cs-2119-asem-ushatova

February 24, 2024

1 Project Endterm

1.1 Asem Ushatova | CS-2119

Analyzing a real dataset related to law enforcement using the following data analysis tools: Pandas, NumPy, SQL.

The goal of this project is to analyze this dataset and identify any patterns or trends that could assist law enforcement agencies in their operations.

1.1.1 Chicago Public Educational Institutions

This dataset offers comprehensive information on school-level performance data used in generating CPS School Report Cards for the 2011-2012 academic year. It is accessible through the City of Chicago's Data Portal.

For further details and access to the original dataset, you can visit the Chicago Data Portal here. This dataset offers valuable insights into educational performance and serves as a significant resource for educational analysis.

1.1.2 Data Preparation

The first step in our analysis is data preparation.

```
[2]: # Import the Pandas Library
     import pandas as pd
     import sqlite3
     conn = sqlite3.connect('chicago.db')
```

```
[3]: # Load it
     %load_ext sql
```

    The sql extension is already loaded. To reload it, use:
      %reload_ext sql

```
[4]: # Connect to db
     %sql sqlite:///chicago.db
```

```
[5]: df = pd.read_csv('https://data.cityofchicago.org/resource/9xs2-f89t.csv')
     df.to_sql("schools", conn)
```

[5]: 566

Verifying that the table was successfully loaded using a basic query like:

[6]:
```sql
%%sql
SELECT *
FROM schools
LIMIT 5;
```

 * sqlite:///chicago.db
Done.

[6]: [(0, 610038, 'Abraham Lincoln Elementary School', 'ES', '615 W Kemper Pl ',
 'Chicago', 'IL', 60614, '(773) 534-5720', 'http://schoolreports.cps.edu/SchoolPr
 ogressReport_Eng/Spring2011Eng_610038.pdf', 'Fullerton Elementary Network',
 'NORTH-NORTHWEST SIDE COLLABORATIVE', 'No', 'Standard', 'Not on Probation',
 'Level 1', 'Yes', 'Very Strong', 99.0, 'Very Strong', '99', 'Strong', 74.0,
 'Strong', 66.0, 'Strong', '65', 'Strong', '70', 'Strong', '56', 'Average', '47',
 96.0, 2.0, 96.4, 95.8, '80.1', '43.3', '89.6', '84.9', '60.7', '62.6', '81.9',
 '85.2', '52', '62.4', '66.3', '77.9', 69.7, 64.4, 0.2, 0.9, 'Yellow', 'Green',
 '67.1', '54.5', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
 'NDA', 813, 33, 'NDA', 150000000000000, 1171699.458, 1915829.428, 41.92449696,
 -87.64452163, 7, 'LINCOLN PARK', 43, 18, '(41.92449696, -87.64452163)'),
 (1, 610281, 'Adam Clayton Powell Paideia Community Academy Elementary School',
 'ES', '7511 S South Shore Dr ', 'Chicago', 'IL', 60649, '(773) 535-6650', 'http:
 //schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_610281.pdf',
 'Skyway Elementary Network', 'SOUTH SIDE COLLABORATIVE', 'No', 'Track_E', 'Not
 on Probation', 'Level 1', 'No', 'Average', 54.0, 'Strong', '66', 'Strong', 74.0,
 'Very Strong', 84.0, 'Strong', '63', 'Strong', '76', 'Weak', '46', 'Average',
 '50', 95.6, 15.7, 95.3, 100.0, '62.4', '51.7', '21.9', '15.1', '29', '42.8',
 '38.5', '27.4', '44.8', '42.7', '14.1', '34.4', 16.8, 16.5, 0.7, 1.4, 'Green',
 'Green', '17.2', '27.3', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
 'NDA', 'NDA', 521, 46, 'NDA', 150000000000000, 1196129.985, 1856209.466,
 41.76032435, -87.55673627, 43, 'SOUTH SHORE', 7, 4, '(41.76032435,
 -87.55673627)'),
 (2, 610185, 'Adlai E Stevenson Elementary School', 'ES', '8010 S Kostner Ave ',
 'Chicago', 'IL', 60652, '(773) 535-2280', 'http://schoolreports.cps.edu/SchoolPr
 ogressReport_Eng/Spring2011Eng_610185.pdf', 'Midway Elementary Network',
 'SOUTHWEST SIDE COLLABORATIVE', 'No', 'Standard', 'Not on Probation', 'Level 2',
 'No', 'Strong', 61.0, 'NDA', 'NDA', 'Average', 50.0, 'Weak', 36.0, 'NDA', 'NDA',
 'NDA', 'NDA', 'Average', '47', 'Weak', '41', 95.7, 2.3, 94.7, 98.3, '53.7',
 '26.6', '38.3', '34.7', '43.7', '57.3', '48.8', '39.2', '46.8', '44', '7.5',
 '21.9', 18.3, 15.5, -0.9, -1.0, 'Red', 'Red', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 1324, 44, 'NDA',
 150000000000000, 1148427.165, 1851012.215, 41.74711093, -87.73170248, 70,
 'ASHBURN', 13, 8, '(41.74711093, -87.73170248)'),
 (3, 609993, 'Agustin Lara Elementary Academy', 'ES', '4619 S Wolcott Ave ',
 'Chicago', 'IL', 60609, '(773) 535-4389', 'http://schoolreports.cps.edu/SchoolPr

```
ogressReport_Eng/Spring2011Eng_609993.pdf', 'Pershing Elementary Network',
'SOUTHWEST SIDE COLLABORATIVE', 'No', 'Track_E', 'Not on Probation', 'Level 1',
'No', 'Average', 56.0, 'Average', '44', 'Average', 45.0, 'Weak', 37.0, 'Strong',
'65', 'Average', '48', 'Average', '53', 'Strong', '58', 95.5, 10.4, 95.8, 100.0,
'76.9', 'NDA', '26', '24.7', '61.8', '49.7', '39.2', '27.2', '69.7', '60.6',
'9.1', '18.2', 11.1, 9.6, 0.9, 2.4, 'Green', 'Green', '42.9', '25', 'NDA',
'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 556, 42, 'NDA',
150000000000000, 1164504.29, 1873959.199, 41.8097569, -87.6721446, 61, 'NEW
CITY', 20, 9, '(41.8097569, -87.6721446)'),
 (4, 610513, 'Air Force Academy High School', 'HS', '3630 S Wells St ',
'Chicago', 'IL', 60609, '(773) 535-1590', 'http://schoolreports.cps.edu/SchoolPr
ogressReport_Eng/Spring2011Eng_610513.pdf', 'Southwest Side High School
Network', 'SOUTHWEST SIDE COLLABORATIVE', 'NDA', 'Standard', 'Not on Probation',
'Not Enough Data', 'Yes', 'Average', 49.0, 'Strong', '60', 'Strong', 60.0,
'Average', 55.0, 'Average', '45', 'Average', '54', 'Average', '53', 'Average',
'49', 93.3, 15.6, 96.9, 100.0, 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
'NDA', 'NDA', 'NDA', 'NDA', 'NDA', None, None, None, None, 'NDA', 'NDA', 'NDA',
'NDA', '14.6', '14.8', 'NDA', '16', '1.4', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
302, 40, '91.8', 150000000000000, 1175177.622, 1880745.126, 41.82814609,
-87.63279369, 34, 'ARMOUR SQUARE', 11, 9, '(41.82814609, -87.63279369)')]
```

1.2 Analysis

Once the data is prepared, perform a detailed analysis using various data analysis techniques. This includes slicing and dicing the data to examine specific subsets, using statistical functions to summarize the data, and applying data visualization techniques to better understand the patterns and trends in the data. We also use string patterns, sorting and grouping, and sub-queries and nested selects to extract meaningful insights from the data.

