

# Corteva Assessment - Data Engineer

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## Part 1:

### Database Modeling:

Yield Data model:

Column Name	Data Type	Constraints	Description
Y_YEAR	INT	Primary Key	Year of the production
YIELD	INT	YIELD >= 0	Yield produced in the year in USA

Weather Data model:

Column Name	Data Type	Constraints	Description
W_DATE	DATE	Primary Key	-
MAX_TEMP	INT	MAX_TEMP >= -2731	Maximum temperature recorded on that day.
MIN_TEMP	INT	MIN_TEMP >= -2731	Minimum temperature recorded on that day.
PRECIPITATION	INT	PRECIPITATION >= 0	Precipitation recorded on that day
STATION_ID	VARCHAR(11)	Primary Key	Station ID

## Log Data model:

Column Name	Data Type	Constraints	Description
START_TIME	DATETIME(4)	Milliseconds to the decimal 4.	Time before Ingestion starts
END_TIME	DATETIME(4)	Milliseconds to the decimal 4.	Time after Ingestion ends
ROWS_AFFECTED	INT		Number of rows ingested.

The Tables in the Database corteva\_database have been created according to the model mentioned above.

## Data Ingestion:

Yield Data:

Procedure:

- 1) All the files under the directory the target have been stored in a Temporary Table #Temp\_files
- 2) All the files other than .txt are removed
- 3) A while loop is initiated with the condition #Temp\_files is not empty
  - a) The File on top of the table is taken
  - b) BULK INSERT is used to read the data from RAW TXT file and into another Temporary File #Temp\_yield
  - c) Data is loaded from #Temp\_yield into YIELD with removal conditions of Null data.
  - d) Log has been recorded with start time, end time, and rows affected and Inserted into Log Table
  - e) #Temp\_yield is truncated
  - f) The current file is removed from the #Temp\_files

Data Loading Yield...LAPTOP\ronak (70) X

```

BEGIN CATCH
    PRINT 'Failed processing : ' + @FILENAME
END CATCH

DELETE FROM #TEMP_FILES WHERE FileName = @FILENAME
TRUNCATE TABLE #TEMP_YIELD

END

SELECT * FROM YIELD;

SELECT * FROM LOG_YIELD;

```

table CORTEVA\_DATABASE.dbo.LOG\_YIELD

110 %

Results Messages

	Y_YEAR	YIELD
1	1985	225447
2	1986	208944
3	1987	181143
4	1988	125194
5	1989	191320
6	1990	201534
7	1991	189868
8	1992	240719
9	1993	160086

	START_TIME	END_TIME	ROWS_AFFECTED
1	2022-12-18 19:24:49.4933	2022-12-18 19:24:49.4933	30

Query executed suc... RONAK\_LAPTOP\MSSQLSERVER01 ... RONAK\_LAPTOP\ronak (70) CORTEVA\_DATABASE 00:00:00 31 rows

## Weather Data Ingestion:

### Procedure:

- 1) All the files under the directory the target have been stored in a Temporary Table #Temp\_files
- 2) All the files other than .txt are removed
- 3) A while loop is initiated with the condition #Temp\_files is not empty
  - a) The File on top of the table is taken
  - b) BULK INSERT is used to read the data from RAW TXT file and into another Temporary File #Temp\_weather
  - c) Data is loaded from #Temp\_weather into WEATHER with removal conditions of Null data.
  - d) Log has been recorded with start time, end time, and rows affected and Inserted into Log Table
  - e) #Temp\_weather is truncated
  - f) The current file is removed from the #Temp\_files

The screenshot shows a SQL Server Enterprise Manager window titled "Data Loading Weat...LAPTOP\ronak (56)". The script editor contains the following T-SQL code:

```

END TRY
BEGIN CATCH
    PRINT 'Failed processing : ' + @FILENAME
END CATCH
--Delete the top files and the next file will be on Top
DELETE FROM #TEMP_FILES WHERE FileName = @FILENAME

-- Clear the temporary table
TRUNCATE TABLE #TEMP_WEATHER
END
-- View Number of Rows currently in Weather

