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# DAMG 7370 Group 10 Final Project

**Part 1 :**

**Ydata profiling**

**Motor Vehicle Collisions - Crashes New York Dataset:** New York

**Dataset Size**:The dataset contains 2075427 entries (rows) and 29 columns.

| | CRASH DATE | CRASH TIME | BOROUGH | ZIP CODE | LATITUDE | LONGITUDE | LOCATION | ON STREET NAME | CROSS STREET NAME | OFF STREET NAME | ... | CONTRIBUTING FACTOR VEHICLE 2 | CONTRIBUTING FACTOR VEHICLE 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 09/11/2021 | 2:39 | NaN | NaN | NaN | NaN | NaN | WHITESTONE EXPRESSWAY | 20 AVENUE | NaN | ... | Unspecified | NaN |
| 1 | 03/26/2022 | 11:45 | NaN | NaN | NaN | NaN | NaN | QUEENSBORO BRIDGE UPPER | NaN | NaN | ... | NaN | NaN |
| 2 | 06/29/2022 | 6:55 | NaN | NaN | NaN | NaN | NaN | THROGS NECK BRIDGE | NaN | NaN | ... | Unspecified | NaN |
| 3 | 09/11/2021 | 9:35 | BROOKLYN | 11208.0 | 40.667202 | -73.866500 | (40.667202, -73.8665) | NaN | NaN | 1211 LORING AVENUE | ... | NaN | NaN |
| 4 | 12/14/2021 | 8:13 | BROOKLYN | 11233.0 | 40.683304 | -73.917274 | (40.683304, -73.917274) | SARATOGA AVENUE | DECATUR STREET | NaN | ... | NaN | NaN |

**Column Types:**

- There are 18 columns of type Text, which are likely categorical.
- There are 11 columns of type integer, which are numerical with decimal values.

**Missing Values:**

- BOROUGH has 645,746 missing values, while ZIP CODE has 645,996 missing values.
- LATITUDE, LONGITUDE, and LOCATION each exhibit 233,626 missing values.
- ON STREET NAME is missing in 440,569 instances, and CROSS STREET NAME is missing in 784,436 instances.
- OFF STREET NAME has a significant 1,727,231 missing values.
- NUMBER OF PERSONS INJURED is absent in 18 cases, and NUMBER OF PERSONS KILLED is absent in 31 cases.
- CONTRIBUTING FACTOR VEHICLE 1 has 6,802 missing values, whereas CONTRIBUTING FACTOR VEHICLE 2 has 321,736 missing values.
- CONTRIBUTING FACTOR VEHICLE 3, CONTRIBUTING FACTOR VEHICLE 4, and CONTRIBUTING FACTOR VEHICLE 5 each lack over 1.9 million entries.
- VEHICLE TYPE CODE 1 is missing in 13,691 instances, and VEHICLE TYPE CODE 2 is missing in 396,691 instances.
- VEHICLE TYPE CODE 3, VEHICLE TYPE CODE 4, and VEHICLE TYPE CODE 5 each have over 1.9 million missing values.
- COLLISION_ID stands out with no missing values.

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The Source Column names for the New York Dataset is as follows:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2075427 entries, 0 to 2075426
Data columns (total 29 columns):
 #   Column                          Dtype
---  ------                          -----
 0   CRASH DATE                      object
 1   CRASH TIME                      object
 2   BOROUGH                         object
 3   ZIP CODE                        object
 4   LATITUDE                        float64
 5   LONGITUDE                       float64
 6   LOCATION                        object
 7   ON STREET NAME                  object
 8   CROSS STREET NAME               object
 9   OFF STREET NAME                 object
 10  NUMBER OF PERSONS INJURED       float64
 11  NUMBER OF PERSONS KILLED        float64
 12  NUMBER OF PEDESTRIANS INJURED   int64
 13  NUMBER OF PEDESTRIANS KILLED    int64
 14  NUMBER OF CYCLIST INJURED       int64
 15  NUMBER OF CYCLIST KILLED        int64
 16  NUMBER OF MOTORIST INJURED      int64
 17  NUMBER OF MOTORIST KILLED       int64
 18  CONTRIBUTING FACTOR VEHICLE 1   object
 19  CONTRIBUTING FACTOR VEHICLE 2   object
 20  CONTRIBUTING FACTOR VEHICLE 3   object
 21  CONTRIBUTING FACTOR VEHICLE 4   object
 22  CONTRIBUTING FACTOR VEHICLE 5   object
 23  COLLISION_ID                    int64
 24  VEHICLE TYPE CODE 1             object
 25  VEHICLE TYPE CODE 2             object
 26  VEHICLE TYPE CODE 3             object
 27  VEHICLE TYPE CODE 4             object
 28  VEHICLE TYPE CODE 5             object
dtypes: float64(4), int64(7), object(18)
memory usage: 459.2+ MB
```

```
[2075427 rows x 29 columns]
```

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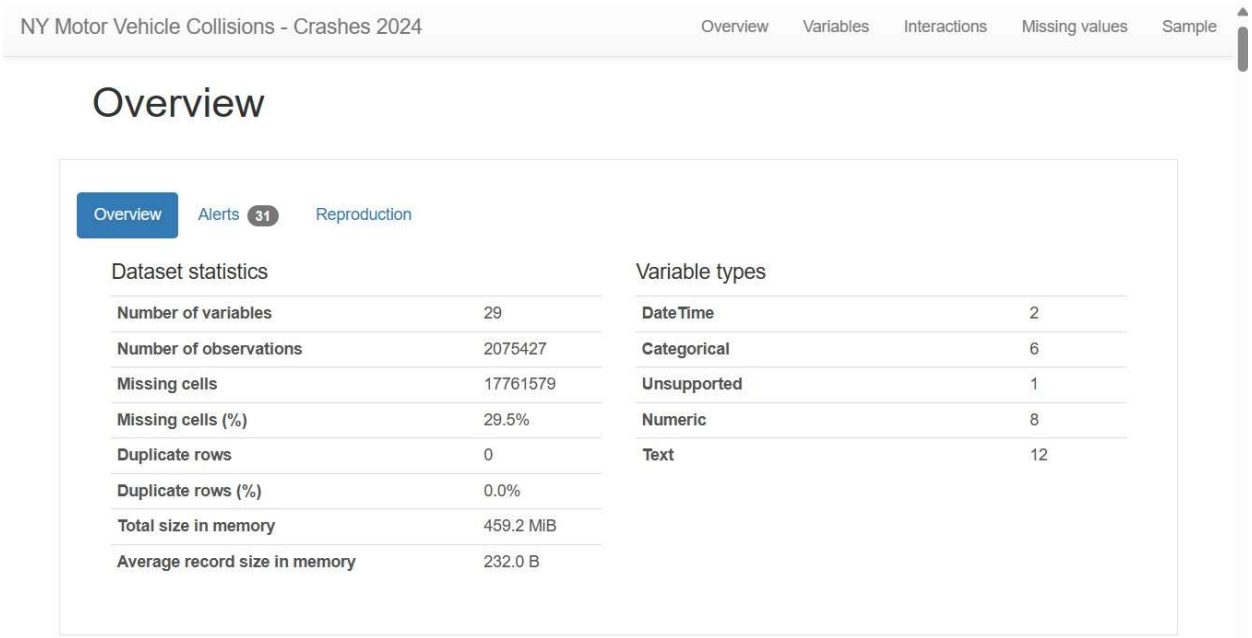
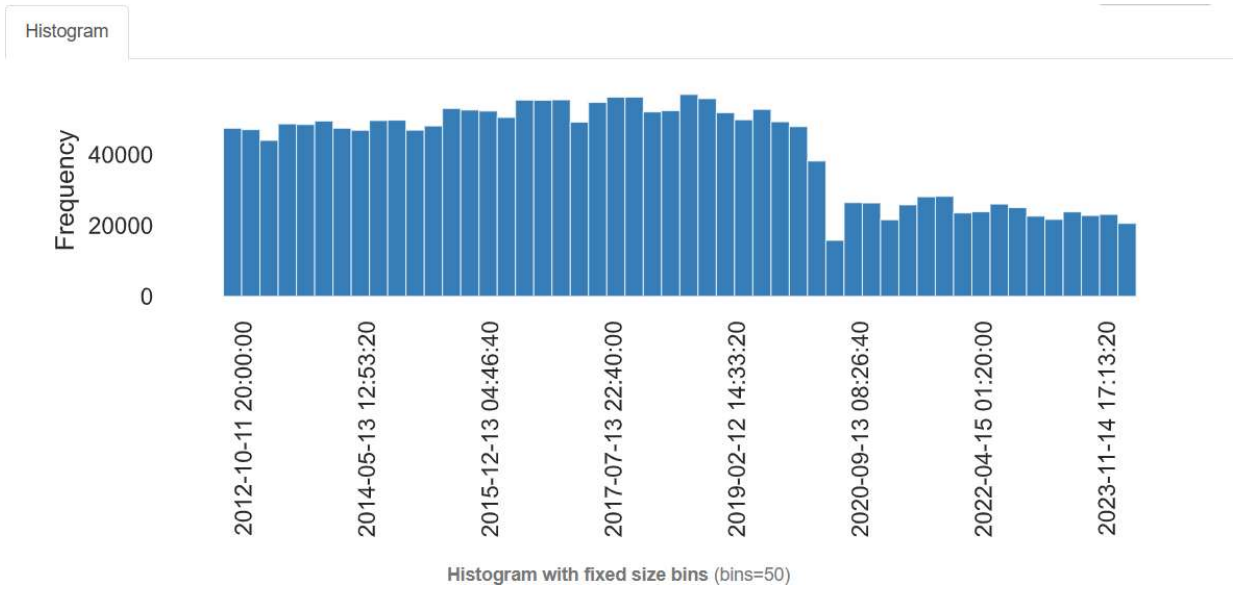
The following is the overview of the whole dataset which consists of all the missing cells, rows, data types,




etc.

For example




The above histogram represents the number of crashes which took place between year 2012 - year 2023

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**Traffic Crashes - Crashes Chicago**

**Dataset**: Chicago
**Dataset Size**: The dataset contains 817,723 entries (rows) and 48 columns.

| | CRASH_RECORD_ID | CRASH_DATE_EST_I | CRASH_DATE | POSTED_SPEED_LIMIT | TRAFFIC_CONTROL_DEVICE | DEVICE_CONDITION | WEATH |
|---|---|---|---|---|---|---|---|
| 0 | 6c1659069e9c6285a650e70d6f9b574ed5f64c12888479... | NaN | 08/18/2023 12:50:00 PM | 15 | OTHER | FUNCTIONING PROPERLY | |
| 1 | 5f54a59fcb087b12ae5b1acff96a3caf4f2d37e79f8db4... | NaN | 07/29/2023 02:45:00 PM | 30 | TRAFFIC SIGNAL | FUNCTIONING PROPERLY | |
| 2 | 61fcb8c1eb522a6469b460e2134df3d15f82e81fd93e9c... | NaN | 08/18/2023 05:58:00 PM | 30 | NO CONTROLS | NO CONTROLS | |
| 3 | 004cd14d0303a9163aad69a2d7f341b7da2a8572b2ab33... | NaN | 11/26/2019 08:38:00 AM | 25 | NO CONTROLS | NO CONTROLS | |
| 4 | a1d5f0ea90897745365a4cbb06cc60329a120d89753fac... | NaN | 08/18/2023 10:45:00 AM | 20 | NO CONTROLS | NO CONTROLS | |

5 rows × 48 columns

**Column Types:**

- There are 31 columns of type object, which are likely categorical or textual in nature.
- There are 11 columns of type float64, which are likely numerical with decimal values.
- There are 6 columns of type int64, which are likely numerical with integer values.

**Missing Values:**

- Several columns have a significant number of missing values.
- For example: CRASH_DATE_EST_I has 756,594 missing values, which is about 92.5% of the total entries.
- LANE_CNT has 618,714 missing values, which is about 75.7% of the total entries.
- INTERSECTION_RELATED_I has 630,174 missing values, which is about 77.1% of the total entries.
- Columns like STREET_DIRECTION, STREET_NAME, BEAT_OF_OCCURRENCE, and MOST_SEVERE_INJURY have relatively few missing values.
- Some columns like PHOTOS_TAKEN_I, STATEMENTS_TAKEN_I, DOORING_I, WORK_ZONE_I, WORK_ZONE_TYPE, and WORKERS_PRESENT_I have a very high percentage of missing values, which might indicate that these events are rare or not commonly reported.

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The Source Column names for the New York Dataset is as follows:

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 817723 entries, 0 to 817722
Data columns (total 48 columns):
 #   Column                        Non-Null Count   Dtype
---  ------                        --------------   -----
 0   CRASH_RECORD_ID               817723 non-null  object
 1   CRASH_DATE_EST_I              61129 non-null   object
 2   CRASH_DATE                    817723 non-null  object
 3   POSTED_SPEED_LIMIT            817723 non-null  int64
 4   TRAFFIC_CONTROL_DEVICE        817723 non-null  object
 5   DEVICE_CONDITION              817723 non-null  object
 6   WEATHER_CONDITION             817723 non-null  object
 7   LIGHTING_CONDITION            817723 non-null  object
 8   FIRST_CRASH_TYPE              817723 non-null  object
 9   TRAFFICWAY_TYPE               817723 non-null  object
 10  LANE_CNT                      199009 non-null  float64
 11  ALIGNMENT                     817723 non-null  object
 12  ROADWAY_SURFACE_COND          817723 non-null  object
 13  ROAD_DEFECT                   817723 non-null  object
 14  REPORT_TYPE                   793409 non-null  object
 15  CRASH_TYPE                    817723 non-null  object
 16  INTERSECTION_RELATED_I        187549 non-null  object
 17  NOT_RIGHT_OF_WAY_I            37708 non-null   object
 18  HIT_AND_RUN_I                 255949 non-null  object
 19  DAMAGE                        817723 non-null  object
 20  DATE_POLICE_NOTIFIED          817723 non-null  object
 21  PRIM_CONTRIBUTORY_CAUSE       817723 non-null  object
 22  SEC_CONTRIBUTORY_CAUSE        817723 non-null  object
 23  STREET_NO                     817723 non-null  int64
 24  STREET_DIRECTION              817719 non-null  object
 25  STREET_NAME                   817722 non-null  object
 26  BEAT_OF_OCCURRENCE            817718 non-null  float64
 27  PHOTOS_TAKEN_I                10775 non-null   object
 28  STATEMENTS_TAKEN_I            18258 non-null   object
 29  DOORING_I                     2512 non-null    object
 30  WORK_ZONE_I                   4670 non-null    object
```

