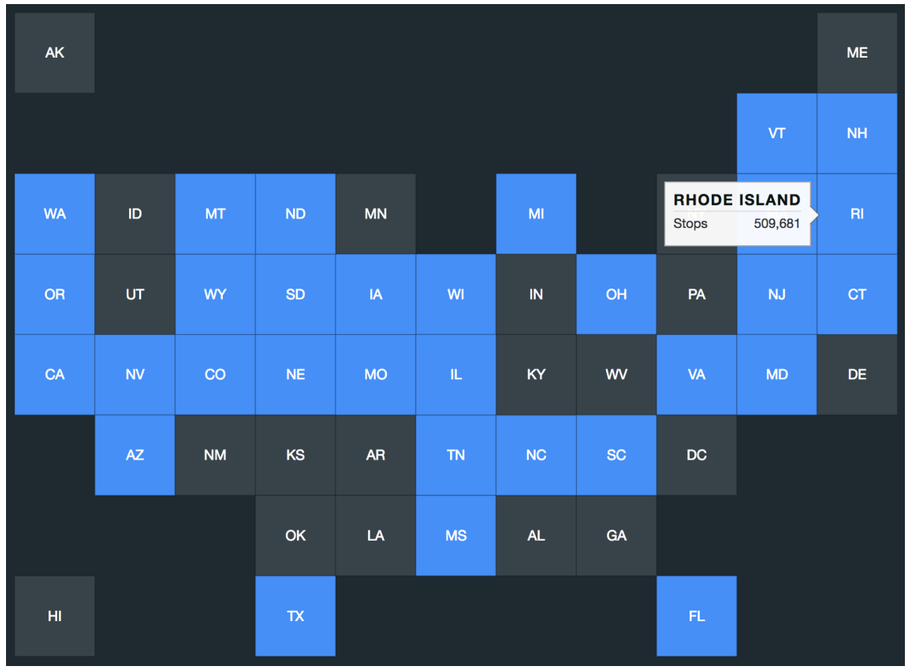
Stanford Open Policing Project dataset

ANALYZING POLICE ACTIVITY WITH PANDAS

Kevin Markham
Founder, Data School

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!

ANALYZING POLICE ACTIVITY WITH PANDAS

Using proper data types

ANALYZING POLICE ACTIVITY WITH PANDAS

Kevin Markham
Founder, Data School

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!

ANALYZING POLICE ACTIVITY WITH PANDAS

Creating a DatetimeIndex

ANALYZING POLICE ACTIVITY WITH PANDAS

Kevin Markham
Founder, Data School

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=Nor
```

Let's practice!

ANALYZING POLICE ACTIVITY WITH PANDAS