Diplomado en Ciencia de Datos UNAM

Modulo 13 Datos Masivos

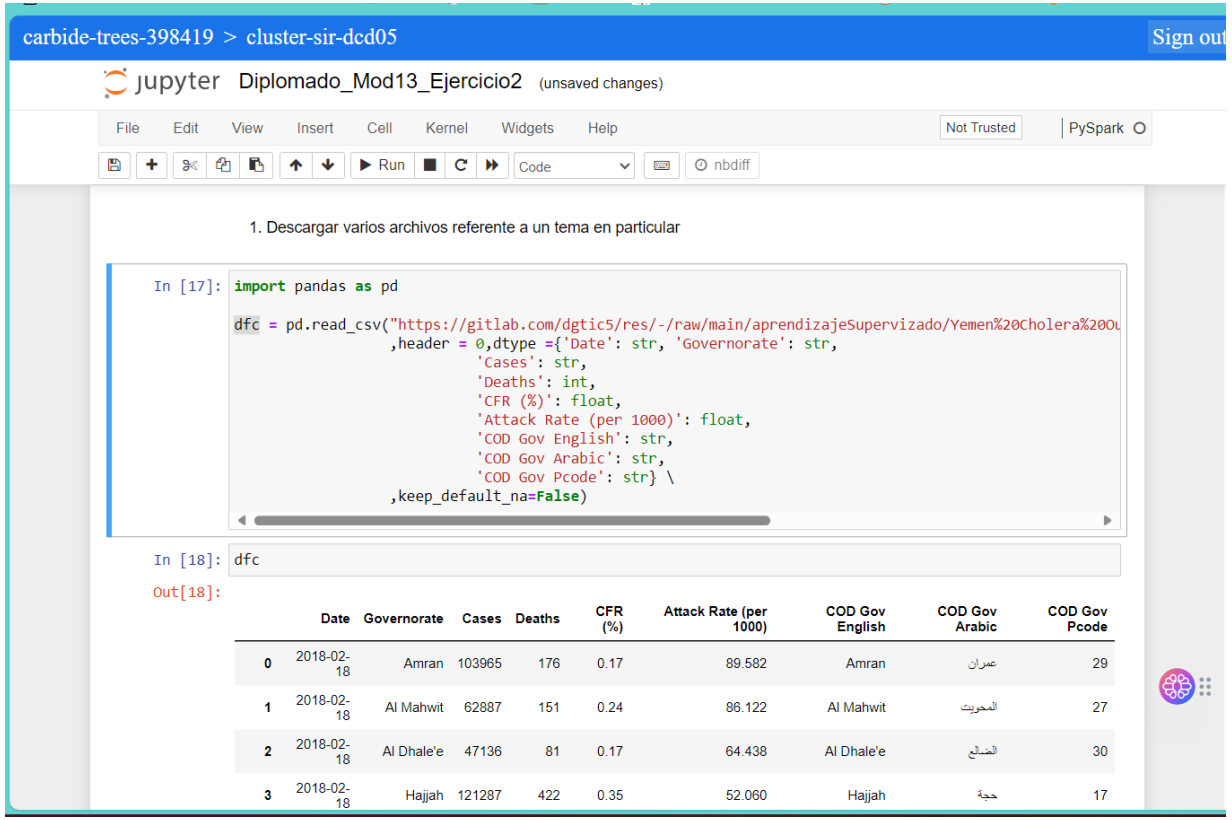
Septiembre de 2023

Sergio Ibarra

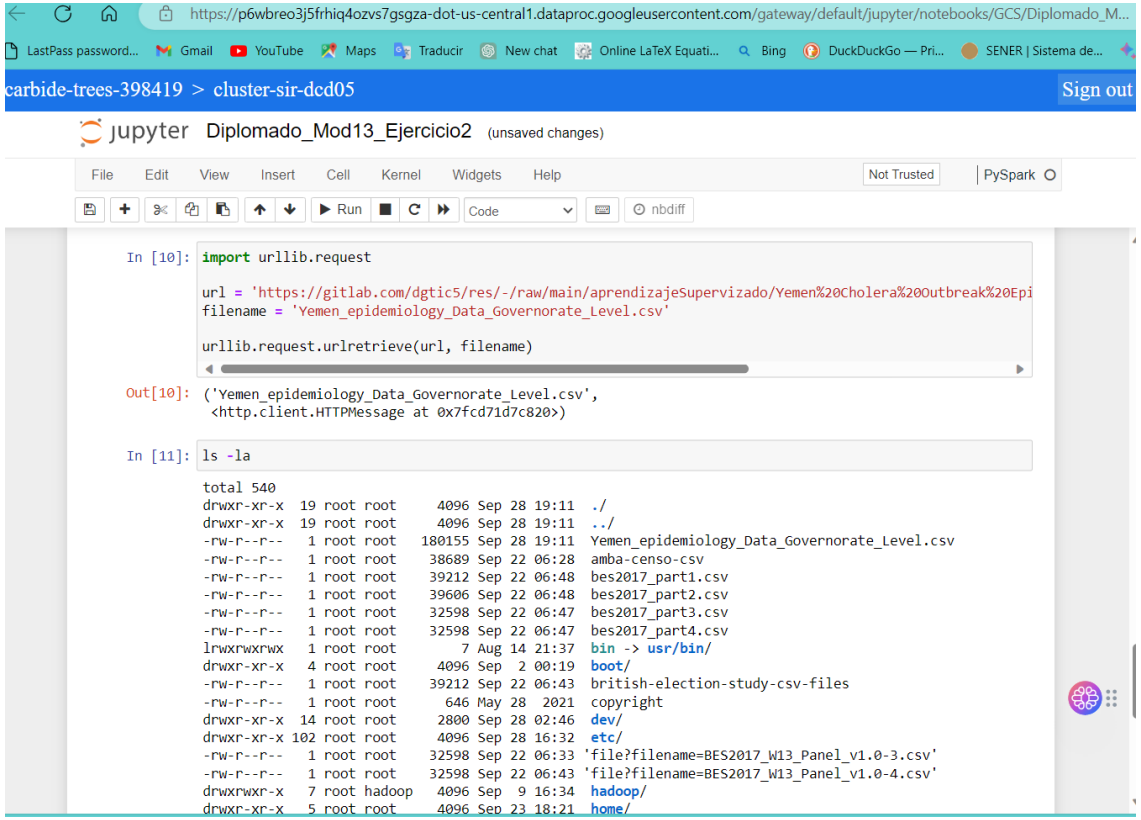
Contenido

1. Descargar varios archivos referente a un tema en particular
2. Cargar los archivos al cluster de HADOOP
3. Crear un Data Frame en Spark
4. Registrar como tabla Spak SQL
5. Generar consultas
6. Guarda el nuevo DF en HDFS y en el Bucket

Descargar varios archivos referente a un tema en particular



	Date	Governorate	Cases	Deaths	CFR (%)	Attack Rate (per 1000)	COD Gov English	COD Gov Arabic	COD Gov Pcode
0	2018-02-18	Amran	103965	176	0.17	89.582	Amran	عمران	29
1	2018-02-18	Al Mahwit	62887	151	0.24	86.122	Al Mahwit	المحويت	27
2	2018-02-18	Al Dhale'e	47136	81	0.17	64.438	Al Dhale'e	الضالع	30
3	2018-02-18	Hajjah	121287	422	0.35	52.060	Hajjah	حجة	17



VENTAJA DESVENTAJA

Cargar los archivos al cluster de HADOOP

```
drwxr-xr-x   - root              hadoop          0 2023-09-23 15:24 /tmp/dcd/job
drwxr-xr-x   - root              hadoop          0 2023-09-23 01:14 /tmp/dcd/particion
drwxr-xr-x   - root              hadoop          0 2023-09-23 00:55 /tmp/dcd/pyspark
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-23 00:08 /tmp/dcd/sirilo
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-23 16:25 /tmp/dcd/streamdat
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-23 16:35 /tmp/dcd/streamdata
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-09 19:33 /tmp/dcd/wordcount
```

Out[15]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd', returncode=0)
```

In [16]:
```
import subprocess

command = 'hdfs dfs -mkdir -p /tmp/dcd/Yemen/output'
subprocess.run(command, shell=True)
```

Out[16]:
```