1.2.1 Slicing

The slicing using old dataframe df

```
[16]: df.iloc[3:6, 0:3]
```

```
[16]:    school_id                   name_of_school elementary_or_high_school
      3     609993      Agustin Lara Elementary Academy                       ES
      4     610513        Air Force Academy High School                       HS
      5     610212  Albany Park Multicultural Academy                       MS
```

The slicing using loc() function on old dataframe df where index column is having labels as 0,1,2

```
[94]: df.loc[0:5, 'collaborative_name':'safety_icon_']
```

```
[94]:               collaborative_name adequate_yearly_progress_made_  \
      0  NORTH-NORTHWEST SIDE COLLABORATIVE                             No
      1            SOUTH SIDE COLLABORATIVE                             No
      2        SOUTHWEST SIDE COLLABORATIVE                             No
```

```
3        SOUTHWEST SIDE COLLABORATIVE                                        No
4        SOUTHWEST SIDE COLLABORATIVE                                       NDA
5  NORTH-NORTHWEST SIDE COLLABORATIVE                                       Yes

  track_schedule cps_performance_policy_status cps_performance_policy_level  \
0       Standard                Not on Probation                     Level 1
1        Track_E                Not on Probation                     Level 1
2       Standard                Not on Probation                     Level 2
3        Track_E                Not on Probation                     Level 1
4       Standard                Not on Probation             Not Enough Data
5       Standard                Not on Probation                     Level 1

  healthy_schools_certified_ safety_icon_
0                        Yes  Very Strong
1                         No      Average
2                         No       Strong
3                         No      Average
4                        Yes      Average
5                         No       Strong
```

1.2.2 Attributes

```
[19]: import numpy as np
```

Converting the DataFrame to a NumPy array

```
[21]: data = df.values
      data
```

```
[21]: array([[610038, 'Abraham Lincoln Elementary School', 'ES', …, 43, 18,
              '(41.92449696, -87.64452163)'],
             [610281,
              'Adam Clayton Powell Paideia Community Academy Elementary School',
              'ES', …, 7, 4, '(41.76032435, -87.55673627)'],
             [610185, 'Adlai E Stevenson Elementary School', 'ES', …, 13, 8,
              '(41.74711093, -87.73170248)'],
             …,
             [610088, 'Wolfgang A Mozart Elementary School', 'ES', …, 35, 25,
              '(41.92092734, -87.72192541)'],
             [609977, 'Woodlawn Community Elementary School', 'ES', …, 5, 3,
              '(41.77339962, -87.59435584)'],
             [610392, 'World Language Academy High School', 'HS', …, 22, 10,
              '(41.83601953, -87.73419465)']], dtype=object)
```

The number of elements:

```
[55]: df.size
```

[55]: 44714

The shape of the dataset:

[22]: `print('Shape:', data.shape)`

Shape: (566, 79)

The first row of the data:

[23]: `print('First row:', data[0])`

```
First row: [610038 'Abraham Lincoln Elementary School' 'ES' '615 W Kemper Pl '
 'Chicago' 'IL' 60614 '(773) 534-5720'
'http://schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_610038.pdf'
 'Fullerton Elementary Network' 'NORTH-NORTHWEST SIDE COLLABORATIVE' 'No'
 'Standard' 'Not on Probation' 'Level 1' 'Yes' 'Very Strong' 99.0
 'Very Strong' '99' 'Strong' 74.0 'Strong' 66.0 'Strong' '65' 'Strong'
 '70' 'Strong' '56' 'Average' '47' 96.0 2.0 96.4 95.8 '80.1' '43.3' '89.6'
 '84.9' '60.7' '62.6' '81.9' '85.2' '52' '62.4' '66.3' '77.9' 69.7 64.4
 0.2 0.9 'Yellow' 'Green' '67.1' '54.5' 'NDA' 'NDA' 'NDA' 'NDA' 'NDA'
 'NDA' 'NDA' 'NDA' 'NDA' 'NDA' 813 33 'NDA' 150000000000000 1171699.458
 1915829.428 41.92449696 -87.64452163 7 'LINCOLN PARK' 43 18
 '(41.92449696, -87.64452163)']
```

The last row of the data:

[24]: `print('Last row:', data[-1])`

```
Last row: [610392 'World Language Academy High School' 'HS' '3120 S Kostner Ave
'
 'Chicago' 'IL' 60623 '(773) 535-4334'
'http://schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_610392.pdf'
 'West Side High School Network' 'WEST SIDE COLLABORATIVE' 'No' 'Track_E'
 'Not on Probation' 'Level 2' 'No' 'Average' 51.0 'Weak' '33' 'Average'
 49.0 'Average' 47.0 'Average' '49' 'Average' '49' 'Average' '50' 'Weak'
 '46' 91.6 4.0 96.0 100.0 'NDA' 'NDA' 'NDA' 'NDA' 'NDA' 'NDA' 'NDA' 'NDA'
 'NDA' 'NDA' 'NDA' 'NDA' nan nan nan nan 'NDA' 'NDA' 'NDA' 'NDA' '12.9'
 '13.4' '14.6' '14.1' '1.2' '16.2' '1.6' '14.6' '69.4' '48.1' 382 37 '76'
 150000000000000 1147521.302 1883405.128 41.83601953 -87.73419465 30
 'SOUTH LAWNDALE' 22 10 '(41.83601953, -87.73419465)']
```

Get a specific column (*name_of_school*) of the data:

[69]:
```
column_index = 2
print('Column:', data[:, column_index])
```

```
Column: ['ES' 'ES' 'ES' 'ES' 'HS' 'MS' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES'
 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'MS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES'
```

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```
'HS' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'HS' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'HS'
'HS' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'MS' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'MS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'HS' 'HS' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS'
'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS' 'HS' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'HS'
'ES' 'ES' 'ES' 'HS' 'HS' 'ES' 'ES' 'HS' 'ES' 'ES' 'MS' 'ES' 'ES' 'ES'
'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'HS' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS'
'HS' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES'
'ES' 'MS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'HS' 'ES' 'ES' 'ES' 'MS' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'HS'
'ES' 'HS' 'HS' 'MS' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'HS' 'HS' 'ES' 'MS' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES'
'ES' 'ES' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'HS'
'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES'
'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'ES'
'ES' 'ES' 'ES' 'HS' 'MS' 'ES' 'HS' 'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS'
'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES'
'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES'
'ES' 'ES' 'ES' 'HS' 'ES' 'ES' 'HS' 'ES' 'ES' 'ES' 'ES' 'HS' 'ES' 'MS'
'ES' 'ES' 'ES' 'ES' 'ES' 'HS']
```

1.2.3 Statistical Functions

Finding the Mean, Standard Deviation, Max and Min value of *safety_score* column:

```
[49]: # Get a specific column of the data
      column_index = 17
      column_data = data[:, column_index]

      # Check if the data can be converted to float
```

```
try:
    float_data = column_data.astype(float)
    mask = np.isnan(float_data)
    mean = np.mean(float_data[~mask])
    print('Mean:', mean)
except ValueError:
    print("Data cannot be converted to float. Cannot compute mean of␣
  ↪non-numerical data.")
```
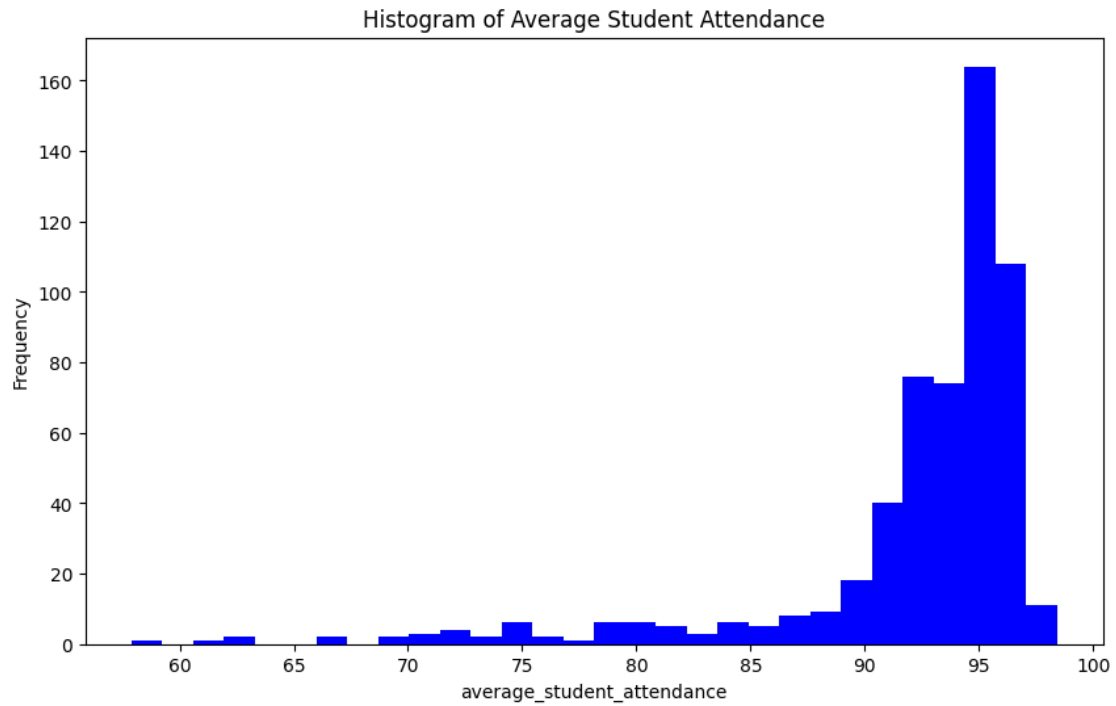
```
Mean: 49.50487329434698
```

[53]:
```
# Get a specific column of the data
column_index = 17
column_data = data[:, column_index]

# Check if the data can be converted to float
try:
    float_data = column_data.astype(float)
    mask = np.isnan(float_data)
    std_dev = np.std(float_data[~mask])
    print('Standard Deviation:', std_dev)
except ValueError:
    print("Data cannot be converted to float. Cannot compute standard deviation␣
  ↪of non-numerical data.")
```

```
Standard Deviation: 20.091226534445568
```

Get the biggest value in the numpy array:

[62]:
```
# Get a specific column of the data
column_index = 17
column_data = data[:, column_index]

# Check if the data can be converted to float
try:
    float_data = column_data.astype(float)
    mask = np.isnan(float_data)
    std_dev = np.max(float_data[~mask])
    print('Max value:', std_dev)
except ValueError:
    print("Data cannot be converted to float. Cannot compute Max value of␣
  ↪non-numerical data.")
```

```
Max value: 99.0
```

Get the smallest value in the numpy array:

```
[63]: # Get a specific column of the data
      column_index = 17
      column_data = data[:, column_index]

      # Check if the data can be converted to float
      try:
          float_data = column_data.astype(float)
          mask = np.isnan(float_data)
          std_dev = np.min(float_data[~mask])
          print('Min value:', std_dev)
      except ValueError:
          print("Data cannot be converted to float. Cannot compute Min value of␣
       ↪non-numerical data.")
```

Min value: 1.0

1.2.4 Data visualization

```
[118]: import matplotlib.pyplot as plt
```

Histograms of Average Student and Teacher Attendance:

```
[72]: plt.figure(figsize=(10,6))
      plt.hist(df['average_student_attendance'], bins=30, color='blue')
      plt.title('Histogram of Average Student Attendance')
      plt.xlabel('average_student_attendance')
      plt.ylabel('Frequency')
      plt.show()
```

Histogram of Average Student Attendance

```
[75]: plt.figure(figsize=(10,6))
      plt.hist(df['average_teacher_attendance'], bins=30, color='blue')
      plt.title('Histogram of Average Teacher Attendance')
      plt.xlabel('average_teacher_attendance')
      plt.ylabel('Frequency')
      plt.show()
```

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Histogram of Average Teacher Attendance
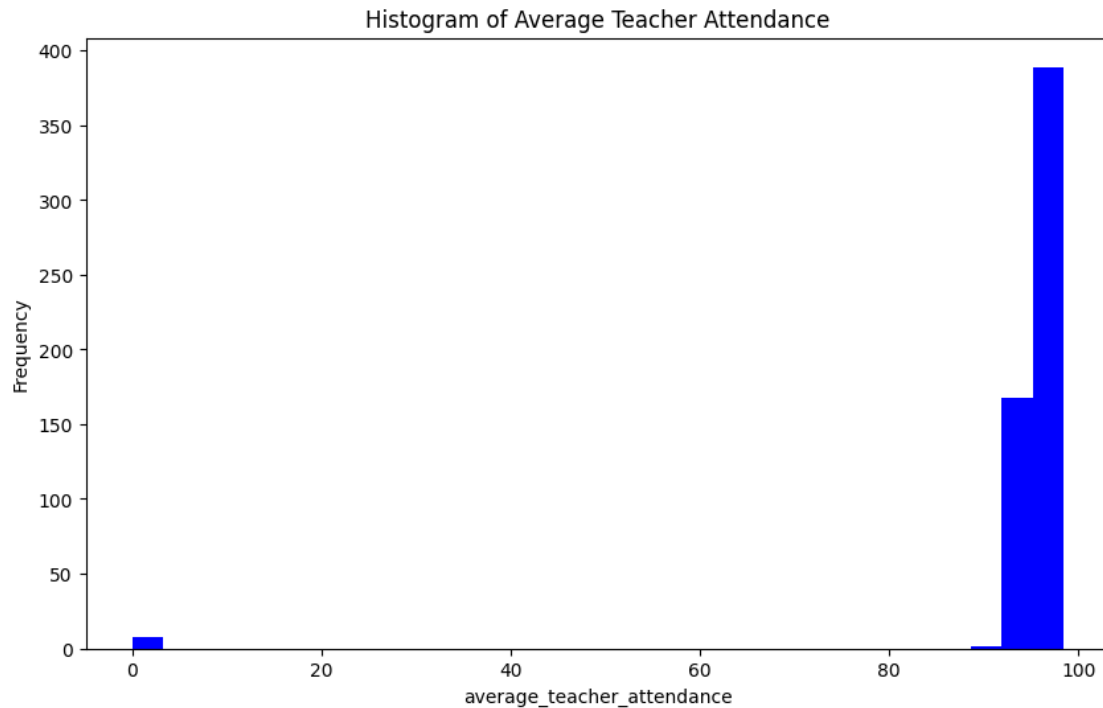
The means of Average Student & Teacher Attendance

