Spark_SQL_Use_Case

Objective-1

- **Load HVAC.csv file into temporary table**
- **Add a new column, tempchange - set to 1, if there is a change of greater than +/-5 between actual and target temperature**

Objective-2

- **Load building.csv file into temporary table**

Objective-3

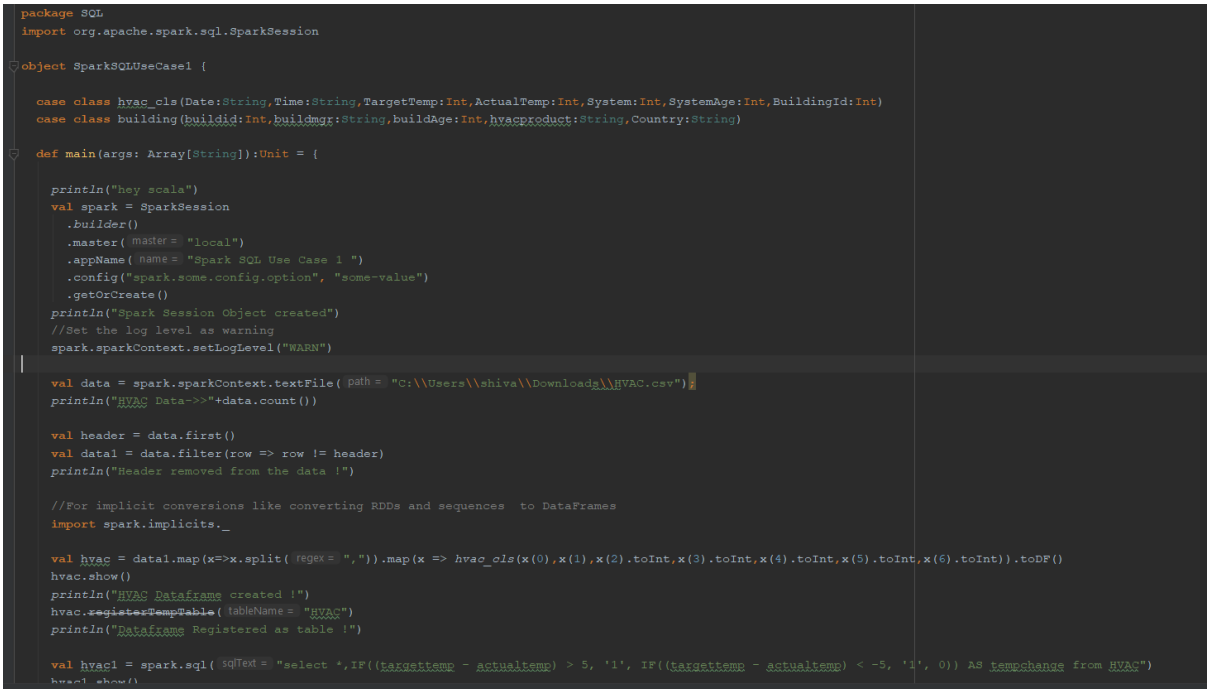
Figure out the number of times, temperature has changed by 5 degrees or more for each country:

○ Join both the tables.

○ Select tempchange and country column

○ Filter the rows where tempchange is 1 and count the number of occurrence for each country