CompletedProcess(args='hdfs dfs -mkdir -p /tmp/dcd/Yemen/output', returncode=0)
```

In [17]:
```
import subprocess

command = 'hdfs dfs -ls /tmp/dcd/Yemen/'
subprocess.run(command, shell=True)
```

```
Found 2 items
drwxr-xr-x   - root hadoop          0 2023-09-28 19:20 /tmp/dcd/Yemen/input
drwxr-xr-x   - root hadoop          0 2023-09-28 19:23 /tmp/dcd/Yemen/output
```

Out[17]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd/Yemen/', returncode=0)
```

2. Cargar los archivos al cluster de HADOOP

In [22]:
```
import subprocess

command = 'hdfs dfs -put Yemen_epidemiology_Data_Governorate_Level.csv /tmp/dcd/Yemen/input/Yemen.csv'
subprocess.run(command, shell=True)
```

Out[22]:
```
CompletedProcess(args='hdfs dfs -put Yemen_epidemiology_Data_Governorate_Level.csv /tmp/dcd/Yemen/inp
ut/Yemen.csv', returncode=0)
```

In [23]:
```
import subprocess

command = 'hdfs dfs -ls /tmp/dcd/Yemen/input'
subprocess.run(command, shell=True)
```

```
Found 1 items
-rw-r--r--   2 root hadoop     180155 2023-09-28 19:30 /tmp/dcd/Yemen/input/Yemen.csv
```

Out[23]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd/Yemen/input', returncode=0)
```

VENTAJA DESVENTAJA

Crear un Data Frame en Spark

```
Found 1 items
-rw-r--r--   2 root hadoop     180155 2023-09-28 19:30 /tmp/dcd/Yemen/input/Yemen.csv
```

Out[23]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd/Yemen/input', returncode=0)
```

3. Crear un dataFrame en Spark

In [24]:
```
Yemen_df = spark.read.csv('hdfs:///tmp/dcd/Yemen/input', header=True, in
```

In [25]:
```
Yemen_df
```

Out[25]:
```
DataFrame[Date: timestamp, Governorate: string, Cases: string, Deaths: int, CFR (%): double, Attack Rate (per 1000): double, COD Gov English: string, COD Gov Arabic: string, COD Gov Pcode: string]
```

