DSC540-T301_2237-1_Project_Milestone2_Samanta_Rajib

July 2, 2023

[183]:

```
# Class : DSC540-T301 Data Preparation (2237-1)
# Name : Rajib Samanta
# Assignment : Project Milestone 2
## Assignment:  Cleaning/Formatting Flat File Source

##      Project: Data Exploration on Marijuana Arrests(D.C)
##          Name: Rajib Samanta

# Overview
## According to the ACLU’s original analysis, marijuana arrests now account for␣
 ↪over half of all drug arrests in the United States. Of the 8.2 million␣
 ↪marijuana arrests between 2001 and 2010,
## 88% were for simply having marijuana. Nationwide, the arrest data revealed␣
 ↪one consistent trend: significant racial bias.
## Despite roughly equal usage rates, Blacks are 3.73 times more likely than␣
 ↪whites to be arrested for marijuana. The laws related to the recreational␣
 ↪use and possession of marijuana have changed at two milestones: the␣
 ↪effective dates of the Marijuana Possession Decriminalization Amendment Act␣
 ↪of 2014 on July 17, 2014, and of Initiative 71 on February 26, 2015 (https://
 ↪mpdc.dc.gov/marijuana).


# Data Sources
# Flat File:adult_income_data.csv
## Description: This data includes arrests made by the Metropolitan Police␣
 ↪Department (MPD). The data represents individuals arrested with a marijuana␣
 ↪charge, regardless of whether there was a more serious secondary charge.
## Link or Flat File uploaded:
## https://www.kaggle.com/code/utkarshx27/
 ↪exploring-dc-marijuana-arrests-insights-trends/input


import os
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from fuzzywuzzy import fuzz
from fuzzywuzzy import process

# Read in the Marijuana_Arrests dataset (given as a .csv file) from local:
directory = '/Users/rajibsamanta/Documents/Rajib/College/Sem5 2023/'  # Replace␣
 ↪with the actual directory path

# Set the working directory
os.chdir(directory)
print(os.getcwd())
data = pd.read_csv("Marijuana_Arrests.csv")
data.head()
# Display the DataFrame
```

```
/Users/rajibsamanta/Documents/Rajib/College/Sem5 2023
```

[183]:

```
                                   TYPE ADULT_JUVENILE  YEAR  \
0                            Possession          Adult  2012
1                            Possession          Adult  2012
2                            Possession          Adult  2012
3                            Possession          Adult  2012
4  Possession with intent to distribute          Adult  2012

                 DATETIME                              CCN   AGE  \
0  2012/01/01 06:00:00+00                 b';\xc8k~\xa4iJ'  20.0
1  2012/01/01 06:00:00+00                 b';\xc8k~\xa4iJ'  23.0
2  2012/01/01 06:00:00+00           b't6\xa0\xac\xec`\xa4'  46.0
3  2012/01/01 09:35:00+00        b'\xbe\x1d\xa7\xf5\xffWx'  30.0
4  2012/01/02 19:40:00+00  b'\xbb\xc0\x8e\x94\x81\xac\xcd'  29.0

  OFFENSE_DISTRICT  OFFENSE_PSA  OFFENSE_BLOCKX  OFFENSE_BLOCKY  …  \
0               5D        501.0        399700.0        137900.0  …
1               5D        501.0        399700.0        137900.0  …
2               7D        707.0        399700.0        130600.0  …
3               6D        605.0        403300.0        134500.0  …
4               6D        604.0        406400.0        135300.0  …

                        ADDRESS ARREST_BLOCKX ARREST_BLOCKY  \
0                FLORIDA AVE NE      401400.0      136900.0
1                FLORIDA AVE NE      401400.0      136900.0
2  3300 BLOCK OF BROTHERS PL SE      399700.0      130600.0
3       700 BLOCK OF 32ND ST SE           NaN           NaN
4         5300 BLOCK OF B ST SE           NaN           NaN

                GIS_ID CREATOR                 CREATED EDITOR  \
0  MARIJUANA_ARRESTS_1    JLAY  2022/10/18 21:51:23+00   JLAY
1  MARIJUANA_ARRESTS_2    JLAY  2022/10/18 21:51:23+00   JLAY
2  MARIJUANA_ARRESTS_3    JLAY  2022/10/18 21:51:23+00   JLAY
```

```
3  MARIJUANA_ARRESTS_4    JLAY  2022/10/18 21:51:23+00   JLAY
4  MARIJUANA_ARRESTS_5    JLAY  2022/10/18 21:51:23+00   JLAY

                   EDITED  OBJECTID                                  GLOBALID
0  2022/10/18 21:51:23+00     12481  {4654D30A-5B56-4E19-8FC2-B19CC723C747}
1  2022/10/18 21:51:23+00     12482  {1C0EBA86-27EC-4B8E-8ABB-6EFFF03A0AA2}
2  2022/10/18 21:51:23+00     12483  {88080D68-CFA3-41E6-AA69-5DB7F950A134}
3  2022/10/18 21:51:23+00     12484  {7769980A-5F36-4B3C-91CF-D1A3A94CE52E}
4  2022/10/18 21:51:23+00     12485  {5D5BEE85-DF16-41A1-BB49-0D16D0EE1320}

[5 rows x 27 columns]
```