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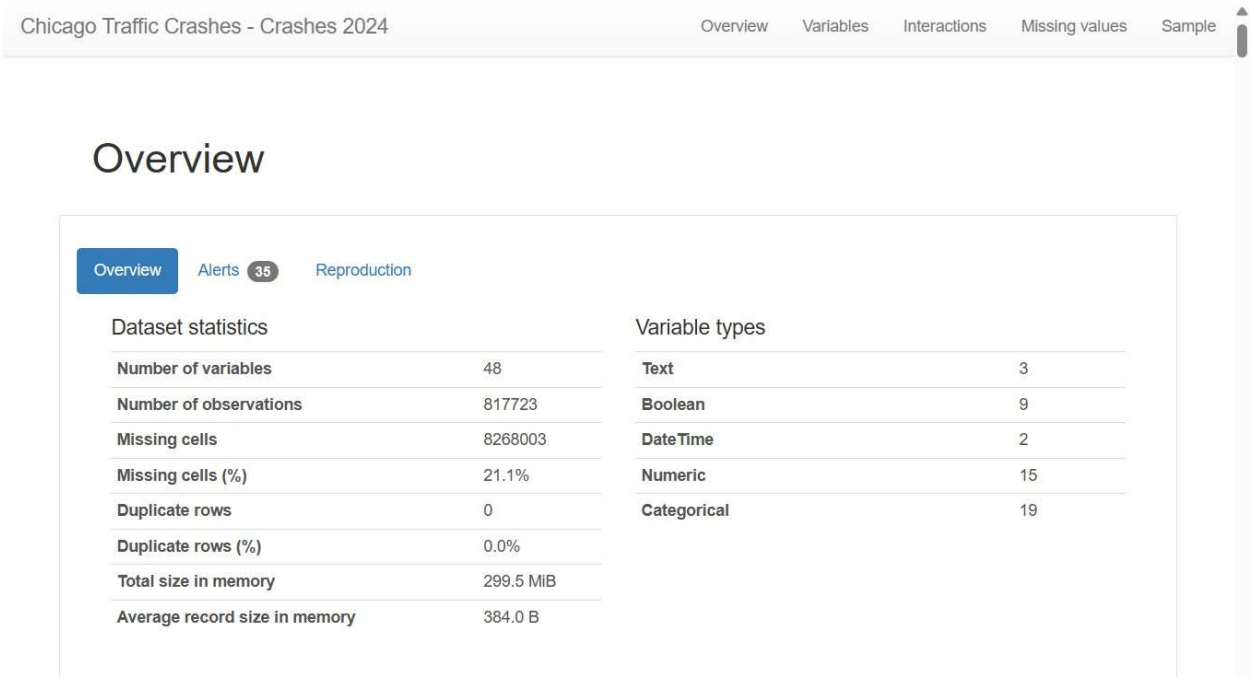
```
 31  WORK_ZONE_TYPE                  3618 non-null    object
 32  WORKERS_PRESENT_I               1194 non-null    object
 33  NUM_UNITS                       817723 non-null  int64
 34  MOST_SEVERE_INJURY              815931 non-null  object
 35  INJURIES_TOTAL                  815943 non-null  float64
 36  INJURIES_FATAL                  815943 non-null  float64
 37  INJURIES_INCAPACITATING         815943 non-null  float64
 38  INJURIES_NON_INCAPACITATING     815943 non-null  float64
 39  INJURIES_REPORTED_NOT_EVIDENT   815943 non-null  float64
 40  INJURIES_NO_INDICATION          815943 non-null  float64
 41  INJURIES_UNKNOWN                815943 non-null  float64
 42  CRASH_HOUR                      817723 non-null  int64
 43  CRASH_DAY_OF_WEEK               817723 non-null  int64
 44  CRASH_MONTH                     817723 non-null  int64
 45  LATITUDE                        812108 non-null  float64
 46  LONGITUDE                       812108 non-null  float64
 47  LOCATION                        812108 non-null  object
dtypes: float64(11), int64(6), object(31)
memory usage: 299.5+ MB

[817723 rows x 48 columns]
```

The following is the overview of the whole dataset which consists of all the missing cells, rows, data types, etc.



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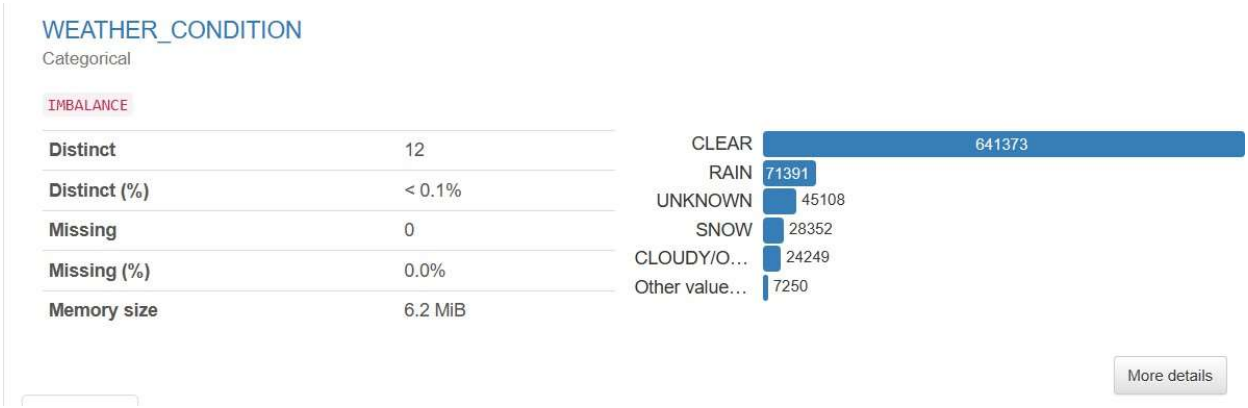
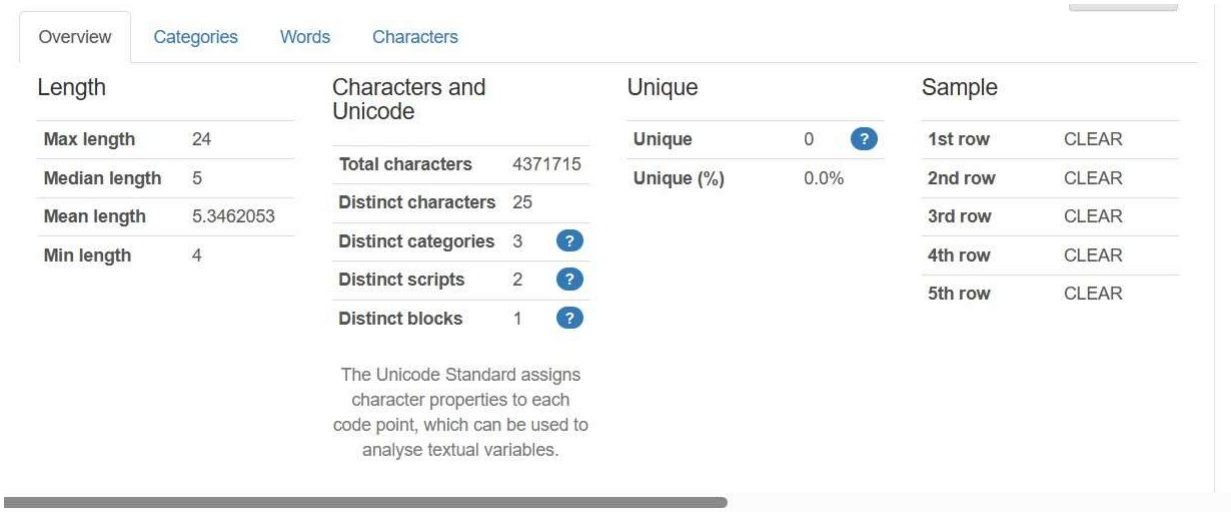
For Example:

If we want the details of the weather condition column we can get it through the following data




So we can the max length, min length etc from the below data along with the sample rows



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## Austin Crash Report Data - Crash Level Records

**Dataset**: Austin
**Dataset Size**:The dataset contains 147750 entries (rows) and 54 columns.

| | crash_id | crash_fatal_fl | crash_date | crash_time | case_id | rpt_latitude | rpt_longitude | rpt_block_num | rpt_street_pfx | rpt_street_name | ... | pedestrian_serious_injury_c |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 13762420 | N | 03/30/2014 10:58:00 AM | 10:58:00 | 140890874 | NaN | NaN | NaN | NaN | 3707 MANCHACA | ... | |
| 1 | 13777334 | N | 03/27/2014 01:07:00 PM | 13:07:00 | 140860852 | NaN | NaN | 3400 | NaN | PALM WAY TO MOPAC NB RAMP | ... | |
| 2 | 13777441 | N | 03/28/2014 03:42:00 PM | 15:42:00 | 140871196 | NaN | NaN | 8704 | NaN | BALCONES CLUB DR | ... | |
| 3 | 13797332 | N | 04/09/2014 02:09:00 PM | 14:09:00 | 140991015 | NaN | NaN | 8000 | NaN | E US 290 HWY SVRD EB | ... | |
| 4 | 13795604 | N | 04/07/2014 06:00:00 PM | 18:00:00 | 140971248 | NaN | NaN | 200 | W | BEN WHITE | ... | |

5 rows × 54 columns

**Column Types:**

There are 23 columns of type object, which are categorical or textual in nature. There are 14 columns of type float64, which are numerical with decimal values. There are 17 columns of type int64, which are numerical with integer values.

**Missing Values:**

- Several columns have a significant number of missing values. For example: rpt_latitude has 137,456 missing values, which is about 93.0% of the total entries.
- rpt_longitude has 137,456 missing values, which is about 93.0% of the total entries.
- street_nbr has 87,038 missing values, which is about 58.9% of the total entries. street_name_2 has 81,474 missing values, which is about 55.1% of the total entries.
- micromobility_fl has 147,439 missing values, which is about 99.8% of the total entries.
- Columns like crash_id, crash_fatal_fl, crash_date, and crash_time have no missing values.
- Some columns like case_id, rpt_block_num, and street_name have a moderate number of missing values.
- Overall, the dataset contains a varied range of missing values across different columns, indicating potential data quality issues and areas for further investigation.

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The following are the source columns of the dataset