In [24]:
```
Yemen_df = spark.read.csv('hdfs:///tmp/dcd/Yemen/input', header=True, in
```

In [26]:
```
Yemen_df.show(10)
```

```
+-------------------+---------------+------+------+-------+-----------+---------------+---------------+-------------+
|               Date|     Governorate| Cases|Deaths|CFR (%)|Attack Rate (per 1000)| COD Gov English|COD Gov Arabic|COD Gov Pcode|
+-------------------+---------------+------+------+-------+-----------+---------------+---------------+-------------+
|2018-02-18 00:00:00|          Amran|103965|   176|   0.17|     89.582|          Amran|          29|          عمران|
|2018-02-18 00:00:00|       Al Mahwit| 62887|   151|   0.24|     86.122|       Al Mahwit|       27|          المحويت|
|2018-02-18 00:00:00|      Al Dhale'e| 47136|    81|   0.17|     64.438|      Al Dhale'e|       30|          الضالع|
|2018-02-18 00:00:00|         Hajjah|121287|   422|   0.35|      52.06|         Hajjah|          17|          حجة|
|2018-02-18 00:00:00|          Sana'a| 76250|   123|   0.16|     51.859|          Sana'a|          23|          صنعاء|
|2018-02-18 00:00:00|         Dhamar|103214|   161|   0.16|     51.292|         Dhamar|          20|          ذمار|
|2018-02-18 00:00:00|          Abyan| 28243|    35|   0.12|     49.477|          Abyan|          12|          أبين|
|2018-02-18 00:00:00|    Al Hudaydah|155908|   282|   0.18|     48.147|    Al Hudaydah|       18|          الحديدة|
|2018-02-18 00:00:00|       Al Bayda| 30568|    36|   0.12|
```

VENTAJA DESVENTAJA

Registrar como tabla Spak SQL

4. Registrar como tabla Spak SQL

In [27]:
```
sub_Yemen_df = Yemen_df.dropDuplicates()
sub_Yemen_df
```

Out[27]:
```
DataFrame[Date: timestamp, Governorate: string, Cases: string, Deaths:
int, CFR (%): double, Attack Rate (per 1000): double, COD Gov English:
string, COD Gov Arabic: string, COD Gov Pcode: string]
```

In [28]:
```
sub_Yemen_df.describe().show()
```

```
[Stage 5:>                                                          (0
+ 1) / 1]
```

```
+-------+-----------+------------------+-----------------+-------------
-----+---------------------+--------------+--------------+-----------
-------+
|summary|Governorate|             Cases|           Deaths|           CF
R (%)|Attack Rate (per 1000)|COD Gov English|COD Gov Arabic|     COD Go
v Pcode|
+-------+-----------+------------------+-----------------+-------------
-----+---------------------+---------------+--------------+-----------
-------+
|  count|       2914|              2914|             2914|
2914|                 2914|           2914|          2914|
2914|
|   mean|       null|23727.266852812125|87.13143445435827|0.38325326012
35424|   18.652564172958154|           null|          null|21.08698857
3534832|
| stddev|       null|26815.270334195033| 96.0375088723309|0.38070487640
15296|   17.531846411491316|           null|          null| 6.18988704
```

VENTAJA DESVENTAJA

Generar consultas

5. Generar consultas

5.1 Aquellas ciudades con mas casos y mas muertes

In [35]:
```
sub_Yemen_df.filter("Cases>100 and Deaths>200").show(10)
```

```
+-------------------+-----------+-----+------+-------+--------------------+--------------+--------------+--------------+
|               Date|Governorate|Cases|Deaths|CFR (%)|Attack Rate (per 1000)|COD Gov English|COD Gov Arabic|COD Gov Pcode|
+-------------------+-----------+-----+------+-------+--------------------+--------------+--------------+--------------+
|2017-06-27 00:00:00|     Hajjah|24580|   223|    9.0|                11.1|        Hajjah|            17|          حجة|
|2017-09-24 00:00:00|     Hajjah|80914|   398|   0.49|              34.731|        Hajjah|            17|          حجة|
|2017-07-12 00:00:00|     Hajjah|35336|   338|    1.0|                15.9|        Hajjah|            17|          حجة|
|2017-06-29 00:00:00|     Hajjah|25335|   243|    1.0|                11.4|        Hajjah|            17|          حجة|
|2017-09-05 00:00:00|     Hajjah|67770|   386|   0.57|              29.089|        Hajjah|            17|          حجة|
|2017-07-11 00:00:00|     Hajjah|35310|   338|    1.0|                15.9|        Hajjah|            17|          حجة|
|2017-09-03 00:00:00|        Ibb|42845|   262|   0.61|              14.489|           Ibb|            11|          إب|
|2017-09-20 00:00:00|        Ibb|47580|   269|   0.57|               16.09|           Ibb|            11|          إب|
|2017-08-18 00:00:00|        Ibb|37347|   252|   0.67|              12.184|           Ibb|            11|          إب|
|2017-07-05 00:00:00|     Hajjah|30271|   308|    1.0|                13.6|        Hajjah|            17|          حجة|
+-------------------+-----------+-----+------+-------+--------------------+--------------+--------------+--------------+
only showing top 10 rows
```