[184]:

```
# pip install fuzzywuzzy
```

[185]:

```
data.shape
# No of rows : 13063 and Number of columns : 27
```

[185]:

```
(13063, 27)
```

[186]:

```
# List all the columns
columns = data.columns.tolist()
# Print the column names
print(columns)
```

```
['TYPE', 'ADULT_JUVENILE', 'YEAR', 'DATETIME', 'CCN', 'AGE', 'OFFENSE_DISTRICT',
'OFFENSE_PSA', 'OFFENSE_BLOCKX', 'OFFENSE_BLOCKY', 'DEFENDANT_PSA',
'DEFENDANT_DISTRICT', 'RACE', 'ETHNICITY', 'SEX', 'CATEGORY', 'DESCRIPTION',
'ADDRESS', 'ARREST_BLOCKX', 'ARREST_BLOCKY', 'GIS_ID', 'CREATOR', 'CREATED',
'EDITOR', 'EDITED', 'OBJECTID', 'GLOBALID']
```

[187]:

```
# Get information about the DataFrame
data_info = data.info()
# Print the DataFrame info
print(data_info)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 13063 entries, 0 to 13062
Data columns (total 27 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   TYPE                13063 non-null  object
 1   ADULT_JUVENILE      13063 non-null  object
 2   YEAR                13063 non-null  int64
 3   DATETIME            13063 non-null  object
 4   CCN                 12510 non-null  object
 5   AGE                 12466 non-null  float64
 6   OFFENSE_DISTRICT    13063 non-null  object
 7   OFFENSE_PSA         13036 non-null  float64
 8   OFFENSE_BLOCKX      12461 non-null  float64
 9   OFFENSE_BLOCKY      12461 non-null  float64
 10  DEFENDANT_PSA       12328 non-null  object
 11  DEFENDANT_DISTRICT  12363 non-null  object
 12  RACE                12510 non-null  object
 13  ETHNICITY           12510 non-null  object
 14  SEX                 12510 non-null  object
 15  CATEGORY            13063 non-null  object
 16  DESCRIPTION         13063 non-null  object
 17  ADDRESS             12481 non-null  object
 18  ARREST_BLOCKX       12093 non-null  float64
 19  ARREST_BLOCKY       12093 non-null  float64
 20  GIS_ID              13063 non-null  object
 21  CREATOR             13063 non-null  object
 22  CREATED             13063 non-null  object
 23  EDITOR              13063 non-null  object
 24  EDITED              13063 non-null  object
 25  OBJECTID            13063 non-null  int64
 26  GLOBALID            13063 non-null  object
dtypes: float64(6), int64(2), object(19)
memory usage: 2.7+ MB
None
```

[188]:

```
# About Dataset
## Column        Description        Format
## TYPE        Indicates the type of arrest
## ADULT_JUVENILE        Specifies whether the arrestee is an adult or a␣
 ↪juvenile        Text
## YEAR        The year in which the arrest occurred        Numeric
## DATETIME        The date and time of the arrest        Text
## CCN        Hash number that allows individuals to determine whether there␣
 ↪are multiple arrests associated with one event        Text
## AGE        The age of the arrestee at the time of the arrest        Numeric
## OFFENSE_DISTRICT        The district where the offense took place        Text
## OFFENSE_PSA        The Police Service Area (PSA) associated with the␣
 ↪offense        Text
## OFFENSE_BLOCKX        X-coordinate of the approximate block location of the␣
 ↪offense        Numeric
## OFFENSE_BLOCKY        Y-coordinate of the approximate block location of the␣
 ↪offense        Numeric
## DEFENDANT_PSA        The PSA associated with the defendant        Text
## DEFENDANT_DISTRICT        The district associated with the␣
 ↪defendant        Text
## RACE        The race of the defendant, based on officer␣
 ↪observation        Text
## ETHNICITY        The ethnicity of the defendant, based on officer␣
 ↪observation        Text
```

```
## SEX        The gender of the defendant        Text
## CATEGORY        The category of the offense (e.g., possession, distribution,␣
↪public consumption)        Text
## DESCRIPTION        A description of the offense        Text
## ADDRESS        The address of the offense location        Text
## ARREST_BLOCKX        X-coordinate of the approximate block location of the␣
↪arrest        Numeric
## ARREST_BLOCKY        Y-coordinate of the approximate block location of the␣
↪arrest        Numeric
## GIS_ID        Geographic Information System (GIS) ID associated with the␣
↪record        Text
## CREATOR        The creator of the record        Text
## CREATED        The date and time when the record was created        Text
## EDITOR        The editor of the record        Text
## EDITED        The date and time when the record was last edited        Text
## OBJECTID        Unique identifier for each record        Numeric
## GLOBALID        Global unique identifier for each record        Text
```