```
[83]: column_index = 32
      column_data = data[:, column_index]

      # Check if the data can be converted to float
      try:
          float_data = column_data.astype(float)
          mask = np.isnan(float_data)
          mean32 = np.mean(float_data[~mask])
          print('Mean:', mean32)
      except ValueError:
          print("Data cannot be converted to float. Cannot compute mean of␣
       ↪non-numerical data.")
```

Mean: 92.31380530973452

```
[84]: column_index = 34
      column_data = data[:, column_index]

      # Check if the data can be converted to float
      try:
          float_data = column_data.astype(float)
          mask = np.isnan(float_data)
```

```
    mean34 = np.mean(float_data[~mask])
    print('Mean:', mean34)
except ValueError:
    print("Data cannot be converted to float. Cannot compute mean of␣
  ↪non-numerical data.")
```

Mean: 94.37844522968197

Subtraction of them

[91]:
```
subtraction = np.subtract(mean34, mean32)
subtraction
```

[91]: 2.064639919947453

1.2.5 String Patterns, Sorting and Grouping

Finding string patterns in the dataset, using **Like** command with **Where** clause

[96]:
```
%sql SELECT * FROM schools WHERE name_of_school LIKE '%e'
```

 * sqlite:///chicago.db
Done.

[96]: [(59, 610353, 'Calmeca Academy of Fine Arts and Dual Language', 'ES', '3456 W
    38th St ', 'Chicago', 'IL', 60632, '(773) 535-7000', 'http://schoolreports.cps.e
    du/SchoolProgressReport_Eng/Spring2011Eng_610353.pdf', 'Pershing Elementary
    Network', 'SOUTHWEST SIDE COLLABORATIVE', 'No', 'Track_E', 'Not on Probation',
    'Level 2', 'Yes', 'Average', 58.0, 'Strong', '67', 'Average', 59.0, 'Strong',
    72.0, 'Strong', '64', 'Average', '55', 'Average', '51', 'Strong', '57', 96.5,
    1.9, 96.9, 100.0, '47', 'NDA', '44.2', '23.9', '52.8', '64.5', '35.8', '26.6',
    '49.8', '49.3', '16.1', '21', 13.9, 10.3, −0.7, 1.5, 'Red', 'Green', 'NDA',
    'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
    792, 39, 'NDA', 150000000000000, 1153706.842, 1879216.756, 41.82440547,
    −87.71160875, 58, 'BRIGHTON PARK', 12, 9, '(41.82440547, −87.71160875)'),
     (99, 610380, 'Daniel Hale Williams Prep School of Medicine', 'HS', '4934 S
    Wabash Ave ', 'Chicago', 'IL', 60615, '(773) 535-1120', 'http://schoolreports.cp
    s.edu/SchoolProgressReport_Eng/Spring2011Eng_610380.pdf', 'South Side High
    School Network', 'SOUTH SIDE COLLABORATIVE', 'No', 'Standard', 'Not on
    Probation', 'Level 2', 'No', 'Average', 50.0, 'NDA', 'NDA', 'Average', 45.0,
    'Average', 54.0, 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 91.3,
    5.4, 96.7, 100.0, 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', '54.5', '63.8',
    '55.8', '58.5', '21.4', '33.3', 23.7, 8.5, −0.9, −1.8, 'Yellow', 'Red', '64.1',
    '25', '15', '15.1', '15.8', '15.4', '0.4', '17.5', '1.7', '32.7', 'NDA', 'NDA',
    324, 42, '90.1', 150000000000000, 1177513.255, 1872170.444, 41.80456384,
    −87.62448408, 38, 'GRAND BOULEVARD', 3, 2, '(41.80456384, −87.62448408)'),
     (111, 610533, 'Dr Jorge Prieto Math and Science', 'ES', '2231 N Central Ave ',
    'Chicago', 'IL', 60639, '(773) 534-0210', 'http://schoolreports.cps.edu/SchoolPr
```