```

The Results pane shows the execution results. The first result is a scalar value representing the number of rows present in the #TEMP\_WEATHER table:

Num of Rows Present
1669107

The second result is a table showing the execution details of the DELETE statement:

	START_TIME	END_TIME	ROWS_AFFECTED
1	2022-12-18 19:27:19.5958	2022-12-18 19:27:19.6584	10421
2	2022-12-18 19:27:19.6604	2022-12-18 19:27:19.7112	10184
3	2022-12-18 19:27:19.7112	2022-12-18 19:27:19.7586	10588
4	2022-12-18 19:27:19.7586	2022-12-18 19:27:19.8109	9116
5	2022-12-18 19:27:19.8109	2022-12-18 19:27:19.8705	10411
6	2022-12-18 19:27:19.8705	2022-12-18 19:27:19.9208	10863
7	2022-12-18 19:27:19.9208	2022-12-18 19:27:19.9680	10204
8	2022-12-18 19:27:19.9680	2022-12-18 19:27:20.0155	9180
9	2022-12-18 19:27:20.0155	2022-12-18 19:27:20.0826	10856

## NOTE:

**A comment has been left on the places to change the directory path in the SQL file. Please check the comment and change the directory in those statements for successful execution.**

**All the SQL files are also stored inside SQL Commands in .txt form for quick review**

## Data Aggregation:

Average of Min and Max temperature:

A Select statement has been used to extract the data with aggregation functions AVG and SUM to find the Average of MIN\_TEMP and MAX\_TEMP and the TOTAL of PRECIPITATION per annum in each station.

Data Aggregation for MAX\_TEMP

	YEAR	STATION_ID	AVG_MAX_TEMP
1	1985	USC00124837	141
2	1985	USC00254985	154
3	1994	USC00259090	165
4	1994	USC00112193	180
5	1995	USC00250435	169
6	1995	USC00258133	166
7	2001	USC00254985	174
8	2001	USC00112140	177

#### Data Aggregation for MIN\_TEMP

	YEAR	STATION_ID	AVG_MIN_TEMP
1	1989	USC00116610	58
2	1989	USC00255310	19
3	1990	USC00116579	73
4	1990	USC00131635	56
5	1990	USC00137161	40
6	1990	USC00258915	37
7	1992	USC00115326	28
8	1992	USC00115515	61

#### Data Aggregation for Precipitation

	YEAR	STATION_ID	TOTAL_PRECIPITATION_TEMP
1	1985	USC00135796	9743
2	1993	USC00258480	9861
3	1993	USC00332791	8539
4	1994	USC00115326	9246
5	1994	USC00116446	9812
6	2000	USC00126580	14562
7	2000	USC00129080	13144
8	2000	USC00255470	4264

### Data Aggregation on all tables

	YEAR	STATION_ID	AVG_MIN_TEMP	AVG_MAX_TEMP	TOTAL_PRECIPITATION_TEMP
1	1991	USC00112193	63	17	8045
2	2001	USC00112140	66	17	10034
3	2002	USC00257515	43	18	3629
4	2007	USC00119241	63	18	6144
5	1991	USC00252840	44	17	5307
6	1995	USC00124837	54	14	9420
7	1995	USC00113335	70	17	9415
8	2002	USC00258480	40	16	7401

### REST API:

Django is used to create the REST API. The SQL Server is connected with the help of pyodbc with the database cortevea\_database. A cursor is used to execute the SQL Statements at each function to return the JSON object.

#### **/api/weather/ -**

A simple select statement is used to extract all the data from the table WEATHER in the form of a list. The data is then looped to get a key-value pair for each data and added to a list.

The final list is then parsed into a JSON object and returned to the request using JsonResponse.