Scala code written for all the above objectives is shown in the below screenshots.



```
package SQL
import org.apache.spark.sql.SparkSession

object SparkSQLUseCase1 {

  case class hvac_cls(Date:String,Time:String,TargetTemp:Int,ActualTemp:Int,System:Int,SystemAge:Int,BuildingId:Int)
  case class building(buildid:Int,buildmgr:String,buildAge:Int,hvacproduct:String,Country:String)

  def main(args: Array[String]):Unit = {

    println("hey scala")
    val spark = SparkSession
      .builder()
      .master( master = "local")
      .appName( name = "Spark SQL Use Case 1 ")
      .config("spark.some.config.option", "some-value")
      .getOrCreate()
    println("Spark Session Object created")
    //Set the log level as warning
    spark.sparkContext.setLogLevel("WARN")

    val data = spark.sparkContext.textFile( path = "C:\\Users\\shiva\\Downloads\\HVAC.csv");
    println("HVAC Data->>"+data.count())

    val header = data.first()
    val data1 = data.filter(row => row != header)
    println("Header removed from the data !")

    //For implicit conversions like converting RDDs and sequences  to DataFrames
    import spark.implicits._

    val hvac = data1.map(x=>x.split( regex = ",")).map(x => hvac_cls(x(0),x(1),x(2).toInt,x(3).toInt,x(4).toInt,x(5).toInt,x(6).toInt)).toDF()
    hvac.show()
    println("HVAC Dataframe created !")
    hvac.registerTempTable( tableName = "HVAC")
    println("Dataframe Registered as table !")

    val hvac1 = spark.sql( sqlText = "select *,IF((targettemp - actualtemp) > 5, '1', IF((targettemp - actualtemp) < -5, '1', 0)) AS tempchange from HVAC")
    hvac1.show()
```

```
val hvac1 = spark.sql( sqlText = "select *,IF((targettemp - actualtemp) > 5, '1', IF((targettemp - actualtemp) < -5, '1', 0)) AS tempchange from HVAC")
hvac1.show()
hvac1.registerTempTable( tableName = "HVAC1")
println("Data Frame Registered as HVAC1 table !")
hvac.registerTempTable( tableName = "HVAC")
println("Dataframe Registered as table !")

val data2 = spark.sparkContext.textFile( path = "C:\\Users\\shiva\\Downloads\\/building.csv");
val header1 = data2.first()
val data3 = data2.filter(row => row != header1)

println("Header removed from the building data")
println("Buildings Data->>"+data3.count())

//Now let us create the building dataframe
val build = data3.map(x=> x.split( regex = ",")).map(x => building(x(0).toInt,x(1),x(2).toInt,x(3),x(4))).toDF
build.show()

build.registerTempTable( tableName = "building")
println("Buildings data registered as building table")

//Now join the two tables
val build1 = spark.sql( sqlText = "select h.*, b.country, b.hvacproduct from building b join hvac1 h on b.buildid = h.buildingid")
build1.show()

//Select temperature and country column from above
val tempCountry = build1.map(x => (new Integer(x(7).toString),x(8).toString))
tempCountry.show()

//Filter the values
val tempCountryOnes = tempCountry.filter(x=> {if(x._1==1) true else false})
tempCountryOnes.show()
tempCountryOnes.groupBy( col1 = "_2").count.show
}
}
```

