Out[573]:

	Subject Age Group	Subject ID	GO / SC Num	Terry Stop ID	Stop Resolution	Weapon Type	Officer ID	Officer YOB	Officer Gender	Officer Race	 Reported Time	Initial Call Type	Final Ca
0	36 - 45	8597903457	20190000243853	8597867579	Field Contact	-	5469	1967	М	White	 06:45:50.0000000	TRESPASS	SUSP CIF SUSP P
1	26 - 35	-1	20160000003391	181276	Field Contact	None	7591	1985	М	Hispanic or Latino	 22:48:00.0000000	-	
2	18 - 25	7774286580	20210000118915	24056783769	Field Contact	-	7459	1973	М	White	 12:16:51.0000000	SFD - ASSIST ON FIRE OR MEDIC RESPONSE	DISTUR -
3	26 - 35	-1	20180000047173	400437	Offense Report	None	6680	1972	М	Hispanic or Latino	 18:31:00.0000000	-	
4	18 - 25	-1	20160000085711	136669	Offense Report	None	7560	1986	М	White	 11:44:00.0000000	SUSPICIOUS PERSON, VEHICLE OR INCIDENT	SUSP CIF SUSP P

5 rows × 23 columns

Out[574]: (58157, 23)

## 

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 58157 entries, 0 to 58156
Data columns (total 23 columns):

Data	COTUMNIS (COCAT 25 COTUM	1113).	
#	Column	Non-Null Count	Dtype
0	Subject Age Group	58157 non-null	object
1	Subject ID	58157 non-null	int64
2	GO / SC Num	58157 non-null	int64
3	Terry Stop ID	58157 non-null	int64
4	Stop Resolution	58157 non-null	object
5	Weapon Type	58157 non-null	object
6	Officer ID	58157 non-null	object
7	Officer YOB	58157 non-null	int64
8	Officer Gender	58157 non-null	object
9	Officer Race	58157 non-null	object
10	Subject Perceived Race	58157 non-null	object
11	Subject Perceived Gende	er 58157 non-null	object
12	Reported Date	58157 non-null	object
13	Reported Time	58157 non-null	object
14	Initial Call Type	58157 non-null	object
15	Final Call Type	58157 non-null	object
16	Call Type	58157 non-null	object
17	Officer Squad	57613 non-null	object
18	Arrest Flag	58157 non-null	object
19	Frisk Flag	58157 non-null	object
20	Precinct	58157 non-null	object
21	Sector	58157 non-null	object
22	Beat	58157 non-null	object

dtypes: int64(4), object(19)
memory usage: 10.2+ MB

```
In [576]: ► df.isna().sum()
   Out[576]: Subject Age Group
                                           0
             Subject ID
                                           0
             GO / SC Num
                                           0
             Terry Stop ID
             Stop Resolution
                                           0
             Weapon Type
                                           0
             Officer ID
                                           0
             Officer YOB
                                           0
             Officer Gender
             Officer Race
                                           0
             Subject Perceived Race
             Subject Perceived Gender
                                           0
             Reported Date
                                           0
             Reported Time
                                           0
             Initial Call Type
                                           0
             Final Call Type
                                           0
             Call Type
                                           0
             Officer Squad
                                          544
             Arrest Flag
                                           0
             Frisk Flag
                                           0
              Precinct
                                           0
              Sector
              Beat
                                           0
             dtype: int64
```

In [577]: ► df.dropna(inplace=True) df.isna().sum() Out[577]: Subject Age Group 0 Subject ID 0 GO / SC Num Terry Stop ID Stop Resolution Weapon Type Officer ID Officer YOB Officer Gender Officer Race Subject Perceived Race Subject Perceived Gender Reported Date Reported Time Initial Call Type Final Call Type Call Type Officer Squad Arrest Flag Frisk Flag Precinct 0 Sector Beat 0 dtype: int64

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 57613 entries, 1 to 58156
Data columns (total 23 columns):
    Column
                              Non-Null Count Dtype
    -----
                              -----
    Subject Age Group
                              57613 non-null object
    Subject ID
                              57613 non-null int64
    GO / SC Num
                              57613 non-null int64
    Terry Stop ID
                              57613 non-null int64
    Stop Resolution
                              57613 non-null object
    Weapon Type
                              57613 non-null object
6
    Officer ID
                              57613 non-null object
    Officer YOB
                              57613 non-null int64
8
    Officer Gender
                              57613 non-null object
9
    Officer Race
                              57613 non-null object
10 Subject Perceived Race
                              57613 non-null object
11 Subject Perceived Gender 57613 non-null object
12 Reported Date
                              57613 non-null object
13 Reported Time
                              57613 non-null object
14 Initial Call Type
                              57613 non-null object
15 Final Call Type
                              57613 non-null object
16 Call Type
                              57613 non-null object
17 Officer Squad
                              57613 non-null object
18 Arrest Flag
                              57613 non-null object
19 Frisk Flag
                              57613 non-null object
20 Precinct
                              57613 non-null object
                              57613 non-null object
21 Sector
                              57613 non-null object
22 Beat
dtypes: int64(4), object(19)
```

memory usage: 10.5+ MB

In [578]: ► df.info()