Key-Value pair structure :

```
{
W_DATE : MMDDYYYY,
MAX_TEMP : INT
MIN_TEMP : INT
PRECIPITATION : INT
STATION_ID : String
}
```

Final JSON Data :

```
{
Weather_data : [data]
}
```

127.0.0.1:8000/api/yield.json

```
[{"Yield_Data": [{"Y_YEAR": 1985, "YIELD": 225447}, {"Y_YEAR": 1986, "YIELD": 208944}, {"Y_YEAR": 1987, "YIELD": 181143}, {"Y_YEAR": 1988, "YIELD": 125194}, {"Y_YEAR": 1989, "YIELD": 191320}, {"Y_YEAR": 1990, "YIELD": 201534}, {"Y_YEAR": 1991, "YIELD": 189868}, {"Y_YEAR": 1992, "YIELD": 240719}, {"Y_YEAR": 1993, "YIELD": 160986}, {"Y_YEAR": 1994, "YIELD": 255295}, {"Y_YEAR": 1995, "YIELD": 187978}, {"Y_YEAR": 1996, "YIELD": 234518}, {"Y_YEAR": 1997, "YIELD": 233864}, {"Y_YEAR": 1998, "YIELD": 247882}, {"Y_YEAR": 1999, "YIELD": 239549}, {"Y_YEAR": 2000, "YIELD": 251854}, {"Y_YEAR": 2001, "YIELD": 241377}, {"Y_YEAR": 2002, "YIELD": 227767}, {"Y_YEAR": 2003, "YIELD": 256229}, {"Y_YEAR": 2004, "YIELD": 299876}, {"Y_YEAR": 2005, "YIELD": 282263}, {"Y_YEAR": 2006, "YIELD": 267503}, {"Y_YEAR": 2007, "YIELD": 331177}, {"Y_YEAR": 2008, "YIELD": 305911}, {"Y_YEAR": 2009, "YIELD": 331921}, {"Y_YEAR": 2010, "YIELD": 315618}, {"Y_YEAR": 2011, "YIELD": 312789}, {"Y_YEAR": 2012, "YIELD": 273192}, {"Y_YEAR": 2013, "YIELD": 351272}, {"Y_YEAR": 2014, "YIELD": 361091}]}]
```

/api/weather/year/station\_id/

A Select statement with WHERE clause is used to extract the data from WEATHER table and filter them based on the year and station\_id given by the user through the GET Request.

The data is then looped to get a key-value pair for each data and added to a list.

The final list is then parsed into a JSON object and returned to the request using JsonResponse.

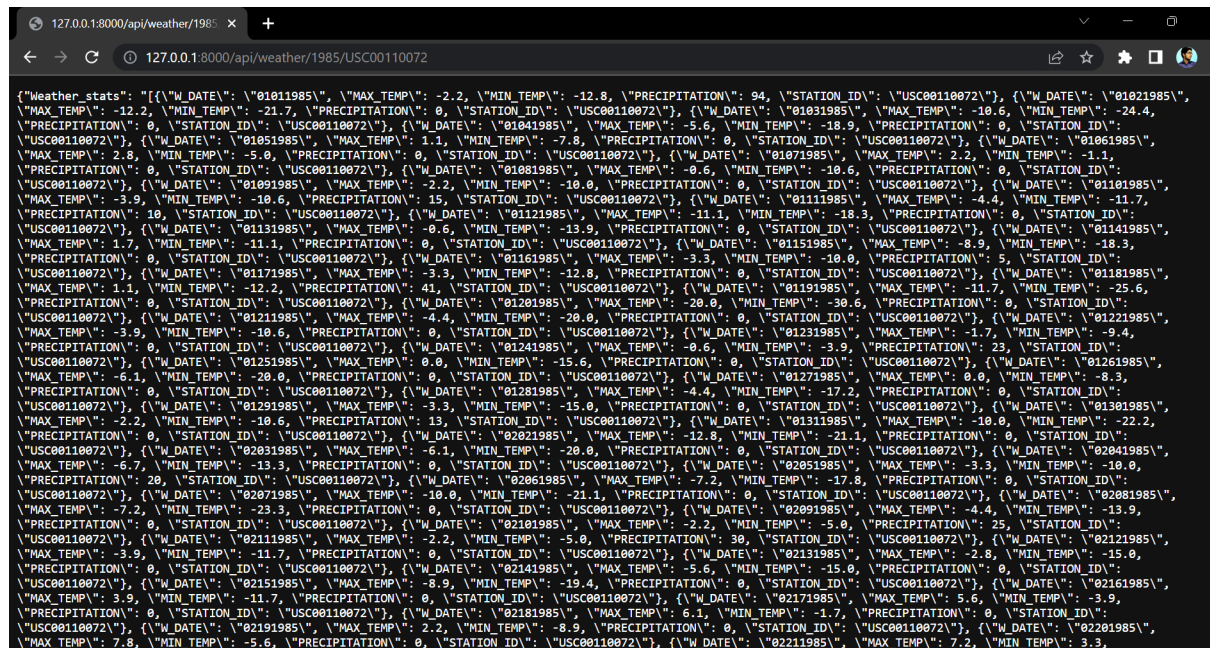
Key-Value pair structure :

```
{
W_DATE : MMDDYYYY,
MAX_TEMP : INT
MIN_TEMP : INT
PRECIPITATION : INT
STATION_ID : String
}
```