ogressReport_Eng/Spring2011Eng_610533.pdf', 'Fullerton Elementary Network', 'NORTH-NORTHWEST SIDE COLLABORATIVE', 'No', 'Standard', 'Not on Probation', 'Not Enough Data', 'No', 'NDA', None, 'NDA', 'NDA', 'NDA', None, 'NDA', None, 'NDA', 'NDA', 'NDA', 'NDA', 'Average', '52', 'Strong', '58', 94.7, 7.0, 96.9, 100.0, '48.4', '19.5', '33.8', '19.9', '43.1', '55', '44.2', '30', '56.9', '47.8', '12.1', '28.9', 14.6, 8.6, -0.7, -0.7, 'Red', 'Red', '17.5', '52.9', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 1001, 29, 'NDA', 150000000000000, 1138718.257, 1914429.033, 41.92131717, -87.7657438, 19, 'BELMONT CRAGIN', 37, 25, '(41.92131717, -87.7657438)'),
 (202, 610383, 'Greater Lawndale High School For Social Justice', 'HS', '3120 S Kostner Ave ', 'Chicago', 'IL', 60623, '(773) 535-4300', 'http://schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_610383.pdf', 'West Side High School Network', 'WEST SIDE COLLABORATIVE', 'No', 'Track_E', 'Probation', 'Level 3', 'No', 'Average', 43.0, 'Strong', '72', 'Average', 46.0, 'Average', 44.0, 'Very Strong', '81', 'Strong', '65', 'Average', '53', 'Weak', '46', 87.5, 16.4, 95.1, 95.6, 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', None, None, None, None, 'NDA', 'NDA', 'NDA', 'NDA', '13.6', '14', '14.5', '14.4', '0.8', '15.7', '1.2', '14.9', '67', '57.4', 371, 37, '87.4', 150000000000000, 1147521.302, 1883405.128, 41.83601953, -87.73419465, 30, 'SOUTH LAWNDALE', 22, 10, '(41.83601953, -87.73419465)'),
 (221, 610297, 'High School of Leadership at South Shore', 'HS', '7627 S Constance Ave ', 'Chicago', 'IL', 60649, '(773) 535-6190', 'http://schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_610297.pdf', 'South Side High School Network', 'SOUTH SIDE COLLABORATIVE', 'No', 'Standard', 'Probation', 'Level 3', 'No', 'NDA', None, 'Weak', '30', 'NDA', None, 'NDA', None, 'Very Weak', '16', 'Weak', '28', 'Weak', '42', 'Weak', '31', 72.0, 43.4, 95.2, 100.0, 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', None, None, None, None, 'NDA', 'NDA', 'NDA', 'NDA', '11.7', '11.7', '13.1', '13.1', '1.4', '14.4', '1.3', '12.2', '36.6', '68.8', 731, 46, '48.8', 150000000000000, 1189903.206, 1854648.757, 41.75619362, -87.57960727, 43, 'SOUTH SHORE', 8, 4, '(41.75619362, -87.57960727)'),
 (234, 610532, 'Irene C. Hernandez Middle School for the Advancement of Science', 'MS', '3510 W 55th St ', 'Chicago', 'IL', 60632, '(773) 535-8850', 'http://schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_610532.pdf', 'Midway Elementary Network', 'SOUTHWEST SIDE COLLABORATIVE', 'No', 'Track_E', 'Not on Probation', 'Not Enough Data', 'No', 'Weak', 34.0, 'Weak', '34', 'Weak', 27.0, 'Weak', 27.0, 'Weak', '28', 'Weak', '27', 'NDA', 'NDA', 'NDA', 'NDA', 95.5, 14.8, 96.2, 100.0, 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', '33.7', '28.9', '34.2', '46.6', '12.5', '18', 11.6, 9.2, -1.8, -0.8, 'Red', 'Red', '18.2', '40.4', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 970, 45, 'NDA', 150000000000000, 1153845.758, 1867957.685, 41.79350627, -87.71139803, 63, 'GAGE PARK', 14, 8, '(41.79350627, -87.71139803)'),
 (280, 609971, 'John Harvard Elementary School of Excellence', 'ES', '7525 S Harvard ', 'Chicago', 'IL', 60620, '(773) 535-3045', 'http://schoolreports.cps.edu/SchoolProgressReport_Eng/Spring2011Eng_609971.pdf', 'AUSL Schools', 'SOUTH SIDE COLLABORATIVE', 'No', 'Track_E', 'Probation', 'Level 2', 'No', 'Average', 51.0, 'Weak', '24', 'Strong', 61.0, 'Strong', 61.0, 'Average', '43', 'Weak',

```
     '36', 'Average', '47', 'Strong', '55', 93.0, 8.7, 96.0, 97.8, 'NDA', 'NDA',
     '25.6', '28.2', '42.7', '46.8', '50', '38.9', '58.8', '53.1', '14.6', '23.1',
     13.8, 7.7, 1.2, 0.4, 'Green', 'Yellow', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
     'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 476, 45, 'NDA',
     150000000000000, 1175413.427, 1854942.117, 41.75733472, -87.63270008, 69,
     'GREATER GRAND CROSSING', 17, 6, '(41.75733472, -87.63270008)'),
      (318, 610000, 'Julia Ward Howe Elementary School of Excellence', 'ES', '720 N
     Lorel Ave ', 'Chicago', 'IL', 60644, '(773) 534-6060', 'http://schoolreports.cps
     .edu/SchoolProgressReport_Eng/Spring2011Eng_610000.pdf', 'AUSL Schools', 'WEST
     SIDE COLLABORATIVE', 'No', 'Track_E', 'Probation', 'Level 1', 'No', 'Strong',
     67.0, 'Average', '46', 'Very Strong', 90.0, 'Strong', 69.0, 'Average', '59',
     'Strong', '67', 'Strong', '57', 'Strong', '64', 96.0, 7.7, 97.1, 100.0, 'NDA',
     'NDA', '36.9', '35.6', '63.1', '75.2', '38.5', '39.1', '67.5', '56.4', '7.4',
     '14.8', 20.6, 9.3, 0.8, -0.8, 'Green', 'Red', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
     'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 576, 36, 'NDA',
     150000000000000, 1140502.548, 1904349.511, 41.89362521, -87.75943557, 25,
     'AUSTIN', 37, 15, '(41.89362521, -87.75943557)'),
      (384, 610257, 'Morton School of Excellence', 'ES', '431 N Troy St ', 'Chicago',
     'IL', 60612, '(773) 534-6791', 'http://schoolreports.cps.edu/SchoolProgressRepor
     t_Eng/Spring2011Eng_610257.pdf', 'AUSL Schools', 'WEST SIDE COLLABORATIVE',
     'No', 'Track_E', 'Probation', 'Level 1', 'No', 'Average', 53.0, 'Average', '49',
     'Strong', 66.0, 'Strong', 63.0, 'Very Strong', '86', 'Very Strong', '95',
     'Average', '52', 'Strong', '59', 93.6, 73.9, 97.1, 100.0, 'NDA', 'NDA', '43.2',
     '36.8', '57.9', '62.2', '38.6', '36', '65.3', '49', '7.1', '7.1', 16.3, 8.4,
     2.8, 0.5, 'Green', 'Yellow', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA',
     'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 349, 34, 'NDA', 150000000000000, 1155338.246,
     1902872.403, 41.88928666, -87.7049885, 23, 'HUMBOLDT PARK', 27, 13,
     '(41.88928666, -87.7049885)'),
      (481, 610160, 'Songhai Elementary Learning Institute', 'ES', '11725 S Perry Ave
     ', 'Chicago', 'IL', 60628, '(773) 535-5547', 'http://schoolreports.cps.edu/Schoo
     lProgressReport_Eng/Spring2011Eng_610160.pdf', 'Lake Calumet Elementary
     Network', 'FAR SOUTH SIDE COLLABORATIVE', 'No', 'Track_E', 'Probation', 'Level
     3', 'No', 'Very Weak', 17.0, 'NDA', 'NDA', 'Average', 47.0, 'Average', 54.0,
     'NDA', 'NDA', 'NDA', 'NDA', 'Weak', '46', 'Weak', '46', 89.5, 84.7, 95.4, 100.0,
     '24.8', 'NDA', '13.8', '16.3', '35.8', '36.8', '25.6', '22.5', '70', '67.2',
     '7.4', '25.9', 3.6, 3.6, 0.1, -1.4, 'Yellow', 'Red', 'NDA', 'NDA', 'NDA', 'NDA',
     'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 'NDA', 352, 48, 'NDA',
     150000000000000, 1177727.869, 1827095.66, 41.68086831, -87.62505762, 53, 'WEST
     PULLMAN', 34, 5, '(41.68086831, -87.62505762)')]
```

Filtering the data using **BETWEEN AND** function

```
[97]: %sql SELECT COUNT(*) FROM schools WHERE average_student_attendance BETWEEN 60␣
      ↪AND 80;
```

```
 * sqlite:///chicago.db
Done.
```

[97]: [(32,)]

[98]: `%sql SELECT COUNT(*) FROM schools`

    * sqlite:///chicago.db
Done.

[98]: [(566,)]

Eliminating duplicates using **DISTINCT** command

[99]: `%sql SELECT DISTINCT(collaborative_name) FROM schools`

    * sqlite:///chicago.db
Done.

[99]: [('NORTH-NORTHWEST SIDE COLLABORATIVE',),
  ('SOUTH SIDE COLLABORATIVE',),
  ('SOUTHWEST SIDE COLLABORATIVE',),
  ('WEST SIDE COLLABORATIVE',),
  ('FAR SOUTH SIDE COLLABORATIVE',)]

Sorting the data (*environment_score* column) using **ORDER BY** function. Data sorted by default in ascending, for descending use **DESC**

[101]: `%sql SELECT name_of_school, environment_score FROM schools WHERE`
    ↪environment_score > 50 ORDER BY environment_score DESC

    * sqlite:///chicago.db
Done.

[101]: [('Frederic Chopin Elementary School', 99.0),
  ('Northside College Preparatory High School', 99.0),
  ('Stephen Decatur Classical Elementary School', 99.0),
  ('Talman Elementary School', 99.0),
  ('William Penn Elementary School', 99.0),
  ('Ellen Mitchell Elementary School', 95.0),
  ('Mary E Courtenay Elementary Language Arts Center', 95.0),
  ('Spry Community Links High School', 92.0),
  ('Julia Ward Howe Elementary School of Excellence', 90.0),
  ('Oriole Park Elementary School', 88.0),
  ('Annie Keller Elementary Gifted Magnet School', 85.0),
  ('Burnham Elementary Inclusive Academy', 85.0),
  ('Frazier Prospective IB Magnet Elementary School', 84.0),
  ('Charles Evans Hughes Elementary School', 82.0),
  ('Daniel Webster Elementary School', 81.0),
  ('Northside Learning Center High School', 81.0),
  ('Nathan R Goldblatt Elementary School', 80.0),

('Walter Payton College Preparatory High School', 80.0),
('Woodlawn Community Elementary School', 80.0),
('Charles S Brownell Elementary School', 79.0),
('Augustus H Burley Elementary School', 78.0),
('Willa Cather Elementary School', 78.0),
('Bret Harte Elementary School', 77.0),
('George Westinghouse High School', 77.0),
('Thomas Hoyne Elementary School', 77.0),
('Wildwood Elementary School', 77.0),
('James G Blaine Elementary School', 76.0),
('Sauganash Elementary School', 76.0),
('John B Murphy Elementary School', 75.0),
('John J Audubon Elementary School', 75.0),
('Robert Lindblom Math & Science Academy High School', 75.0),
('Abraham Lincoln Elementary School', 74.0),
('Adam Clayton Powell Paideia Community Academy Elementary School', 74.0),
('Nicholson Technology Academy', 74.0),
('William C Goudy Elementary School', 74.0),
('Nathaniel Pope Elementary School', 73.0),
('Arthur E Canty Elementary School', 70.0),
('Jacob Beidler Elementary School', 70.0),
('John A Walsh Elementary School', 70.0),
('John Barry Elementary School', 70.0),
('John Spry Elementary Community School', 70.0),
('William P Nixon Elementary School', 70.0),
('John C Dore Elementary School', 69.0),
('Joshua D Kershaw Elementary School', 69.0),
('Norwood Park Elementary School', 69.0),
('Whitney M Young Magnet High School', 69.0),
('Henry H Nash Elementary School', 68.0),
('Johann W von Goethe Elementary School', 68.0),
('Jonathan Burr Elementary School', 68.0),
('Mary Mapes Dodge Elementary Renaissance Academy', 68.0),
('Philip Rogers Elementary School', 68.0),
('Alcott High School for the Humanities', 67.0),
('Belmont-Cragin Elementary School', 67.0),
('Carrie Jacobs Bond Elementary School', 67.0),
('Hannah G Solomon Elementary School', 67.0),
('Hiram H Belding Elementary School', 67.0),
('James Otis Elementary School', 67.0),
('John T McCutcheon Elementary School', 67.0),
('Thomas A Hendricks Elementary Community Academy', 67.0),
('Albany Park Multicultural Academy', 66.0),
('Carl von Linne Elementary School', 66.0),
('Christian Ebinger Elementary School', 66.0),
('Dvorak Technology Academy', 66.0),
('Edgar Allan Poe Elementary Classical School', 66.0),

('Edward C Delano Elementary School', 66.0),
('George M Pullman Elementary School', 66.0),
('Infinity Math Science and Technology High School', 66.0),
('Morton School of Excellence', 66.0),
('Richard Yates Elementary School', 66.0),
('Dunne Technology Academy', 65.0),
('Enrico Fermi Elementary School', 65.0),
('Genevieve Melody Elementary School', 65.0),
('Guglielmo Marconi Elementary Community Academy', 65.0),
('John C Coonley Elementary School', 65.0),
('Michael Faraday Elementary School', 65.0),
('National Teachers Elementary Academy', 65.0),
('Alexander Graham Bell Elementary School', 64.0),
('Anthony Overton Elementary School', 64.0),
('Crispus Attucks Elementary School', 64.0),
('Elizabeth H Sutherland Elementary School', 64.0),
('Hyman G Rickover Naval Academy High School', 64.0),
('Ida B Wells Preparatory Elementary Academy', 64.0),
('John P Altgeld Elementary School', 64.0),
('Robert Emmet Elementary School', 64.0),
('Thomas A Edison Regional Gifted Center Elementary School', 64.0),
('Victor Herbert Elementary School', 64.0),
('William Jones College Preparatory High School', 64.0),
('Cesar E Chavez Multicultural Academic Center Elementary School', 63.0),
('Ignance Paderewski Elementary Learning Academy', 63.0),
('John T Pirie Fine Arts & Academic Center Elementary School', 63.0),
('Robert A Black Magnet Elementary School', 63.0),
('Robert Fulton Elementary School', 63.0),
('Albert G Lane Technical High School', 62.0),
('Charles W Earle Elementary School', 62.0),
('Edward Jenner Elementary Academy of the Arts', 62.0),
('George B Swift Elementary Specialty School', 62.0),
('LaSalle Elementary Language Academy', 62.0),
('Minnie Mars Jamieson Elementary School', 62.0),
('Walter Reed Elementary School', 62.0),
('William J & Charles H Mayo Elementary School', 62.0),
('Fort Dearborn Elementary School', 61.0),
('Hawthorne Elementary Scholastic Academy', 61.0),
('James Weldon Johnson Elementary School', 61.0),
('John Harvard Elementary School of Excellence', 61.0),
('John Palmer Elementary School', 61.0),
('Mariano Azuela Elementary School', 61.0),
('Ninos Heroes Elementary Academic Center', 61.0),
('Uplift Community High School', 61.0),
('Air Force Academy High School', 60.0),
('Alexander Hamilton Elementary School', 60.0),
('Amelia Earhart Options for Knowledge Elementary School', 60.0),

