# Introduction

The City of Melbourne has made available the dataset with hourly pedestrian Count from sensors deployed across the city. The dataset contains the hourly pedestrian count since year 2009. The analysis should be done on the dataset to produce following statistics:

1. Top 10 (most pedestrians) locations by day
2. Top 10 (most pedestrians) locations by month
3. Location that has shown most decline due to lockdowns in last 2 years
4. Location that has most growth in last year

# Approach

For the purpose of this coding test, the analysis was done on the source file using Python. The file was read and loaded into Python Pandas Dataframe. Pandas Dataframe capability used to derive the required statistics.

# DQ Issue

During data profiling of the data, below data quality issue identified:

* Distinct value count of Sensor ID and Sensor Name didn’t match
  + Further investigation found that for some Sensor IDs multiple variants of the Sensor Name exist in the data set
  + In order to fix this data quality issue, the Sensor Names were standardised for those Sensor IDs

Refer to the Jupyter notebook link for the code and outcome of the data profiling that identified the DQ issue:

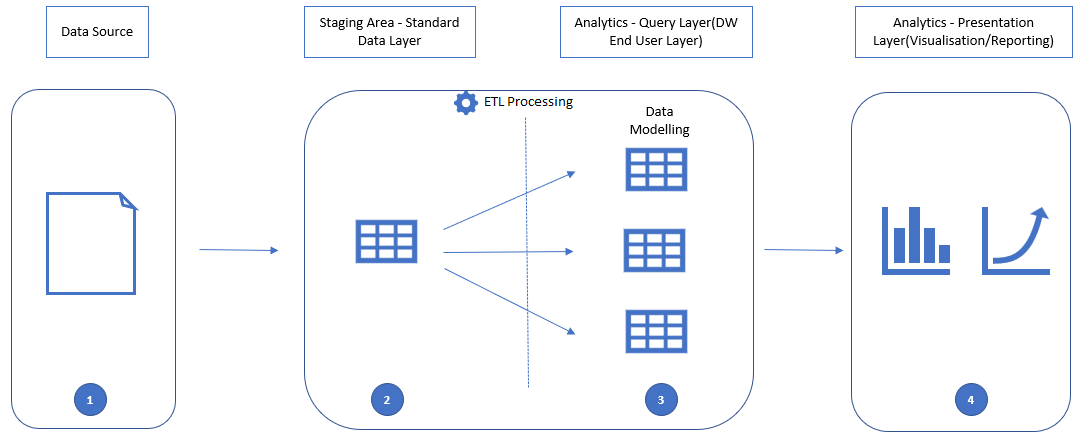
* [data-analytics/Pedestrian\_Counting\_System\_DataProfiling.ipynb at main · rameshpachamuthu80/data-analytics (github.com)](https://github.com/rameshpachamuthu80/data-analytics/blob/main/Pedestrian_Counting_System_DataProfiling.ipynb)

# Proposed Future State Architecture

The following considerations have been made to propose the architecture:

* Hourly pedestrian count source data available in CSV flat file format in file landing area
* Source file will contain the entire history of the sensor reading data

## Data Flow Architecture



The brief summary of the above data flow architecture

1. Ingestion Layer: The source data made available in a file landing area ready for data ingestion
2. Standard Data Layer: Source data ingested and loaded into this staging area. Data stored in source/raw format with no transformation
3. Data warehouse Layer: In this layer where data from standard data layer (staging area) were read, processed and stored in a meaningful conformed dimension, facts, measures and business logic applied
4. Presentation Layer: which consumes warehouse dimensions and facts for reporting and analytics

