**Project ETL - Extract, Transform, Load**

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**Minneapolis Police Incidents, Use of Force, and Demographics**

Project Objective:

To create a database that will facilitate an analysis of the relationship between police incidents, the use of force by police in those incidents, and the demographic characteristics of the neighborhood in which the incidents occurred such as race and income.

The team will extract data from various sources, clean and normalize the data, and load the data into a database. Such data can then be used by applications to allows analysis of relationships and trends between these factors.

The target data, for the city of Minneapolis, includes:

1. Police incident data by neighborhood
2. Police “use of force” data by neighborhood
3. Income levels by neighborhood
4. Race distribution by neighborhood

Please find following Table of Contents directing to ERD, SQL, and detailed ETL flow for each dataset.

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# Entity Relationship Diagram (ERD)

A screenshot of a cell phone

Description automatically generated

# SQL for PostgreSQL tables

|  |
| --- |
| --COMMUNITY |
|  | DROP TABLE IF EXISTS COMMUNITY CASCADE; |
|  | CREATE TABLE COMMUNITY ( |
|  | community\_id INT NOT NULL, |
|  | name VARCHAR(50) NOT NULL, |
|  | CONSTRAINT pk\_COMMUNITY PRIMARY KEY ( |
|  | community\_id |
|  | ), |
|  | CONSTRAINT uc\_COMMUNITY\_name UNIQUE ( |
|  | name |
|  | ) |
|  | ); |
|  |  |
|  | --NEIGHBORHOOD |
|  | DROP TABLE IF EXISTS NEIGHBORHOOD CASCADE; |
|  | CREATE TABLE NEIGHBORHOOD ( |
|  | neighborhood\_id INT NOT NULL, |
|  | name VARCHAR(50) NOT NULL, |
|  | community\_id INT NOT NULL, |
|  | CONSTRAINT pk\_NEIGHBORHOOD PRIMARY KEY ( |
|  | neighborhood\_id |
|  | ), |
|  | CONSTRAINT uc\_NEIGHBORHOOD\_name UNIQUE ( |
|  | name |
|  | ) |
|  |  |
|  | ); |
|  |  |
|  | DROP TABLE IF EXISTS HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD CASCADE; |
|  | CREATE TABLE HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD ( |
|  | household\_income\_by\_neighborhood\_id INT NOT NULL, |
|  | neighborhood\_id INT NOT NULL, |
|  | IncomeLess35000\_count INT DEFAULT NULL, |
|  | IncomeLess35000\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | IncomeLess35to49\_count INT DEFAULT NULL, |
|  | IncomeLess35to49\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | IncomeLess50to74\_count INT DEFAULT NULL, |
|  | IncomeLess50to74\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | IncomeLess75to99\_count INT DEFAULT NULL, |
|  | IncomeLess75to99\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | Income100Plus\_count INT DEFAULT NULL, |
|  | Income100Plus\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | Median\_Income\_Total DECIMAL(10,2) DEFAULT NULL, |
|  | CONSTRAINT pk\_HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD PRIMARY KEY ( |
|  | household\_income\_by\_neighborhood\_id |
|  | ), |
|  | CONSTRAINT uc\_HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD\_neighborhood\_id UNIQUE ( |
|  | neighborhood\_id |
|  | ) |
|  | ); |
|  |  |
|  | DROP TABLE IF EXISTS HOUSEHOLD\_INCOME\_BY\_COMMUNITY CASCADE; |
|  | CREATE TABLE HOUSEHOLD\_INCOME\_BY\_COMMUNITY ( |
|  | household\_income\_by\_community\_id INT NOT NULL, |
|  | community\_id INT NOT NULL, |
|  | IncomeLess35000\_count INT DEFAULT NULL, |
|  | IncomeLess35000\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | IncomeLess35to49\_count INT DEFAULT NULL, |
|  | IncomeLess35to49\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | IncomeLess50to74\_count INT DEFAULT NULL, |
|  | IncomeLess50to74\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | IncomeLess75to99\_count INT DEFAULT NULL, |
|  | IncomeLess75to99\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | Income100Plus\_count INT DEFAULT NULL, |
|  | Income100Plus\_percent DECIMAL(10,2) DEFAULT NULL, |
|  | Median\_Income\_Total DECIMAL(10,2) DEFAULT NULL, |
|  | CONSTRAINT pk\_HOUSEHOLD\_INCOME\_BY\_COMMUNITY PRIMARY KEY ( |
|  | household\_income\_by\_community\_id |
|  | ), |
|  | CONSTRAINT uc\_HOUSEHOLD\_INCOME\_BY\_COMMUNITY\_community\_id UNIQUE ( |
|  | community\_id |
|  | ) |
|  | ); |
|  |  |
|  | DROP TABLE IF EXISTS RACE\_BY\_NEIGHBORHOOD CASCADE; |
|  | CREATE TABLE RACE\_BY\_NEIGHBORHOOD ( |
|  | race\_by\_neighborhood\_id SERIAL NOT NULL, |
|  | neighborhood\_id INT NOT NULL, |
|  | total\_cnt DECIMAL(10,2) DEFAULT NULL, |
|  | white\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | black\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | native\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | asian\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | other\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | two\_or\_more\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | hispanic\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | of\_color\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | CONSTRAINT pk\_RACE\_BY\_NEIGHBORHOOD PRIMARY KEY ( |