5.2 Aquellas ciudades con mayor 'Attack Rate'

In [36]:
```
sub_Yemen_df.orderBy(sub_Yemen_df['Attack Rate (per 1000)'].desc()).limit(10).show()
```

```
+-------------------+-----------+------+------+-------+--------------------+--------------+--------------+--------------+
|               Date|Governorate| Cases|Deaths|CFR (%)|Attack Rate (per 1000)|COD Gov English|COD Gov Arabic|COD Gov Pcode|
+-------------------+-----------+------+------+-------+--------------------+--------------+--------------+--------------+
|2018-02-18 00:00:00|      Amran|103965|   176|   0.17|              89.582|         Amran|            29|          عمران|
|2018-02-11 00:00:00|      Amran|103814|   176|   0.17|              89.452|         Amran|            29|          عمران|
|2018-02-04 00:00:00|      Amran|103556|   176|   0.17|              89.229|         Amran|            29|          عمران|
|2018-01-28 00:00:00|      Amran|103285|   176|   0.17|              88.996|         Amran|            29|          عمران|
|2018-01-21 00:00:00|      Amran|102917|   175|    0.0|              88.679|         Amran|            29|          عمران|
|2018-01-14 00:00:00|      Amran|102231|   175|   0.17|              88.088|         Amran|            29|          عمران|
|2018-01-07 00:00:00|      Amran|101793|   174|   0.17|               87.71|         Amran|            29|          عمران|
|2017-12-31 00:00:00|      Amran|100981|   174|   0.17|              87.011|         Amran|            29|          عمران|
|2018-02-18 00:00:00|  Al Mahwit| 62887|   151|   0.24|              86.122|      Al Mahwit|            27|          المحويت|
|2018-02-11 00:00:00|  Al Mahwit| 62606|   151|   0.24|              85.737|      Al Mahwit|            27|          المحويت|
+-------------------+-----------+------+------+-------+--------------------+--------------+--------------+--------------+
```

VENTAJA DESVENTAJA

Guarda el nuevo DF en HDFS y en el Bucket

6. Guarda el nuevo DF en HDFS y en el Bucket

In [41]:
```
sub_Yemen_df.filter("Cases<100 and Deaths<100").write.save("hdfs:///tmp/dcd/Yemen/output1")
```

In [ ]:
```
Escribimos en el GS bucket
```

In [42]:
```
sub_Yemen_df.filter("Cases<100 and Deaths<100").write.format("csv").save("gs://dcd05-sir-bucket/dcd/Yemen/output1")
```

In [44]:
```
import subprocess

command = 'hdfs dfs -ls -R gs://dcd05-sir-bucket/dcd/Yemen/output1'
subprocess.run(command, shell=True)
```

```
-rwx------   3 root root          0 2023-09-28 20:12 gs://dcd05-sir-bucket/dcd/Yemen/output1/_SUCCESS
-rwx------   3 root root       9086 2023-09-28 20:12 gs://dcd05-sir-bucket/dcd/Yemen/output1/part-00000-07715bba-34b5-4494-84ad
-4717d1467385-c000.csv
```

Out[44]:
```
CompletedProcess(args='hdfs dfs -ls -R gs://dcd05-sir-bucket/dcd/Yemen/output1', returncode=0)
```

In [ ]:

In [ ]:

VENTAJA DESVENTAJA

Diplomado_Mod13_Ejercicio2

September 28, 2023

1. Descargar varios archivos referente a un tema en particular

[17]:
```
import pandas as pd

dfc = pd.read_csv("https://gitlab.com/dgtic5/res/-/raw/main/
 ↪aprendizajeSupervizado/
 ↪Yemen%20Cholera%20Outbreak%20Epidemiology%20Data%20-%20Data_Governorate_Level.
 ↪csv" \
                  ,header = 0,dtype ={'Date': str, 'Governorate': str,
                            'Cases': str,
                            'Deaths': int,
                            'CFR (%)': float,
                            'Attack Rate (per 1000)': float,
                            'COD Gov English': str,
                            'COD Gov Arabic': str,
                            'COD Gov Pcode': str} \
                  ,keep_default_na=False)
```

[18]:
```
dfc
```

[18]:

	Date	Governorate	Cases	Deaths	CFR (%)	Attack Rate (per 1000)	\
0	2018-02-18	Amran	103965	176	0.17	89.582	
1	2018-02-18	Al Mahwit	62887	151	0.24	86.122	
2	2018-02-18	Al Dhale'e	47136	81	0.17	64.438	
3	2018-02-18	Hajjah	121287	422	0.35	52.060	
4	2018-02-18	Sana'a	76250	123	0.16	51.859	
…	…	…	…	…	…	…	
2909	2017-05-22	Raymah	549	4	0.70	0.870	
2910	2017-05-22	Aden	489	12	2.50	0.510	
2911	2017-05-22	Al_Jawf	189	3	1.60	0.290	
2912	2017-05-22	Lahj	168	0	0.00	0.160	
2913	2017-05-22	Ma'areb	2	0	0.00	0.010	