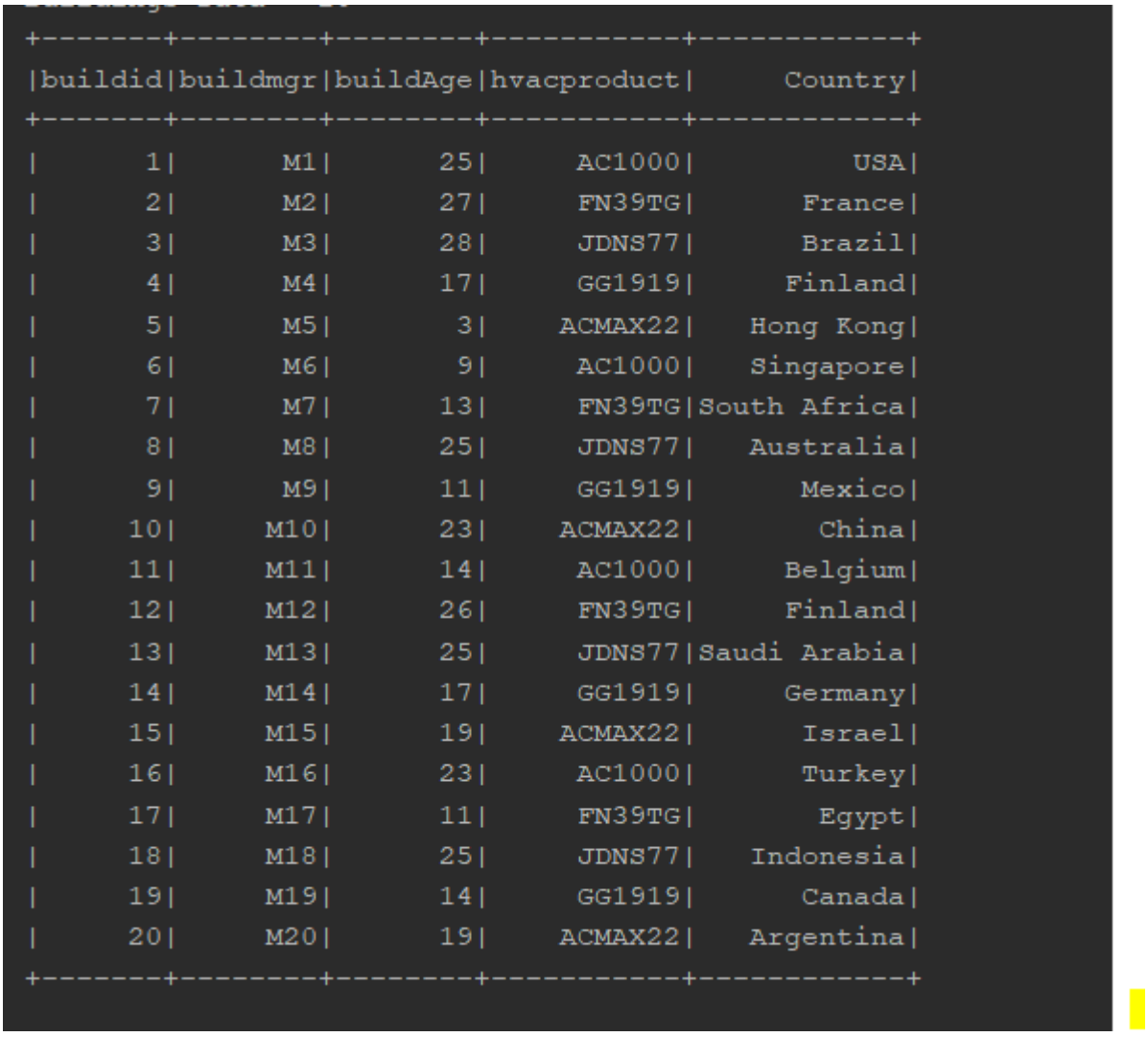
Loading HVAC.csv data into temporary table has been done successfully. Output is shown in the below screenshot.

```
HVAC Data->>8001
Header removed from the data !
+-------+--------+----------+----------+------+---------+-----------+
|   Date|    Time|TargetTemp|ActualTemp|System|SystemAge|BuildingId|
+-------+--------+----------+----------+------+---------+-----------+
| 6/1/13| 0:00:01|        66|        58|    13|       20|          4|
| 6/2/13| 1:00:01|        69|        68|     3|       20|         17|
| 6/3/13| 2:00:01|        70|        73|    17|       20|         18|
| 6/4/13| 3:00:01|        67|        63|     2|       23|         15|
| 6/5/13| 4:00:01|        68|        74|    16|        9|          3|
| 6/6/13| 5:00:01|        67|        56|    13|       28|          4|
| 6/7/13| 6:00:01|        70|        58|    12|       24|          2|
| 6/8/13| 7:00:01|        70|        73|    20|       26|         16|
| 6/9/13| 8:00:01|        66|        69|    16|        9|          9|
|6/10/13| 9:00:01|        65|        57|     6|        5|         12|
|6/11/13|10:00:01|        67|        70|    10|       17|         15|
|6/12/13|11:00:01|        69|        62|     2|       11|          7|
|6/13/13|12:00:01|        69|        73|    14|        2|         15|
|6/14/13|13:00:01|        65|        61|     3|        2|          6|
|6/15/13|14:00:01|        67|        59|    19|       22|         20|
|6/16/13|15:00:01|        65|        56|    19|       11|          8|
|6/17/13|16:00:01|        67|        57|    15|        7|          6|
|6/18/13|17:00:01|        66|        57|    12|        5|         13|
|6/19/13|18:00:01|        69|        58|     8|       22|          4|
|6/20/13|19:00:01|        67|        55|    17|        5|          7|
+-------+--------+----------+----------+------+---------+-----------+
only showing top 20 rows
```