[189]:

```
# Change Header
data = data.rename(columns={'OFFENSE_BLOCKX': 'OFFENSE_X-COORDINATE'})
data = data.rename(columns={'OFFENSE_BLOCKY': 'OFFENSE_Y-COORDINATE'})
data = data.rename(columns={'ARREST_BLOCKX': 'ARREST_X-COORDINATE'})
data = data.rename(columns={'ARREST_BLOCKY': 'ARREST_X-COORDINATE'})
```

[190]:

```
# Format data into a more readable format
# Convert the column to datetime format
data['DATETIME'] = pd.to_datetime(data['DATETIME'])
data['CREATED'] = pd.to_datetime(data['CREATED'])
data['EDITED'] = pd.to_datetime(data['EDITED'])

# Reformat the datetime values
data['DATETIME'] = data['DATETIME'].dt.strftime('%Y/%m/%d %H:%M:%S')
data['CREATED'] = data['CREATED'].dt.strftime('%Y/%m/%d %H:%M:%S')
data['EDITED'] = data['EDITED'].dt.strftime('%Y/%m/%d %H:%M:%S')
data.head()
```

[190]:

```
                                TYPE ADULT_JUVENILE  YEAR  \
0                         Possession          Adult  2012
1                         Possession          Adult  2012
2                         Possession          Adult  2012
3                         Possession          Adult  2012
4  Possession with intent to distribute      Adult  2012

              DATETIME                          CCN   AGE  \
0  2012/01/01 06:00:00             b';\xc8k~\xa4iJ'  20.0
1  2012/01/01 06:00:00             b';\xc8k~\xa4iJ'  23.0
2  2012/01/01 06:00:00        b't6\xa0\xac\xec`\xa4'  46.0
```

```
3  2012/01/01 09:35:00        b'\xbe\x1d\xa7\xf5\xffWx'  30.0
4  2012/01/02 19:40:00  b'\xbb\xc0\x8e\x94\x81\xac\xcd'  29.0

  OFFENSE_DISTRICT  OFFENSE_PSA  OFFENSE_X-COORDINATE  OFFENSE_Y-COORDINATE  \
0                5D        501.0              399700.0              137900.0
1                5D        501.0              399700.0              137900.0
2                7D        707.0              399700.0              130600.0
3                6D        605.0              403300.0              134500.0
4                6D        604.0              406400.0              135300.0

   …                       ADDRESS ARREST_X-COORDINATE ARREST_X-COORDINATE  \
0  …                FLORIDA AVE NE            401400.0            136900.0
1  …                FLORIDA AVE NE            401400.0            136900.0
2  …  3300 BLOCK OF BROTHERS PL SE            399700.0            130600.0
3  …       700 BLOCK OF 32ND ST SE                 NaN                 NaN
4  …         5300 BLOCK OF B ST SE                 NaN                 NaN

                GIS_ID CREATOR              CREATED EDITOR  \
0  MARIJUANA_ARRESTS_1    JLAY  2022/10/18 21:51:23   JLAY
1  MARIJUANA_ARRESTS_2    JLAY  2022/10/18 21:51:23   JLAY
2  MARIJUANA_ARRESTS_3    JLAY  2022/10/18 21:51:23   JLAY
3  MARIJUANA_ARRESTS_4    JLAY  2022/10/18 21:51:23   JLAY
4  MARIJUANA_ARRESTS_5    JLAY  2022/10/18 21:51:23   JLAY

                EDITED  OBJECTID                                GLOBALID
0  2022/10/18 21:51:23     12481  {4654D30A-5B56-4E19-8FC2-B19CC723C747}
1  2022/10/18 21:51:23     12482  {1C0EBA86-27EC-4B8E-8ABB-6EFFF03A0AA2}
2  2022/10/18 21:51:23     12483  {88080D68-CFA3-41E6-AA69-5DB7F950A134}
3  2022/10/18 21:51:23     12484  {7769980A-5F36-4B3C-91CF-D1A3A94CE52E}
4  2022/10/18 21:51:23     12485  {5D5BEE85-DF16-41A1-BB49-0D16D0EE1320}

[5 rows x 27 columns]
```

[191]:

```
# Find the missing values of columns
data.isnull().sum() # Sum of null value for each columns
## From the below table we can see AGE is missing for 597 records, CCN,RACE,ETHNICITY & SEX is missing for 553 records
## We can remove these 553 records a insufficient records or bad data.
```

[191]:

```
TYPE                      0
ADULT_JUVENILE            0
YEAR                      0
DATETIME                  0
CCN                     553
AGE                     597
OFFENSE_DISTRICT          0
OFFENSE_PSA              27
```

```
OFFENSE_X-COORDINATE    602
OFFENSE_Y-COORDINATE    602
DEFENDANT_PSA           735
DEFENDANT_DISTRICT      700
RACE                    553
ETHNICITY               553
SEX                     553
CATEGORY                  0
DESCRIPTION               0
ADDRESS                 582
ARREST_X-COORDINATE     970
ARREST_X-COORDINATE     970
GIS_ID                    0
CREATOR                   0
CREATED                   0
EDITOR                    0
EDITED                    0
OBJECTID                  0
GLOBALID                  0
dtype: int64
```