Final JSON Data :

```
{
Weather_stats: [data]
}
```

Weather Data for year **1985** and Station\_id **USC00110072**



```
{
  "Weather_stats": [
    {
      "W_DATE": "01011985",
      "MAX_TEMP": -2.2,
      "MIN_TEMP": -12.8,
      "PRECIPITATION": 94,
      "STATION_ID": "USC00110072",
      "W_DATE": "01011985",
      "MAX_TEMP": -12.2,
      "MIN_TEMP": -21.7,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01031985",
      "MAX_TEMP": -10.6,
      "MIN_TEMP": -24.4,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01041985",
      "MAX_TEMP": -5.6,
      "MIN_TEMP": -18.9,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01051985",
      "MAX_TEMP": 1.1,
      "MIN_TEMP": -7.8,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01061985",
      "MAX_TEMP": 2.2,
      "MIN_TEMP": -5.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01071985",
      "MAX_TEMP": 2.2,
      "MIN_TEMP": -1.1,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01081985",
      "MAX_TEMP": 0.6,
      "MIN_TEMP": -10.6,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01091985",
      "MAX_TEMP": -2.2,
      "MIN_TEMP": -10.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01101985",
      "MAX_TEMP": -3.9,
      "MIN_TEMP": -10.6,
      "PRECIPITATION": 15,
      "STATION_ID": "USC00110072",
      "W_DATE": "01111985",
      "MAX_TEMP": -4.4,
      "MIN_TEMP": -11.7,
      "PRECIPITATION": 10,
      "STATION_ID": "USC00110072",
      "W_DATE": "01121985",
      "MAX_TEMP": -11.1,
      "MIN_TEMP": -18.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01131985",
      "MAX_TEMP": -0.6,
      "MIN_TEMP": -13.9,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01141985",
      "MAX_TEMP": 1.7,
      "MIN_TEMP": -11.1,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01151985",
      "MAX_TEMP": -8.9,
      "MIN_TEMP": -18.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01161985",
      "MAX_TEMP": -3.3,
      "MIN_TEMP": -10.0,
      "PRECIPITATION": 5,
      "STATION_ID": "USC00110072",
      "W_DATE": "01171985",
      "MAX_TEMP": -3.3,
      "MIN_TEMP": -12.8,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01181985",
      "MAX_TEMP": 1.1,
      "MIN_TEMP": -12.2,
      "PRECIPITATION": 41,
      "STATION_ID": "USC00110072",
      "W_DATE": "01191985",
      "MAX_TEMP": -11.7,
      "MIN_TEMP": -25.6,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01201985",
      "MAX_TEMP": -20.0,
      "MIN_TEMP": -30.6,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01211985",
      "MAX_TEMP": -4.4,
      "MIN_TEMP": -20.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01221985",
      "MAX_TEMP": -3.9,
      "MIN_TEMP": -10.6,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01231985",
      "MAX_TEMP": -1.7,
      "MIN_TEMP": -9.4,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01241985",
      "MAX_TEMP": -0.6,
      "MIN_TEMP": -3.9,
      "PRECIPITATION": 23,
      "STATION_ID": "USC00110072",
      "W_DATE": "01251985",
      "MAX_TEMP": 0.0,
      "MIN_TEMP": -15.6,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01261985",
      "MAX_TEMP": -6.1,
      "MIN_TEMP": -20.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01271985",
      "MAX_TEMP": 0.0,