A new column has been added to the temporary table, which will set **“1”** if there is a temperature variation of greater or less than **“5”** else it will set **“0”**.

```
HVAC Dataframe created !
Dataframe Registered as table !
+--------+--------+----------+----------+------+---------+----------+----------+
|    Date|    Time|TargetTemp|ActualTemp|System|SystemAge|BuildingId|tempchange|
+--------+--------+----------+----------+------+---------+----------+----------+
| 6/1/13| 0:00:01|        66|        58|    13|       20|         4|         1|
| 6/2/13| 1:00:01|        69|        68|     3|       20|        17|         0|
| 6/3/13| 2:00:01|        70|        73|    17|       20|        18|         0|
| 6/4/13| 3:00:01|        67|        63|     2|       23|        15|         0|
| 6/5/13| 4:00:01|        68|        74|    16|        9|         3|         1|
| 6/6/13| 5:00:01|        67|        56|    13|       28|         4|         1|
| 6/7/13| 6:00:01|        70|        58|    12|       24|         2|         1|
| 6/8/13| 7:00:01|        70|        73|    20|       26|        16|         0|
| 6/9/13| 8:00:01|        66|        69|    16|        9|         9|         0|
|6/10/13| 9:00:01|        65|        57|     6|        5|        12|         1|
|6/11/13|10:00:01|        67|        70|    10|       17|        15|         0|
|6/12/13|11:00:01|        69|        62|     2|       11|         7|         1|
|6/13/13|12:00:01|        69|        73|    14|        2|        15|         0|
|6/14/13|13:00:01|        65|        61|     3|        2|         6|         0|
|6/15/13|14:00:01|        67|        59|    19|       22|        20|         1|
|6/16/13|15:00:01|        65|        56|    19|       11|         8|         1|
|6/17/13|16:00:01|        67|        57|    15|        7|         6|         1|
|6/18/13|17:00:01|        66|        57|    12|        5|        13|         1|
|6/19/13|18:00:01|        69|        58|     8|       22|         4|         1|
|6/20/13|19:00:01|        67|        55|    17|        5|         7|         1|
+--------+--------+----------+----------+------+---------+----------+----------+
only showing top 20 rows
```

Objective of loading **Building.csv** into temporary table has been done successfully. Output is shown in the below screenshot.