[192]:

```
dataNull = data["RACE"].isna()
data[dataNull]
## CCN,RACE,ETHNICITY & SEX is missing for 553 records
## We can remove these 553 records a insufficient records or bad data as all␣
 ↪above columns has null values
```

[192]:

```
                                       TYPE ADULT_JUVENILE  YEAR  \
42     Possession with intent to distribute       Juvenile  2012
56                               Possession       Juvenile  2012
75                             Distribution       Juvenile  2012
76                             Distribution       Juvenile  2012
83                               Possession       Juvenile  2012
…                                      …             …   …
13058  Possession with intent to distribute       Juvenile  2021
13059  Possession with intent to distribute       Juvenile  2021
13060                    Public consumption       Juvenile  2021
13061                            Possession       Juvenile  2021
13062  Possession with intent to distribute       Juvenile  2021

                  DATETIME  CCN  AGE OFFENSE_DISTRICT  OFFENSE_PSA  \
42     2012/01/05 05:00:00  NaN  NaN               7D        701.0
56     2012/01/06 05:00:00  NaN  NaN               3D        307.0
75     2012/01/07 05:00:00  NaN  NaN               1D        105.0
76     2012/01/07 05:00:00  NaN  NaN               1D        105.0
83     2012/01/08 05:00:00  NaN  NaN               7D        703.0
…                     …  …  …              …          …
```

```
13058  2021/12/03 05:00:00  NaN  NaN               4D        403.0
13059  2021/12/04 05:00:00  NaN  NaN               7D        702.0
13060  2021/12/11 05:00:00  NaN  NaN               4D        403.0
13061  2021/12/18 05:00:00  NaN  NaN               6D        608.0
13062  2021/12/23 05:00:00  NaN  NaN               4D        403.0

       OFFENSE_X-COORDINATE  OFFENSE_Y-COORDINATE  … ADDRESS  \
42                      NaN                   NaN  …     NaN
56                      NaN                   NaN  …     NaN
75                      NaN                   NaN  …     NaN
76                      NaN                   NaN  …     NaN
83                      NaN                   NaN  …     NaN
…                     …                   …  …     …
13058                   NaN                   NaN  …     NaN
13059                   NaN                   NaN  …     NaN
13060                   NaN                   NaN  …     NaN
13061                   NaN                   NaN  …     NaN
13062                   NaN                   NaN  …     NaN

      ARREST_X-COORDINATE ARREST_X-COORDINATE                   GIS_ID  \
42                    NaN                 NaN     MARIJUANA_ARRESTS_43
56                    NaN                 NaN     MARIJUANA_ARRESTS_57
75                    NaN                 NaN     MARIJUANA_ARRESTS_76
76                    NaN                 NaN     MARIJUANA_ARRESTS_77
83                    NaN                 NaN     MARIJUANA_ARRESTS_84
…                   …                 …                      …
13058                 NaN                 NaN  MARIJUANA_ARRESTS_13059
13059                 NaN                 NaN  MARIJUANA_ARRESTS_13060
13060                 NaN                 NaN  MARIJUANA_ARRESTS_13061
13061                 NaN                 NaN  MARIJUANA_ARRESTS_13062
13062                 NaN                 NaN  MARIJUANA_ARRESTS_13063

      CREATOR              CREATED EDITOR               EDITED  OBJECTID  \
42       JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12523
56       JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12537
75       JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12556
76       JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12557
83       JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12564
…       …                  …    …                  …       …
13058    JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25539
13059    JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25540
13060    JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25541
13061    JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25542
13062    JLAY  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25543

                                     GLOBALID
42     {0573D242-F205-4519-B483-D4FD6386759A}
```

```
56     {2CC11F3D-2B87-4F6F-B71C-014EDB65CBCF}
75     {02EFCD74-6E32-4CB9-809F-1EA1DF4C332F}
76     {3C8A9F29-F57D-477A-9DF0-581746DF571A}
83     {48FCBB48-EA1A-4B78-8FD9-6E1E5032C37F}
…                                        …
13058  {32BCC186-3BB1-4F80-8D17-FB2416635554}
13059  {A91CDAA3-B495-41DB-9960-FE56D629E73F}
13060  {CF889832-B7D2-4DD4-B0DB-8453C97D450F}
13061  {1DB2096B-346A-46E5-9724-942DBA82DB76}
13062  {E9D89CF7-5D0A-45F7-8856-51715166AAD1}

[553 rows x 27 columns]
```

[193]:

```
# Remove rows with null values in column CCN,RACE,ETHNICITY & SEX
data = data.dropna(subset=['RACE'])
data.shape
## After removing 553 row nor count is 12510, earlier was 13063
```