```
In [580]: ► df["Stop Resolution"]
   Out[580]: 1
                       Field Contact
                       Field Contact
              2
                      Offense Report
              3
              4
                      Offense Report
              5
                              Arrest
              58152
                              Arrest
              58153
                              Arrest
              58154
                        Field Contact
              58155
                        Field Contact
             58156
                       Offense Report
             Name: Stop Resolution, Length: 57613, dtype: object
In [581]: ► df["Stop Resolution"].unique()
   Out[581]: array(['Field Contact', 'Offense Report', 'Arrest',
                     'Referred for Prosecution', 'Citation / Infraction'], dtype=object)
```

In [582]: N new\_df = df[["Subject Age Group", "Stop Resolution", "Officer Gender", "Officer Race", "Subject Perceived Gender", "Subject Perceived Gender Gen new\_df

Out[582]:

	Subject Age Group	Stop Resolution	Officer Gender	Officer Race	Subject Perceived Gender	Subject Perceived Race	Arrest Flag	Frisk Flag
1	26 - 35	Field Contact	М	Hispanic or Latino	Female	Unknown	N	N
2	18 - 25	Field Contact	М	White	Male	White	N	Υ
3	26 - 35	Offense Report	M	Hispanic or Latino	Male	White	N	N
4	18 - 25	Offense Report	М	White	Male	Black or African American	N	N
5	26 - 35	Arrest	М	White	Male	Black or African American	Υ	N
58152	18 - 25	Arrest	М	White	Male	Black or African American	N	Υ
58153	18 - 25	Arrest	М	White	Male	White	N	N
58154	36 - 45	Field Contact	М	Black or African American	Male	White	N	N
58155	36 - 45	Field Contact	М	White	Male	Black or African American	N	N
58156	36 - 45	Offense Report	М	White	Male	Black or African American	N	N

57613 rows × 8 columns

C:\Users\admin\anaconda3\Lib\site-packages\sklearn\preprocessing\\_encoders.py:972: FutureWarning: `sparse` was renamed to `sparse\_output` in version 1.2 and will be removed in 1.4. `sparse\_output` is ignored unless you leave `sparse` to its defau lt value.

warnings.warn(

## Out[583]:

	Subject Age Group	Stop Resolution	Officer Gender	Officer Race	Subject Perceived Gender	Subject Perceived Race	Arrest Flag_Y	Frisk Flag_N	Frisk Flag_Y
1	26 - 35	Field Contact	М	Hispanic or Latino	Female	Unknown	0.0	0.0	1.0
2	18 - 25	Field Contact	М	White	Male	White	0.0	1.0	0.0
3	26 - 35	Offense Report	М	Hispanic or Latino	Male	White	0.0	1.0	0.0
4	18 - 25	Offense Report	М	White	Male	Black or African American	1.0	1.0	0.0
5	26 - 35	Arrest	М	White	Male	Black or African American	0.0	0.0	1.0
57158	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57174	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57175	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57278	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57566	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0

58145 rows × 9 columns

```
In [586]: ▶ import statsmodels as sm
              import sklearn.preprocessing as preprocessing
              from sklearn.linear model import LogisticRegression
              from sklearn.model selection import train test split
              from scipy import stats
              import numpy as np
In [587]: ▶
              # Convert race and sex using get dummies()
              x feats = ["Officer Race", "Subject Perceived Race", "Officer Gender", "Subject Perceived Gender"]
              X = pd.get dummies(new df[x feats], drop first=True, dtype=float)
              # Convert target using get dummies
              y = pd.get_dummies(new_df["Arrest Flag_Y"], drop_first=True, dtype=float)
              # Rename the column to be consistent with the Logistic regression assumption
              y.columns = ['Arrest_Flag']
In [588]: ▶ from sklearn.model_selection import train_test_split
              X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=0)
```