# Expected Outputs

## 1.Top 10 (most pedestrians) locations by day

|  |  |
| --- | --- |
| Top 10 pedestrian count by days: For Sunday |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 18,172,940 |
| Melbourne Central | 15,659,936 |
| Princes Bridge | 15,588,544 |
| Bourke Street Mall (North) | 13,719,617 |
| Bourke Street Mall (South) | 13,474,209 |
| Flinders Street Station Underpass | 13,016,524 |
| Flinders St-Elizabeth St (East) | 9,225,154 |
| Southbank | 9,199,517 |
| The Arts Centre | 8,963,423 |
| State Library | 8,931,922 |
|  |  |
| Top 10 pedestrian count by days: For Monday |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 19,272,251 |
| Flinders Street Station Underpass | 17,820,508 |
| Melbourne Central | 15,661,642 |
| Bourke Street Mall (South) | 14,738,561 |
| Princes Bridge | 14,581,093 |
| Bourke Street Mall (North) | 14,281,681 |
| Spencer St-Collins St (North) | 11,849,061 |
| Flinders St-Elizabeth St (East) | 11,537,518 |
| State Library | 10,339,353 |
| Flagstaff Station | 9,654,896 |
|  |  |
| Top 10 pedestrian count by days: For Tuesday |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 19,457,168 |
| Flinders Street Station Underpass | 18,537,064 |
| Melbourne Central | 16,161,824 |
| Bourke Street Mall (South) | 14,480,606 |
| Princes Bridge | 14,460,721 |
| Bourke Street Mall (North) | 14,337,781 |
| Spencer St-Collins St (North) | 12,623,319 |
| Flinders St-Elizabeth St (East) | 11,864,474 |
| State Library | 10,617,852 |
| Flagstaff Station | 10,430,342 |
|  |  |
| Top 10 pedestrian count by days: For Wednesday | |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 20,360,823 |
| Flinders Street Station Underpass | 19,083,684 |
| Melbourne Central | 16,753,294 |
| Princes Bridge | 15,665,642 |
| Bourke Street Mall (South) | 15,396,248 |
| Bourke Street Mall (North) | 15,112,531 |
| Spencer St-Collins St (North) | 13,004,087 |
| Flinders St-Elizabeth St (East) | 12,031,778 |
| State Library | 11,000,867 |
| Flagstaff Station | 10,553,562 |
|  |  |
| Top 10 pedestrian count by days: For Thursday | |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 21,187,600 |
| Flinders Street Station Underpass | 19,496,066 |
| Melbourne Central | 17,114,784 |
| Bourke Street Mall (South) | 16,378,446 |
| Bourke Street Mall (North) | 16,037,716 |
| Princes Bridge | 15,776,348 |
| Spencer St-Collins St (North) | 13,007,689 |
| Flinders St-Elizabeth St (East) | 12,088,848 |
| State Library | 11,091,657 |
| Southern Cross Station | 10,465,545 |
|  |  |
| Top 10 pedestrian count by days: For Friday |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 24,393,876 |
| Flinders Street Station Underpass | 21,320,727 |
| Melbourne Central | 19,993,700 |
| Bourke Street Mall (South) | 18,881,248 |
| Princes Bridge | 18,484,231 |
| Bourke Street Mall (North) | 18,445,974 |
| Spencer St-Collins St (North) | 13,058,283 |
| Flinders St-Elizabeth St (East) | 12,619,633 |
| State Library | 12,265,360 |
| Southbank | 11,080,180 |
|  |  |
| Top 10 pedestrian count by days: For Saturday | |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 22,499,236 |
| Melbourne Central | 19,171,957 |
| Princes Bridge | 18,369,336 |
| Bourke Street Mall (South) | 17,095,304 |
| Bourke Street Mall (North) | 16,862,095 |
| Flinders Street Station Underpass | 15,417,211 |
| Southbank | 11,062,405 |
| State Library | 10,673,040 |
| Flinders St-Elizabeth St (East) | 10,583,641 |
| The Arts Centre | 9,883,781 |