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 147750 entries, 0 to 147749
Data columns (total 54 columns):
 #   Column                                Non-Null Count   Dtype
---  ------                                --------------   -----
 0   crash_id                              147750 non-null  int64
 1   crash_fatal_fl                        147750 non-null  object
 2   crash_date                            147750 non-null  object
 3   crash_time                            147750 non-null  object
 4   case_id                               145892 non-null  object
 5   rpt_latitude                          10294 non-null   float64
 6   rpt_longitude                         10294 non-null   float64
 7   rpt_block_num                         128139 non-null  object
 8   rpt_street_pfx                        79945 non-null   object
 9   rpt_street_name                       147747 non-null  object
 10  rpt_street_sfx                        97410 non-null   object
 11  crash_speed_limit                     147748 non-null  float64
 12  road_constr_zone_fl                   147748 non-null  object
 13  latitude                              145507 non-null  float64
 14  longitude                             145507 non-null  float64
 15  street_name                           147748 non-null  object
 16  street_nbr                            60712 non-null   float64
 17  street_name_2                         66276 non-null   object
 18  street_nbr_2                          0 non-null       float64
 19  crash_sev_id                          147750 non-null  int64
 20  sus_serious_injry_cnt                 147750 non-null  int64
 21  nonincap_injry_cnt                    147749 non-null  float64
 22  poss_injry_cnt                        147749 non-null  float64
 23  non_injry_cnt                         147749 non-null  float64
 24  unkn_injry_cnt                        147748 non-null  float64
 25  tot_injry_cnt                         147748 non-null  float64
 26  death_cnt                             147750 non-null  int64
 27  contrib_factn_p1_id                   28607 non-null   float64
```

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| | | | |
|---|---|---|---|
| 27 | contrib_factr_pl_id | 28607 non-null | float64 |
| 28 | contrib_factr_p2:_id | 4515 non-null | float64 |
| 29 | units involved | 147743 non-null | object |
| 30 | atd mode_category_metadata | 147743 non-null | object |
| 31 | pedestrian_fl | 3505 non-null | object |
| 32 | motor vehicle fl | 146634 non-null | object |
| 33 | motorcycle_fl | 3602 non-null | object |
| 34 | bicycle_fl | 2444 non-null | object |
| 35 | other fl | 4845 non-null | object |
| 36 | point | 145507 non-null | object |
| 37 | apd_confirmed_fatality | 147750 non-null | object |
| 38 | apd_confirmed_death_count | 147750 non-null | int64 int64 |
| 39 | motor vehicle death count | 147750 non-null | int64 int64 |
| 40 | motor vehicle_serious_injury_count | 147750 non-null | int64 int64 |
| 41 | bicycle_death_count | 147750 non-null | int64 int64 |
| 42 | bicycle_serious_injury_count | 147750 non-null | int64 int64 |
| 43 | pedestrian_death_count | 147750 non-null | int64 |
| 44 | pedestrian_serious_injury_count | 147750 non-null | object |
| 45 | motorcycle_death_count | 147750 non-null | object |
| 46 | motorcycle_serious_injury_count | 147750 non-null | int64 int64 |
| 47 | other death count | 147750 non-null | |
| 48 | other_serious_injury_count | 147750 non-null | |
| 49 | onsys_fl | 147750 non-null | |
| 50 | private_dr_fl | 147750 non-null | |
| 51 | micromobility_serious_injury_count | 147750 non-null | |
| 52 | micromobility_death_count | 147750 non-null | |
| 53 | micromobility_fl | 311 non-null | object |

dtypes: float64(14), int64(17), object(23)
memory usage: 60.9+ MB

[147750 rows x 54 columns]

f-fli+M ertsCD Reproduction

Dataset statistics

| | |
|---|---|
| Number of variables | 54 |