	COD Gov English	COD Gov Arabic	COD Gov Pcode
0	Amran		29
1	Al Mahwit		27
2	Al Dhale'e		30
3	Hajjah		17

```
4              Sana'a                          23
…                …              …              …
2909           Raymah                          31
2910             Aden                          24
2911          Al Jawf                          16
2912             Lahj                          25
2913            Marib                          26

[2914 rows x 9 columns]
```

[20]:
```
dfc['Cases']
```

[20]:
```
0       103965
1        62887
2        47136
3       121287
4        76250
         …
2909       549
2910       489
2911       189
2912       168
2913         2
Name: Cases, Length: 2914, dtype: object
```

[21]:
```
# Define the convert_to_int function.
def convert_to_int(x):
    """
    Converts a string to an int, removing commas if necessary.

    Args:
        x (str): The string to convert.

    Returns:
        int: The converted int.
    """

    # Remove commas.
    x = x.replace(',', '')

    # Try to convert to int.
    try:
        return int(x)
    except ValueError:
        # Return the original string if the conversion fails.
        return x
```

```
# Convert the 'Cases' column to int.
dfc['Cases'] = dfc['Cases'].apply(convert_to_int)
```

[23]:
```
dfc.describe()
```

[23]:

	Cases	Deaths	CFR (%)	Attack Rate (per 1000)
count	2914.000000	2914.000000	2914.000000	2914.000000
mean	26067.229581	87.131434	0.383253	18.652564
std	28246.793106	96.037509	0.380705	17.531846
min	2.000000	0.000000	0.000000	0.000000
25%	3336.250000	7.000000	0.150000	5.090250
50%	16522.000000	59.000000	0.300000	14.601000
75%	40385.000000	140.000000	0.500000	25.633750
max	155908.000000	422.000000	9.000000	89.582000

[4]:
```
ls -la
```

```
total 364
drwxr-xr-x  19 root root    4096 Sep 28 02:46  ./
drwxr-xr-x  19 root root    4096 Sep 28 02:46  ../
-rw-r--r--   1 root root   38689 Sep 22 06:28  amba-censo-csv
-rw-r--r--   1 root root   39212 Sep 22 06:48  bes2017_part1.csv
-rw-r--r--   1 root root   39606 Sep 22 06:48  bes2017_part2.csv
-rw-r--r--   1 root root   32598 Sep 22 06:47  bes2017_part3.csv
-rw-r--r--   1 root root   32598 Sep 22 06:47  bes2017_part4.csv
lrwxrwxrwx   1 root root       7 Aug 14 21:37  bin ->
usr/bin/
drwxr-xr-x   4 root root    4096 Sep  2 00:19  boot/
-rw-r--r--   1 root root   39212 Sep 22 06:43  british-election-study-csv-files
-rw-r--r--   1 root root     646 May 28  2021  copyright
drwxr-xr-x  14 root root    2800 Sep 28 02:46  dev/
drwxr-xr-x 102 root root    4096 Sep 28 16:32  etc/
-rw-r--r--   1 root root   32598 Sep 22 06:33
'file?filename=BES2017_W13_Panel_v1.0-3.csv'
-rw-r--r--   1 root root   32598 Sep 22 06:43
'file?filename=BES2017_W13_Panel_v1.0-4.csv'
drwxrwxr-x   7 root hadoop  4096 Sep  9 16:34  hadoop/
drwxr-xr-x   5 root root    4096 Sep 23 18:21  home/
lrwxrwxrwx   1 root root       7 Aug 14 21:37  lib ->
usr/lib/
lrwxrwxrwx   1 root root       9 Aug 14 21:37  lib32 ->
usr/lib32/
lrwxrwxrwx   1 root root       9 Aug 14 21:37  lib64 ->
usr/lib64/
lrwxrwxrwx   1 root root      10 Aug 14 21:37  libx32 ->
usr/libx32/
drwx------   2 root root   16384 Aug 14 21:36  lost+found/
drwxr-xr-x   2 root root    4096 Aug 14 21:37  media/
```

```
drwxr-xr-x   2 root root    4096 Aug 14 21:37  mnt/
drwxr-xr-x   9 root root    4096 Sep  9 16:34  opt/
dr-xr-xr-x 175 root root       0 Sep 28 02:46  proc/
drwx------   8 root root    4096 Sep 22 06:28  root/
drwxr-xr-x  31 root root     880 Sep 28 09:16  run/
lrwxrwxrwx   1 root root       8 Aug 14 21:37  sbin ->
usr/sbin/
drwxr-xr-x   2 root root    4096 Aug 14 21:37  srv/
dr-xr-xr-x  13 root root       0 Sep 28 02:46  sys/
drwxrwxrwt  39 root root    4096 Sep 28 18:46  tmp/
drwxr-xr-x  14 root root    4096 Aug 14 21:37  usr/
drwxr-xr-x  12 root root    4096 Sep  2 00:48  var/
```

Descargamos el archivo en nuestro Hadoop

[10]:
```
import urllib.request

url = 'https://gitlab.com/dgtic5/res/-/raw/main/aprendizajeSupervizado/
 ↪Yemen%20Cholera%20Outbreak%20Epidemiology%20Data%20-%20Data_Governorate_Level.
 ↪csv'
filename = 'Yemen_epidemiology_Data_Governorate_Level.csv'

urllib.request.urlretrieve(url, filename)
```