## 2.Top 10 (most pedestrians) locations by month

|  |  |
| --- | --- |
| Top 10 pedestrian count by months: For January |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,967,639 |
| Princes Bridge | 10,796,073 |
| Flinders Street Station Underpass | 10,279,628 |
| Bourke Street Mall (South) | 9,106,886 |
| Melbourne Central | 8,433,264 |
| Bourke Street Mall (North) | 8,136,291 |
| Flinders St-Elizabeth St (East) | 6,307,184 |
| Southbank | 6,279,974 |
| The Arts Centre | 6,214,671 |
| Spencer St-Collins St (North) | 6,096,117 |
|  |  |
| Top 10 pedestrian count by months: For-February |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,156,945 |
| Flinders Street Station Underpass | 10,292,516 |
| Princes Bridge | 9,493,960 |
| Melbourne Central | 9,004,266 |
| Bourke Street Mall (North) | 8,335,328 |
| Bourke Street Mall (South) | 8,134,134 |
| Spencer St-Collins St (North) | 6,591,467 |
| Flinders St-Elizabeth St (East) | 6,547,085 |
| State Library | 5,708,978 |
| The Arts Centre | 5,657,723 |
|  |  |
| Top 10 pedestrian count by months: For-March |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 12,655,259 |
| Melbourne Central | 11,737,486 |
| Flinders Street Station Underpass | 11,419,121 |
| Princes Bridge | 11,001,403 |
| Bourke Street Mall (North) | 9,643,824 |
| Bourke Street Mall (South) | 9,017,586 |
| Flinders St-Elizabeth St (East) | 7,566,831 |
| Spencer St-Collins St (North) | 7,149,300 |
| State Library | 7,091,544 |
| Southbank | 5,930,487 |
|  |  |
| Top 10 pedestrian count by months: For-April |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 12,463,968 |
| Melbourne Central | 10,862,976 |
| Princes Bridge | 10,660,422 |
| Flinders Street Station Underpass | 10,135,936 |
| Bourke Street Mall (North) | 9,194,871 |
| Bourke Street Mall (South) | 8,815,472 |
| Flinders St-Elizabeth St (East) | 7,561,340 |
| Spencer St-Collins St (North) | 6,215,026 |
| State Library | 6,159,571 |
| The Arts Centre | 6,090,009 |
|  |  |
| Top 10 pedestrian count by months: For-May |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,591,495 |
| Flinders Street Station Underpass | 10,787,077 |
| Melbourne Central | 10,615,667 |
| Bourke Street Mall (North) | 9,774,547 |
| Princes Bridge | 9,561,337 |
| Bourke Street Mall (South) | 8,901,477 |
| Flinders St-Elizabeth St (East) | 7,592,610 |
| State Library | 6,580,684 |
| Spencer St-Collins St (North) | 6,009,446 |
| Southbank | 5,862,252 |
|  |  |
| Top 10 pedestrian count by months: For-June |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,934,368 |
| Melbourne Central | 10,287,904 |
| Flinders Street Station Underpass | 9,867,379 |
| Bourke Street Mall (North) | 9,455,301 |
| Princes Bridge | 8,997,795 |
| Bourke Street Mall (South) | 8,818,621 |
| Flinders St-Elizabeth St (East) | 6,549,459 |
| Spencer St-Collins St (North) | 6,139,724 |
| State Library | 5,463,552 |
| Southbank | 5,242,526 |
|  |  |
| Top 10 pedestrian count by months: For-July |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 12,555,809 |
| Melbourne Central | 11,224,490 |
| Flinders Street Station Underpass | 10,808,119 |
| Bourke Street Mall (North) | 9,677,482 |
| Bourke Street Mall (South) | 9,499,308 |
| Princes Bridge | 9,159,764 |
| Spencer St-Collins St (North) | 6,588,137 |
| State Library | 6,434,716 |
| Southbank | 5,903,894 |
| Flinders St-Elizabeth St (East) | 5,883,997 |
|  |  |
| Top 10 pedestrian count by months: For-August |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,675,587 |
| Melbourne Central | 10,477,135 |
| Flinders Street Station Underpass | 9,214,815 |
| Bourke Street Mall (North) | 8,299,742 |
| Bourke Street Mall (South) | 8,282,631 |
| Princes Bridge | 7,861,189 |
| State Library | 6,404,288 |
| Spencer St-Collins St (North) | 5,933,432 |
| Flinders St-Elizabeth St (East) | 4,805,402 |
| Flagstaff Station | 4,648,096 |
|  |  |
| Top 10 pedestrian count by months: For-September |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,475,209 |
| Melbourne Central | 9,902,555 |
| Flinders Street Station Underpass | 9,602,620 |
| Bourke Street Mall (South) | 8,286,561 |
| Bourke Street Mall (North) | 8,192,967 |
| Princes Bridge | 7,823,066 |
| Flinders St-Elizabeth St (East) | 6,435,942 |
| State Library | 6,321,620 |
| Spencer St-Collins St (North) | 6,126,071 |
| The Arts Centre | 4,742,644 |
|  |  |
| Top 10 pedestrian count by months: For-October |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 11,152,763 |
| Flinders Street Station Underpass | 10,333,881 |
| Bourke Street Mall (North) | 8,737,215 |
| Bourke Street Mall (South) | 8,675,275 |
| Melbourne Central | 8,260,476 |
| Princes Bridge | 7,877,358 |
| State Library | 6,942,115 |
| Spencer St-Collins St (North) | 6,728,313 |
| Flinders St-Elizabeth St (East) | 5,860,962 |
| Southbank | 5,276,274 |
|  |  |
| Top 10 pedestrian count by months: For-November |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 12,136,661 |
| Flinders Street Station Underpass | 10,598,560 |
| Bourke Street Mall (South) | 9,772,438 |
| Melbourne Central | 9,752,026 |
| Princes Bridge | 8,942,629 |
| Bourke Street Mall (North) | 8,871,745 |
| Flinders St-Elizabeth St (East) | 7,197,048 |
| Spencer St-Collins St (North) | 6,661,345 |
| State Library | 6,630,549 |
| Southbank | 5,660,775 |
|  |  |
| Top 10 pedestrian count by months: For-December |  |
| **Location** | **Pedestrian Count** |
| Town Hall (West) | 14,578,191 |
| Bourke Street Mall (South) | 13,134,233 |
| Flinders Street Station Underpass | 11,352,132 |
| Princes Bridge | 10,750,919 |
| Bourke Street Mall (North) | 10,478,082 |
| Melbourne Central | 9,958,892 |
| Flinders St-Elizabeth St (East) | 7,643,186 |
| Southbank | 7,087,552 |
| State Library | 6,079,839 |
| Spencer St-Collins St (North) | 5,946,613 |

## 3.Location that has shown most decline due to lockdowns in last 2 years

|  |  |  |
| --- | --- | --- |
| **Location** | **Pedestrian Count in 2021** | **Change Compared to 2020** |
| Flinders St-Elizabeth St (East) | 5,852,590 | -1,507,594 |

## 4.Location that has most growth in last year

|  |  |  |
| --- | --- | --- |
| **Location** | **Pedestrian Count in 2021** | **Change Compared to 2020** |
| State Library - New | 3,994,935 | 2,188,455 |

# Code to Derive the Outputs

Refer to the Jupyter notebook link for the Python script written to derive the above outcome:

* [data-analytics/Pedestrian\_Counting\_System\_Analysis.ipynb at main · rameshpachamuthu80/data-analytics (github.com)](https://github.com/rameshpachamuthu80/data-analytics/blob/main/Pedestrian_Counting_System_Analysis.ipynb)