| Number of observations | 147750 |
| Missing cells | 1725084 |
| Missing cells (%) | 21.6% |
| Duplicate rows | 0 |
| Duplicate rows (%) | 0.0% |
| Total size in memory | 60.9 MiB |
| Average record size in memory | 432.0 B |

Variable types

| | |
|---|---|
| Numeric | 17 |
| Boolean | 11 |
| DateTime | 2 |
| Text | 7 |
| Unsupported | 2 |
| Categorical | 15 |

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For Example:

If we want the details of the street name column we can get it through the following data

street_name
Text

| | |
|---|---|
| **Distinct** | 4630 |
| **Distinct (%)** | 3.1% |
| **Missing** | 2 |
| **Missing (%)** | < 0.1% |
| **Memory size** | 1.1 MiB |


More details

Here we can see the details of the street name for the above data

Overview | Words | Characters

### Length

| | |
|---|---|
| **Max length** | 41 |
| **Median length** | 40 |
| **Mean length** | 9.2789682 |
| **Min length** | 3 |

### Characters and Unicode

| | |
|---|---|
| **Total characters** | 1370949 |
| **Distinct characters** | 37 |
| **Distinct categories** | 3 |
| **Distinct scripts** | 2 |
| **Distinct blocks** | 1 |

The Unicode Standard assigns character properties to each code point, which can be used to analyse textual variables.

### Unique

| | |
|---|---|
| **Unique** | 2208 |
| **Unique (%)** | 1.5% |

### Sample

| | |
|---|---|
| **1st row** | 3707 MANCHACA RD |
| **2nd row** | PALM WAY TO MOPAC NB RAMP |
| **3rd row** | BALCONES CLUB DR |
| **4th row** | US0290 |
| **5th row** | US0290 |

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**Data Staging using Talend**

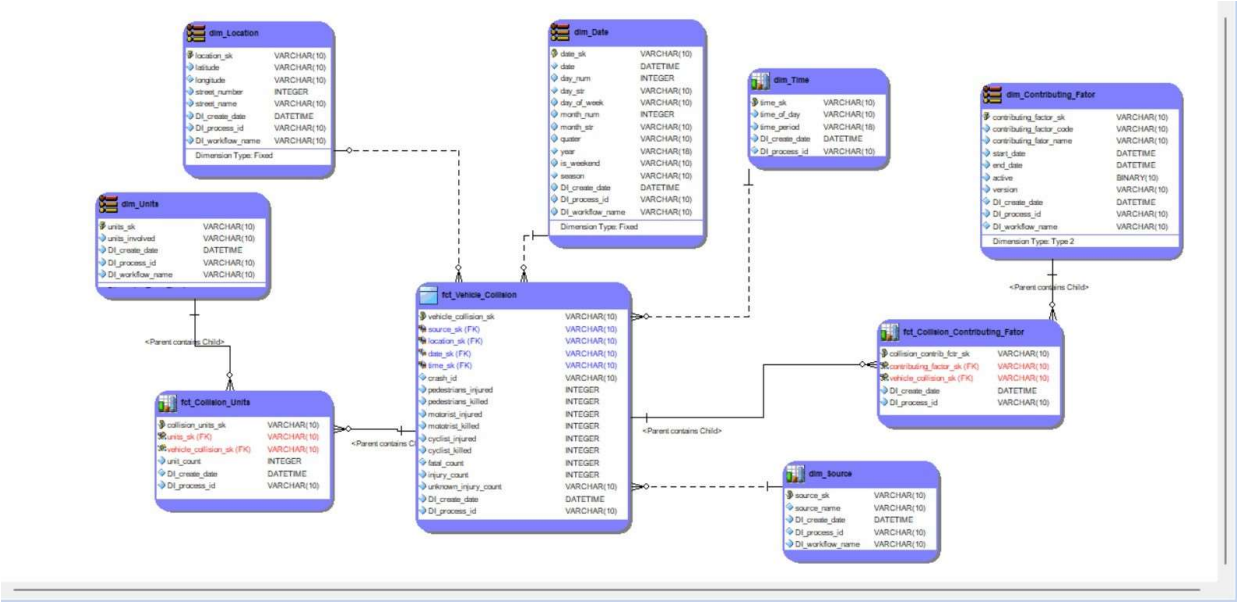
We are staging the source data using talend ETL pipelines for all the three datasets and storing the data into SQL server tables. We are going to use this staged data for transformations according to the business requirements.

## Dimensional model:

We have outlined the process of creating a dimensional model consisting of both facts and dimensions, along with the necessary mapping documents and explanations of source-to-target column mappings.

Facts and Dimensions Creation:

- Identified the relevant facts and dimensions based on business requirements and data analysis.
- Created the necessary tables to represent these facts and dimensions.




We have created five dimensional tables and two fact tables along with a source table, all having a many to one relationships

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**Fact Table:**

The fct_Vehicle_Collision table is one fact table in this model. It contains detailed information about individual vehicle collisions, such as:

- Location details (linked to the dim_Location table)
- Date and time details (linked to dim_Date and dim_Time tables)
- Units involved (linked to the dim_Units table)
- Contributing factors (linked to the fct_Collision_Contributing_Fator junction table and dim_Contributing_Fator table)
- Collusion details (e.g., crash_id, crash_id (FK), units involved, pedestrians injured/killed, motorists injured/killed, cyclists injured/killed, injury counts)
- Additional attributes like DI_create_date and DI_process_id

The fct_Collision_Contributing_Factor is the second fact table that we have created and has the following attributes:

- collision_contrib_fct_sk: Surrogate key for the fact table
- vehicle_collision_sk (FK): Foreign key referencing the Vehicle Collision fact table
- contributing_factor_sk (FK): Foreign key referencing the dim_Contributing_Fator dimension table
- DI_create_date: Date when the record was created
- DI_process_id: Process ID related to the record

The fct_Collision_Units is the third fact table that we have created and has the following attributes:

- collision_unit_sk: Surrogate key for the fact table
- unit_sk (FK): Foreign key referencing the Vehicle Collision fact table
- vehicle_collision_sk (FK): Foreign key referencing the Vehicle Collision fact table