|  | race\_by\_neighborhood\_id |
|  | ), |
|  | CONSTRAINT uc\_RACE\_BY\_NEIGHBORHOOD\_neighborhood\_id UNIQUE ( |
|  | neighborhood\_id |
|  | ) |
|  | ); |
|  |  |
|  | DROP TABLE IF EXISTS RACE\_BY\_COMMUNITY CASCADE; |
|  | CREATE TABLE RACE\_BY\_COMMUNITY ( |
|  | race\_by\_community\_id SERIAL NOT NULL, |
|  | community\_id INT NOT NULL, |
|  | total\_cnt DECIMAL(10,2) DEFAULT NULL, |
|  | white\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | black\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | native\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | asian\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | other\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | two\_or\_more\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | hispanic\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | of\_color\_pct DECIMAL(10,5) DEFAULT NULL, |
|  | CONSTRAINT pk\_RACE\_BY\_COMMUNITY PRIMARY KEY ( |
|  | race\_by\_community\_id |
|  | ), |
|  | CONSTRAINT uc\_RACE\_BY\_COMMUNITY\_community\_id UNIQUE ( |
|  | community\_id |
|  | ) |
|  | ); |
|  |  |
|  | DROP TABLE IF EXISTS POLICE\_USE\_OF\_FORCE CASCADE; |
|  | CREATE TABLE POLICE\_USE\_OF\_FORCE ( |
|  | police\_use\_of\_force\_id SERIAL NOT NULL, |
|  | response\_date TIMESTAMP DEFAULT NULL, |
|  | case\_number VARCHAR(50) DEFAULT NULL, |
|  | problem VARCHAR(100) DEFAULT NULL, |
|  | subject\_race VARCHAR(50) DEFAULT NULL, |
|  | subject\_sex VARCHAR(50) DEFAULT NULL, |
|  | subject\_age INT DEFAULT NULL, |
|  | subject\_role VARCHAR(50) DEFAULT NULL, |
|  | primary\_offense VARCHAR(50) DEFAULT NULL, |
|  | type\_of\_resistance VARCHAR(50) DEFAULT NULL, |
|  | police\_use\_of\_force\_type VARCHAR(50) DEFAULT NULL, |
|  | force\_type\_action VARCHAR(50) DEFAULT NULL, |
|  | subject\_injury VARCHAR(50) DEFAULT NULL, |
|  | neighborhood\_id INT DEFAULT NULL, |
|  | neighborhood VARCHAR(50) DEFAULT NULL, |
|  | precinct VARCHAR(10) DEFAULT NULL, |
|  | CONSTRAINT pk\_POLICE\_USE\_OF\_FORCE PRIMARY KEY ( |
|  | police\_use\_of\_force\_id |
|  | ), |
|  | CONSTRAINT uc\_POLICE\_USE\_OF\_FORCE\_case\_number UNIQUE ( |
|  | case\_number |
|  | ) |
|  | ); |
|  |  |
|  | DROP TABLE IF EXISTS POLICE\_INCIDENT CASCADE; |
|  | CREATE TABLE POLICE\_INCIDENT ( |
|  | police\_incident\_id SERIAL NOT NULL, |
|  | casenumber VARCHAR(50) DEFAULT NULL, |
|  | reporteddate TIMESTAMP DEFAULT NULL, |
|  | offense VARCHAR(100) DEFAULT NULL, |
|  | neighborhood VARCHAR(100) DEFAULT NULL, |
|  | incident\_id INT DEFAULT NULL, |
|  | neighborhood\_id INT DEFAULT NULL, |
|  | community\_id INT DEFAULT NULL, |
|  | CONSTRAINT pk\_POLICE\_INCIDENT PRIMARY KEY ( |
|  | police\_incident\_id |
|  | ), |
|  | CONSTRAINT uc\_POLICE\_INCIDENT\_incident\_id UNIQUE ( |
|  | incident\_id |
|  | ) |
|  | ); |
|  |  |
|  |  |
|  | --Foreign Keys |
|  | ALTER TABLE NEIGHBORHOOD ADD CONSTRAINT fk\_NEIGHBORHOOD\_community\_id FOREIGN KEY(community\_id) |
|  | REFERENCES COMMUNITY (community\_id); |
|  |  |
|  |  |
|  | ALTER TABLE HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD ADD CONSTRAINT fk\_HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD\_neighborhood\_id FOREIGN KEY(neighborhood\_id) |
|  | REFERENCES NEIGHBORHOOD (neighborhood\_id); |
|  |  |
|  | ALTER TABLE HOUSEHOLD\_INCOME\_BY\_COMMUNITY ADD CONSTRAINT fk\_HOUSEHOLD\_INCOME\_BY\_COMMUNITY\_community\_id FOREIGN KEY(community\_id) |
|  | REFERENCES COMMUNITY (community\_id); |
|  |  |
|  | ALTER TABLE HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD ADD CONSTRAINT fk\_HOUSEHOLD\_INCOME\_BY\_NEIGHBORHOOD\_neighborhood\_id FOREIGN KEY(neighborhood\_id) |
|  | REFERENCES NEIGHBORHOOD (neighborhood\_id); |
|  |  |
|  | ALTER TABLE HOUSEHOLD\_INCOME\_BY\_COMMUNITY ADD CONSTRAINT fk\_HOUSEHOLD\_INCOME\_BY\_COMMUNITY\_community\_id FOREIGN KEY(community\_id) |
|  | REFERENCES COMMUNITY (community\_id); |
|  |  |
|  | ALTER TABLE RACE\_BY\_COMMUNITY ADD CONSTRAINT fk\_RACE\_BY\_COMMUNITY\_community\_id FOREIGN KEY(community\_id) |
|  | REFERENCES COMMUNITY (community\_id); |
|  |  |
|  | ALTER TABLE POLICE\_USE\_OF\_FORCE ADD CONSTRAINT fk\_POLICE\_USE\_OF\_FORCE\_neighborhood\_id FOREIGN KEY(neighborhood\_id) |
|  | REFERENCES NEIGHBORHOOD (neighborhood\_id); |
|  |  |
|  | ALTER TABLE POLICE\_INCIDENT ADD CONSTRAINT fk\_POLICE\_INCIDENT\_neighborhood\_id FOREIGN KEY(neighborhood\_id) |
|  | REFERENCES NEIGHBORHOOD (neighborhood\_id); |
|  |  |
|  | ALTER TABLE POLICE\_INCIDENT ADD CONSTRAINT fk\_POLICE\_INCIDENT\_community\_id FOREIGN KEY(community\_id) |
|  | REFERENCES COMMUNITY (community\_id); |