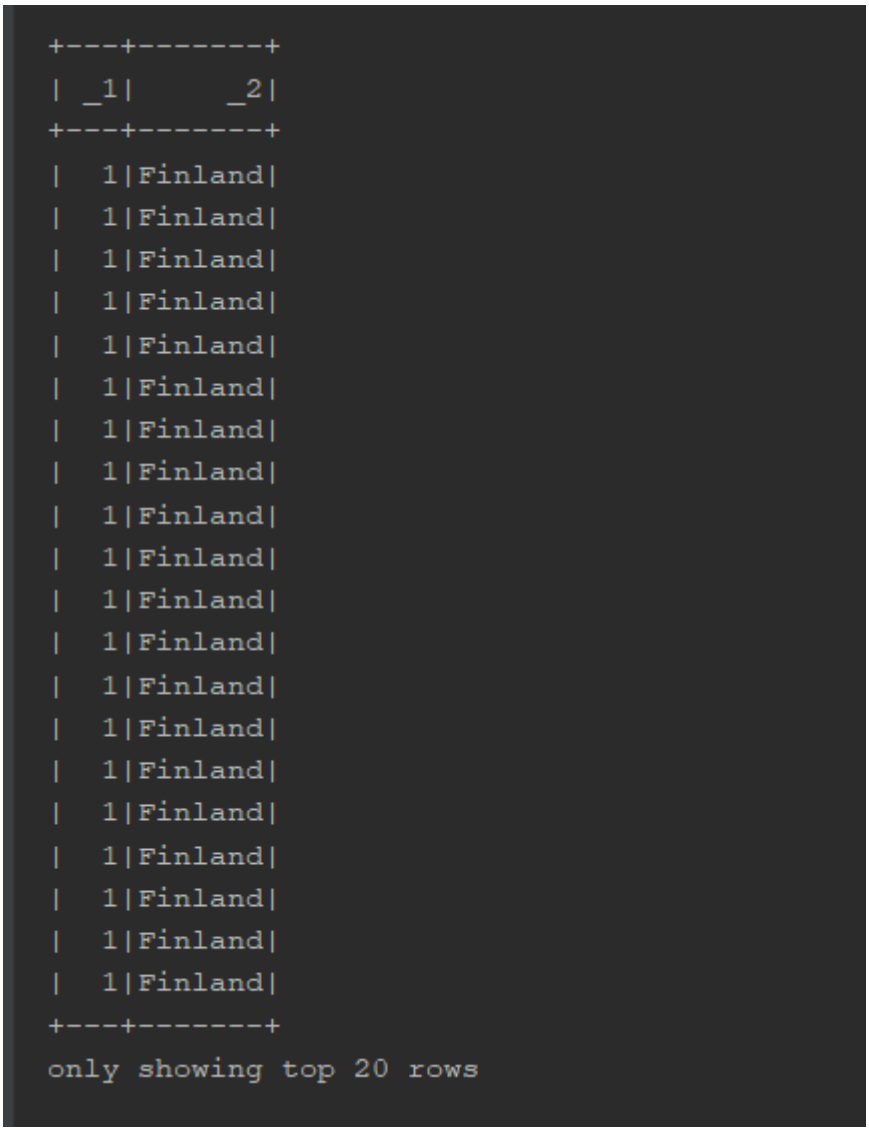


buildid	buildmgr	buildAge	hvacproduct	Country
1	M1	25	AC1000	USA
2	M2	27	FN39TG	France
3	M3	28	JDNS77	Brazil
4	M4	17	GG1919	Finland
5	M5	3	ACMAX22	Hong Kong
6	M6	9	AC1000	Singapore
7	M7	13	FN39TG	South Africa
8	M8	25	JDNS77	Australia
9	M9	11	GG1919	Mexico
10	M10	23	ACMAX22	China
11	M11	14	AC1000	Belgium
12	M12	26	FN39TG	Finland
13	M13	25	JDNS77	Saudi Arabia
14	M14	17	GG1919	Germany
15	M15	19	ACMAX22	Israel
16	M16	23	AC1000	Turkey
17	M17	11	FN39TG	Egypt
18	M18	25	JDNS77	Indonesia
19	M19	14	GG1919	Canada
20	M20	19	ACMAX22	Argentina

Both HVAC and Building tables has been joined. Output is shown in the below screenshot.

```
Buildings data registered as building table
+-------+--------+----------+----------+------+---------+----------+----------+-------+-----------+
|   Date|    Time|TargetTemp|ActualTemp|System|SystemAge|BuildingId|tempchange|country|hvacproduct|
+-------+--------+----------+----------+------+---------+----------+----------+-------+-----------+
|6/10/13| 9:00:01|        65|        57|     6|        5|        12|         1|Finland|     FN39TG|
|6/18/13|23:13:19|        66|        75|     1|       13|        12|         1|Finland|     FN39TG|
| 6/2/13|13:43:51|        65|        72|    20|       26|        12|         1|Finland|     FN39TG|
|6/13/13| 0:13:20|        67|        77|     8|       19|        12|         1|Finland|     FN39TG|
|6/16/13| 3:13:20|        67|        55|    11|       16|        12|         1|Finland|     FN39TG|
|6/30/13|17:13:20|        65|        57|    17|        9|        12|         1|Finland|     FN39TG|
| 6/1/13|18:13:20|        68|        65|     7|       21|        12|         0|Finland|     FN39TG|
|6/25/13|18:33:07|        70|        66|    20|       20|        12|         0|Finland|     FN39TG|
|6/17/13|16:00:01|        69|        68|    16|        4|        12|         0|Finland|     FN39TG|
| 6/5/13|16:43:51|        69|        69|    19|       15|        12|         0|Finland|     FN39TG|
|6/23/13|10:13:20|        65|        61|     1|        1|        12|         0|Finland|     FN39TG|
|6/29/13|16:13:20|        67|        80|    12|        8|        12|         1|Finland|     FN39TG|
| 6/4/13|21:13:20|        66|        72|     7|        1|        12|         1|Finland|     FN39TG|
| 6/3/13| 2:00:01|        69|        72|     7|       21|        12|         0|Finland|     FN39TG|
|6/16/13|15:00:01|        67|        77|     4|       22|        12|         1|Finland|     FN39TG|
|6/22/13|21:00:01|        70|        77|    13|       12|        12|         1|Finland|     FN39TG|
|6/26/13| 7:43:51|        65|        62|     6|        6|        12|         0|Finland|     FN39TG|
|6/26/13|13:13:20|        65|        63|    20|        9|        12|         0|Finland|     FN39TG|
|6/30/13|17:13:20|        66|        62|    14|       26|        12|         0|Finland|     FN39TG|
|6/10/13| 3:33:07|        70|        78|     5|        9|        12|         1|Finland|     FN39TG|
+-------+--------+----------+----------+------+---------+----------+----------+-------+-----------+
only showing top 20 rows
```

Selected the tempchange and column country as shown in the below screenshot.



```
+---+-------+
| _1|     _2|
+---+-------+
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
+---+-------+
only showing top 20 rows
```

Count of temperature change occurrence for each country is shown in the below screenshot.

_2	count
Singapore	230
Turkey	243
Germany	196
France	251
Argentina	230
Belgium	199
Finland	473
China	241
Hong Kong	248
Israel	232
USA	213
Mexico	228
Indonesia	243
Saudi Arabia	233
Canada	232
Brazil	226
Australia	225
Egypt	236
South Africa	237