- DI_create_date: Date when the record was created
- DI_process_id: Process ID related to the record
- unit_count : linked to the dim_Units table

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**Dimensional Tables:**

dim_Location: This table stores location-related information, such as latitude, longitude, street number, and street name.

dim_Date: This table contains date-related attributes like date, day, month, year, quarter, and week.

dim_Time: This table holds time-related information, such as time, hour, and minute.

dim_Units: This table stores details about the units involved in the collision, such as the unit type and the process ID.

dim_Contributing_Fator: This table contains information about contributing factors related to the collision, such as the contributing factor code, factor name, start date, and end date.

dim_Source: This table has the source data which will be used for loading and processing data.

**Mapping Document:**

- Developed a comprehensive mapping document that clearly specifies the relationship between source and target columns.
- Documented each transformation applied during the ETL process, ensuring transparency and traceability.

The screenshot for the mapping document is as follows:

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Final Column | Austin | | Chicago | | New York | |
| 2 | | Columns | Transformation | Columns | Transformation | Columns | Transformation |
| 3 | crash_id | crash_id | | crash_record_id | | collision_id | |
| 4 | crash_date | crash_date | | crash_date | | crash_date | merge crash date and crash time |
| 5 | crash_time | crash_date | parse crash_date and get crash timein 24hr format | crash_date | parse crash_date and get crash timein 24hr format | crash_time | |
| 6 | street number | street_nbr | will use street_nbr, street_nbr_2 column is null | street_no | | doesn't have column | doesn't have column |
| 7 | street name | street_name | | street_name | | on_street_name | |
| 8 | latitude | latitude | | latitude | | location | split location and get latitude |
| 9 | longitude | longitude | | longitude | | location | split location and get |
| 10 | contributing_factor_name | doesn't have column | with the help of contributing code we get the contributing factor | primary_contributory_cause +secondary_contributory_cause | concat these columns, normalize them | contributing_fact_vechicle1+contributing_fact_vechicle2+contributing_fact_vechicle3+contributing_fact_vechicle4+contributing_fact_vechicle5 | concat these columns, normalize them |
| 11 | contributing_factor_code | contrib_factr_p1_id+contrib_factr_p2_id | concat these columns and normalize | | with the help of document we can get code for each of the contributing factor name | | with the help of document we can get code for each of the contributing factor name |
| 12 | units_involved | units_involved | | doesn't have column | doesn't have column | vehicle_type_code1+vehicle_type_code2+vehicle_type_code3+vehicle_type_code4+vehicle_type_code5 | concat these columns, normalize them |
| 13 | unit_count | units_involved | normalize the column 'units_involved' and then group by on crash_id which will gives us the unit count | no column specific to only units, num_units has information about number of pedestrains, vehicles and cyclists as well | no column specific to only units, num_units has information about number of pedestrains, vehicles and cyclists as well | vehicle_type_code1+vehicle_type_code2+vehicle_type_code3+vehicle_type_code4+vehicle_type_code5 | concat these columns and then normalize and perform groupby to count units |
| 14 | pedestrain_injured | pedestrian_serious_injury_count | | doesn't have column | doesn't have column | number_of_pedestrian_injured | |
| 15 | pedestrian_killed | pedestrian_death_count | | doesn't have column | doesn't have column | number_of_pedestrian_killed | |