[193]:

```
(12510, 27)
```

[194]:

```
# data.describe
data.head()
```

[194]:

```
                                   TYPE ADULT_JUVENILE  YEAR  \
0                            Possession          Adult  2012
1                            Possession          Adult  2012
2                            Possession          Adult  2012
3                            Possession          Adult  2012
4  Possession with intent to distribute          Adult  2012

              DATETIME                              CCN   AGE  \
0  2012/01/01 06:00:00                 b';\xc8k~\xa4iJ'  20.0
1  2012/01/01 06:00:00                 b';\xc8k~\xa4iJ'  23.0
2  2012/01/01 06:00:00           b't6\xa0\xac\xec`\xa4'  46.0
3  2012/01/01 09:35:00        b'\xbe\x1d\xa7\xf5\xffWx'  30.0
4  2012/01/02 19:40:00  b'\xbb\xc0\x8e\x94\x81\xac\xcd'  29.0

  OFFENSE_DISTRICT  OFFENSE_PSA  OFFENSE_X-COORDINATE  OFFENSE_Y-COORDINATE  \
0               5D        501.0              399700.0              137900.0
1               5D        501.0              399700.0              137900.0
2               7D        707.0              399700.0              130600.0
3               6D        605.0              403300.0              134500.0
4               6D        604.0              406400.0              135300.0

   …                       ADDRESS ARREST_X-COORDINATE ARREST_X-COORDINATE  \
0  …                FLORIDA AVE NE            401400.0            136900.0
1  …                FLORIDA AVE NE            401400.0            136900.0
```

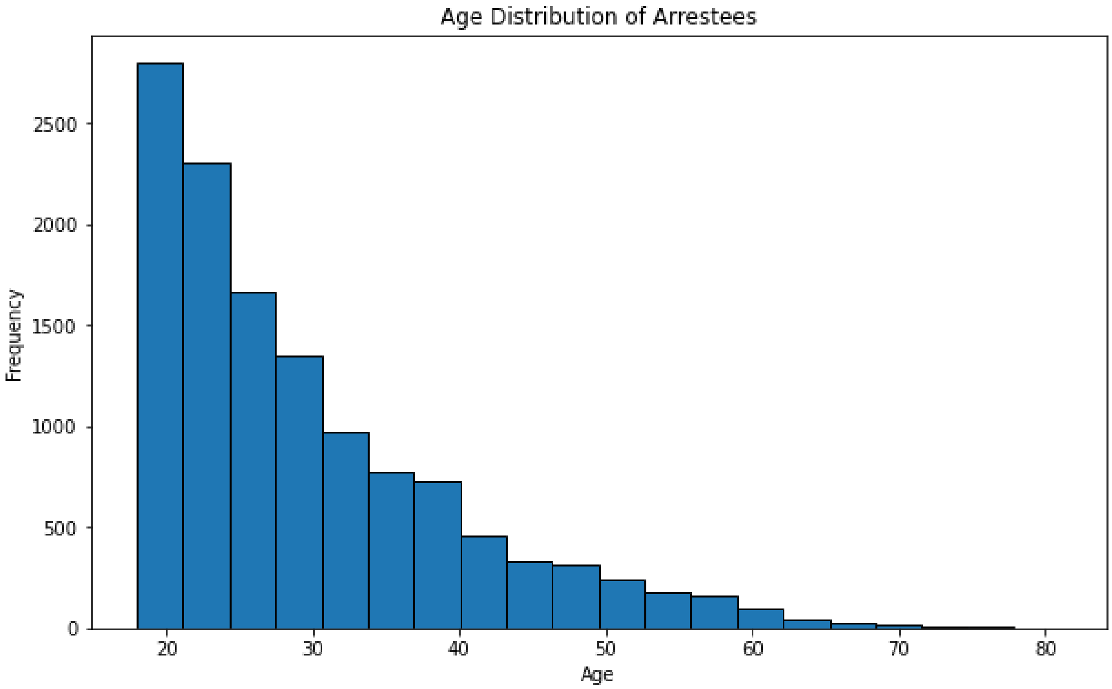
```
2  …  3300 BLOCK OF BROTHERS PL SE            399700.0            130600.0
3  …       700 BLOCK OF 32ND ST SE                 NaN                 NaN
4  …         5300 BLOCK OF B ST SE                 NaN                 NaN

                GIS_ID CREATOR              CREATED EDITOR  \
0  MARIJUANA_ARRESTS_1    JLAY  2022/10/18 21:51:23   JLAY
1  MARIJUANA_ARRESTS_2    JLAY  2022/10/18 21:51:23   JLAY
2  MARIJUANA_ARRESTS_3    JLAY  2022/10/18 21:51:23   JLAY
3  MARIJUANA_ARRESTS_4    JLAY  2022/10/18 21:51:23   JLAY
4  MARIJUANA_ARRESTS_5    JLAY  2022/10/18 21:51:23   JLAY

                EDITED  OBJECTID                                GLOBALID
0  2022/10/18 21:51:23     12481  {4654D30A-5B56-4E19-8FC2-B19CC723C747}
1  2022/10/18 21:51:23     12482  {1C0EBA86-27EC-4B8E-8ABB-6EFFF03A0AA2}
2  2022/10/18 21:51:23     12483  {88080D68-CFA3-41E6-AA69-5DB7F950A134}
3  2022/10/18 21:51:23     12484  {7769980A-5F36-4B3C-91CF-D1A3A94CE52E}
4  2022/10/18 21:51:23     12485  {5D5BEE85-DF16-41A1-BB49-0D16D0EE1320}

[5 rows x 27 columns]
```

