**Building Heating Analysis**

**For this data analysis, you can download the necessary dataset from this link.**
**In the above link there are two datasets; building.csv contains the details of the top 20 buildings all over the world and HVAC.csv contains the target temperature and the actual temperature along with the building Id.**

**HVAC (heating, ventilating/ventilation, and air conditioning) is the technology of indoor and vehicular environmental comfort. Its goal is to provide thermal comfort and acceptable indoor air quality. Through the HVAC sensors, we will get the temperature of the buildings.**

**Here are the columns that are present in the datasets:**
**Building.csv – BuildingID, BuildingMgr, BuildingAge, HVACproduct,Country**
**HVAC.csv – Date, Time, TargetTemp, ActualTemp, System, SystemAge, BuildingID**
**Objective 1:**

- Load HVAC.csv file into temporary table

```
18/06/06 15:54:26 INFO DAGScheduler: Job 0 finished: count at SparkSQLUseCase1.scala:24
HVAC Data->>8001
18/06/06 15:54:26 INFO SparkContext: Starting job: first at SparkSQLUseCase1.scala:26
```

| 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

● Add a new column, tempchange - set to 1, if there is a change of greater than +/-5 between actual and target temperature

| 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 2:**

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

| 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 |

```
Buildings data registered as building table
```

**Objective 3:**

**Join both the tables.**

```
+-------+--------+----------+----------+------+---------+----------+----------+-------+-----------+
|   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
```

**Select tempchange and country column**

```
+---+-------+
| _1|     _2|
+---+-------+
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  1|Finland|
|  0|Finland|
|  0|Finland|
|  0|Finland|
|  0|Finland|
|  0|Finland|
|  1|Finland|
|  1|Finland|
|  0|Finland|
|  1|Finland|
|  1|Finland|
|  0|Finland|
|  0|Finland|
|  0|Finland|
|  1|Finland|
+---+-------+
only showing top 20 rows
```

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

| _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 |