| 16 | pedestrian_involved | pedestrian_death_count+ pedestrian_serious_injury_count | | doesn't have column | doesn't have column | number_of_pedestrian_injured+number_of_pedestrian_killed | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 17 | roadusers_involved | motorcycle_death_count+motorcycle_serious_injury_count+motor_vehicle_death_count+motor_vehicle_serious_injury_count+bicycle_death_count+bicycle_serious_injury_count | | doesn't have column | doesn't have column | number_of_cyclist_injured+number_of_cyclist_killed+number_of_motorist_injured+number_of_motorist_killed | |
| 18 | motorist_injured | motorcycle_serious_injury_count+motor_vehicle_serious_injury_count | | doesn't have column | doesn't have column | number_of_motorist_injured | |
| 19 | motorist_killed | motorcycle_death_count+motor_vehicle_death_count | | doesn't have column | doesn't have column | number_of_motorist_killed | |
| 20 | cyclist_injured | bicycle_serious_injury_count | | doesn't have column | doesn't have column | number_of_cyclist_injured | |
| 21 | cyclist_killed | bicycle_death_count | | doesn't have column | doesn't have column | number_of_cyclist_killed | |
| 22 | fatal_count | death_cnt+apd_confirmed_death_count+bicycle death count+motor vehicle death count+ motor cycle death count+other death count+micromobility_death_count | | injuries_fatal | | no of person killed+ no of pedestrian killed+no of cyclist killed+no of motorist killed | |
| 23 | injury_count | motorcycle_serious_injury_count +pedestrian_serious_injury_count +bicycle_serious_injury_count+motor_vehicle_serious_injury_count+other_serious_injury_count +micromobility_serious_injury_count | | injuries non incapacitiating +injuries_incapacitating | | no of person injured+ no of pedestrian injured+no of cyclist injured+no of motorist injured | |
| 24 | unknown_injury_count | no column | no column | injuries reported not evident+injuriesno indication + injuries unknow | merge these columns | no column | no column |

The Target columns are as follows:

- Crash_id
- Crash_date
- Crash_time
- Street number
- Street name
- Latitude
- Longitude
- Contributing_factor_name
- Contributing_factor_code
- Units_involved
- Unit_count
- Pedestrain_injured
- Pedestrian_killed
- Pedestrian_involved
- Roadusers_involved
- Motorist_injured
- Motorist_killed
- Cyclist_injured
- Cyclist_killed
- Fatal_count
- Injury_count
- Unknown_injury_count

**Explanation:**

crash_id: This column represents a unique identifier for each crash event. It is mapped directly from the source column "crash_id" in Austin, "crash_record_id" in Chicago, and "collision_id" in New York.

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crash_date: This column stores the date of each crash event. The transformation involves parsing the "crash_date" from the source and merging it with the "crash_time" to create a unified datetime format in 24-hour format.

crash_time: Represents the time of the crash event. This is derived from parsing the "crash_date" in the source data to extract the time component.

street_number: Stores the street number where the crash occurred. The transformation involves selecting "street_nbr" in Austin and "street_no" in Chicago. For New York, there is no specific column provided.

street_name: Represents the name of the street where the crash occurred. This is directly mapped from the source column "street_name".

latitude: Stores the latitude coordinate of the crash location. This is obtained by splitting the "location" column in the source data to extract latitude information.

longitude: Represents the longitude coordinate of the crash location. Similar to latitude, this is obtained by splitting the "location" column in the source data.

contributing_factor_name: This column represents the primary contributing factor(s) to the crash event. The transformation involves concatenating and normalizing contributing factors from multiple source columns.

