lec05

September 7, 2021

[1]:
```
from datascience import *
import numpy as np

%matplotlib inline
import matplotlib.pyplot as plots
plots.style.use('fivethirtyeight')
```

0.1 Creating a Table from Scratch

[2]:
```
Table()
```

[2]:

[3]:
```
streets = make_array('Bancroft', 'Durant', 'Channing', 'Haste')
```

[4]:
```
streets
```

[4]:
```
array(['Bancroft', 'Durant', 'Channing', 'Haste'], dtype='<U8')
```

[5]:
```
Table().with_column('Street name', streets)
```

[5]:
```
Street name
Bancroft
Durant
Channing
Haste
```

[6]:
```
southside = Table().with_column('Street name', streets)
```

[7]:
```
# creates a new table with the specified column
southside.with_column('Blocks away from campus', np.arange(4))
```

[7]:
```
Street name | Blocks away from campus
Bancroft    | 0
Durant      | 1
Channing    | 2
Haste       | 3
```

```
[8]: southside
```

```
[8]: Street name
     Bancroft
     Durant
     Channing
     Haste
```

```
[9]: southside = southside.with_column('Blocks away from campus', np.arange(4))
```

```
[10]: southside
```

```
[10]: Street name | Blocks away from campus
      Bancroft    | 0
      Durant      | 1
      Channing    | 2
      Haste       | 3
```

0.2 Reading a Table from a File

```
[11]: minard = Table.read_table('minard.csv')
```

```
[12]: minard
```

```
[12]: Longitude | Latitude | City        | Direction | Survivors
      32        | 54.8     | Smolensk    | Advance   | 145000
      33.2      | 54.9     | Dorogobouge | Advance   | 140000
      34.4      | 55.5     | Chjat       | Advance   | 127100
      37.6      | 55.8     | Moscou      | Advance   | 100000
      34.3      | 55.2     | Wixma       | Retreat   | 55000
      32        | 54.6     | Smolensk    | Retreat   | 24000
      30.4      | 54.4     | Orscha      | Retreat   | 20000
      26.8      | 54.3     | Moiodexno   | Retreat   | 12000
```

0.3 Selecting data in a column

```
[13]: minard.select('Survivors')
```

```
[13]: Survivors
      145000
      140000
      127100
      100000
      55000
      24000
      20000
      12000
```

```
[14]: minard.column('Survivors')
```

```
[14]: array([145000, 140000, 127100, 100000,  55000,  24000,  20000,  12000])
```

```
[15]: minard.column('Survivors').item(0)
```

```
[15]: 145000
```

0.4 Extending a table with a new column

```
[16]: initial_count = minard.column('Survivors').item(0)
```

```
[17]: proportion_surviving = minard.column('Survivors')/initial_count
```

```
[18]: minard = minard.with_column('Percent surviving', proportion_surviving)
```

```
[19]: minard
```

```
[19]: Longitude | Latitude | City        | Direction | Survivors | Percent surviving
      32        | 54.8     | Smolensk    | Advance   | 145000    | 1
      33.2      | 54.9     | Dorogobouge | Advance   | 140000    | 0.965517
      34.4      | 55.5     | Chjat       | Advance   | 127100    | 0.876552
      37.6      | 55.8     | Moscou      | Advance   | 100000    | 0.689655
      34.3      | 55.2     | Wixma       | Retreat   | 55000     | 0.37931
      32        | 54.6     | Smolensk    | Retreat   | 24000     | 0.165517
      30.4      | 54.4     | Orscha      | Retreat   | 20000     | 0.137931
      26.8      | 54.3     | Moiodexno   | Retreat   | 12000     | 0.0827586
```

```
[20]: minard.set_format('Percent surviving', PercentFormatter)
```

```
[20]: Longitude | Latitude | City        | Direction | Survivors | Percent surviving
      32        | 54.8     | Smolensk    | Advance   | 145000    | 100.00%
      33.2      | 54.9     | Dorogobouge | Advance   | 140000    | 96.55%
      34.4      | 55.5     | Chjat       | Advance   | 127100    | 87.66%
      37.6      | 55.8     | Moscou      | Advance   | 100000    | 68.97%
      34.3      | 55.2     | Wixma       | Retreat   | 55000     | 37.93%
      32        | 54.6     | Smolensk    | Retreat   | 24000     | 16.55%
      30.4      | 54.4     | Orscha      | Retreat   | 20000     | 13.79%
      26.8      | 54.3     | Moiodexno   | Retreat   | 12000     | 8.28%
```

0.5 Working with Columns

```
[21]: movies = Table.read_table('movies_by_year_with_ticket_price.csv')
```

[22]:
```
movies.show()
```

```
<IPython.core.display.HTML object>
```

[23]:
```
movies.labels
```

[23]:
```
('Year', 'Average Ticket Price', 'Total Gross', 'Number of Movies', '#1 Movie')
```

[24]:
```
movies.num_rows
```

[24]:
```
36
```

[25]:
```
number_of_tix = movies.column('Total Gross') * (10 ** 6) / movies.
 ↪column('Average Ticket Price')
```