# Police Incidents

## Description

## Data sources

## Data extraction

## Data transformation

## Data loading

# Police Use of Force

## Description

## Data sources

## Data extraction

## Data transformation

## Data loading

# Neighborhood Race Demographics

## Description

The objective is to obtain data regarding the racial mix of Minneapolis neighborhoods and communities.

## Data sources

Data is obtained from MINNESOTA COMPASS (mncompass.org). We need to scrape data from the following endpoints:

1. Scrape links to Minneapolis neighborhood-specific webpage on mncompass.org found on:
   1. <http://www.mncompass.org/profiles/neighborhoods/minneapolis-saint-paul>
2. Scrape links to Minneapolis community-specific webpage on mncompass.org found on:
   1. <http://www.mncompass.org/profiles/neighborhoods/minneapolis-saint-paul>
3. Scrape race data for each Minneapolis neighborhood links obtained in step 1. For example, Armatage neighborhood at:
   1. <http://www.mncompass.org/profiles/neighborhoods/minneapolis/armatage>
4. Scrape race data for each Minneapolis community links obtained in step 2. For example, Camden at:
   1. <http://www.mncompass.org/profiles/communities/minneapolis/camden>

## Data extraction

Selenium webdriver (from selenium import webdriver) was used to scrape data at the URL. This is because the data is populated by Javascript and therefore not accessible by Splinter.

Extraction followed the following process:

1. Scrape the individual neighborhood and community links and store in lists of URLs.
2. Send the webdriver to each link in the lists and scrape the race data from each page.

The neighborhood and community race data is then stored in a Pandas dataframe and written to csv files.

## Data transformation

Transformation (cleaning) involved the following steps:

1. Read in the csv’s from extraction as Pandas dataframes.
2. The scraped data contained the word ‘suppressed’ in some table cells. Replace this with NaN so all missing data is represented by NaN.
3. Convert text-styled numbers into numeric type.
4. Add a ‘total’ column as the sum of the individual race columns.
5. Use pd.merge to bring in neighborhood and community ID’s that will be used in PostgreSQL keys.
6. Delete extraneous columns.
7. Reorder columns for presentability.

## Data loading

Steps:

1. Create tables in PostgreSQL using the SQL script based on the ERD presented at the beginning of this document.
2. Use Sqlalchemy (from sqlalchemy import create\_engine) to connect to PostgreSQL database.
3. Use Pandas df.to\_sql to populate PostgreSQL tables with Pandas dataframe values.

# Neighborhood Income Demographics

## Description

## Data sources

## Data extraction

## Data transformation

## Data loading

# Web Application