contributing_factor_code: Stores the code corresponding to each contributing factor. This is obtained by concatenating and normalizing contributing factor codes from multiple source columns.

units_involved: Represents the number of units (e.g., vehicles, pedestrians) involved in the crash event. This is obtained by concatenating and normalizing vehicle type codes from multiple source columns.

unit_count: Stores the count of units involved in each crash event. This is obtained by normalizing the "units_involved" column and performing a group-by operation on the crash ID.

pedestrian_injured: Stores the count of pedestrians injured in the crash event. pedestrian_killed:

Represents the count of pedestrians killed in the crash event.

pedestrian_involved: Represents the total count of pedestrians involved in the crash event (both injured and killed).

roadusers_involved: Represents the total count of road users involved in the crash event, including motorists, cyclists, and pedestrians.

motorist_injured: Stores the count of motorists injured in the crash event.

motorist_killed: Represents the count of motorists killed in the crash event.

cyclist_injured: Represents the count of cyclists injured in the crash event.

cyclist_killed: Stores the count of cyclists killed in the crash event.

fatal_count: Represents the total count of fatalities in the crash event, including pedestrians, cyclists, and motorists.

injury_count: Stores the total count of injuries in the crash event, including pedestrians, cyclists, and motorists.

unknown_injury_count: Represents the count of injuries with unknown severity or indication.

**Transformation Explanations:**

crash_id: No transformation is applied here; it directly maps from the source column in each city.

crash_date: The transformation involves parsing the "crash_date" from the source and merging it with the "crash_time" to create a unified datetime format in 24-hour format.

crash_time: This column is derived from parsing the "crash_date" in the source data to extract the time component.

street_number: In Austin, it uses the "street_nbr" column, and if "street_nbr_2" is null, it takes its value. In Chicago, it directly maps to the "street_no" column. For New York, there is no specific column provided.

street_name: No transformation is applied here; it directly maps from the source column.

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latitude: The transformation involves splitting the "location" column in the source data to extract the latitude information.

longitude: Similarly, this column is derived from splitting the "location" column in the source data to extract the longitude information.

contributing_factor_name: The transformation involves concatenating and normalizing contributing factors from multiple source columns.

contributing_factor_code: This column is obtained by concatenating and normalizing contributing factor codes from multiple source columns.

units_involved: It represents the number of units involved in the crash event, obtained by concatenating and normalizing vehicle type codes from multiple source columns.

unit_count: The transformation involves normalizing the "units_involved" column and performing a group-by operation on the crash ID to count the units involved.

pedestrian_injured: No transformation is applied here, it directly maps from the source column.

pedestrian_killed: Similarly, this column directly maps from the source column.

pedestrian_involved: This column represents the total count of pedestrians involved in the crash event, obtained by adding pedestrian death and serious injury counts.

roadusers_involved: Represents the total count of road users involved in the crash event, including motorists, cyclists, and pedestrians. It's obtained by adding counts of motorcycle deaths, motorcycle serious injuries, motor vehicle deaths, motor vehicle serious injuries, bicycle deaths, and bicycle serious injuries.