[26]:
```
movies = movies.with_column('Number of tickets', number_of_tix)
```

[27]:
```
movies
```

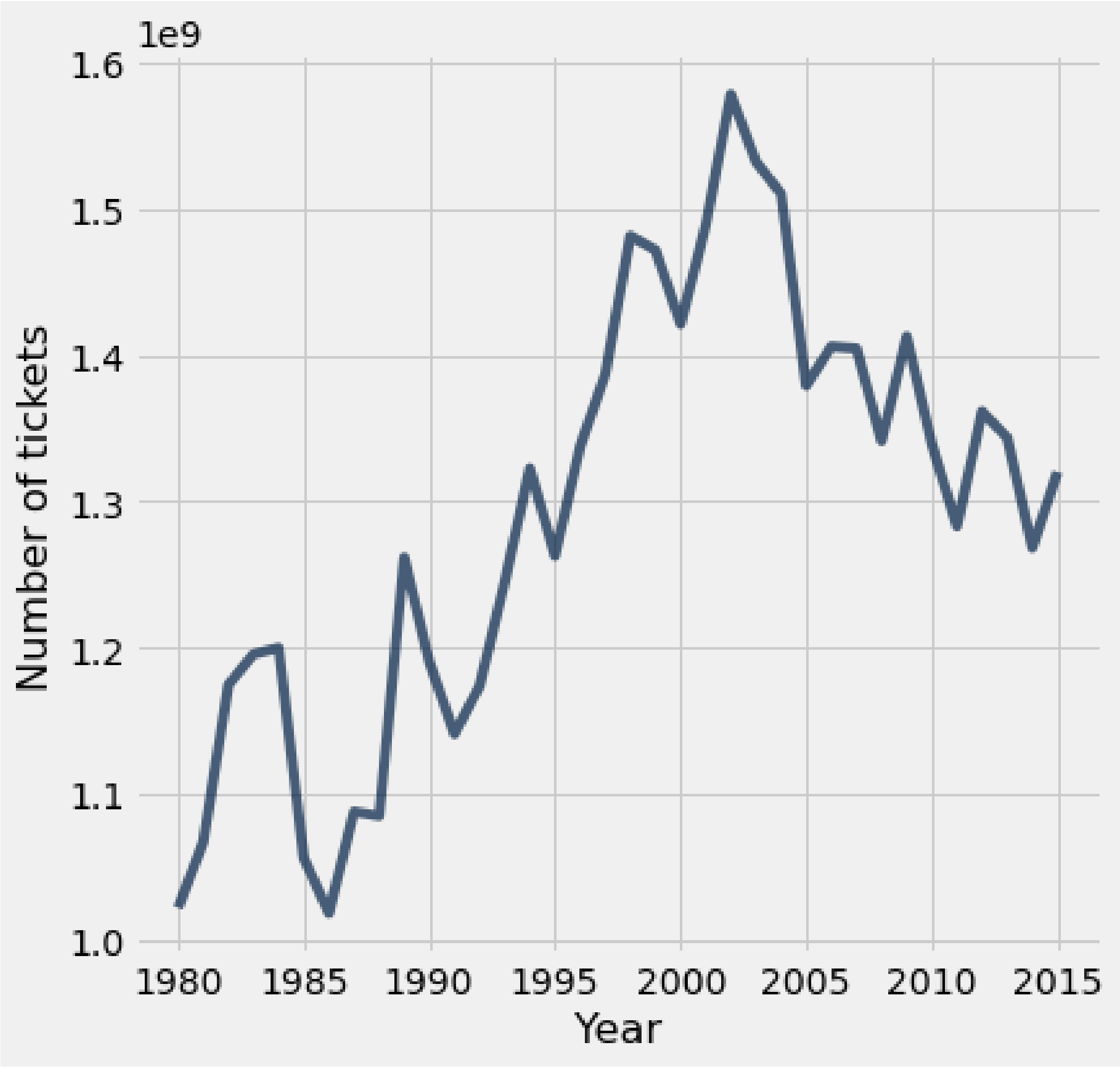
[27]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
| Number of tickets
2015 | 8.43                 | 11128.5     | 702              | Star Wars: The
Force Awakens        | 1.32011e+09
2014 | 8.17                 | 10360.8     | 702              | American Sniper
| 1.26815e+09
2013 | 8.13                 | 10923.6     | 688              | Catching Fire
| 1.34362e+09
2012 | 7.96                 | 10837.4     | 667              | The Avengers
| 1.36148e+09
2011 | 7.93                 | 10174.3     | 602              | Harry Potter /
Deathly Hallows (P2) | 1.28301e+09
2010 | 7.89                 | 10565.6     | 536              | Toy Story 3
| 1.33911e+09
2009 | 7.5                  | 10595.5     | 521              | Avatar
| 1.41273e+09
2008 | 7.18                 | 9630.7      | 608              | The Dark Knight
| 1.34132e+09
2007 | 6.88                 | 9663.8      | 631              | Spider-Man 3
| 1.40462e+09
2006 | 6.55                 | 9209.5      | 608              | Dead Man's Chest
| 1.40603e+09
… (26 rows omitted)
```

[28]:
```
movies.set_format(5, NumberFormatter)
```

[28]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
| Number of tickets
```

```
2015 | 8.43                 | 11128.5     | 702                 | Star Wars: The
Force Awakens       | 1,320,106,761.57
2014 | 8.17                 | 10360.8     | 702                 | American Sniper
| 1,268,151,774.79
2013 | 8.13                 | 10923.6     | 688                 | Catching Fire
| 1,343,616,236.16
2012 | 7.96                 | 10837.4     | 667                 | The Avengers
| 1,361,482,412.06
2011 | 7.93                 | 10174.3     | 602                 | Harry Potter /
Deathly Hallows (P2) | 1,283,013,871.37
2010 | 7.89                 | 10565.6     | 536                 | Toy Story 3
| 1,339,112,801.01
2009 | 7.5                  | 10595.5     | 521                 | Avatar
| 1,412,733,333.33
2008 | 7.18                 | 9630.7      | 608                 | The Dark Knight
| 1,341,323,119.78
2007 | 6.88                 | 9663.8      | 631                 | Spider-Man 3
| 1,404,622,093.02
2006 | 6.55                 | 9209.5      | 608                 | Dead Man's Chest
| 1,406,030,534.35
… (26 rows omitted)
```

```
[29]: movies.plot('Year', 'Number of tickets')
```