[10]:
```
('Yemen_epidemiology_Data_Governorate_Level.csv',
 <http.client.HTTPMessage at 0x7fcd71d7c820>)
```

[11]:
```
ls -la
```

```
total 540
drwxr-xr-x  19 root root     4096 Sep 28 19:11  ./
drwxr-xr-x  19 root root     4096 Sep 28 19:11  ../
-rw-r--r--   1 root root   180155 Sep 28 19:11
Yemen_epidemiology_Data_Governorate_Level.csv
-rw-r--r--   1 root root    38689 Sep 22 06:28  amba-censo-csv
-rw-r--r--   1 root root    39212 Sep 22 06:48  bes2017_part1.csv
-rw-r--r--   1 root root    39606 Sep 22 06:48  bes2017_part2.csv
-rw-r--r--   1 root root    32598 Sep 22 06:47  bes2017_part3.csv
-rw-r--r--   1 root root    32598 Sep 22 06:47  bes2017_part4.csv
lrwxrwxrwx   1 root root        7 Aug 14 21:37  bin ->
usr/bin/
drwxr-xr-x   4 root root     4096 Sep  2 00:19  boot/
-rw-r--r--   1 root root    39212 Sep 22 06:43  british-election-study-csv-files
-rw-r--r--   1 root root      646 May 28  2021  copyright
drwxr-xr-x  14 root root     2800 Sep 28 02:46  dev/
drwxr-xr-x 102 root root     4096 Sep 28 16:32  etc/
-rw-r--r--   1 root root    32598 Sep 22 06:33
'file?filename=BES2017_W13_Panel_v1.0-3.csv'
-rw-r--r--   1 root root    32598 Sep 22 06:43
```

```
'file?filename=BES2017_W13_Panel_v1.0-4.csv'
drwxrwxr-x   7 root hadoop   4096 Sep  9 16:34  hadoop/
drwxr-xr-x   5 root root     4096 Sep 23 18:21  home/
lrwxrwxrwx   1 root root        7 Aug 14 21:37  lib ->
usr/lib/
lrwxrwxrwx   1 root root        9 Aug 14 21:37  lib32 ->
usr/lib32/
lrwxrwxrwx   1 root root        9 Aug 14 21:37  lib64 ->
usr/lib64/
lrwxrwxrwx   1 root root       10 Aug 14 21:37  libx32 ->
usr/libx32/
drwx------   2 root root    16384 Aug 14 21:36  lost+found/
drwxr-xr-x   2 root root     4096 Aug 14 21:37  media/
drwxr-xr-x   2 root root     4096 Aug 14 21:37  mnt/
drwxr-xr-x   9 root root     4096 Sep  9 16:34  opt/
dr-xr-xr-x 174 root root        0 Sep 28 02:46  proc/
drwx------   8 root root     4096 Sep 22 06:28  root/
drwxr-xr-x  31 root root      880 Sep 28 09:16  run/
lrwxrwxrwx   1 root root        8 Aug 14 21:37  sbin ->
usr/sbin/
drwxr-xr-x   2 root root     4096 Aug 14 21:37  srv/
dr-xr-xr-x  13 root root        0 Sep 28 02:46  sys/
drwxrwxrwt  39 root root     4096 Sep 28 18:46  tmp/
drwxr-xr-x  14 root root     4096 Aug 14 21:37  usr/
drwxr-xr-x  12 root root     4096 Sep  2 00:48  var/
```

Creamos las carpetas necesarias para subir el archivo a Hadoop

[13]:
```
import subprocess

command = 'hdfs dfs -mkdir -p /tmp/dcd/Yemen/input'
subprocess.run(command, shell=True)
```

[13]:
```
CompletedProcess(args='hdfs dfs -mkdir -p /tmp/dcd/Yemen/input', returncode=0)
```

[15]:
```
import subprocess

command = 'hdfs dfs -ls /tmp/dcd'
subprocess.run(command, shell=True)
```

```
Found 12 items
drwxr-xr-x   - root              hadoop          0 2023-09-23 18:24
/tmp/dcd/OnTimeDB
drwxr-xr-x   - root              hadoop          0 2023-09-28 19:20
/tmp/dcd/Yemen
drwxr-xr-x   - root              hadoop          0 2023-09-22 07:15
/tmp/dcd/british
drwxr-xr-x   - root              hadoop          0 2023-09-22 08:39
/tmp/dcd/british2
```

```
drwxr-xr-x   - root              hadoop          0 2023-09-09 19:52
/tmp/dcd/ecobici
drwxr-xr-x   - root              hadoop          0 2023-09-23 15:24 /tmp/dcd/job
drwxr-xr-x   - root              hadoop          0 2023-09-23 01:14
/tmp/dcd/particion
drwxr-xr-x   - root              hadoop          0 2023-09-23 00:55
/tmp/dcd/pyspark
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-23 00:08
/tmp/dcd/sirilo
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-23 16:25
/tmp/dcd/streamdat
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-23 16:35
/tmp/dcd/streamdata
drwxr-xr-x   - sergio_ibarra1795 hadoop          0 2023-09-09 19:33
/tmp/dcd/wordcount
```

