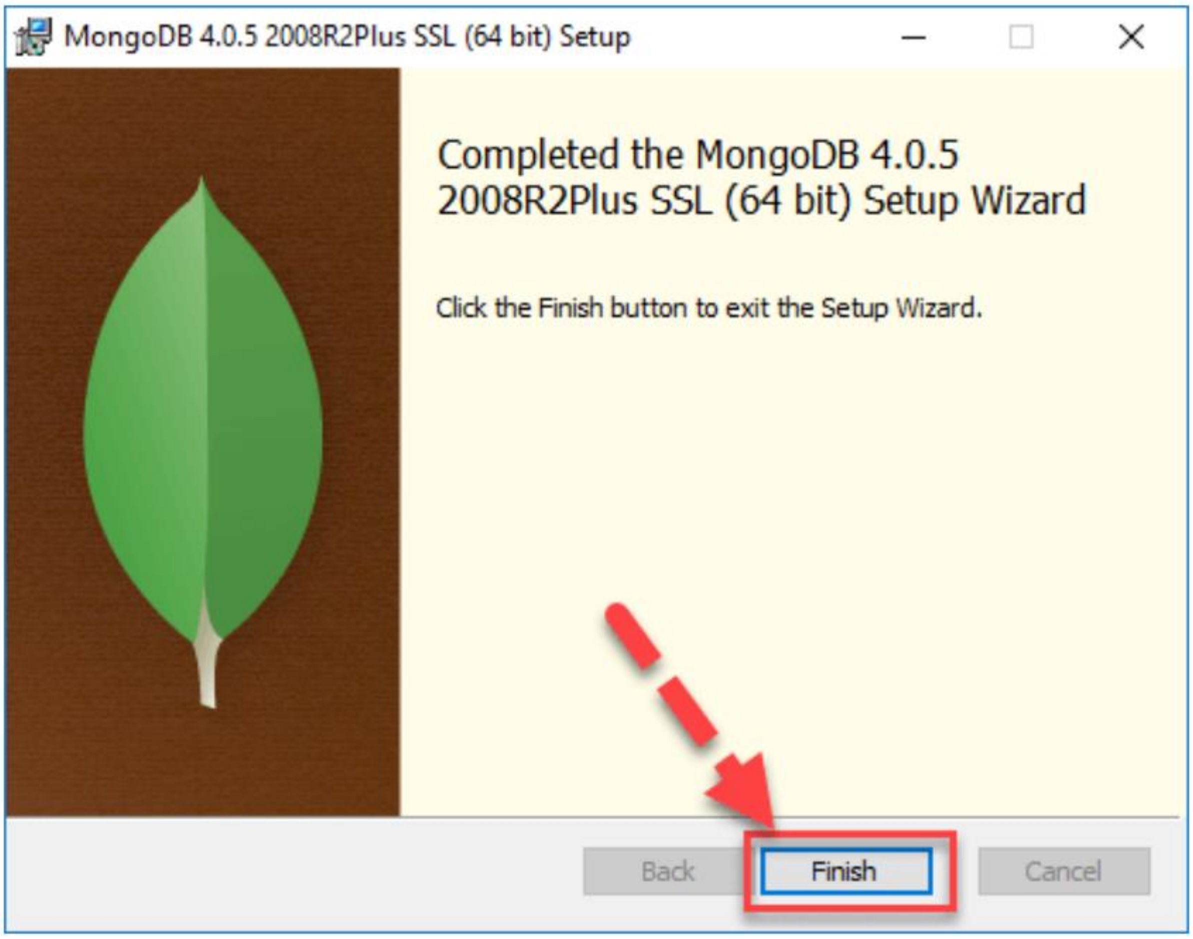
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.

Step 7) Installation begins. Click Next once completed.


MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup
Installing MongoDB 4.0.5 2008R2Plus SSL (64 bit)
Status:
Back
Next
Cancel

Please wait while the Setup Wizard installs MongoDB 4.0.5 2008R2Plus SSL (64 bit).

Step 8) Click on the Finish button to complete the installation.


MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup

Completed the MongoDB 4.0.5 2008R2Plus SSL (64 bit) Setup Wizard

Click the Finish button to exit the Setup Wizard.

Test Mongodb
Step 1) Go to " C:\Program Files\MongoDB\Server\4.0\bin" and double click on **mongo.exe.** Alternatively, you can also click on the MongoDB desktop icon.

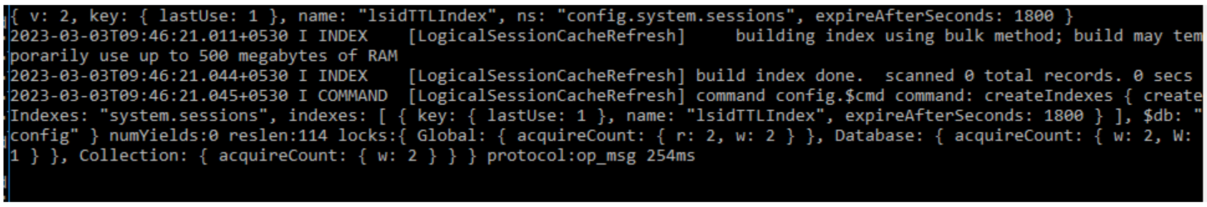
- **Create the directory where MongoDB will store its files.**
  Open command prompt window and apply following commands

```
C:\users\admin> cd\
C:\>md data\db
```

Step 2) Execute mongodb
Open another command prompt window.

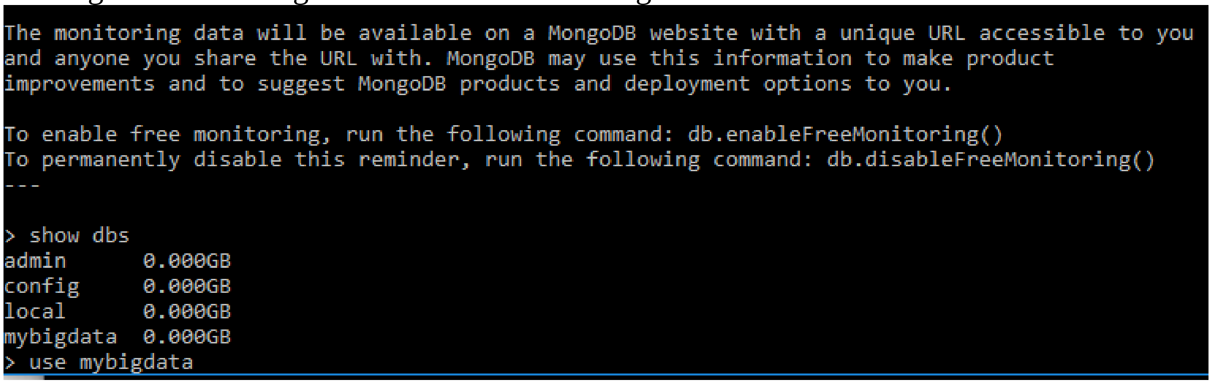
```
C:\> cd C:\Program Files\MongoDB\Server\4.0\bin
C:\Program Files\MongoDB\Server\4.0\bin> mongod
```

In case if it gives an error then run the following command:
C:\Program Files\MongoDB\Server\4.0\bin> mongod –repair



```
{ v: 2, key: { lastUse: 1 }, name: "lsidTTLIndex", ns: "config.system.sessions", expireAfterSeconds: 1800 }
2023-03-03T09:46:21.011+0530 I INDEX    [LogicalSessionCacheRefresh]     building index using bulk method; build may tem
porarily use up to 500 megabytes of RAM
2023-03-03T09:46:21.044+0530 I INDEX    [LogicalSessionCacheRefresh] build index done.  scanned 0 total records. 0 secs
2023-03-03T09:46:21.045+0530 I COMMAND  [LogicalSessionCacheRefresh] command config.$cmd command: createIndexes { create
Indexes: "system.sessions", indexes: [ { key: { lastUse: 1 }, name: "lsidTTLIndex", expireAfterSeconds: 1800 } ], $db: "
config" } numYields:0 reslen:114 locks:{ Global: { acquireCount: { r: 2, w: 2 } }, Database: { acquireCount: { w: 2, W:
1 } }, Collection: { acquireCount: { w: 2 } } } protocol:op_msg 254ms
```

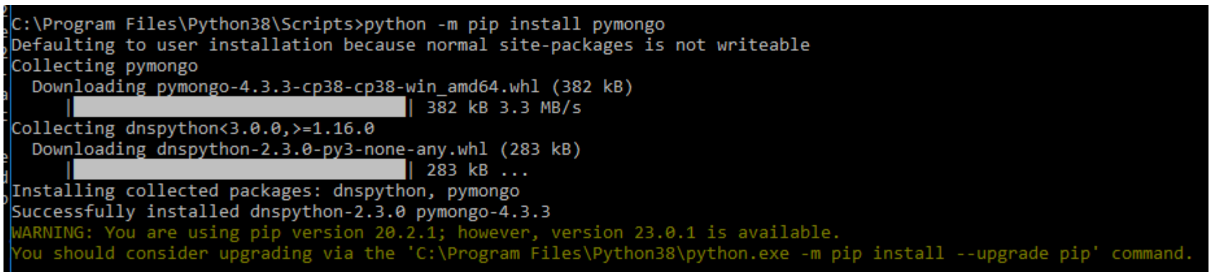
Step 3) Connect to MongoDB using the Mongo shell
Let the MongoDB daemon to run.
Open another command prompt window and run the following commands:
C:\users\admin> cd C:\Program Files\MongoDB\Server\4.0\bin
C:\Program Files\MongoDB\Server\4.0\bin>mongo



```
The monitoring data will be available on a MongoDB website with a unique URL accessible to you
and anyone you share the URL with. MongoDB may use this information to make product
improvements and to suggest MongoDB products and deployment options to you.

To enable free monitoring, run the following command: db.enableFreeMonitoring()
To permanently disable this reminder, run the following command: db.disableFreeMonitoring()
---

> show dbs
admin      0.000GB
config     0.000GB
local      0.000GB
mybigdata  0.000GB
> use mybigdata
```

Step 4) Install PyMongo
Open another command prompt window and run the following commands:
Check the python version on your desktop / laptop and copy that path from window explorer

C:\users\admin>cd C:\Program Files\Python311\Scripts
C:\Program Files\<Python38>\Scripts > python -m pip install pymongo



```
C:\Program Files\Python38\Scripts>python -m pip install pymongo
Defaulting to user installation because normal site-packages is not writeable
Collecting pymongo
  Downloading pymongo-4.3.3-cp38-cp38-win_amd64.whl (382 kB)
     |████████████████████████████████| 382 kB 3.3 MB/s
Collecting dnspython<3.0.0,>=1.16.0
  Downloading dnspython-2.3.0-py3-none-any.whl (283 kB)
     |████████████████████████████████| 283 kB ...
Installing collected packages: dnspython, pymongo
Successfully installed dnspython-2.3.0 pymongo-4.3.3
WARNING: You are using pip version 20.2.1; however, version 23.0.1 is available.
You should consider upgrading via the 'C:\Program Files\Python38\python.exe -m pip install --upgrade pip' command.
```

Note: # **-m** option is for <module-name>
Now you have downloaded and installed a mongoDB driver.

Step 5) Test PyMongo
Run the following command from python command prompt

import pymongo

Now, either create a file in Python IDLE or run all commands one by one in sequence on Python cell
Program 1: Creating a Database: create_dp.py
import pymongo

```
myclient = pymongo.MongoClient("mongodb://localhost:27017/")
mydb = myclient["mybigdata"]
print(myclient.list_database_names())
```

```
['admin', 'config', 'local']
```

Progam 2: Creating a Collection: create_collection.py

```
import pymongo
myclient = pymongo.MongoClient("mongodb://localhost:27017/")
mydb = myclient["mybigdata"]
mycol=mydb["student"]
print(mydb.list_collection_names())
```

```
[]
```

Progam 3: Insert into Collection: insert_into_collection.py

```
import pymongo
myclient = pymongo.MongoClient("mongodb://localhost:27017/")
mydb = myclient["mybigdata"]
mycol=mydb["student"]
mydict={"name":"Beena", "address":"Mumbai"}
x=mycol.insert_one(mydict) # insert_one(containing the name(s) and value(s) of each field
```

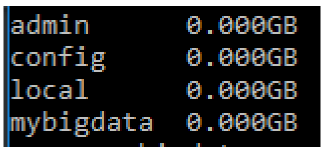
Program 4: Insert Multiple data into Collection: insert_many.py

```
import pymongo
myclient = pymongo.MongoClient("mongodb://localhost:27017/")
mydb = myclient["mybigdata"]
mycol=mydb["student"]
mylist=[{"name":"Khyati", "address":"Mumbai"}, {"name":"Kruti", "address":"Mumbai"},
{"name":"Nidhi", "address":"Pune"}, {"name":"Komal", "address":"Pune"},]
x=mycol.insert_many(mylist)
```

Step 6) Test in Mongodb to check database and data inserted in collection

a. If you want to check your database list, use the command show dbs in mongo command prompt

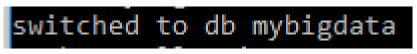
```
> show dbs
```



```
admin       0.000GB
config      0.000GB
local       0.000GB
mybigdata   0.000GB
```

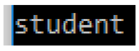
b. If you want to use a database with name mybigdata, then use database statement would be as follow:

```
> use mybigdata
```



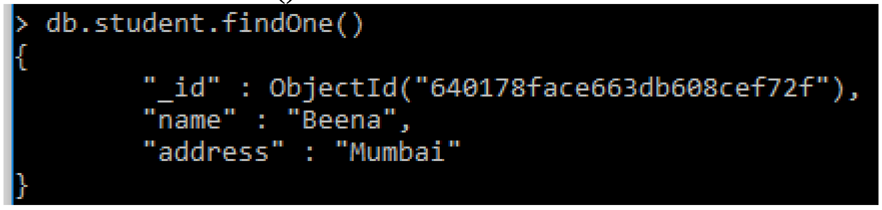
```
switched to db mybigdata
```

c. If you want to check collection in mongodb use the command show collections
> show collections



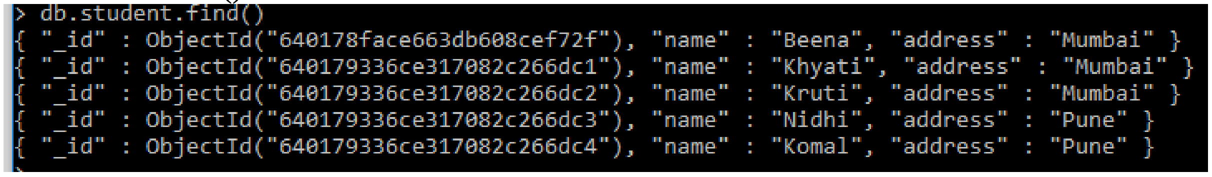
```
student
```

d. If you want to display the first row from collection: db.collection_name.find()
> db.student.findOne()



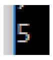
```
> db.student.findOne()
{
        "_id" : ObjectId("640178face663db608cef72f"),
        "name" : "Beena",
        "address" : "Mumbai"
}
```

e. If you want to display all the data from collection: db.collection_name.find()
> db.student.find()



```
> db.student.find()
{ "_id" : ObjectId("640178face663db608cef72f"), "name" : "Beena", "address" : "Mumbai" }
{ "_id" : ObjectId("640179336ce317082c266dc1"), "name" : "Khyati", "address" : "Mumbai" }
{ "_id" : ObjectId("640179336ce317082c266dc2"), "name" : "Kruti", "address" : "Mumbai" }
{ "_id" : ObjectId("640179336ce317082c266dc3"), "name" : "Nidhi", "address" : "Pune" }
{ "_id" : ObjectId("640179336ce317082c266dc4"), "name" : "Komal", "address" : "Pune" }
```

f. count number of rows in a collection
> db.student.count()



```
5
```

Site for R packages documentation:
https://cran.r-project.org/web/packages/available_packages_by_name.html

PRACTICAL 4

Aim : Write a Pig Script for solving counting problems.

Steps :

```
cat> /home/cloudera/input.csv

cat  /home/cloudera/input.csv

pig -x local

lines = load '/home/cloudera/input.csv' as (line:chararray);

words = foreach lines GENERATE FLATTEN(TOKENIZE(line)) as woed;

grouped = GROUP words by woed;

wordcount = foreach grouped GENERATE group, COUNT(words);

dump wordcount;
```

PRACTICAL 5

Aim: Install Hive and use Hive Create and store structured databases.

Steps:

```
cat > /home/cloudera/employee.txt
        1~Sachine~Pune~Product Engineering~100000~Big Data
        2~Gaurav~Banglore~Sales~90000~CRM
        3~Manish~Chennai~Recruiter~125000~HR
        4~Bhushan~Hyderabad~Developer~50000~BFSI
cat  /home/cloudera/employee.txt
sudo -u hdfs hadoop fs -put /home/cloudera/employee.txt /inputdirectroy
hdfs dfs -ls /
hdfs dfs -ls /inputdirectory
hadoop fs -cat  /inputdirectory/employee.txt
hive
show databases;
create database organization;
show databases;
use organization;
show tables;
hive> create table employee(
    > id int,
    > name string,
    > city string,
    > department string,
    > salary int,
    > domain string)
    > row format delimited
    > fields terminated by '~';

show tables;
select * from employee;
```

```
show tables;
load data inpath '/inputdirectory/employee.txt' overwrite into table employee;
show tables;
select * from employee;
```

PRACTICAL 6

PRACTICAL 6A

Aim:
a) Implement Decision Tree classification technique using Social_Network_Ads.csv dataset.

Code:

```
# Decision Tree Classification

# Importing the dataset
dataset = read.csv("C:\\2022-23\\BDA PRACTICAL 2023\\Social_Network_Ads.csv")
#print(dataset)
dataset = dataset[3:5] # columns 3 4 ad 5
print(dataset)

# Encoding the target feature as factor(just like a vector having levels
# levels to convey that only two possible values for purchased - 0 & 1
dataset$Purchased = factor(dataset$Purchased, levels = c(0, 1))
print (dataset$Purchased)

# Splitting the dataset into the Training set and Test set
install.packages('caTools')
library(caTools)
set.seed(123)
#split = sample.split(dataset$Purchased, SplitRatio = 0.75)
split = sample.split(dataset$Purchased, SplitRatio = 0.75)
training_set = subset(dataset, split == TRUE)
test_set = subset(dataset, split == FALSE)

# Feature Scaling - scale() method centers and/or scales the columns of a numeric matrix.
training_set[-3] = scale(training_set[-3]) # scaling first 2 columns, don't consider 3rd column
test_set[-3] = scale(test_set[-3])
#print(test_set[-3])

# Fitting Decision Tree Classification to the Training set
install.packages('rpart')
library(rpart) # for partitioning tree
install.packages('rpart.plot')
library(rpart.plot)

classifier = rpart(formula = Purchased ~ .,data = training_set)

# Predicting the Test set results
y_pred = predict(classifier, newdata = test_set[-3], type = 'class')
print(y_pred)

# Making the Confusion Matrix
```

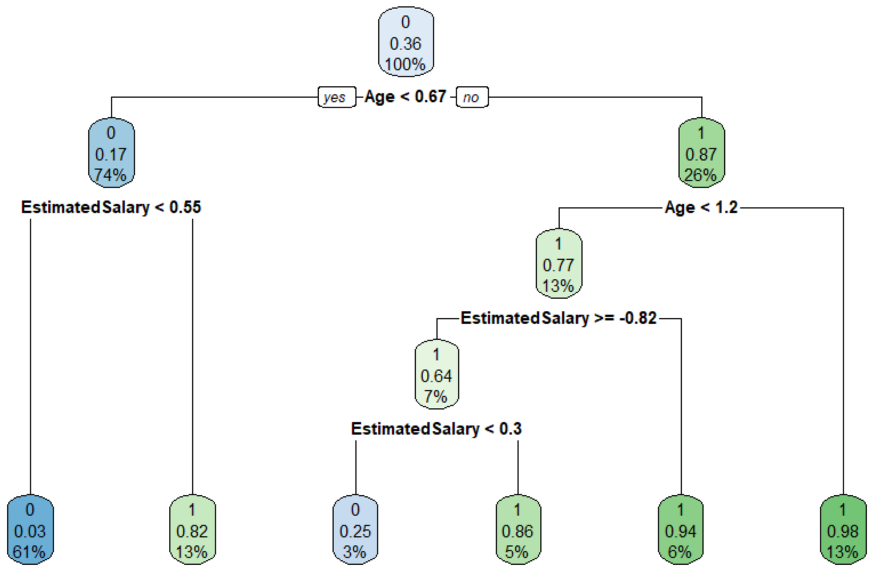
cm = table(test_set[, 3], y_pred)
print(cm)

y_grid = predict(classifier, newdata = grid_set, type = 'class')

# Plotting the tree
#extra=106 class model with a binary response
#extra=104 class model with a response having more than two levels
rpart.plot(classifier, extra = 106)

Output:

```
> cm = table(test_set[, 3], y_pred)
> print(cm)
   y_pred
     0  1
  0 53 11
  1  6 30
```



PRACTICAL 6B

SVM Classification

Aim:

b) Implement SVM Classification technique using Social_Network_Ads.csv dataset. Evaluate the performance of classifier.

Code:

```
# Support Vector Machine (SVM)

# Importing the dataset
dataset = read.csv('C:\\2022-23\\BDA PRACTICAL 2023\\Social_Network_Ads.csv')
dataset = dataset[3:5]
print(dataset)
print(dataset$Purchased)
# Splitting the dataset into the Training set and Test set
install.packages('caTools')
library(caTools)
set.seed(123)
split = sample.split(dataset$Purchased, SplitRatio = 0.75)
training_set = subset(dataset, split == TRUE)
print(training_set)
test_set = subset(dataset, split == FALSE)
print(test_set)
# Feature Scaling
training_set[-3] = scale(training_set[-3]) # [-3] means 3rd index will be dropped
test_set[-3] = scale(test_set[-3])
print(training_set[-3])
print (test_set[-3])
# Fitting SVM to the Training set
install.packages('e1071')
library(e1071)
classifier = svm(formula = Purchased ~ .,
                 data = training_set,
                 type = 'C-classification',
                 kernel = 'linear')
print (classifier)

# Predicting the Test set results
y_pred = predict(classifier, newdata = test_set[-3])
print(y_pred)

# Making the Confusion Matrix
cm = table(test_set[, 3], y_pred)
print (cm)
```

Output:

```
> cm = table(test_set[, 3], y_pred)
> print (cm)
   y_pred
     0  1
  0 57  7
  1 13 23
```

PRACTICAL 7

PRACTICAL 7A

Logistic Regression

Aim:

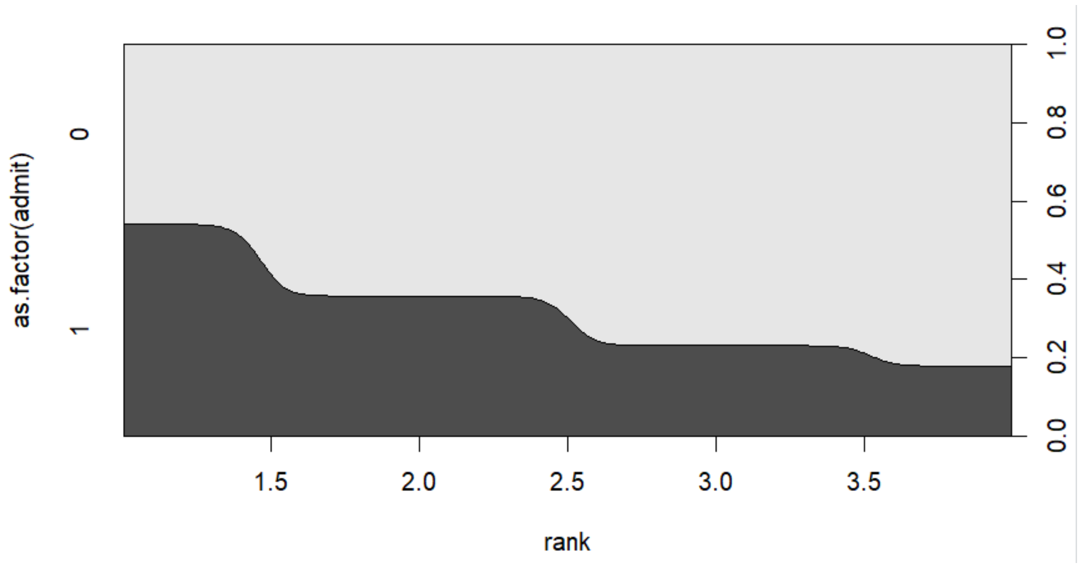
a) Import data from web storage – binary.csv. Name the dataset and do Logistic Regression to find out relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not.

Code:

```
#fetch the data
college <- read.csv("https://raw.githubusercontent.com/csquared/udacity-
dlnd/master/nn/binary.csv")
head(college)
nrow(college)

install.packages("caTools")    # For Logistic regression
library(caTools)

split <- sample.split(college, SplitRatio = 0.75)
split

training_reg <- subset(college, split == "TRUE")
test_reg <- subset(college, split == "FALSE")

# Training model
fit_logistic_model <- glm(admit ~ .,
                    data = training_reg,
                    family = "binomial")

# Predict test data based on model
predict_reg <- predict(fit_logistic_model,
                     test_reg, type = "response")
predict_reg

cdplot(as.factor(admit)~ gpa, data=college)
cdplot(as.factor(admit)~ gre, data=college)
cdplot(as.factor(admit)~ rank, data=college)


# Changing probabilities
predict_reg <- ifelse(predict_reg >0.5, 1, 0)
predict_reg


# Evaluating model accuracy
# using confusion matrix
table(test_reg$admit, predict_reg)
```

Output:

```
> table(test_reg$admit, predict_reg)
   predict_reg
     0  1
  0 70  2
  1 21  7
```



PRACTICAL 7B

Multiple Regression Model

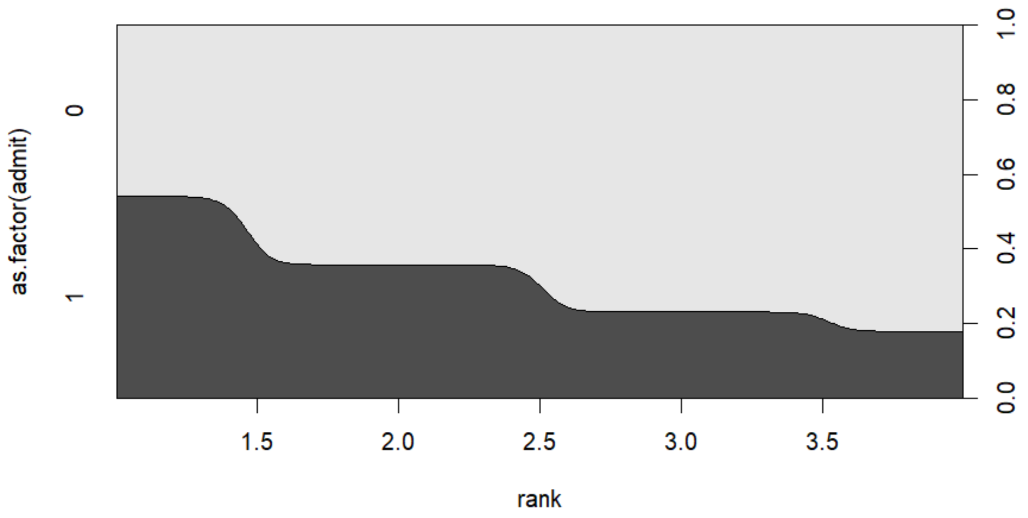
Aim:

b) Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset – binary.csv.

Code:

```
#fetch the data
college <- read.csv("https://raw.githubusercontent.com/csquared/udacity-
dlnd/master/nn/binary.csv")
head(college)
nrow(college)

install.packages("caTools")    # For Logistic regression
library(caTools)

split <- sample.split(college, SplitRatio = 0.75)
split

training_reg <- subset(college, split == "TRUE")
test_reg <- subset(college, split == "FALSE")

# Training model
fit_MRegressor_model <- lm(formula = admit ~ gre+gpa+rank,
                    data = training_reg)

# Predict test data based on model
predict_reg <- predict(fit_MRegressor_model,
                    newdata = test_reg)
predict_reg

cdplot(as.factor(admit)~ gpa, data=college)
cdplot(as.factor(admit)~ gre, data=college)
cdplot(as.factor(admit)~ rank, data=college)
```

Output:


as.factor(admit)
0
1
1.0
0.8
0.6
0.4
0.2
0.0
1.5
2.0
2.5
3.0
3.5
rank

PRACTICAL 8

PRACTICAL 8A

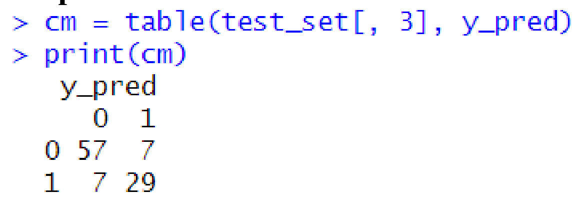
Classification Model
Naïve Bayes Classification

Aim:
a) Implement Naïve Bayes Classification technique using Social_Network_Ads.csv dataset. Evaluate the performance of classifier.

Code:

```
# Naive Bayes
# Importing the dataset
dataset = read.csv('C:\\2022-23\\BDA PRACTICAL 2023\\Social_Network_Ads.csv')
dataset = dataset[3:5]
# Encoding the target feature as factor
dataset$Purchased = factor(dataset$Purchased, levels = c(0, 1))
# Splitting the dataset into the Training set and Test set
#install.packages('caTools')
library(caTools)
set.seed(123)
split = sample.split(dataset$Purchased, SplitRatio = 0.75)
training_set = subset(dataset, split == TRUE)
test_set = subset(dataset, split == FALSE)
# Feature Scaling
training_set[-3] = scale(training_set[-3])
test_set[-3] = scale(test_set[-3])
# Fitting Naive Bayes to the Training set
install.packages('e1071')
library(e1071)
classifier = naiveBayes(x = training_set[-3],
                        y = training_set$Purchased)
# Predicting the Test set results
y_pred = predict(classifier, newdata = test_set[-3])
# Making the Confusion Matrix
cm = table(test_set[, 3], y_pred)
print(cm)
```

Output:



```
> cm = table(test_set[, 3], y_pred)
> print(cm)
   y_pred
     0  1
  0 57  7
  1  7 29
```