0.6 Rows

```
[30]: movies.where('Year', are.between(2000, 2005))
```

```
[30]: Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
      | Number of tickets
      2004 | 6.21                 | 9380.5      | 551              | Shrek 2
      | 1,510,547,504.03
      2003 | 6.03                 | 9239.7      | 506              | Return of the
      King               | 1,532,288,557.21
      2002 | 5.8                  | 9155        | 479              | Spider-Man
      | 1,578,448,275.86
      2001 | 5.65                 | 8412.5      | 482              | Harry Potter /
      Sorcerer's Stone | 1,488,938,053.10
```

```
2000 | 5.39                  | 7661        | 478                | The Grinch
| 1,421,335,807.05
```

[31]:
```python
movies.where('#1 Movie', are.equal_to('Avatar'))
```

[31]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie | Number
of tickets
2009 | 7.5                  | 10595.5     | 521              | Avatar   |
1,412,733,333.33
```

[32]:
```python
movies.where('#1 Movie', 'Avatar')
```

[32]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie | Number
of tickets
2009 | 7.5                  | 10595.5     | 521              | Avatar   |
1,412,733,333.33
```

[33]:
```python
movies.where('#1 Movie', are.containing('Harry Potter'))
```

[33]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
| Number of tickets
2011 | 7.93                 | 10174.3     | 602              | Harry Potter /
Deathly Hallows (P2) | 1,283,013,871.37
2001 | 5.65                 | 8412.5      | 482              | Harry Potter /
Sorcerer's Stone     | 1,488,938,053.10
```

[34]:
```python
movies.where('Number of Movies', are.below(450))
```

[34]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
| Number of tickets
1995 | 4.35                 | 5493.5      | 411              | Toy Story
| 1,262,873,563.22
1990 | 4.22                 | 5021.8      | 410              | Home Alone
| 1,190,000,000.00
1982 | 2.94                 | 3453        | 428              | E.T.
| 1,174,489,795.92
1981 | 2.78                 | 2966        | 173              | Raiders / Lost
Ark      | 1,066,906,474.82
1980 | 2.69                 | 2749        | 161              | The Empire
Strikes Back | 1,021,933,085.50
```

[35]:
```python
movies.where('Year', are.above(2010))
```

[35]:
```
Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
| Number of tickets
2015 | 8.43                 | 11128.5     | 702              | Star Wars: The
Force Awakens        | 1,320,106,761.57
```

```
2014 | 8.17                 | 10360.8     | 702              | American Sniper
| 1,268,151,774.79
2013 | 8.13                 | 10923.6     | 688              | Catching Fire
| 1,343,616,236.16
2012 | 7.96                 | 10837.4     | 667              | The Avengers
| 1,361,482,412.06
2011 | 7.93                 | 10174.3     | 602              | Harry Potter /
Deathly Hallows (P2) | 1,283,013,871.37
```

```
[36]: movies.take(3)
```

```
[36]: Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie     |
      Number of tickets
      2012 | 7.96                 | 10837.4     | 667              | The Avengers |
      1,361,482,412.06
```

```
[37]: movies.take(np.arange(4))
```

```
[37]: Year | Average Ticket Price | Total Gross | Number of Movies | #1 Movie
      | Number of tickets
      2015 | 8.43                 | 11128.5     | 702              | Star Wars: The
      Force Awakens | 1,320,106,761.57
      2014 | 8.17                 | 10360.8     | 702              | American Sniper
      | 1,268,151,774.79
      2013 | 8.13                 | 10923.6     | 688              | Catching Fire
      | 1,343,616,236.16
      2012 | 7.96                 | 10837.4     | 667              | The Avengers
      | 1,361,482,412.06
```

```
[ ]:
```