[15]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd', returncode=0)
```

[16]:
```
import subprocess

command = 'hdfs dfs -mkdir -p /tmp/dcd/Yemen/output'
subprocess.run(command, shell=True)
```

[16]:
```
CompletedProcess(args='hdfs dfs -mkdir -p /tmp/dcd/Yemen/output', returncode=0)
```

[17]:
```
import subprocess

command = 'hdfs dfs -ls /tmp/dcd/Yemen/'
subprocess.run(command, shell=True)
```

```
Found 2 items
drwxr-xr-x   - root hadoop          0 2023-09-28 19:20 /tmp/dcd/Yemen/input
drwxr-xr-x   - root hadoop          0 2023-09-28 19:23 /tmp/dcd/Yemen/output
```

[17]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd/Yemen/', returncode=0)
```

[ ]:
```

```

2. Cargar los archivos al cluster de HADOOP

[22]:
```
import subprocess

command = 'hdfs dfs -put Yemen_epidemiology_Data_Governorate_Level.csv /tmp/dcd/
↪Yemen/input/Yemen.csv'
subprocess.run(command, shell=True)
```

[22]:
```
CompletedProcess(args='hdfs dfs -put
Yemen_epidemiology_Data_Governorate_Level.csv /tmp/dcd/Yemen/input/Yemen.csv',
returncode=0)
```

[23]:
```
import subprocess

command = 'hdfs dfs -ls /tmp/dcd/Yemen/input'
subprocess.run(command, shell=True)
```

```
Found 1 items
-rw-r--r--   2 root hadoop     180155 2023-09-28 19:30
/tmp/dcd/Yemen/input/Yemen.csv
```

[23]:
```
CompletedProcess(args='hdfs dfs -ls /tmp/dcd/Yemen/input', returncode=0)
```

3. Crear un dataFrame en Spark

[24]:
```
Yemen_df = spark.read.csv('hdfs:///tmp/dcd/Yemen/input', header=True,␣
↪inferSchema=True)
```

[26]:
```
Yemen_df.show(10)
```

```
+-------------------+---------------+------+------+-------+--------------------
--+---------------+-------------+-------------+
|               Date|     Governorate| Cases|Deaths|CFR (%)|Attack Rate (per
1000)| COD Gov English|COD Gov Arabic|COD Gov Pcode|
+-------------------+---------------+------+------+-------+--------------------
--+---------------+-------------+-------------+
|2018-02-18 00:00:00|           Amran|103965|   176|   0.17|
89.582|           Amran|          |              |29
|2018-02-18 00:00:00|       Al Mahwit| 62887|   151|   0.24|
86.122|       Al Mahwit|          |              |27
|2018-02-18 00:00:00|      Al Dhale'e| 47136|    81|   0.17|
64.438|      Al Dhale'e|          |              |30
|2018-02-18 00:00:00|          Hajjah|121287|   422|   0.35|
52.06|          Hajjah|          |              |17
|2018-02-18 00:00:00|          Sana'a| 76250|   123|   0.16|
51.859|          Sana'a|          |              |23
|2018-02-18 00:00:00|          Dhamar|103214|   161|   0.16|
51.292|          Dhamar|          |              |20
|2018-02-18 00:00:00|           Abyan| 28243|    35|   0.12|
49.477|           Abyan|          |              |12
|2018-02-18 00:00:00|     Al Hudaydah|155908|   282|   0.18|
48.147|     Al Hudaydah|          |              |18
|2018-02-18 00:00:00|        Al Bayda| 30568|    36|   0.12|
40.253|        Al Bayda|          |              |14
|2018-02-18 00:00:00|Amanat Al Asimah|103184|    71|   0.07|
36.489|Amanat Al Asimah|          |              |13
+-------------------+---------------+------+------+-------+--------------------
--+---------------+-------------+-------------+
only showing top 10 rows
```

4. Registrar como tabla Spak SQL

[27]:
```
sub_Yemen_df = Yemen_df.dropDuplicates()
sub_Yemen_df
```

[27]:
```
DataFrame[Date: timestamp, Governorate: string, Cases: string, Deaths: int, CFR
(%): double, Attack Rate (per 1000): double, COD Gov English: string, COD Gov
Arabic: string, COD Gov Pcode: string]
```

[28]:
```
sub_Yemen_df.describe().show()
```

```
[Stage 5:>                                                          (0 + 1) / 1]

+-------+-----------+-----------------+----------------+------------------+---
------------------+--------------+-------------+------------------+
|summary|Governorate|            Cases|          Deaths|               CFR
(%)|Attack Rate (per 1000)|COD Gov English|COD Gov Arabic|     COD Gov Pcode|
+-------+-----------+-----------------+----------------+------------------+---
------------------+--------------+-------------+------------------+
|  count|       2914|             2914|            2914|              2914|
2914|           2914|          2914|              2914|
|   mean|       null|23727.266852812125|87.13143445435827|0.3832532601235424|
18.652564172958154|           null|          null|21.086988573534832|
| stddev|       null|26815.270334195033| 96.0375088723309|0.3807048764015296|
17.531846411491316|           null|          null| 6.189887041320621|
|    min|  AL Mahrah|            1,162|               0|               0.0|
0.0|           #N/A|          #N/A|              #N/A|
|    max|      Taizz|             9996|             422|               9.0|
89.582|          Taizz|          |                 |31
+-------+-----------+-----------------+----------------+------------------+---
------------------+--------------+-------------+------------------+
```