PRACTICAL 8B

K-Means Clustering

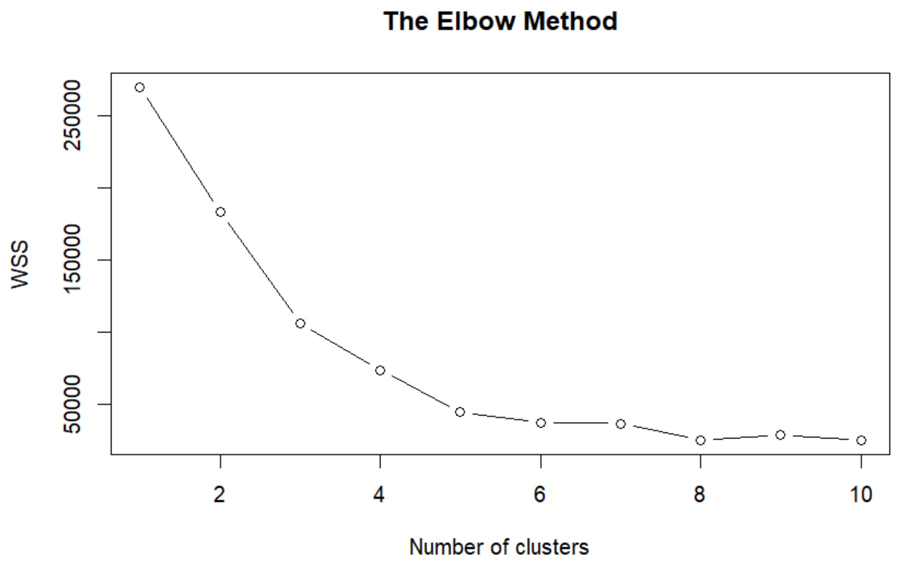
Aim:

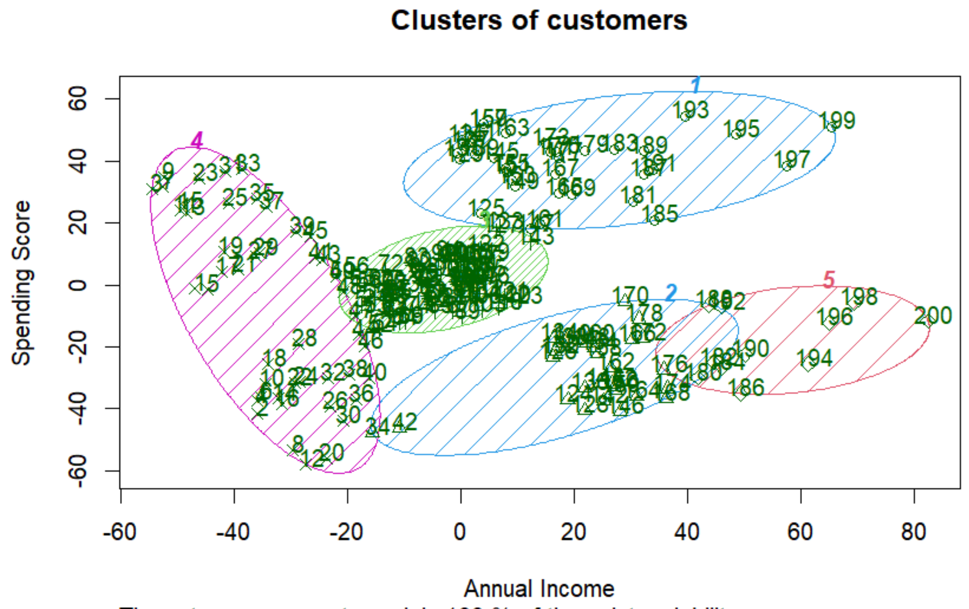
a) Clustering algorithms for unsupervised classification. Read a datafile Mall_Customers.csv and apply k-means clustering. Plot the cluster data using R visualizations.

Code:

```
# K-Means Clustering

# Importing the dataset
dataset = read.csv('C:\\2022-23\\BDA PRACTICAL 2023\\Mall_Customers.csv')
head(dataset)
dataset = dataset[4:5]
head(dataset)

wcss = vector()
for (i in 1:10) wcss[i] = sum(kmeans(dataset, i)$withinss)
plot(1:10,
    wcss,
    type = 'b',
    main = paste('The Elbow Method'),
    xlab = 'Number of clusters',
    ylab = 'WSS')


# Fitting K-Means to the dataset with no of clusters = 5
kmeans = kmeans(x = dataset, centers = 5)
y_kmeans = kmeans$cluster

# Visualising the clusters
library(cluster)
clusplot(dataset,
        y_kmeans,
        lines = 0,
        shade = TRUE,
        color = TRUE,
        labels = 2,
        main = paste('Clusters of customers'),
        xlab = 'Annual Income',
        ylab = 'Spending Score')
```

Output:





These two components explain 100 % of the point variability.