[195]:

```python
# Identify outliers
```

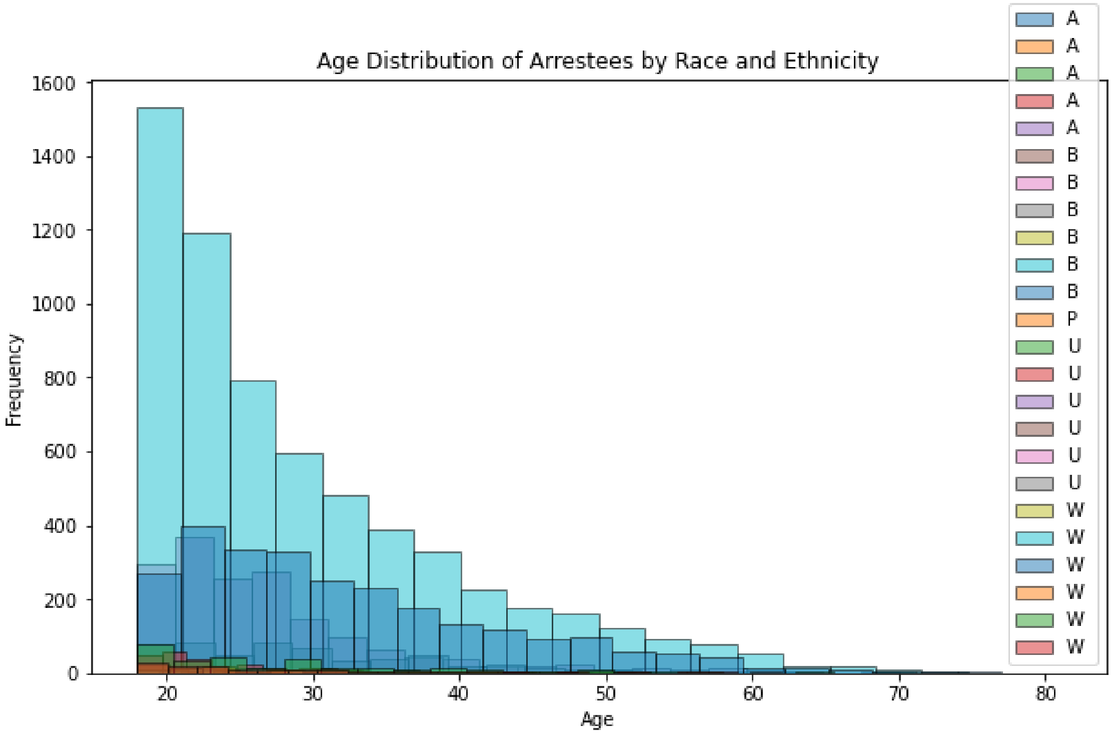
[196]:

```python
plt.figure(figsize=(10, 6))
plt.hist(data['AGE'],edgecolor='black', bins=20)
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.title('Age Distribution of Arrestees')
plt.show()
```



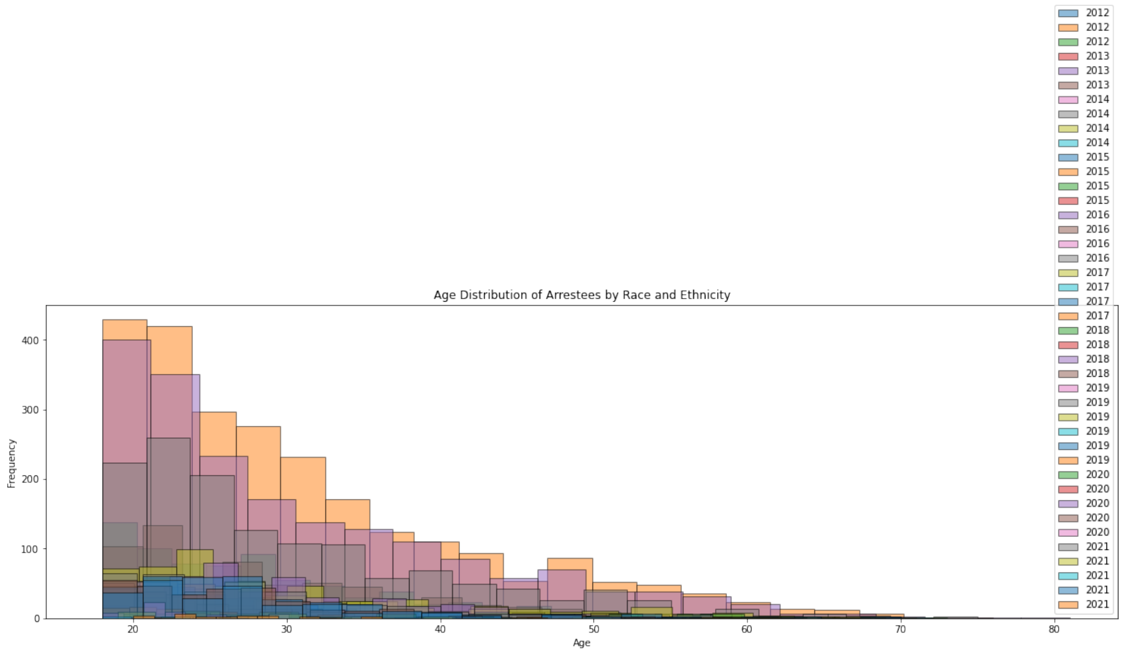
[197]:

```
# Age Distribution of Arrestees by Race and Ethnicity
grouped = data.groupby(['RACE', 'ETHNICITY'])
plt.figure(figsize=(10, 6))
for group, data1 in grouped:
    plt.hist(data1['AGE'], bins=20,edgecolor='black', alpha=0.5, label=group)
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.title('Age Distribution of Arrestees by Race and Ethnicity')
plt.legend()
plt.show()
```