motorist_injured: This column represents the count of motorists injured in the crash event, obtained by adding counts of motorcycle serious injuries and motor vehicle serious injuries.

motorist_killed: Similarly, this column represents the count of motorists killed in the crash event, obtained by adding counts of motorcycle deaths and motor vehicle deaths.

cyclist_injured: Represents the count of cyclists injured in the crash event, obtained from the count of bicycle serious injuries.

cyclist_killed: Similarly, this column represents the count of cyclists killed in the crash event, obtained from the count of bicycle deaths.

fatal_count: This column represents the total count of fatalities in the crash event, including pedestrians, cyclists, and motorists. It's obtained by summing up various death counts from different sources.

injury_count: Represents the total count of injuries in the crash event, including pedestrians, cyclists, and motorists. It's obtained by summing up various serious injury counts from different sources.

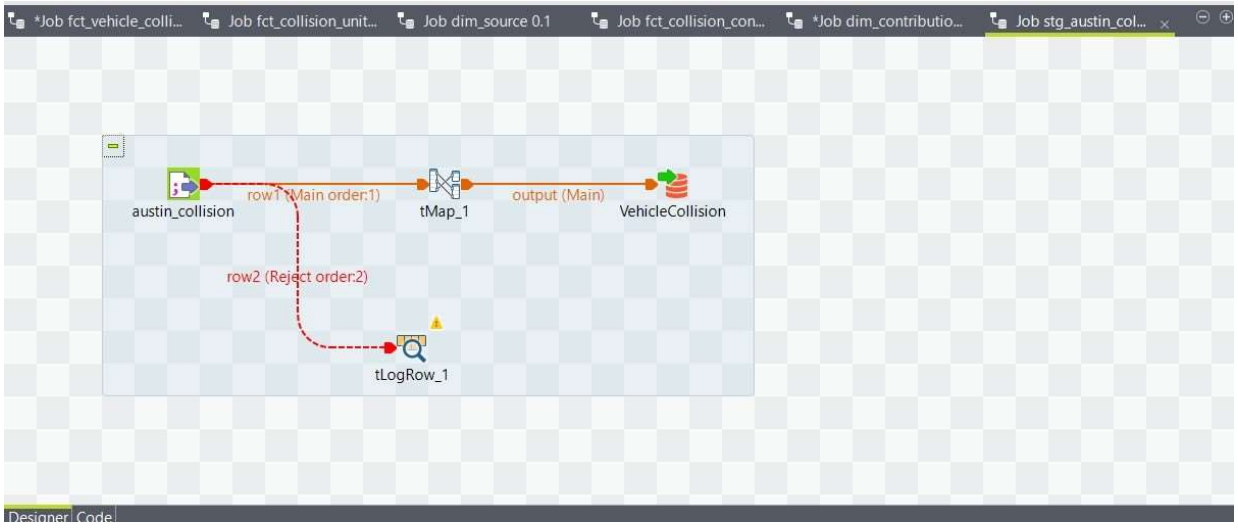
unknown_injury_count: Represents the count of injuries with unknown severity or indication, obtained by merging multiple columns indicating different types of unknown injuries.

**NULL values:**
Regarding the Null values, we will be handling it during visualization as we will be getting a clear picture of the null count.

## Part 2 :

### 1) Loading data into stage table and their row counts

Stg_Austin:



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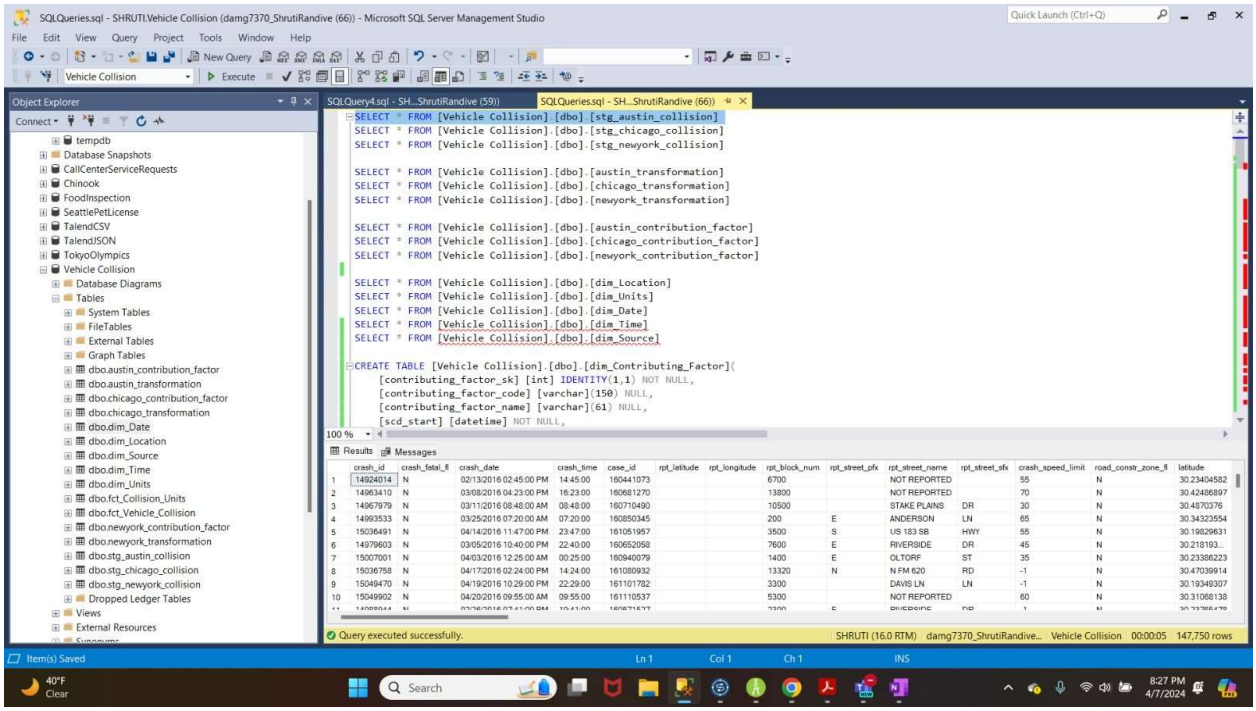
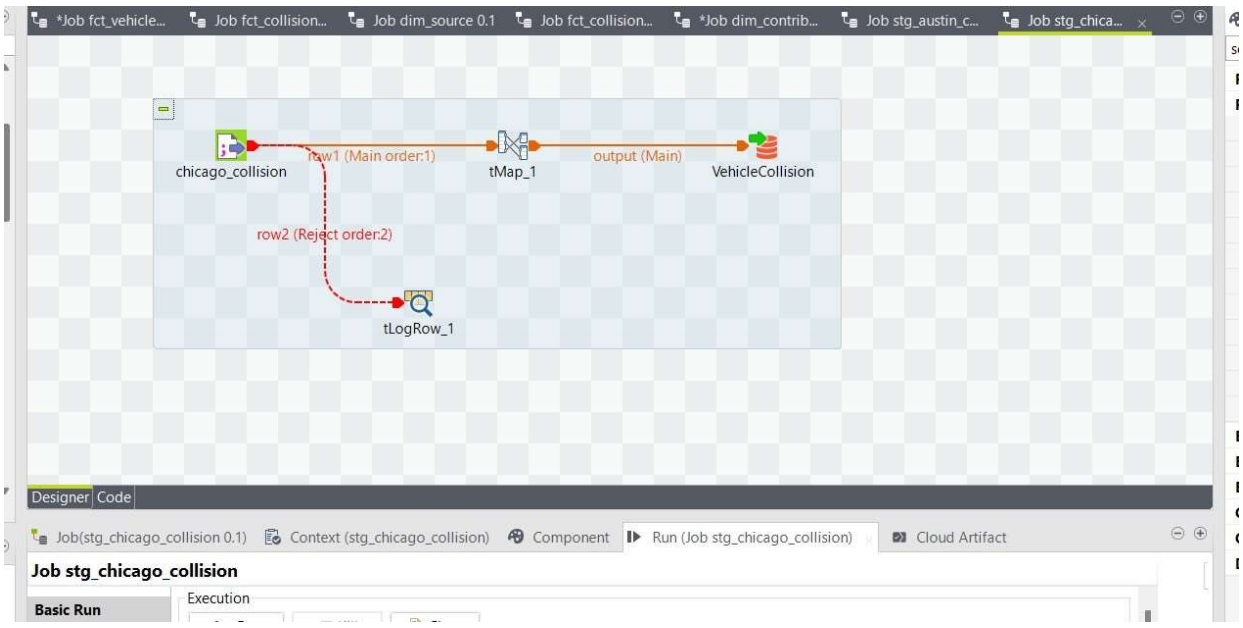



Stg_Chicago:



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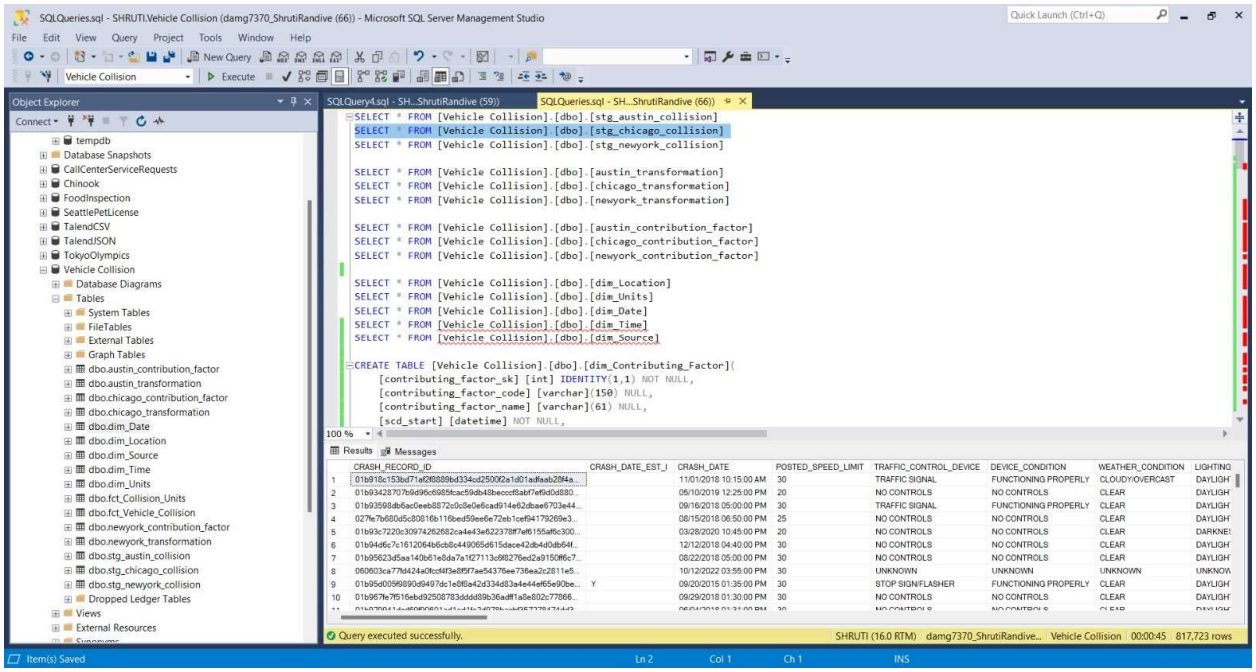
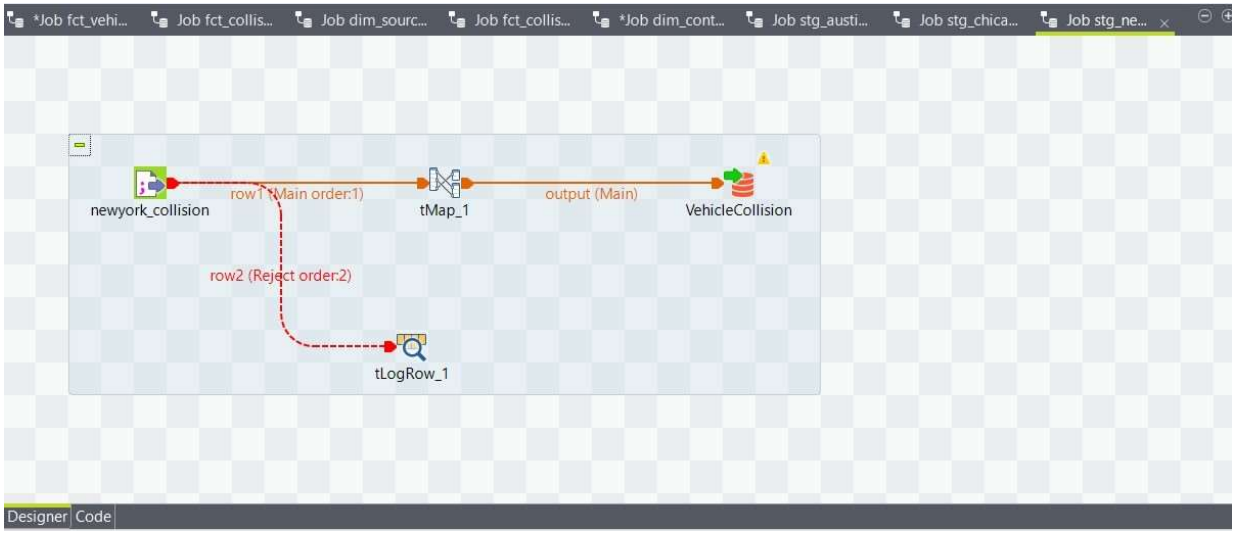



Stg_NewYork:



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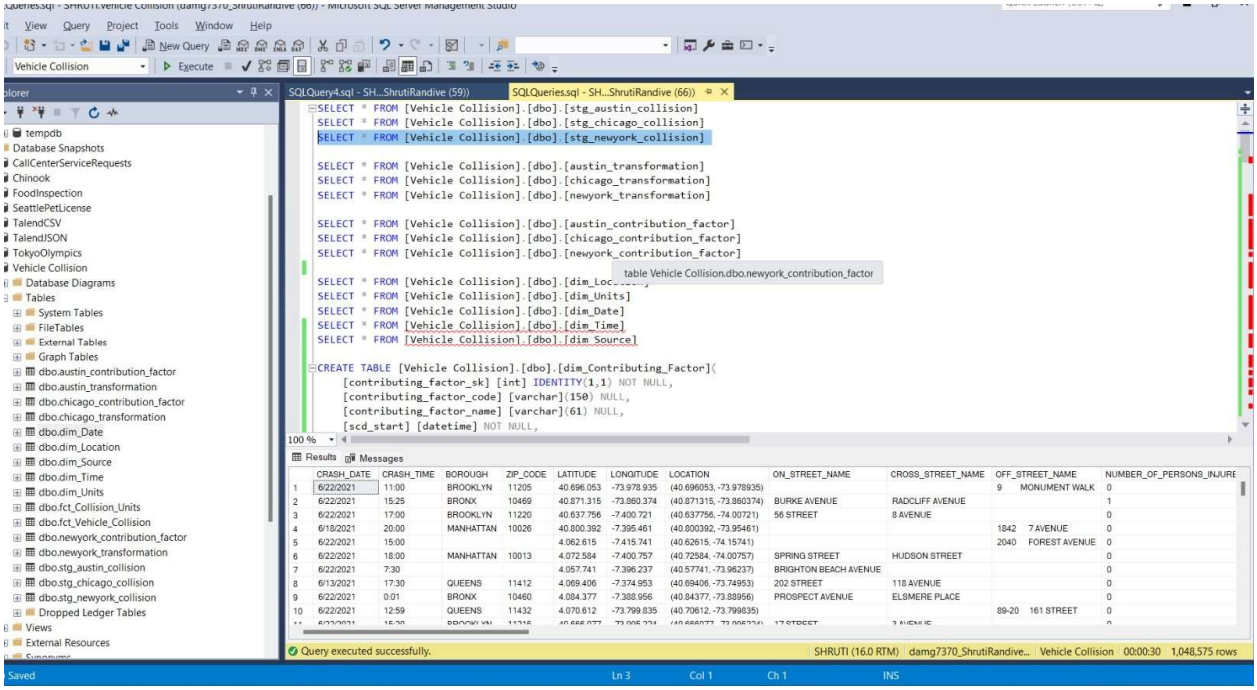
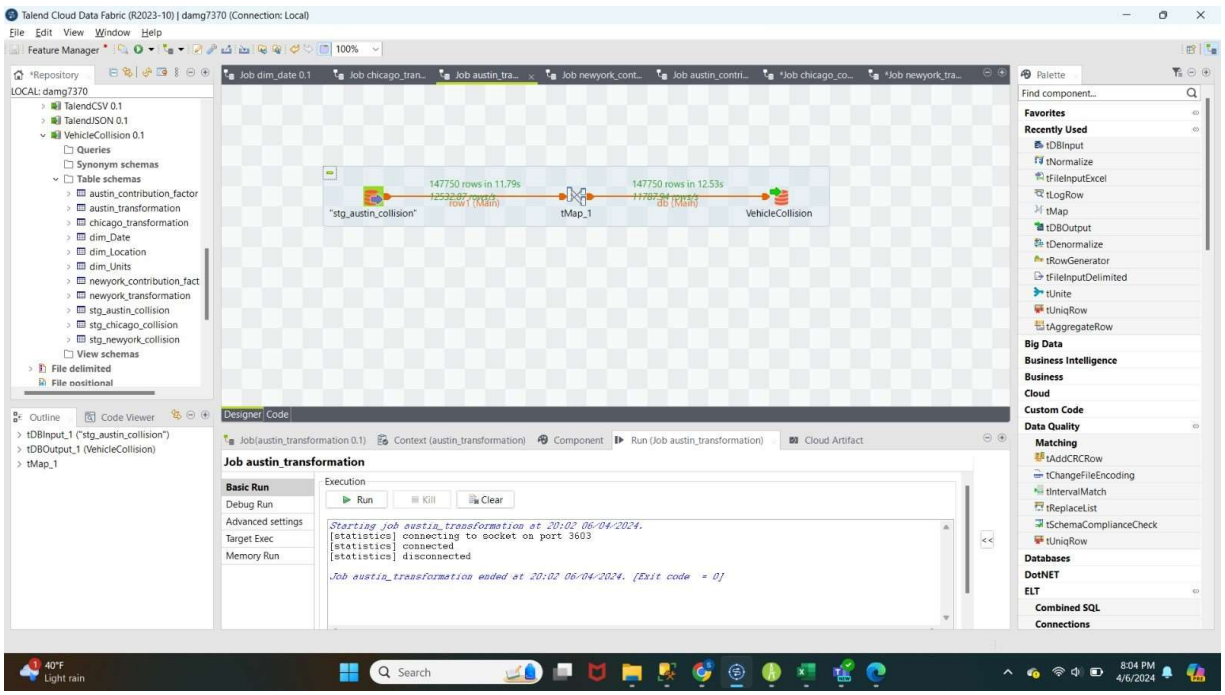



## 2) Loading the transformed data

We did transformation workflows for all the three dataset i.e. Austin, Chicago and New york. Below are the screenshots of the workflows.



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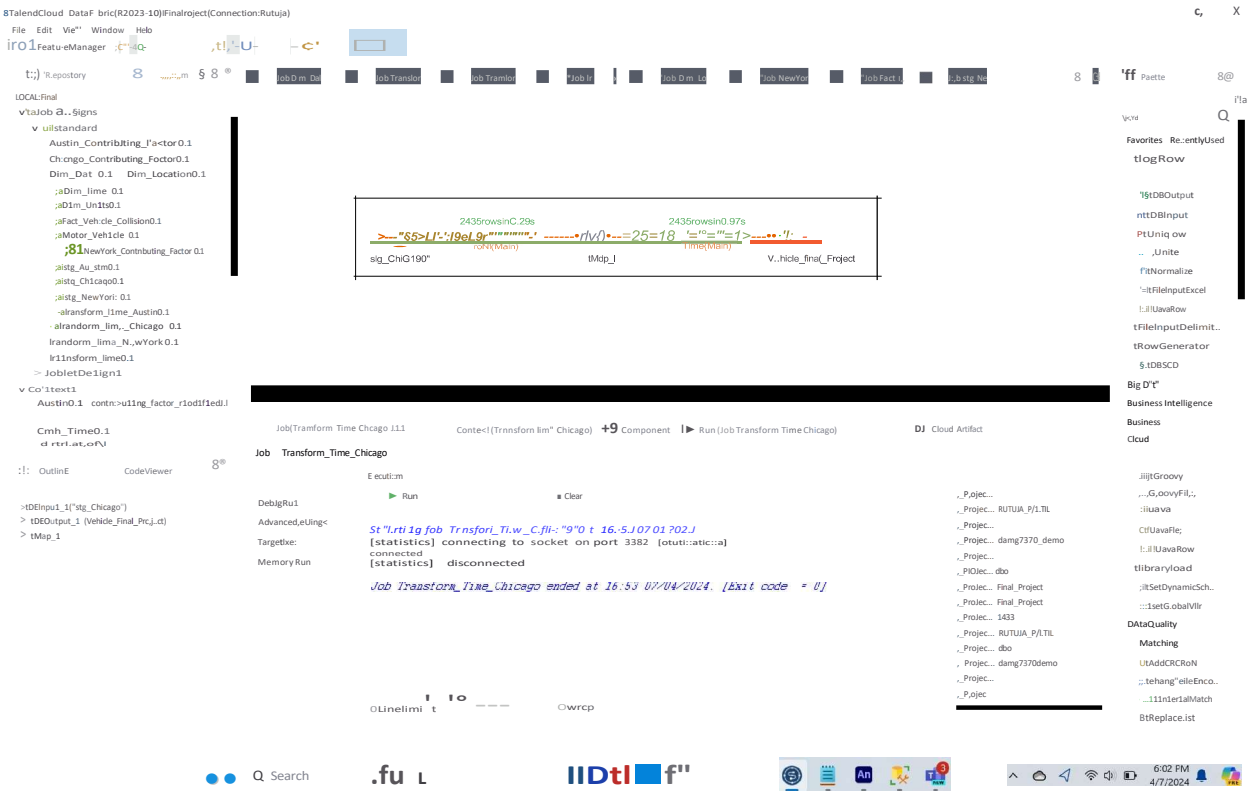


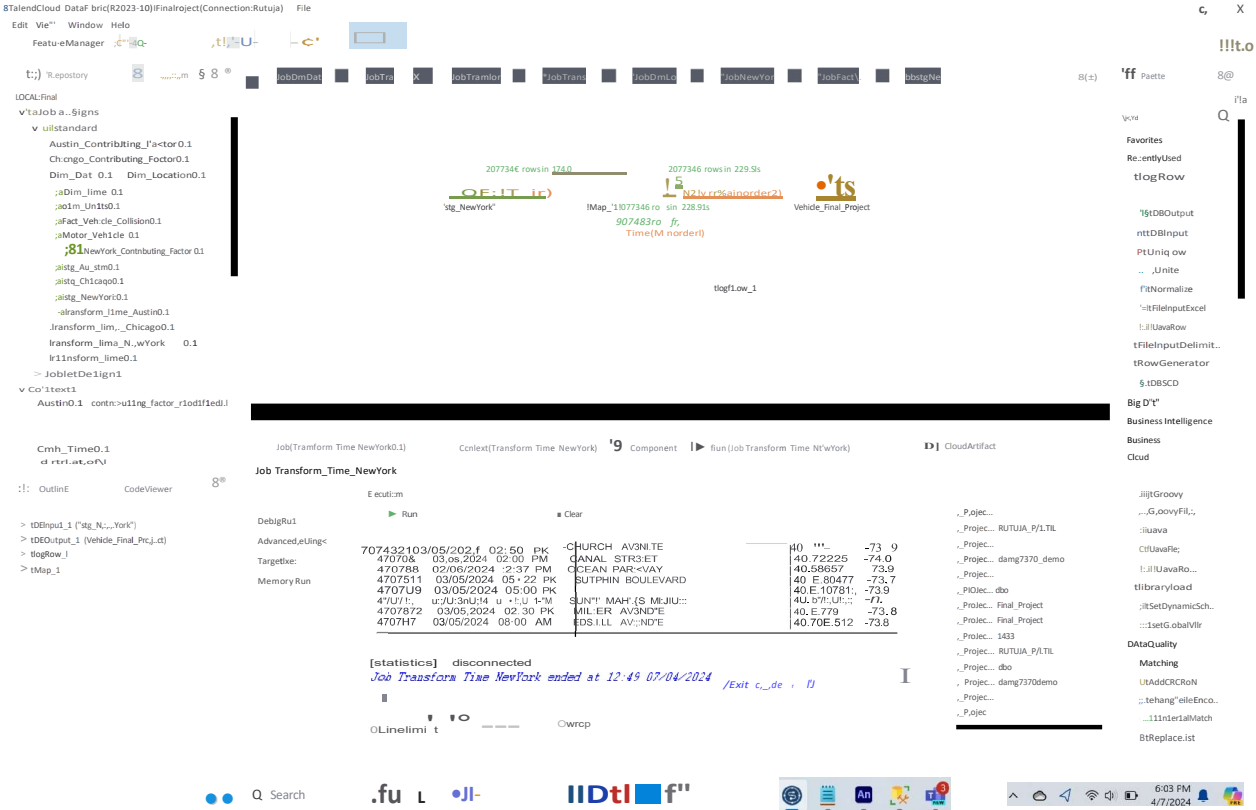

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## 4)ETL for loading Dimensional tables:

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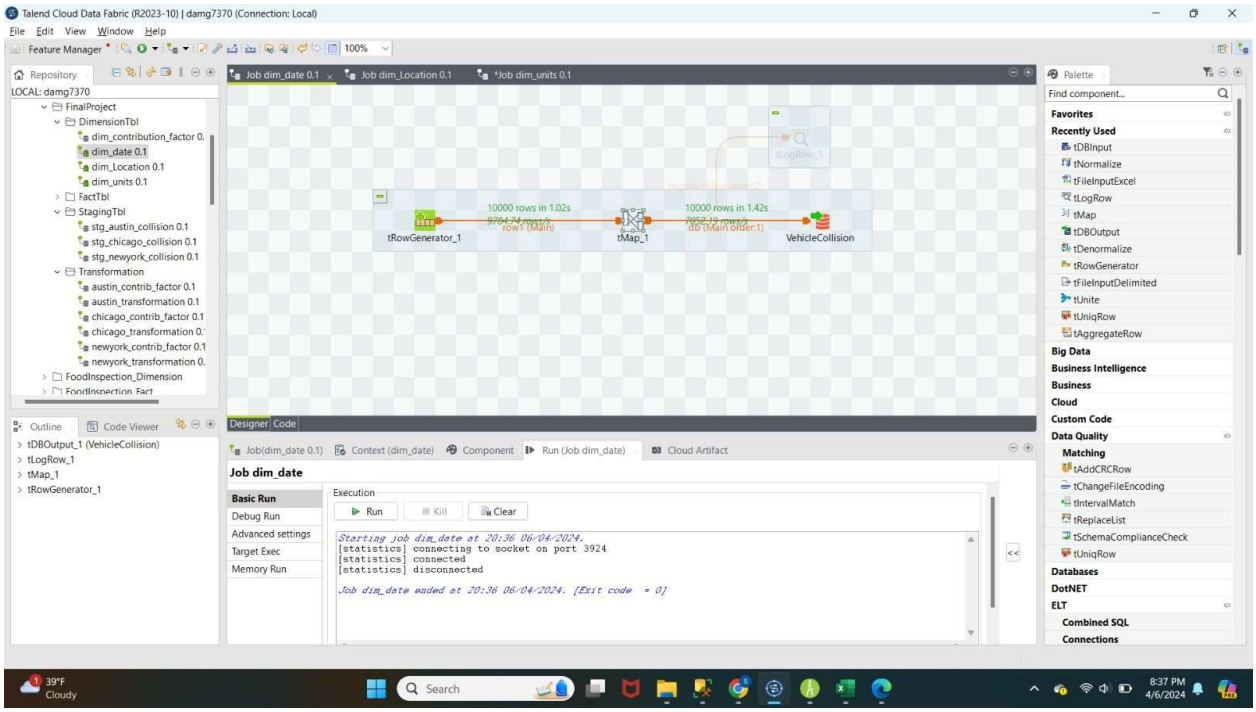


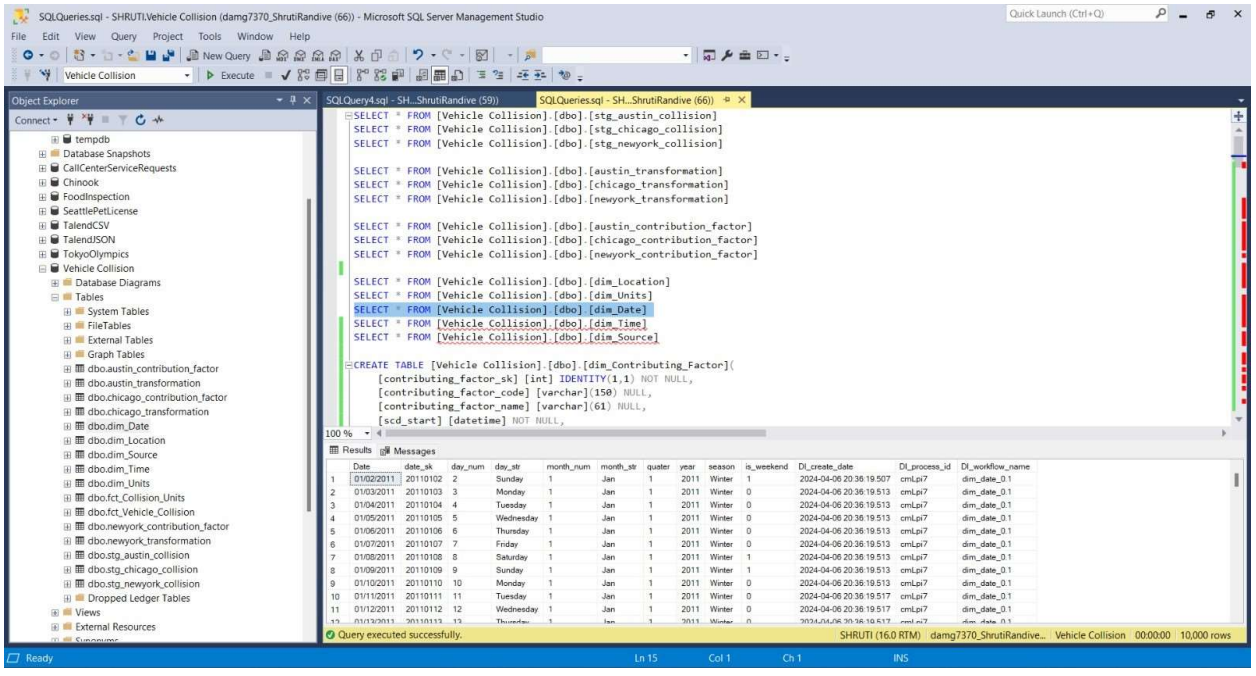

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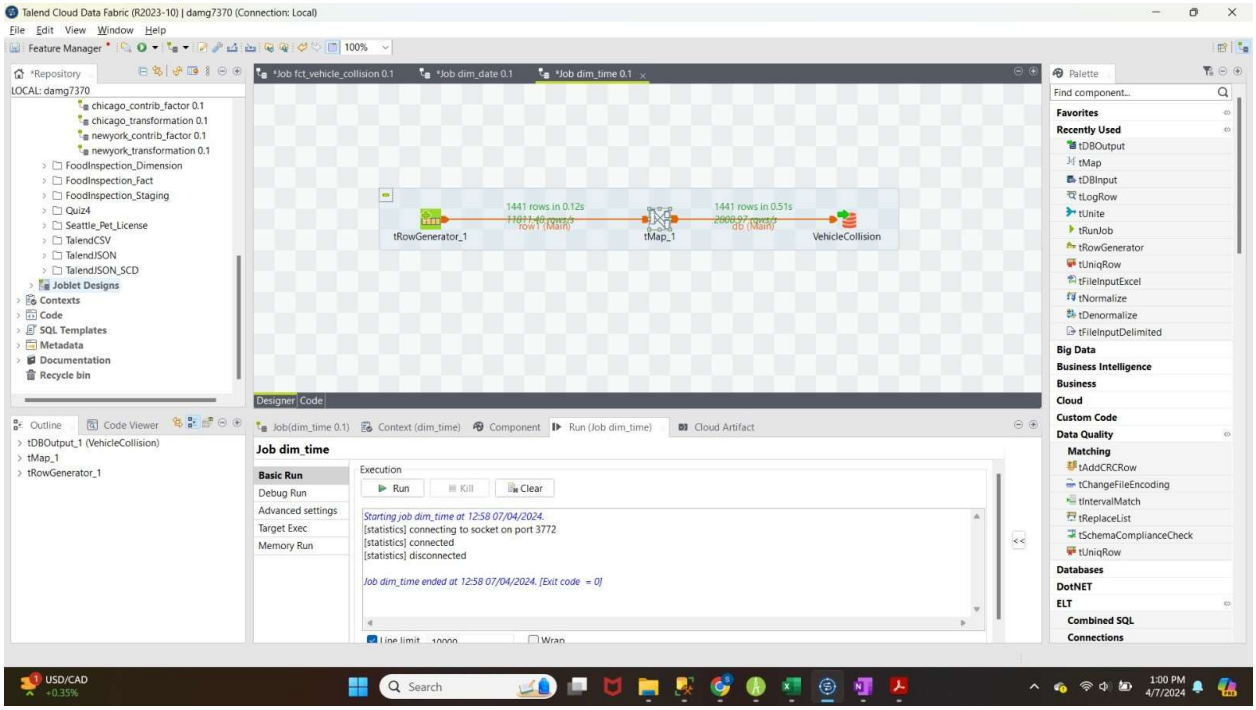
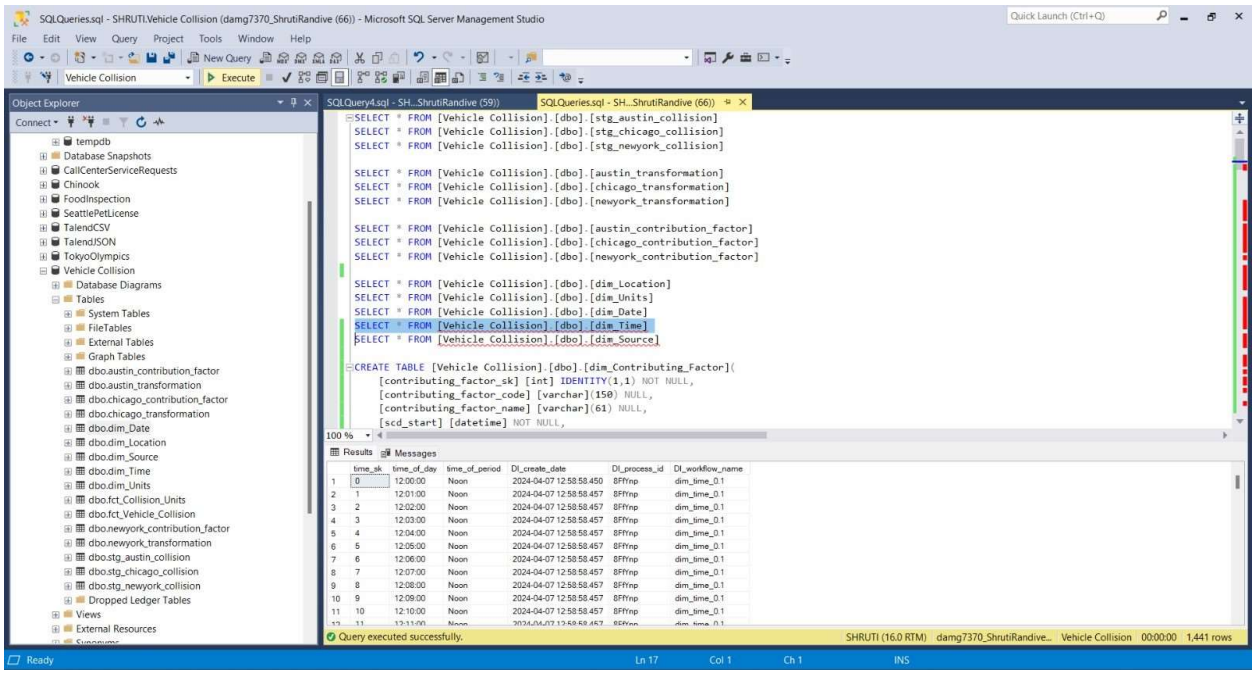
Dim_Time:



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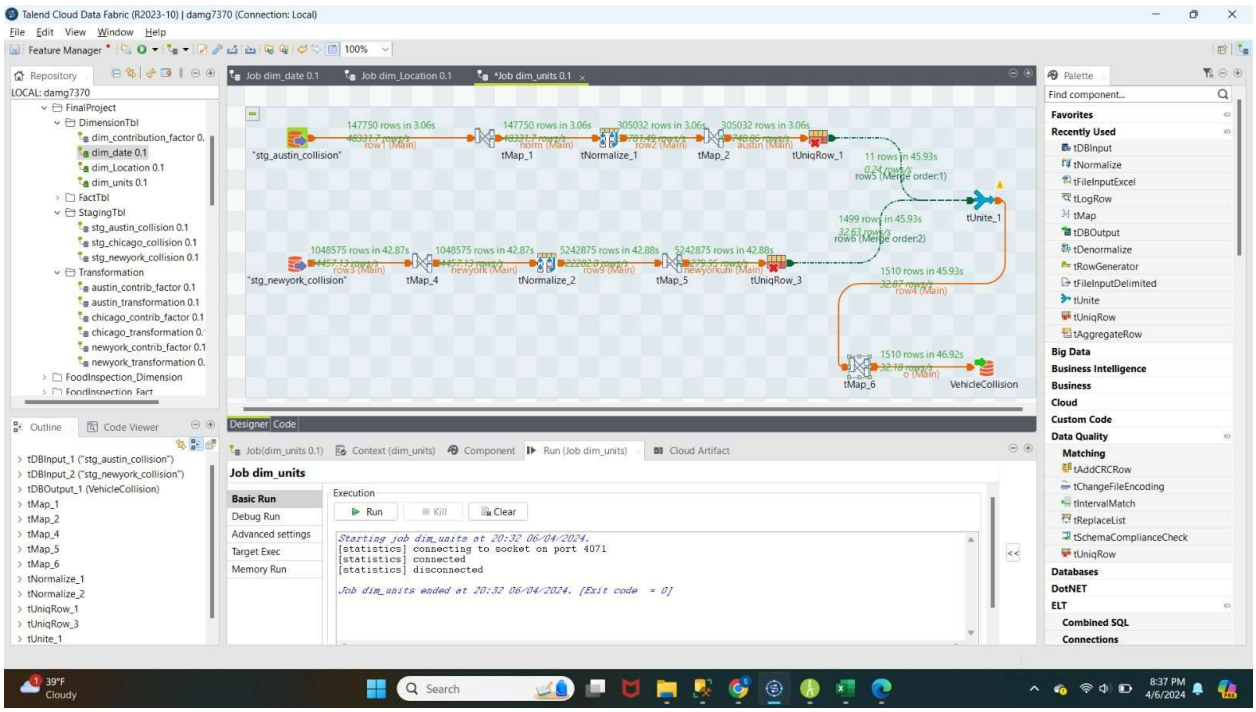


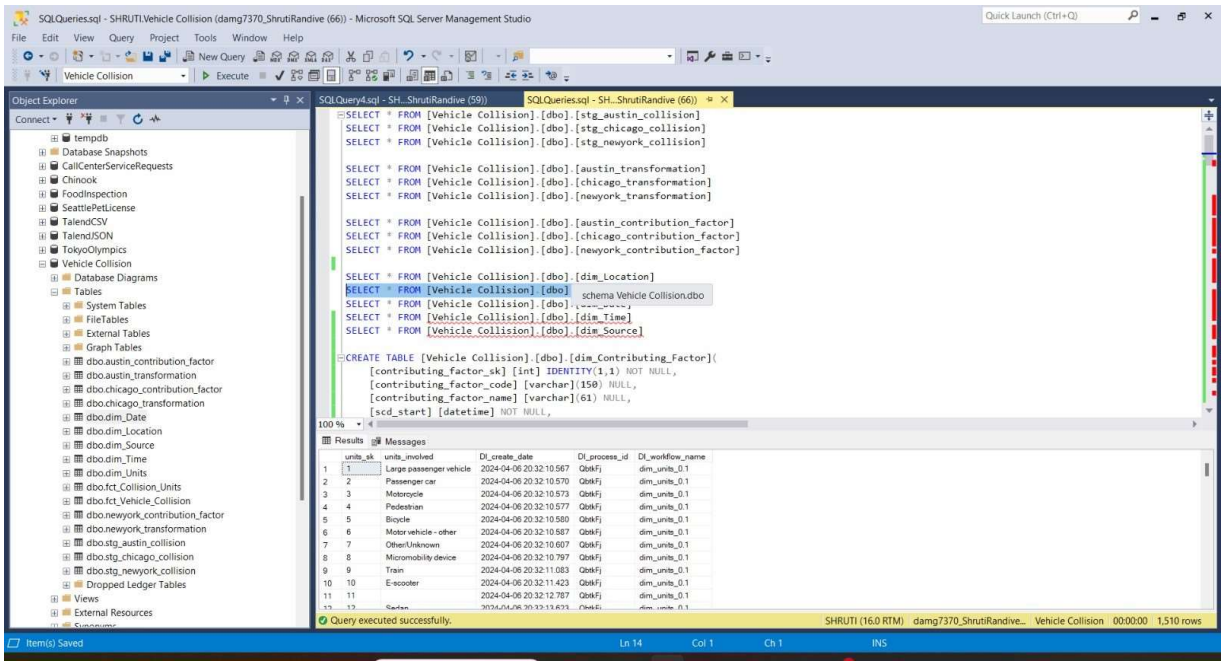

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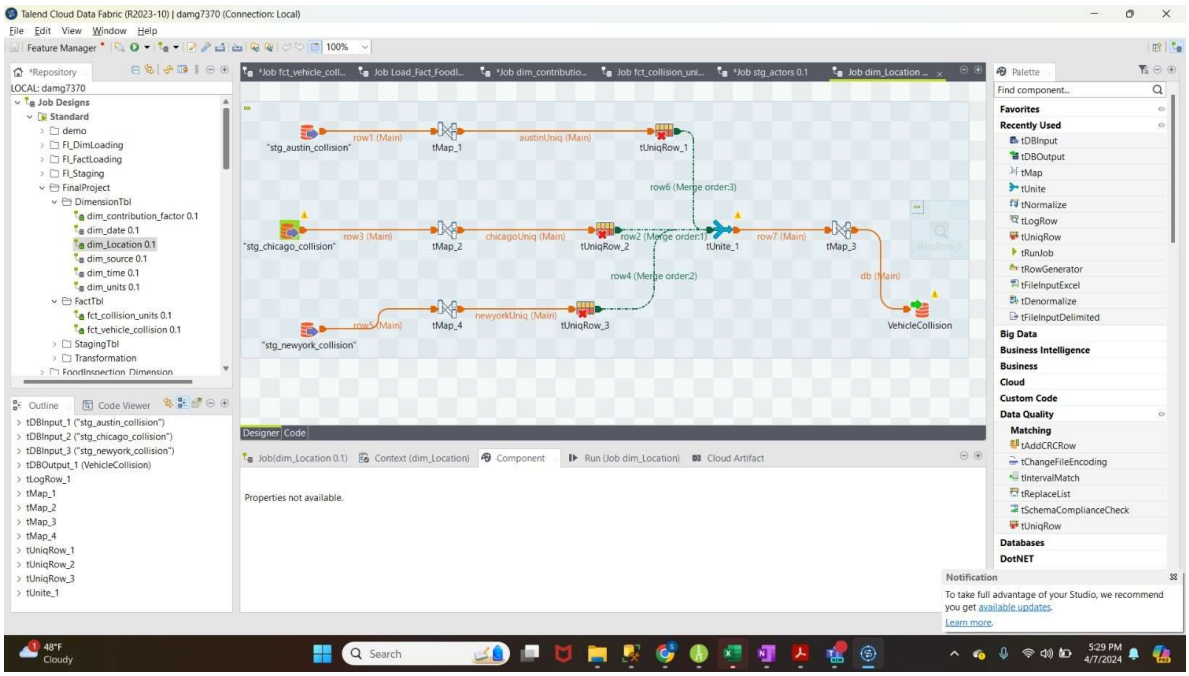


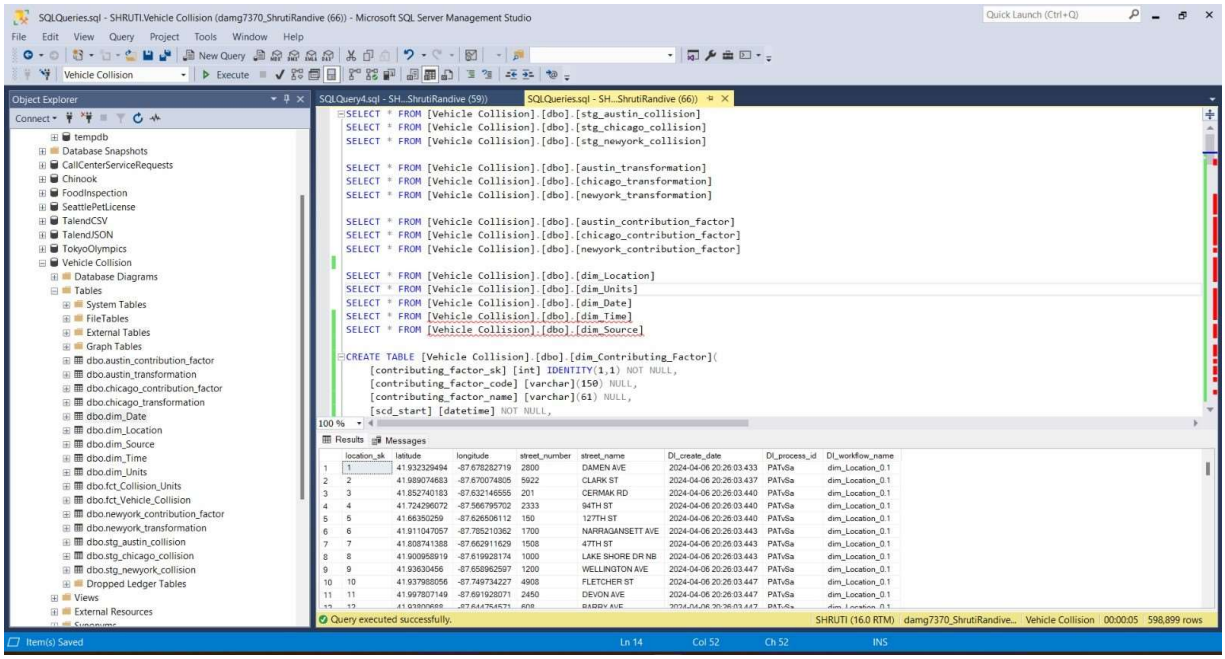

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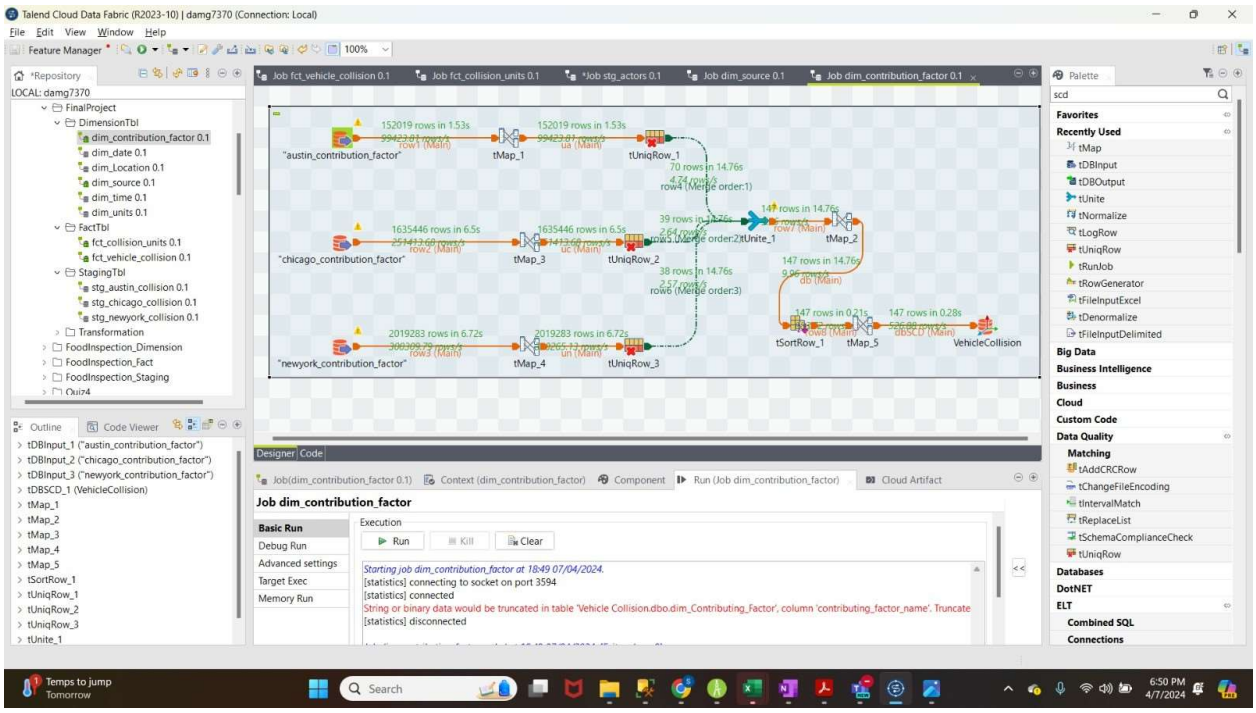
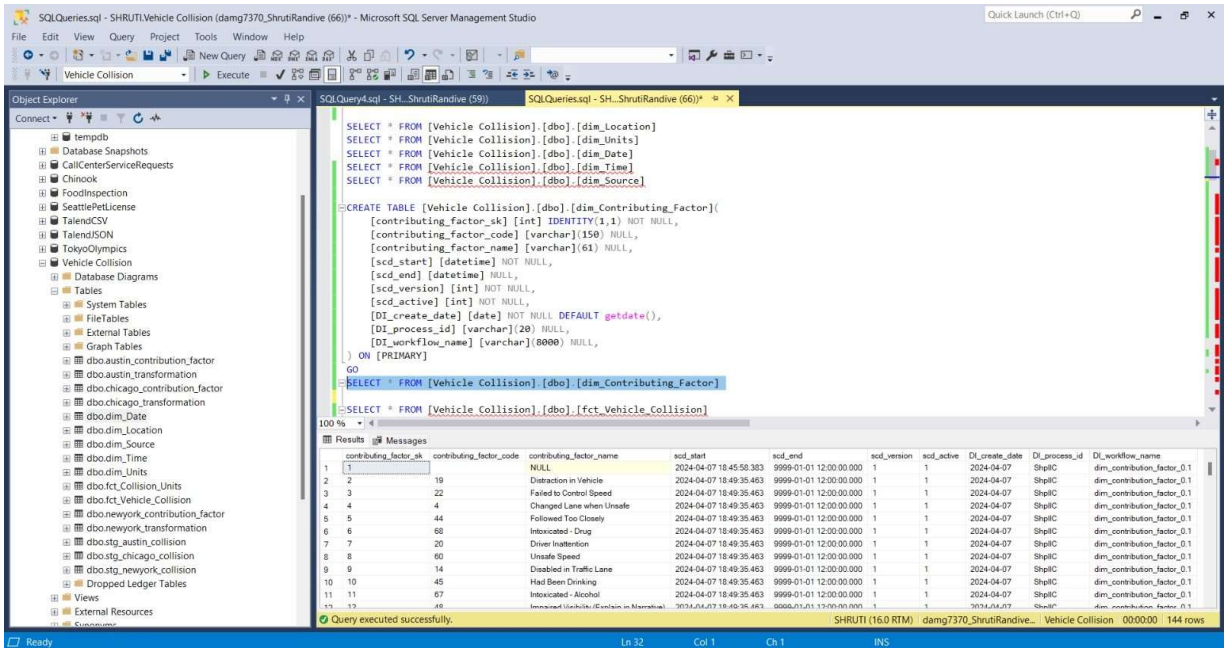
Dim_Contributing_Factor:

We did Contributing_Factor workflows for all the three dataset i.e. Austin, Chicago and New york. This is our SCD type 2, columns are added as required.



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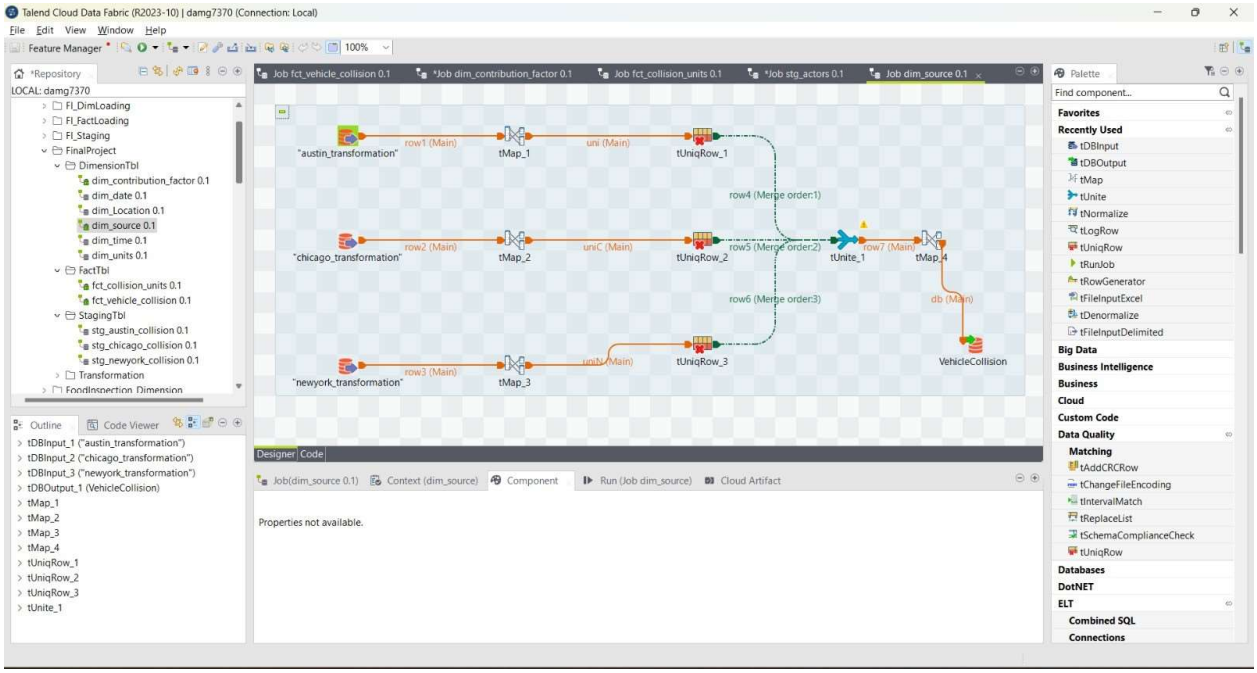
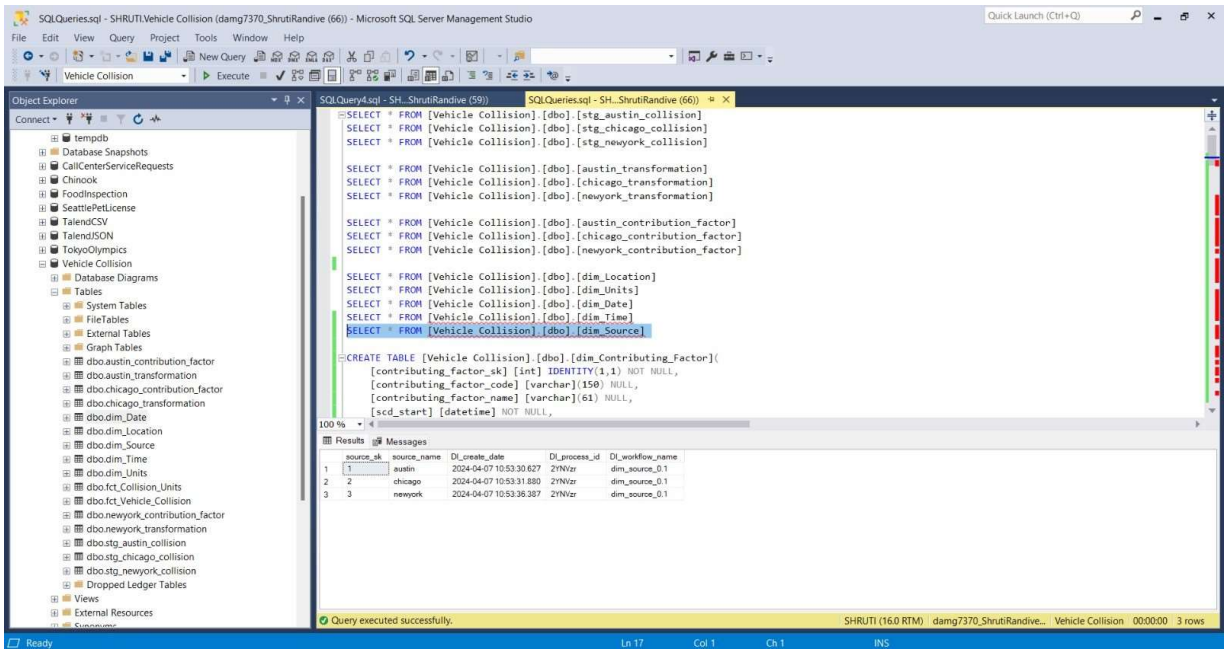
Dim_Source:



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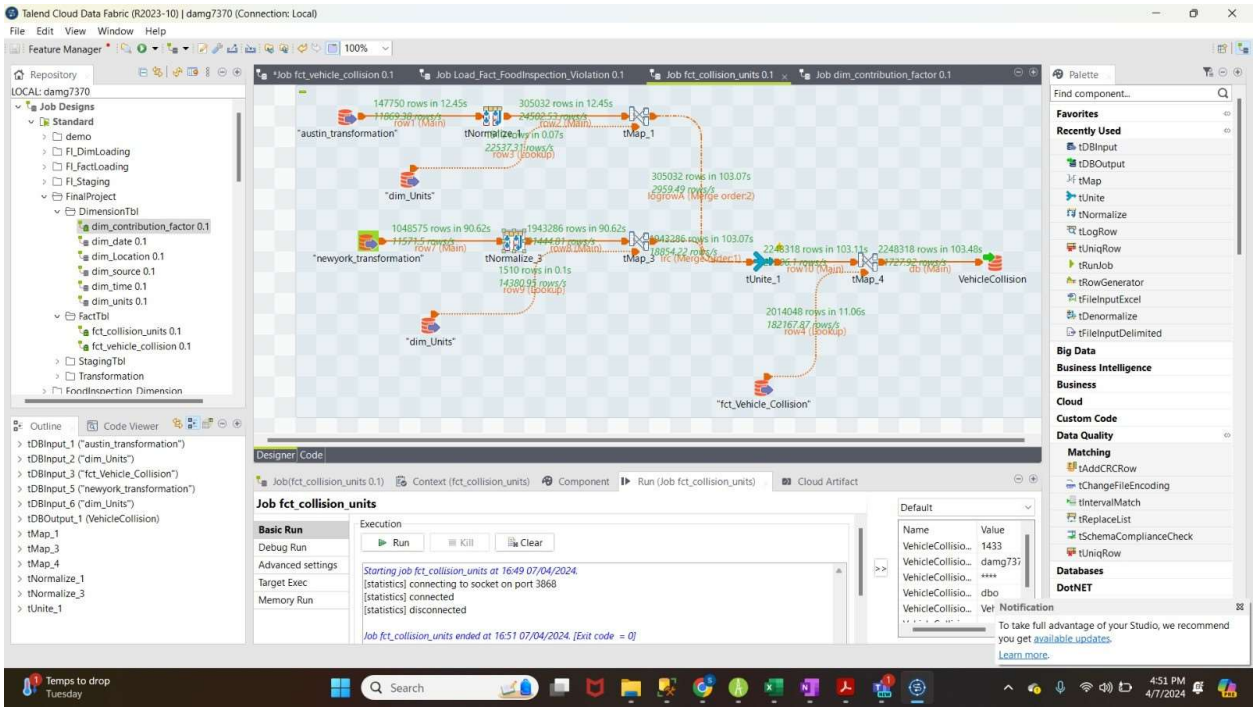
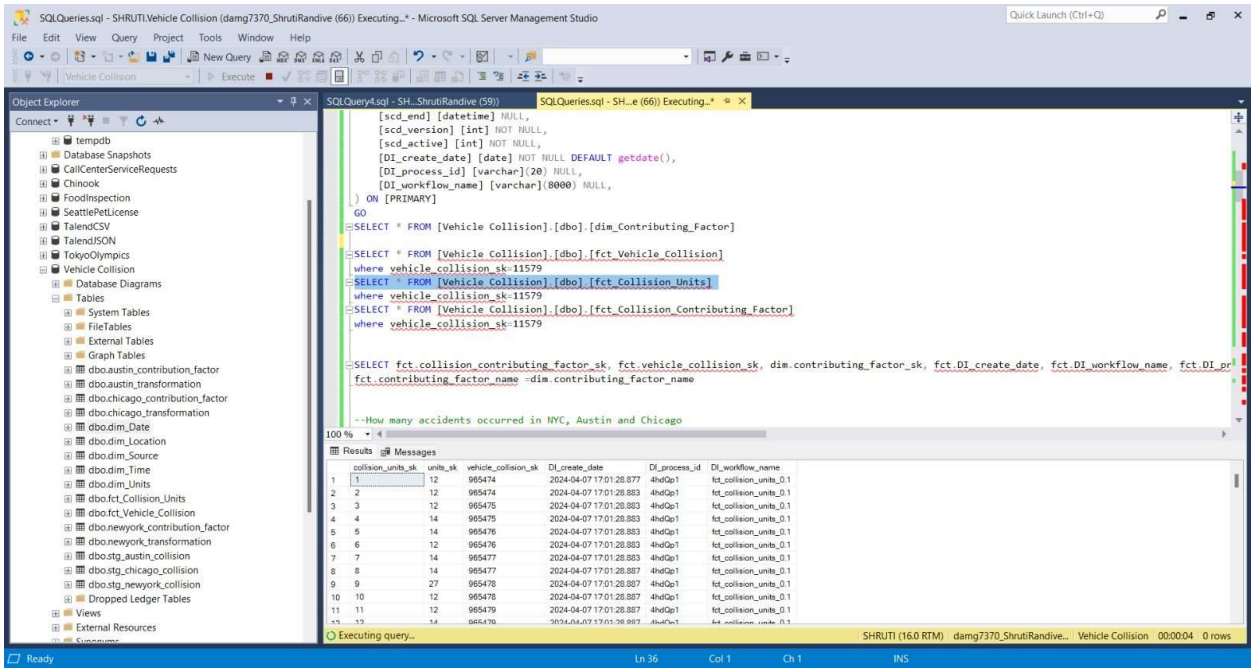
## 4)Fact Tables

Fact_Collision_Units



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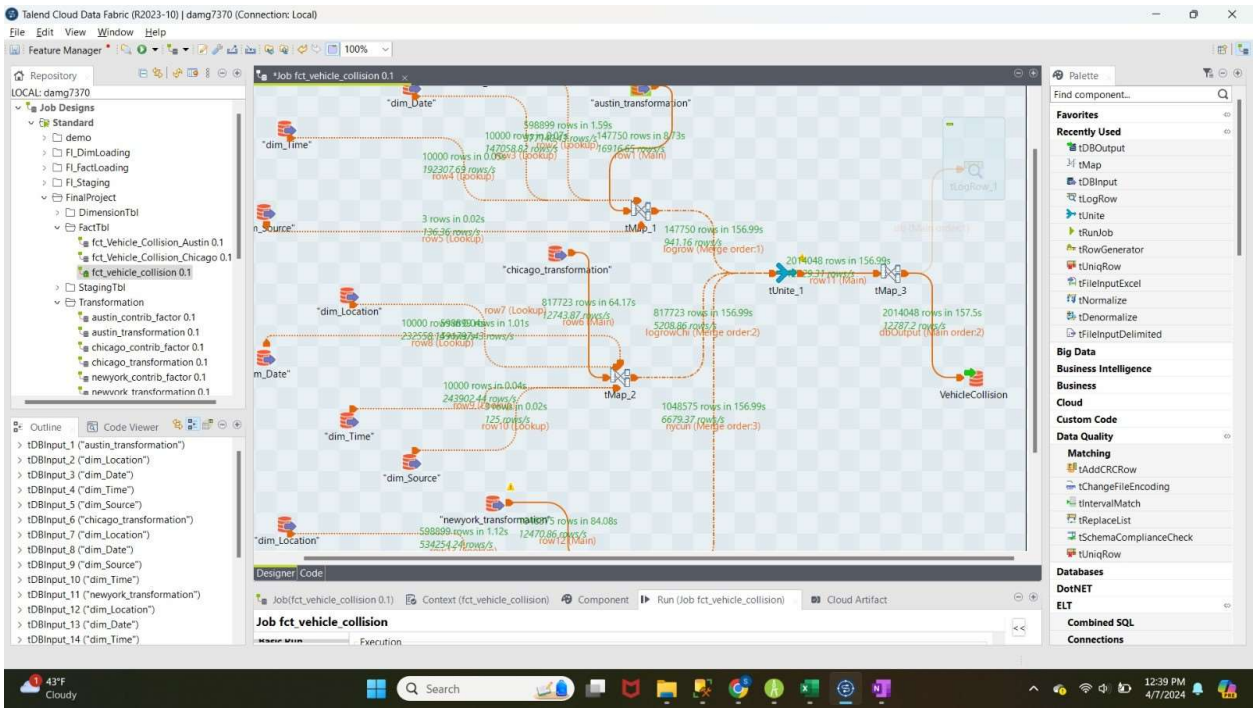
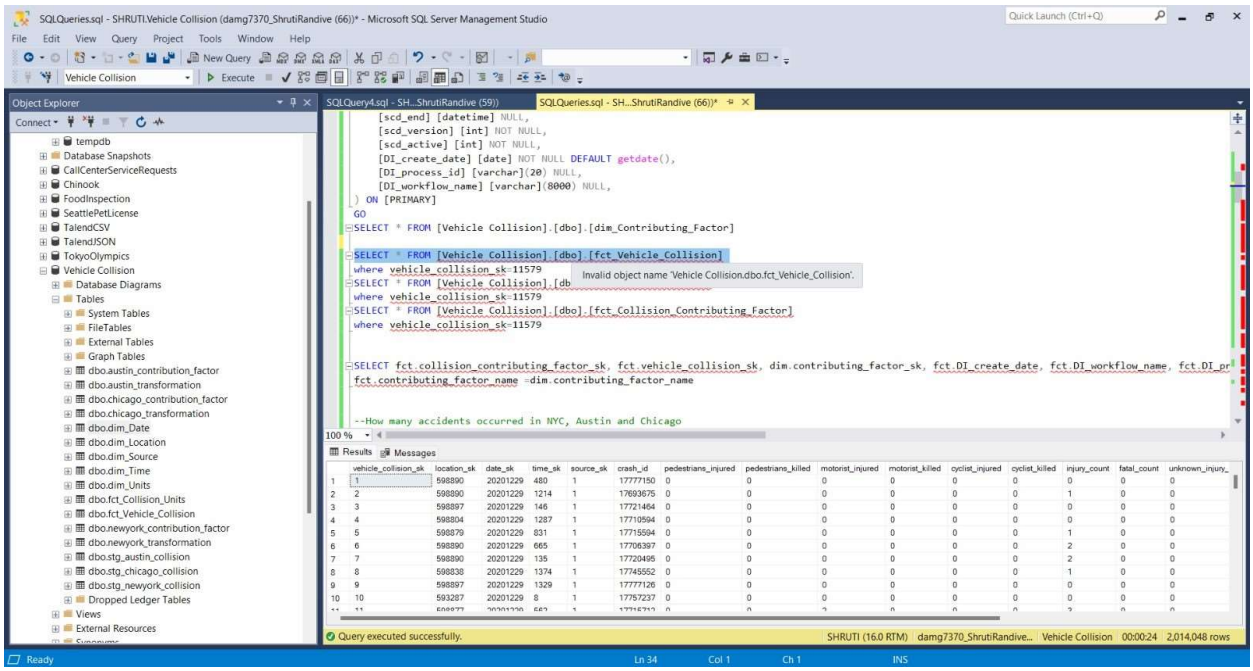
# Fact_Vehicle_Collision



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# Fact_Collision_Contribution_Factor