```
In [589]:  ▶ import statsmodels.api as sm
              # Create intercept term required for sm.Logit, see documentation for more information
             X = sm.add_constant(X_train)
              # Fit model
              logit_model = sm.Logit(y_train, X_train)
              # Get results of the fit
              result = logit_model.fit()
              result.summary()
              Warning: Maximum number of iterations has been exceeded.
```

Current function value: 0.334629

Iterations: 35

C:\Users\admin\anaconda3\Lib\site-packages\statsmodels\base\model.py:607: ConvergenceWarning: Maximum Likelihood optimizati on failed to converge. Check mle\_retvals

warnings.warn("Maximum Likelihood optimization failed to "

# Out[589]: Logit Regression Results

Dep. Variable: Arrest\_Flag No. Observations: 43608 Df Residuals: Logit 43584 Model: Method: MLE Df Model: 23 **Date:** Sat, 02 Dec 2023 Pseudo R-squ.: -0.01127 00:06:09 Log-Likelihood: Time: -14592. converged: False **LL-Null:** -14430. Covariance Type: LLR p-value: 1.000 nonrobust

	coef	std err	z	P> z	[0.025	0.975]
Officer Race_Asian	-1.0741	0.158	-6.803	0.000	-1.384	-0.765
Officer Race_Black or African American	-1.1662	0.160	-7.310	0.000	-1.479	-0.854
Officer Race_Hispanic or Latino	-1.0218	0.153	-6.659	0.000	-1.322	-0.721
Officer Race_Nat Hawaiian/Oth Pac Islander	-1.2047	0.227	-5.305	0.000	-1.650	-0.760
Officer Race_Not Specified	-1.0684	0.189	-5.642	0.000	-1.440	-0.697
Officer Race_Two or More Races	-1.0540	0.176	-5.982	0.000	-1.399	-0.709
Officer Race_Unknown	-12.1832	156.352	-0.078	0.938	-318.627	294.261
Officer Race_White	-1.0138	0.144	-7.055	0.000	-1.295	-0.732
Subject Perceived Race_American Indian or Alaska Native	-0.0271	0.040	-0.679	0.497	-0.105	0.051
Subject Perceived Race_Asian	-0.1672	0.052	-3.217	0.001	-0.269	-0.065
Subject Perceived Race_Black or African American	-0.0305	nan	nan	nan	nan	nan
Subject Perceived Race_DUPLICATE	0.1101	nan	nan	nan	nan	nan
Subject Perceived Race_Hispanic	-0.1472	0.084	-1.746	0.081	-0.312	0.018
Subject Perceived Race_Multi-Racial	-0.1465	0.105	-1.400	0.162	-0.352	0.059
Subject Perceived Race_Native Hawaiian or Other Pacific Islander	-0.2922	0.355	-0.822	0.411	-0.989	0.404
Subject Perceived Race_Other	0.5015	0.231	2.169	0.030	0.048	0.955
Subject Perceived Race_Unknown	0.0568	0.036	1.600	0.110	-0.013	0.126
Subject Perceived Race_White	-0.0067	nan	nan	nan	nan	nan
Officer Gender_M	-0.0485	0.045	-1.080	0.280	-0.137	0.039
Subject Perceived Gender_DUPLICATE	0.1101	nan	nan	nan	nan	nan
Subject Perceived Gender_Female	-1.0902	0.053	-20.703	0.000	-1.193	-0.987
Subject Perceived Gender_Gender Diverse (gender non-conforming and/or transgender)	-0.7559	0.540	-1.399	0.162	-1.815	0.303

#### **Subject Perceived Gender Male** -1.0825 nan nan nan nan nan Subject Perceived Gender\_Unable to Determine -1.1305 0.243 -1.606 -0.655**-**4.661 0.000 Subject Perceived Gender Unknown -0.9163 0.379 -0.174-2.418 0.016 -1.659

```
In [590]:
   Out[590]: Officer Race Asian
                                                                                                   0.341615
             Officer Race Black or African American
                                                                                                   0.311548
             Officer Race Hispanic or Latino
                                                                                                   0.359964
             Officer Race Nat Hawaiian/Oth Pac Islander
                                                                                                   0.299780
             Officer Race Not Specified
                                                                                                   0.343571
             Officer Race Two or More Races
                                                                                                   0.348527
              Officer Race Unknown
                                                                                                   0.000005
             Officer Race White
                                                                                                   0.362843
              Subject Perceived Race American Indian or Alaska Native
                                                                                                   0.973274
              Subject Perceived Race Asian
                                                                                                   0.846038
             Subject Perceived Race Black or African American
                                                                                                   0.969966
              Subject Perceived Race DUPLICATE
                                                                                                   1.116378
             Subject Perceived Race Hispanic
                                                                                                   0.863159
             Subject Perceived Race Multi-Racial
                                                                                                   0.863711
             Subject Perceived Race Native Hawaiian or Other Pacific Islander
                                                                                                   0.746617
              Subject Perceived Race Other
                                                                                                   1.651116
             Subject Perceived Race Unknown
                                                                                                   1.058490
              Subject Perceived Race White
                                                                                                   0.993309
             Officer Gender M
                                                                                                   0.952651
              Subject Perceived Gender DUPLICATE
                                                                                                   1.116378
              Subject Perceived Gender Female
                                                                                                   0.336144
              Subject Perceived Gender Gender Diverse (gender non-conforming and/or transgender)
                                                                                                   0.469589
              Subject Perceived Gender Male
                                                                                                   0.338745
             Subject Perceived Gender Unable to Determine
                                                                                                   0.322862
              Subject Perceived Gender Unknown
                                                                                                   0.400014
             dtype: float64
In [591]:
           ▶ model_log.coef_
   Out[591]: array([[-1.07380115, -1.16592594, -1.02148029, -1.20435648, -1.06808804,
                      -1.0537694, -4.78110185, -1.01352402, -0.02726226, -0.16736489,
                      -0.03064991, 0.11121594, -0.14733636, -0.14671854, -0.29248295,
                       0.50067857, 0.05669608, -0.00686996, -0.04851256, 0.11121594,
                      -1.09031518, -0.75733462, -1.08260815, -1.13068 , -0.91712143]])
```

```
In [592]: N logreg = LogisticRegression(fit intercept=False, C=1e15, solver='liblinear')
             model log = logreg.fit(X train, y train)
             y hat train = logreg.predict(X train)
             y hat test = logreg.predict(X test)
             C:\Users\admin\anaconda3\Lib\site-packages\sklearn\utils\validation.py:1184: DataConversionWarning: A column-vector y was p
             assed when a 1d array was expected. Please change the shape of y to (n samples, ), for example using ravel().
               y = column or 1d(y, warn=True)
In [593]: ▶ | from sklearn.metrics import mean squared error
             train mse = mean squared error(y train, y hat train)
             test mse = mean squared error(y test, y hat test)
             print('Train Mean Squared Error:', train mse)
             print('Test Mean Squared Error:', test mse)
             Train Mean Squared Error: 0.10266464868831407
             Test Mean Squared Error: 0.10462956593519983
In [594]: ▶ import matplotlib.pyplot as plt
             from sklearn.model selection import train test split
             from sklearn.tree import DecisionTreeClassifier
             from sklearn.metrics import accuracy score
             from sklearn.preprocessing import OneHotEncoder
             from sklearn import tree
clf.fit(X train, y train)
             other train mse = mean squared error(y train, clf.predict(X train))
             other test mse = mean squared error(y test, clf.predict(X test))
             print('Train Mean Squared Error:', other train mse)
             print('Test Mean Squared Error:', other test mse)
             Train Mean Squared Error: 0.10252705925518253
             Test Mean Squared Error: 0.10476714590355644
In [596]:  ▶ | y pred = clf.predict(X test)
             y pred
   Out[596]: array([0., 0., 0., ..., 0., 0., 0.])
```

Out[598]: 0.8974729407448174

```
# Create a base decision tree classifier
             base_dt_classifier_boost = DecisionTreeClassifier(max depth=1)
             # Create an AdaBoostClassifier
             adaboost classifier = AdaBoostClassifier(base_estimator=base_dt_classifier_boost, n_estimators=50, random_state=42)
             # Train the AdaBoostClassifier
             adaboost classifier.fit(X train, y train)
             # Evaluate AdaBoost performance
             adaboost predictions = adaboost classifier.predict(X test)
             print("AdaBoost Accuracy:", accuracy score(y test, adaboost predictions))
             print("AdaBoost Classification Report:")
             print(classification report(y test, adaboost predictions))
             C:\Users\admin\anaconda3\Lib\site-packages\sklearn\utils\validation.py:1184: DataConversionWarning: A column-vector y was p
             assed when a 1d array was expected. Please change the shape of y to (n samples, ), for example using ravel().
               y = column or 1d(y, warn=True)
             C:\Users\admin\anaconda3\Lib\site-packages\sklearn\ensemble\ base.py:156: FutureWarning: `base estimator` was renamed to `e
             stimator in version 1.2 and will be removed in 1.4.
               warnings.warn(
             AdaBoost Accuracy: 0.8953704340648002
             AdaBoost Classification Report:
                          precision
                                       recall f1-score
                                                         support
                      0.0
                               0.90
                                         1.00
                                                  0.94
                                                           13016
```

C:\Users\admin\anaconda3\Lib\site-packages\sklearn\metrics\\_classification.py:1469: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero\_division` parameter to control this behavior.

warn prf(average, modifier, msg start, len(result))

0.00

0.50

0.90

0.00

0.90

0.47

0.85

1521

14537

14537

14537

1.0

accuracy macro avg

weighted avg

0.00

0.45

0.80

C:\Users\admin\anaconda3\Lib\site-packages\sklearn\metrics\\_classification.py:1469: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero\_division` parameter to control this behavior.

warn prf(average, modifier, msg start, len(result))

C:\Users\admin\anaconda3\Lib\site-packages\sklearn\metrics\\_classification.py:1469: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, msg\_start, len(result))

In [ ]: ▶

In [600]: ► new\_df

Out[600]:

	Subject Age Group	Stop Resolution	Officer Gender	Officer Race	Subject Perceived Gender	Subject Perceived Race	Arrest Flag_Y	Frisk Flag_N	Frisk Flag_Y
1	26 - 35	Field Contact	М	Hispanic or Latino	Female	Unknown	0.0	0.0	1.0
2	18 - 25	Field Contact	М	White	Male	White	0.0	1.0	0.0
3	26 - 35	Offense Report	М	Hispanic or Latino	Male	White	0.0	1.0	0.0
4	18 - 25	Offense Report	М	White	Male	Black or African American	1.0	1.0	0.0
5	26 - 35	Arrest	М	White	Male	Black or African American	0.0	0.0	1.0
•••	***		•••						•••
57158	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57174	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57175	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57278	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0
57566	NaN	NaN	NaN	NaN	NaN	NaN	0.0	1.0	0.0

58145 rows × 9 columns

# Now you can work with the filtered\_df, for example: print(filtered\_df.groupby("Frisk Flag\_Y").size())

Frisk Flag\_Y 0.0 3837 1.0 2161 dtype: int64

### In [602]: print(filtered\_df.groupby("Subject Perceived Race").size()) Subject Perceived Race 186 American Indian or Alaska Native 163 Asian 190 Black or African American 1750 DUPLICATE 4 Hispanic 147 Multi-Racial 81 Native Hawaiian or Other Pacific Islander 11 25 0ther Unknown 438 White 2946 dtype: int64 In [603]: print(filtered\_df.groupby("Officer Race").size()) Officer Race American Indian/Alaska Native 41 Asian 273

222

384

267

386

4322

46

Black or African American

Nat Hawaiian/Oth Pac Islander

Hispanic or Latino

Two or More Races

Not Specified

dtype: int64

White

```
In [604]:  

# Assuming new df is your DataFrame
              grouped df = new df[new df["Arrest Flag Y"] == 1.0].groupby(["Subject Perceived Gender", "Officer Gender"]).size()
              # Now you can work with the grouped df
              grouped_df
   Out[604]: Subject Perceived Gender
                                                                           Officer Gender
                                                                                                1
                                                                                                19
                                                                           Μ
                                                                                                1
              DUPLICATE
                                                                                                 3
                                                                           Μ
              Female
                                                                                              130
                                                                                              1031
              Gender Diverse (gender non-conforming and/or transgender)
                                                                                                1
                                                                                                 3
              Male
                                                                                              524
                                                                                              4186
              Unable to Determine
                                                                                                2
                                                                                                29
              Unknown
                                                                           Μ
                                                                                               11
              dtype: int64
In [605]: M filtered_df = new_df[(new_df["Arrest Flag_Y"] == 1.0) & (new_df["Subject Perceived Gender"] == "Male")].groupby(["Subject Perceived Gender"]
              # Now you can work with the filtered_df
              print(filtered_df)
              Subject Perceived Race Subject Age Group
                                                              7
                                                               5
                                       1 - 17
                                       18 - 25
                                                              30
                                       26 - 35
                                                              39
                                                              29
                                       36 - 45
              White
                                       18 - 25
                                                             355
                                       26 - 35
                                                             807
                                       36 - 45
                                                             555
                                       46 - 55
                                                             345
                                       56 and Above
                                                             161
              Length: 62, dtype: int64
```

In [606]:	<pre>M aces = ["White", "Black or African American"] iltered_df = new_df[(new_df["Arrest Flag_Y"] == 1.0) &amp; (new_df["Subject Perceived Race"] == "Races")].groupby(["Frish</pre>	k Flag_Y
	Now you can work with the filtered_df rint(filtered_df)	
		Þ
	Series([], dtype: int64)	
In [ ]:	M N	
In [ ]:	N	
TH [ ].	PI	
In [ ]:	н	