[198]:

```
# Age Distribution of Arrestees by YEAR and TYPE
grouped = data.groupby(['YEAR', 'TYPE'])
plt.figure(figsize=(20, 6))
for group, data1 in grouped:
    plt.hist(data1['AGE'], bins=20,edgecolor='black', alpha=0.5, label=group)
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.title('Age Distribution of Arrestees by Race and Ethnicity')
plt.legend()
plt.show()
data.shape
```



```
[198]: (12510, 27)
```

```
[199]: ## --> From the above plot we can say that below 10 years and above 70 years␣
         ↪datas are outlier
       # Now remove the outlier
       data = data[(data['AGE'] <= 70) & (data['AGE'] >= 10)]  # using operator
       data.shape
       ## Removed 60 outlier rows
```

```
[199]: (12455, 27)
```

```
[200]: # Find duplicates based on key columns "TYPE","ADULT_JUVENILE",␣
         ↪"OFFENSE_DISTRICT", "YEAR","CCN", "AGE", "SEX", "RACE"
       # create data set with duplicate values
       duplicate_data = data[data.duplicated(subset=["TYPE","ADULT_JUVENILE",␣
         ↪"OFFENSE_DISTRICT", "YEAR","CCN", "AGE", "SEX", "RACE"])]
       # Remove duplicate from the original data set
       data = data[~data.duplicated(subset=["TYPE","ADULT_JUVENILE",␣
         ↪"OFFENSE_DISTRICT", "YEAR","CCN", "AGE", "SEX", "RACE"])]

       data.shape
       ## --> Removed 216 duplicate rows
```

```
[200]: (12239, 27)
```

```
[201]: #data.head()
```

[202]:

```
# Fix casing or inconsistent values
# Convert all values in the 'Name' column to lowercase
#data['TYPE'] = data['Name'].str.lower()

# Capitalize the first letter of each value in the 'Name' column
data['TYPE'] = data['TYPE'].str.capitalize()
data['ADULT_JUVENILE'] = data['ADULT_JUVENILE'].str.capitalize()
# Capitalize the first letter of each word in the 'Name' column
data['ADDRESS'] = data['ADDRESS'].str.title()
data['ADDRESS'] = data['ADDRESS'].astype(str)


# Convert the 'Age' column to integer
data['AGE'] = data['AGE'].astype(int)
# Print the DataFrame with fixed casing
data
```