('Arthur A Libby Elementary School', 60.0),
('Franklin Elementary Fine Arts Center', 60.0),
('Friedrich Ludwig Jahn Elementary School', 60.0),
('William E Dever Elementary School', 60.0),
('Calmeca Academy of Fine Arts and Dual Language', 59.0),
('Columbia Explorers Elementary Academy', 59.0),
('George Armstrong International Studies Elementary School', 59.0),
('Mancel Talcott Elementary School', 59.0),
('Mason High School', 59.0),
('Phoenix Military Academy High School', 59.0),
('Salmon P Chase Elementary School', 59.0),
('Thomas Drummond Elementary School', 59.0),
('Alex Haley Elementary Academy', 58.0),
('A.N. Pritzker School', 58.0),
('Burnside Elementary Scholastic Academy', 58.0),
('Garrett A Morgan Elementary School', 58.0),
('Grover Cleveland Elementary School', 58.0),
('Julia C Lathrop Elementary School', 58.0),
('Ludwig Van Beethoven Elementary School', 58.0),
('Mount Greenwood Elementary School', 58.0),
('William H Brown Elementary School', 58.0),
('Andrew Jackson Elementary Language Academy', 57.0),
('Chicago Academy High School', 57.0),
('Christopher Columbus Elementary School', 57.0),
('Durkin Park Elementary School', 57.0),
('George F Cassell Elementary School', 57.0),
('Helge A Haugan Elementary School', 57.0),
('Irma C Ruiz Elementary School', 57.0),
('James E McDade Elementary Classical School', 57.0),
('James Shields Elementary School', 57.0),
('John B Drake Elementary School', 57.0),
('Jordan Elementary Community School', 57.0),
('Kate S Kellogg Elementary School', 57.0),
('Spencer Technology Academy', 57.0),
('Johnnie Colemon Elementary Academy', 56.0),
('Joseph Jungman Elementary School', 56.0),
('Robert L Grimes Elementary School', 56.0),
('Ronald E McNair Elementary School', 56.0),
('Thomas J Waters Elementary School', 56.0),
('Wolfgang A Mozart Elementary School', 56.0),
('Benjamin E Mays Elementary Academy', 55.0),
('Edward A Bouchet Math & Science Academy Elementary School', 55.0),
('Frank I Bennett Elementary School', 55.0),
('Joseph Brennemann Elementary School', 55.0),
('Maria Saucedo Elementary Scholastic Academy', 55.0),
('Rufus M Hitch Elementary School', 55.0),
('Stone Elementary Scholastic Academy', 55.0),

```
('TEAM Englewood Community Academy High School', 55.0),
('West Pullman Elementary School', 55.0),
('Anna R. Langford Community Academy', 54.0),
('John M Smyth Elementary School', 54.0),
('Mahalia Jackson Elementary School', 54.0),
('Pulaski International Academy Elmentary School', 54.0),
('Robert Healy Elementary School', 54.0),
('Rueben Salazar Elementary Bilingual Center', 54.0),
('Charles Allen Prosser Career Academy High School', 53.0),
('Eliza Chappell Elementary School', 53.0),
('Eric Solorio Academy High School', 53.0),
('Federico Garcia Lorca Elementary School', 53.0),
('Francis W Parker Elementary Community Academy', 53.0),
('John Foster Dulles Elementary School', 53.0),
('John L Marsh Elementary School', 53.0),
('Mark Sheridan Elementary Math & Science Academy', 53.0),
('Mary McLeod Bethune Elementary School', 53.0),
('North River Elementary School', 53.0),
('Theodore Herzl Elementary School', 53.0),
('Ashburn Community Elementary School', 52.0),
('Edison Park Elementary School', 52.0),
('Elaine O Goodlow Elementary Magnet School', 52.0),
('Lake View High School', 52.0),
('Little Village Elementary School', 52.0),
('Ray Graham Training Center High School', 52.0),
('Ronald Brown Elementary Community Academy', 52.0),
('Stephen K Hayt Elementary School', 52.0),
('VOISE Academy High School', 52.0),
('Walter L Newberry Math & Science Academy Elementary School', 52.0),
('Al Raby High School', 51.0),
('Betsy Ross Elementary School', 51.0),
('Collins Academy High School', 51.0),
('Crown Community Academy of Fine Arts Center Elementary School', 51.0),
('Edgebrook Elementary School', 51.0),
('Joseph Stockton Elementary School', 51.0),
('Lenart Elementary Regional Gifted Center', 51.0),
('Nathan Hale Elementary School', 51.0),
('Robert Nathaniel Dett Elementary School', 51.0),
('Sir Miles Davis Magnet Elementary Academy', 51.0),
('Virgil Grissom Elementary School', 51.0),
('William H Prescott Elementary School', 51.0)]
```

GROUP BY function usually comes with aggregate functions like **AVG, COUNT, SUM**

```
[102]: %sql SELECT AVG(pk_2_math_) as Math, police_district FROM schools GROUP BY␣
       ↪police_district
```

* sqlite:///chicago.db

```
Done.
```

[102]:
```
[(17.2375, 1),
 (25.348387096774196, 2),
 (19.395238095238096, 3),
 (27.725806451612904, 4),
 (34.148148148148145, 5),
 (28.472727272727276, 6),
 (21.17096774193548, 7),
 (29.9439024390244, 8),
 (21.164864864864864, 9),
 (16.84, 10),
 (32.199999999999996, 11),
 (19.335294117647063, 12),
 (25.099999999999998, 13),
 (33.30526315789474, 14),
 (34.05789473684211, 15),
 (23.360714285714288, 16),
 (26.423076923076923, 17),
 (22.558333333333334, 18),
 (37.62222222222223, 19),
 (31.241666666666664, 20),
 (30.611111111111114, 22),
 (42.50714285714285, 24),
 (26.234482758620693, 25)]
```

Along with group by use **HAVING**, which always goes after GROUP BY clause

[103]:
```
%sql SELECT AVG(pk_2_math_) as Math, police_district FROM schools GROUP BY␣
 ↪police_district HAVING MATH < 20
```

```
 * sqlite:///chicago.db
Done.
```

[103]:
```
[(17.2375, 1), (19.395238095238096, 3), (16.84, 10), (19.335294117647063, 12)]
```

1.2.6 Sub-queries and Nested Selects

Retrieving only police districts where teachers_score is lower than the average teachers_score.