      "MIN_TEMP": -8.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01281985",
      "MAX_TEMP": -4.4,
      "MIN_TEMP": -17.2,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01291985",
      "MAX_TEMP": -3.3,
      "MIN_TEMP": -15.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "01301985",
      "MAX_TEMP": -2.2,
      "MIN_TEMP": -10.6,
      "PRECIPITATION": 13,
      "STATION_ID": "USC00110072",
      "W_DATE": "01311985",
      "MAX_TEMP": -10.0,
      "MIN_TEMP": -22.2,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02011985",
      "MAX_TEMP": -12.8,
      "MIN_TEMP": -21.1,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02021985",
      "MAX_TEMP": -6.1,
      "MIN_TEMP": -20.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02031985",
      "MAX_TEMP": -6.7,
      "MIN_TEMP": -13.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02041985",
      "MAX_TEMP": -3.3,
      "MIN_TEMP": -10.0,
      "PRECIPITATION": 20,
      "STATION_ID": "USC00110072",
      "W_DATE": "02051985",
      "MAX_TEMP": -7.2,
      "MIN_TEMP": -17.8,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02061985",
      "MAX_TEMP": -10.0,
      "MIN_TEMP": -21.1,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02071985",
      "MAX_TEMP": -7.2,
      "MIN_TEMP": -23.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02081985",
      "MAX_TEMP": -4.4,
      "MIN_TEMP": -13.9,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02091985",
      "MAX_TEMP": -2.2,
      "MIN_TEMP": -5.0,
      "PRECIPITATION": 25,
      "STATION_ID": "USC00110072",
      "W_DATE": "02101985",
      "MAX_TEMP": -2.2,
      "MIN_TEMP": -5.0,
      "PRECIPITATION": 30,
      "STATION_ID": "USC00110072",
      "W_DATE": "02111985",
      "MAX_TEMP": -3.9,
      "MIN_TEMP": -11.7,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02121985",
      "MAX_TEMP": -2.8,
      "MIN_TEMP": -15.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02131985",
      "MAX_TEMP": -5.6,
      "MIN_TEMP": -15.0,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02141985",
      "MAX_TEMP": -8.9,
      "MIN_TEMP": -19.4,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02151985",
      "MAX_TEMP": 5.6,
      "MIN_TEMP": -3.9,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02161985",
      "MAX_TEMP": 6.1,
      "MIN_TEMP": -1.7,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02171985",
      "MAX_TEMP": 2.2,
      "MIN_TEMP": -8.9,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02181985",
      "MAX_TEMP": 7.8,
      "MIN_TEMP": -5.6,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02191985",
      "MAX_TEMP": 7.2,
      "MIN_TEMP": 3.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02201985",
      "MAX_TEMP": 7.2,
      "MIN_TEMP": 3.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072",
      "W_DATE": "02211985",
      "MAX_TEMP": 7.2,
      "MIN_TEMP": 3.3,
      "PRECIPITATION": 0,
      "STATION_ID": "USC00110072"
    }
  ]
}
```



## Weather Data for the year 1987 and station\_id USC00110072

```
127.0.0.1:8000/api/weather/1987 x +
127.0.0.1:8000/api/weather/1987/USC00110072

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## Weather Data for the year 1987 and station\_id USC00112193

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