[202]:

```
                                       TYPE ADULT_JUVENILE  YEAR  \
0                                Possession          Adult  2012
1                                Possession          Adult  2012
2                                Possession          Adult  2012
3                                Possession          Adult  2012
4      Possession with intent to distribute          Adult  2012
…                                     …            …   …
13029  Possession with intent to distribute          Adult  2021
13030  Possession with intent to distribute          Adult  2021
13031  Possession with intent to distribute          Adult  2021
13032  Possession with intent to distribute          Adult  2021
13033  Possession with intent to distribute          Adult  2021

                  DATETIME                              CCN  AGE  \
0      2012/01/01 06:00:00                 b';\xc8k~\xa4iJ'   20
1      2012/01/01 06:00:00                 b';\xc8k~\xa4iJ'   23
2      2012/01/01 06:00:00           b't6\xa0\xac\xec`\xa4'   46
3      2012/01/01 09:35:00        b'\xbe\x1d\xa7\xf5\xffWx'   30
4      2012/01/02 19:40:00  b'\xbb\xc0\x8e\x94\x81\xac\xcd'   29
…                   …                               …  …
13029  2021/12/06 21:00:00                 105e0539b622e4c6   18
13030  2021/12/23 21:00:00                 14daeb983691273a   28
13031  2021/12/23 21:00:00                 14daeb983691273a   35
13032  2021/04/26 11:00:00                 f09f73792bd6d544   31
13033  2021/04/26 11:00:00                 f09f73792bd6d544   23

      OFFENSE_DISTRICT  OFFENSE_PSA  OFFENSE_X-COORDINATE  \
0                   5D        501.0              399700.0
1                   5D        501.0              399700.0
2                   7D        707.0              399700.0
```

```
3                   6D        605.0              403300.0
4                   6D        604.0              406400.0
…                …          …                   …
13029               7D        706.0              400700.0
13030               7D        708.0              398900.0
13031               7D        708.0              398900.0
13032               7D        701.0              401700.0
13033               7D        701.0              401700.0

       OFFENSE_Y-COORDINATE  …  \
0                  137900.0  …
1                  137900.0  …
2                  130600.0  …
3                  134500.0  …
4                  135300.0  …
…                     …  …
13029              129500.0  …
13030              128600.0  …
13031              128600.0  …
13032              132700.0  …
13033              132700.0  …

                                             ADDRESS ARREST_X-COORDINATE  \
0                                     Florida Ave Ne            401400.0
1                                     Florida Ave Ne            401400.0
2                       3300 Block Of Brothers Pl Se            399700.0
3                            700 Block Of 32Nd St Se                 NaN
4                              5300 Block Of B St Se                 NaN
…                                              …                 …
13029                    3800 Block Of 9Th Street Se            400700.0
13030  4600 Block Of Martin Luther King Jr Avenue Sw            398900.0
13031  4600 Block Of Martin Luther King Jr Avenue Sw            398900.0
13032                  2300 Block Of Green Street Se            401700.0
13033                  2300 Block Of Green Street Se            401700.0

      ARREST_X-COORDINATE                   GIS_ID CREATOR  \
0                136900.0      MARIJUANA_ARRESTS_1    JLAY
1                136900.0      MARIJUANA_ARRESTS_2    JLAY
2                130600.0      MARIJUANA_ARRESTS_3    JLAY
3                     NaN      MARIJUANA_ARRESTS_4    JLAY
4                     NaN      MARIJUANA_ARRESTS_5    JLAY
…                   …                      …     …
13029            129500.0  MARIJUANA_ARRESTS_13030    JLAY
13030            128600.0  MARIJUANA_ARRESTS_13031    JLAY
13031            128600.0  MARIJUANA_ARRESTS_13032    JLAY
13032            132700.0  MARIJUANA_ARRESTS_13033    JLAY
13033            132700.0  MARIJUANA_ARRESTS_13034    JLAY
```

```
                   CREATED EDITOR               EDITED  OBJECTID  \
0      2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12481
1      2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12482
2      2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12483
3      2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12484
4      2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     12485
…                    …    …                  …       …
13029  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25510
13030  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25511
13031  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25512
13032  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25513
13033  2022/10/18 21:51:23   JLAY  2022/10/18 21:51:23     25514

                                     GLOBALID
0      {4654D30A-5B56-4E19-8FC2-B19CC723C747}
1      {1C0EBA86-27EC-4B8E-8ABB-6EFFF03A0AA2}
2      {88080D68-CFA3-41E6-AA69-5DB7F950A134}
3      {7769980A-5F36-4B3C-91CF-D1A3A94CE52E}
4      {5D5BEE85-DF16-41A1-BB49-0D16D0EE1320}
…                                       …
13029  {E601ABAA-7760-46D5-8062-63AF36923BEE}
13030  {2FD433F4-4C4E-43CD-9843-3343C8F9187C}
13031  {C748915D-AF10-42A3-98A1-1225BDBE4209}
13032  {7C8C3268-3EA9-419F-A0D5-EDCACDEAEF9B}
13033  {5E9233E2-BBBE-48B5-B0A1-F30BAD6BBE3B}

[12239 rows x 27 columns]
```

[203]:

```
# Conduct Fuzzy Matching
## conduct Fuzzy search to find out the address with 'King Jr Avenue Sw'

# Target address to match
target_address = 'King Jr Avenue Sw'

# Calculate similarity scores for each address in the DataFrame
data['Similarity Score'] = data['ADDRESS'].apply(lambda x: fuzz.
 ↪ratio(target_address.lower(), x.lower()))

# Find the best match and its similarity score
best_match = process.extractOne(target_address.lower(), data['ADDRESS'].
 ↪apply(lambda x: x.lower()))
best_match_address = best_match[0]
best_match_score = best_match[1]

# Print the DataFrame and the best match
print("DataFrame:")
```

```
#print(data)
print("\nBest Match:")
print(f"Address: {best_match_address}")
print(f"Similarity Score: {best_match_score}")
```

```
DataFrame:

Best Match:
Address: 4600 block of martin luther king jr avenue sw
Similarity Score: 90
```

[204]:

```
##--> Address: 4600 block of martin luther king jr avenue sw has similary score of 90
```

[ ]:

```

```