[105]:
```
%%sql
SELECT police_district, AVG(teachers_score) AS AVG_Teacher_Score, ␣
 ↪teachers_score
FROM schools
WHERE teachers_score <  (SELECT AVG(teachers_score)FROM schools) GROUP BY␣
 ↪police_district
```

```
      * sqlite:///chicago.db
     Done.
```

[105]: [(1, 16.0, '16'),
         (2, 18.333333333333332, '15'),
         (3, 20.0, '19'),
         (4, 21.666666666666668, '16'),
         (5, 20.0, '19'),
         (8, 24.5, '25'),
         (9, 14.0, '14'),
         (10, 15.0, '13'),
         (13, 25.0, '25'),
         (14, 23.0, '23'),
         (15, 20.0, '20'),
         (22, 19.0, '19'),
         (24, 15.0, '15')]

Consider executing a SQL query that retrieves records from school table with name_of_school, parent_engagement_score, and minimum parent_engagement_score as MIN_SCORE in each row.

[107]:
```sql
%%sql
SELECT name_of_school, parent_engagement_score,  (SELECT␣
  ↪MIN(parent_engagement_score) from schools) as  MIN_SCORE
FROM schools
```

```
      * sqlite:///chicago.db
     Done.
```

[107]: [('Abraham Lincoln Elementary School', '56', '37'),
         ('Adam Clayton Powell Paideia Community Academy Elementary School', '46',
         '37'),
         ('Adlai E Stevenson Elementary School', '47', '37'),
         ('Agustin Lara Elementary Academy', '53', '37'),
         ('Air Force Academy High School', '53', '37'),
         ('Albany Park Multicultural Academy', '46', '37'),
         ('Albert G Lane Technical High School', 'NDA', '37'),
         ('Albert R Sabin Elementary Magnet School', 'NDA', '37'),
         ('Alcott High School for the Humanities', '57', '37'),
         ('Alessandro Volta Elementary School', '51', '37'),
         ('Alexander Graham Bell Elementary School', 'NDA', '37'),
         ('Alexander Graham Elementary School', '48', '37'),
         ('Alexander Hamilton Elementary School', '57', '37'),
         ('Alexander von Humboldt Elementary School', '43', '37'),
         ('Alex Haley Elementary Academy', '47', '37'),
         ('Alfred David Kohn Elementary School', '47', '37'),
         ('Alfred Nobel Elementary School', '48', '37'),
         ('Alice L Barnard Computer Math & Science Center Elementary School', '69',
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('TEAM Englewood Community Academy High School', '58', '37'),
('Telpochcalli Elementary School', '55', '37'),
('Theodore Herzl Elementary School', 'NDA', '37'),
('Theodore Roosevelt High School', 'NDA', '37'),
('Theophilus Schmid Elementary School', '41', '37'),
('Thomas A Edison Regional Gifted Center Elementary School', '55', '37'),
('Thomas A Hendricks Elementary Community Academy', '51', '37'),
('Thomas Chalmers Specialty Elementary School', 'NDA', '37'),
('Thomas Drummond Elementary School', '58', '37'),
('Thomas Hoyne Elementary School', 'NDA', '37'),
('Thomas J Higgins Elementary Community Academy', '49', '37'),
('Thomas J Waters Elementary School', '52', '37'),
('Thomas Kelly High School', 'NDA', '37'),
('Thurgood Marshall Middle School', 'NDA', '37'),
('Turner-Drew Elementary Language Academy', 'NDA', '37'),
('Uplift Community High School', 'NDA', '37'),
('Velma F Thomas Early Childhood Center', '55', '37'),
('Victor Herbert Elementary School', '50', '37'),
('Virgil Grissom Elementary School', 'NDA', '37'),
('VOISE Academy High School', 'NDA', '37'),
('Walt Disney Magnet Elementary School', 'NDA', '37'),
('Walter L Newberry Math & Science Academy Elementary School', '54', '37'),
('Walter Payton College Preparatory High School', 'NDA', '37'),
('Walter Q Gresham Elementary School', '48', '37'),
('Walter Reed Elementary School', '47', '37'),
('Walter S Christopher Elementary School', '52', '37'),
('Washington D Smyser Elementary School', 'NDA', '37'),
('Washington Irving Elementary School', '48', '37'),
('Wells Community Academy High School', 'NDA', '37'),
('Wendell E Green Elementary School', '53', '37'),
('Wendell Phillips Academy High School', 'NDA', '37'),
('Wendell Smith Elementary School', '42', '37'),
('West Park Elementary Academy', '46', '37'),
('West Pullman Elementary School', '47', '37'),
('West Ridge Elementary School', '46', '37'),
('Whitney M Young Magnet High School', '53', '37'),
('Wildwood Elementary School', '55', '37'),
```

```
('Willa Cather Elementary School', '56', '37'),
('William A Hinton Elementary School', '45', '37'),
('William Bishop Owen Scholastic Academy Elementary School', '58', '37'),
('William B Ogden Elementary School', 'NDA', '37'),
('William C Goudy Elementary School', 'NDA', '37'),
('William C Reavis Math & Science Specialty Elementary School', '45', '37'),
('William E B Dubois Elementary School', '50', '37'),
('William E Dever Elementary School', '50', '37'),
('William F Finkl Elementary School', '49', '37'),
('William G Hibbard Elementary School', '49', '37'),
('William H Brown Elementary School', '46', '37'),
('William H King Elementary School', 'NDA', '37'),
('William Howard Taft High School', 'NDA', '37'),
('William H Prescott Elementary School', '50', '37'),
('William H Ray Elementary School', '50', '37'),
('William H Ryder Math & Science Specialty Elementary School', 'NDA', '37'),
('William H Seward Communication Arts Academy Elementary School', '49', '37'),
('William J Bogan High School', '41', '37'),
('William J & Charles H Mayo Elementary School', '50', '37'),
('William J Onahan Elementary School', '47', '37'),
('William Jones College Preparatory High School', 'NDA', '37'),
('William K New Sullivan Elementary School', '47', '37'),
('William Penn Elementary School', '52', '37'),
('William P Gray Elementary School', '47', '37'),
('William P Nixon Elementary School', '46', '37'),
('William Rainey Harper High School', '49', '37'),
('Williams Multiplex Elementary School', '50', '37'),
('Williams Preparatory Academy Middle School', '53', '37'),
('William T Sherman Elementary School', '49', '37'),
('William W Carter Elementary School', '46', '37'),
('Wilma Rudolph Elementary Learning Center', '57', '37'),
('Wolfgang A Mozart Elementary School', '50', '37'),
('Woodlawn Community Elementary School', '59', '37'),
('World Language Academy High School', '50', '37')]
```

Using subqueries to create derived tables, which can then be used to query specific information. For instance, have to retrieve the average *police_district* of the top 10 Police District. From that table, query the average value.

[117]:
```sql
%%sql
SELECT AVG(police_district)
FROM (SELECT police_district FROM schools ORDER BY police_district  DESC LIMIT␣
    ↪10) as police_district
```

 * sqlite:///chicago.db
Done.

`[117]:` `[(25.0,)]`

1.3 Conclusion

To sum up, the analysis of the Chicago Public Educational Institutions dataset offers valuable insights into educational performance. These findings can greatly aid law enforcement agencies in their ongoing endeavors to prevent crime and uphold public safety. By comprehending the intricate socioeconomic factors that impact crime rates, law enforcement agencies can formulate and implement more targeted, efficient strategies and policies.

`[ ]:`