5. Generar consultas

5.1 Aquellas ciudades con mas casos y mas muertes

[35]:
```
sub_Yemen_df.filter("Cases>100 and Deaths>200").show(10)
```

```
+-------------------+-----------+-----+------+-------+----------------------+---
-----------+-------------+-------------+
|               Date|Governorate|Cases|Deaths|CFR (%)|Attack Rate (per 1000)|COD
Gov English|COD Gov Arabic|COD Gov Pcode|
+-------------------+-----------+-----+------+-------+----------------------+---
-----------+-------------+-------------+
|2017-06-27 00:00:00|     Hajjah|24580|   223|    9.0|                  11.1|
Hajjah|           |             |17
```

```
|2017-09-24 00:00:00|     Hajjah|80914|   398|   0.49|                34.731|
Hajjah|           |            |17
|2017-07-12 00:00:00|     Hajjah|35336|   338|    1.0|                 15.9|
Hajjah|           |            |17
|2017-06-29 00:00:00|     Hajjah|25335|   243|    1.0|                 11.4|
Hajjah|           |            |17
|2017-09-05 00:00:00|     Hajjah|67770|   386|   0.57|                29.089|
Hajjah|           |            |17
|2017-07-11 00:00:00|     Hajjah|35310|   338|    1.0|                 15.9|
Hajjah|           |            |17
|2017-09-03 00:00:00|        Ibb|42845|   262|   0.61|                14.489|
Ibb|            |            |11
|2017-09-20 00:00:00|        Ibb|47580|   269|   0.57|                 16.09|
Ibb|            |            |11
|2017-08-18 00:00:00|        Ibb|37347|   252|   0.67|                12.184|
Ibb|            |            |11
|2017-07-05 00:00:00|     Hajjah|30271|   308|    1.0|                 13.6|
Hajjah|           |            |17
+-------------------+-----------+-----+------+-------+----------------------+---
-----------+-------------+-------------+
only showing top 10 rows
```

5.2 Aquellas ciudades con mayor 'Attack Rate'

[36]:
```
sub_Yemen_df.orderBy(sub_Yemen_df['Attack Rate (per 1000)'].desc()).limit(10).
  ↪show()
```

```
+-------------------+-----------+------+------+-------+----------------------+--
-------------+-------------+-------------+
|               Date|Governorate| Cases|Deaths|CFR (%)|Attack Rate (per
1000)|COD Gov English|COD Gov Arabic|COD Gov Pcode|
+-------------------+-----------+------+------+-------+----------------------+--
-------------+-------------+-------------+
|2018-02-18 00:00:00|      Amran|103965|   176|   0.17|                89.582|
Amran|          |            |29
|2018-02-11 00:00:00|      Amran|103814|   176|   0.17|                89.452|
Amran|          |            |29
|2018-02-04 00:00:00|      Amran|103556|   176|   0.17|                89.229|
Amran|          |            |29
|2018-01-28 00:00:00|      Amran|103285|   176|   0.17|                88.996|
Amran|          |            |29
|2018-01-21 00:00:00|      Amran|102917|   175|    0.0|                88.679|
Amran|          |            |29
|2018-01-14 00:00:00|      Amran|102231|   175|   0.17|                88.088|
Amran|          |            |29
|2018-01-07 00:00:00|      Amran|101793|   174|   0.17|                 87.71|
Amran|          |            |29
|2017-12-31 00:00:00|      Amran|100981|   174|   0.17|                87.011|
```

```
Amran|         |              |29
|2018-02-18 00:00:00|  Al Mahwit| 62887|   151|   0.24|                86.122|
Al Mahwit|       |              |27
|2018-02-11 00:00:00|  Al Mahwit| 62606|   151|   0.24|                85.737|
Al Mahwit|       |              |27
+-------------------+-----------+------+------+-------+----------------------+--
-------------+--------------+-------------+
```

6. Guarda el nuevo DF en HDFS y en el Bucket

[41]:
```
sub_Yemen_df.filter("Cases<100 and Deaths<100").write.save("hdfs:///tmp/dcd/
↪Yemen/output1")
```

[ ]:
```
Escribimos en el GS bucket
```

[42]:
```
sub_Yemen_df.filter("Cases<100 and Deaths<100").write.format("csv").save("gs://
↪dcd05-sir-bucket/dcd/Yemen/output1")
```

[44]:
```
import subprocess

command = 'hdfs dfs -ls -R gs://dcd05-sir-bucket/dcd/Yemen/output1'
subprocess.run(command, shell=True)
```

```
-rwx------   3 root root          0 2023-09-28 20:12 gs://dcd05-sir-
bucket/dcd/Yemen/output1/_SUCCESS
-rwx------   3 root root       9086 2023-09-28 20:12 gs://dcd05-sir-bucket/dcd/Y
emen/output1/part-00000-07715bba-34b5-4494-84ad-4717d1467385-c000.csv
```

[44]:
```
CompletedProcess(args='hdfs dfs -ls -R gs://dcd05-sir-bucket/dcd/Yemen/output1',
returncode=0)
```

[ ]:

[ ]: