

Stanford Open Policing Project dataset

ANALYZING POLICE ACTIVITY WITH PANDAS



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Introduction to the dataset

- Traffic stops by police officers



- Download data for any state:
<https://openpolicing.stanford.edu/>

Preparing the data

- Examine the data
- Clean the data

```
import pandas as pd
ri = pd.read_csv('police.csv')
ri.head(3)
```

	state	stop_date	stop_time	county_name	driver_gender	driver_race
0	RI	2005-01-04	12:55	NaN	M	White
1	RI	2005-01-23	23:15	NaN	M	White
2	RI	2005-02-17	04:15	NaN	M	White

- Each row represents one traffic stop
- NaN indicates a missing value

Locating missing values (1)

```
ri.isnull()
```

```
   state stop_date stop_time county_name driver_gender
0  False      False      False         True         False
1  False      False      False         True         False
2  False      False      False         True         False
...
```

Locating missing values (2)

```
ri.isnull().sum()
```

```
state                0
stop_date            0
stop_time            0
county_name          91741
driver_gender        5205
...
```

- `.sum()` calculates the sum of each column
- `True = 1` , `False = 0`

Dropping a column

```
ri.isnull().sum()
```

```
state          0
stop_date      0
stop_time      0
county_name    91741
driver_gender   5205
driver_race    5202
...
```

```
ri.shape
```

```
(91741, 15)
```

- `county_name` column only contains missing values
- Drop `county_name` using the `.drop()` method

```
ri.drop('county_name',  
       axis='columns', inplace=True)
```

Dropping rows

- `.dropna()` : Drop rows based on the presence of missing values

```
ri.head()
```

	state	stop_date	stop_time	driver_gender	driver_race
0	RI	2005-01-04	12:55	M	White
1	RI	2005-01-23	23:15	M	White
2	RI	2005-02-17	04:15	M	White
3	RI	2005-02-20	17:15	M	White
4	RI	2005-02-24	01:20	F	White

```
ri.dropna(subset=['stop_date', 'stop_time'], inplace=True)
```

Let's practice!

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Using proper data types

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Examining the data types

```
ri.dtypes
```

```
stop_date      object
stop_time      object
driver_gender   object
...            ...
stop_duration   object
drugs_related_stop  bool
district        object
```

- `object` : Python strings (or other Python objects)
- `bool` : `True` and `False` values
- Other types: `int` , `float` , `datetime` , `category`

Why do data types matter?

- Affects which operations you can perform
- Avoid storing data as strings (when possible)
 - `int` , `float` : enables mathematical operations
 - `datetime` : enables date-based attributes and methods
 - `category` : uses less memory and runs faster
 - `bool` : enables logical and mathematical operations

Fixing a data type

```
apple
```

```
   date    time  price
0  2/13/18  16:00  164.34
1  2/14/18  16:00  167.37
2  2/15/18  16:00  172.99
```

```
apple.price.dtype
```

```
dtype('O')
```

```
apple['price'] =  
    apple.price.astype('float')
```

```
apple.price.dtype
```

```
dtype('float64')
```

- Dot notation: `apple.price`
- Bracket notation:
`apple['price']`

Let's practice!

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Creating a DatetimeIndex

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Using datetime format

```
ri.head(3)
```

```
   stop_date stop_time driver_gender driver_race
0  2005-01-04   12:55             M         White
1  2005-01-23   23:15             M         White
2  2005-02-17   04:15             M         White
```

```
ri.dtypes
```

```
stop_date      object
stop_time      object
driver_gender   object
driver_race     object
...
```

1. Combine `stop_date` and `stop_time` into one column
2. Convert it to `datetime` format

Combining object columns

```
apple
```

```
   date  time  price
0  2/13/18 16:00 164.34
1  2/14/18 16:00 167.37
2  2/15/18 16:00 172.99
```

```
apple.date.str.replace('/', '-')
```

```
0    2-13-18
1    2-14-18
2    2-15-18
Name: date, dtype: object
```

```
combined =
    apple.date.str.cat(apple.time, sep=' ')
```

```
combined
```

```
0    2/13/18 16:00
1    2/14/18 16:00
2    2/15/18 16:00
Name: date, dtype: object
```


Converting to datetime format

```
apple['date_and_time'] = pd.to_datetime(combined)
apple
```

```
   date  time  price  date_and_time
0  2/13/18  16:00  164.34  2018-02-13 16:00:00
1  2/14/18  16:00  167.37  2018-02-14 16:00:00
2  2/15/18  16:00  172.99  2018-02-15 16:00:00
```

```
apple.dtypes
```

```
date           object
time           object
price          float64
date_and_time  datetime64[ns]
```

Setting the index

```
apple.set_index('date_and_time', inplace=True)
apple
```

	date	time	price
date_and_time			
2018-02-13 16:00:00	2/13/18	16:00	164.34
2018-02-14 16:00:00	2/14/18	16:00	167.37
2018-02-15 16:00:00	2/15/18	16:00	172.99

```
apple.index
```

```
DatetimeIndex(['2018-02-13 16:00:00', '2018-02-14 16:00:00',  
               '2018-02-15 16:00:00'],  
              dtype='datetime64[ns]', name='date_and_time', freq=None)
```

Let's practice!

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