MANIPULATING DATAFRAMES WITH PANDAS

Case Study: Olympic Medals

Olympic medals dataset

	City	Edition	Sport	Discipline	Athlete	NOC	Gender	Event	Event_gender	Medal
0	Athens	1896	Aquatics	Swimming	HAJOS, Alfred	HUN	Men	100m freestyle	M	Gold
1	Athens	1896	Aquatics	Swimming	HERSCHMANN, Otto	AUT	Men	100m freestyle	M	Silver
2	Athens	1896	Aquatics	Swimming	DRIVAS, Dimitrios	GRE	Men	100m freestyle for sailors	M	Bronze
3	Athens	1896	Aquatics	Swimming	MALOKINIS, Ioannis	GRE	Men	100m freestyle for sailors	M	Gold
4	Athens	1896	Aquatics	Swimming	CHASAPIS, Spiridon	GRE	Men	100m freestyle for sailors	M	Silver
5	Athens	1896	Aquatics	Swimming	CHOROPHAS, Efstathios	GRE	Men	1200m freestyle	M	Bronze
6	Athens	1896	Aquatics	Swimming	HAJOS, Alfred	HUN	Men	1200m freestyle	M	Gold
7	Athens	1896	Aquatics	Swimming	ANDREOU, Joannis	GRE	Men	1200m freestyle	M	Silver
8	Athens	1896	Aquatics	Swimming	CHOROPHAS, Efstathios	GRE	Men	400m freestyle	M	Bronze
9	Athens	1896	Aquatics	Swimming	NEUMANN, Paul	AUT	Men	400m freestyle	M	Gold

Reminder: indexing & pivoting

- Filtering and indexing
  - One-level indexing
  - Multi-level indexing
- Reshaping DataFrames with pivot()
- pivot_table()

Reminder: groupby

- Useful DataFrame methods
  - unique()
  - value_counts()
- Aggregations, transformations, filtering

MANIPULATING DATAFRAMES WITH PANDAS

Let’s practice!

MANIPULATING DATAFRAMES WITH PANDAS

Understanding the column labels

“Gender” and “Event_gender”

	NOC	Gender	Event	Event_gender	Medal
145	GRE	Men	heavyweight - two hand lift	M	Bronze
146	DEN	Men	heavyweight - two hand lift	M	Gold
147	GBR	Men	heavyweight - two hand lift	M	Silver
148	GRE	Men	open event	M	Bronze
149	GER	Men	open event	M	Gold
150	GRE	Men	open event	M	Silver
151	HUN	Men	1500m freestyle	M	Bronze
152	GBR	Men	1500m freestyle	M	Gold
153	AUT	Men	1500m freestyle	M	Silver
154	NED	Men	200m backstroke	M	Bronze

Reminder: slicing & filtering

- Indexing and slicing
  - .loc[] and .iloc[] accessors
- Filtering
  - Selecting by Boolean Series
  - Filtering null/non-null and zero/non-zero values

Reminder: Handling categorical data

- Useful DataFrame methods for handling categorical data:
  - value_counts()
  - unique()
  - groupby()
- groupby() aggregations:
  - mean(), std(), count()

MANIPULATING DATAFRAMES WITH PANDAS

Let’s practice!

MANIPULATING DATAFRAMES WITH PANDAS

Constructing alternative country rankings

Counting distinct events

```
In [1]: medals[‘Sport'].unique() # 42 distinct events
Out[1]:
array(['Aquatics', 'Athletics', 'Cycling', 'Fencing', 'Gymnastics',
       'Shooting', 'Tennis', 'Weightlifting', 'Wrestling', 'Archery',
       'Basque Pelota', 'Cricket', 'Croquet', 'Equestrian', 'Football',
       'Golf', 'Polo', 'Rowing', 'Rugby', 'Sailing', 'Tug of War',
       'Boxing', 'Lacrosse', 'Roque', 'Hockey', 'Jeu de paume', 'Rackets',
       'Skating', 'Water Motorsports', 'Modern Pentathlon', 'Ice Hockey',
       'Basketball', 'Canoe / Kayak', 'Handball', 'Judo', 'Volleyball',
       'Table Tennis', 'Badminton', 'Baseball', 'Softball', 'Taekwondo',
       'Triathlon'], dtype=object)
```

Ranking of distinct events

- Top five countries that have won medals in the most sports
- Compare medal counts of USA and USSR from 1952 to 1988

Two new DataFrame methods

- idxmax(): Row or column label where maximum value is located
- idxmin(): Row or column label where minimum value is located

idxmax() Example

```
In [2]: weather = pd.read_csv('monthly_mean_temperature.csv',
   ...:                       index_col='Month')

In [3]: weather # DataFrame with single column
Out[3]:
               Mean TemperatureF
       Month
       Apr             53.100000
       Aug             70.000000
       Dec             34.935484
       Feb             28.714286
       Jan             32.354839
       Jul             72.870968
       Jun             70.133333
       Mar             35.000000
       May             62.612903
       Nov             39.800000
       Oct             55.451613
       Sep             63.766667
```

Using idxmax()

```
In [4]: weather.idxmax()  # Returns month of highest temperature
Out[4]:
Mean TemperatureF    Jul
dtype: object
```

Using idxmax() along columns

```
In [5]: weather.T  # Returns DataFrame with single row, 12 columns
Out[5]:
Month                 Apr   Aug        Dec         Feb         Jan         Jul  \
Mean TemperatureF  53.1  70.0  34.935484  28.714286  32.354839  72.870968

Month                      Jun   Mar        May   Nov        Oct        Sep
Mean TemperatureF  70.133333  35.0  62.612903  39.8  55.451613  63.766667

In [6]: weather.T.idxmax(axis='columns')
Out[6]:
Mean TemperatureF    Jul
dtype: object
```

Using idxmin()

```
In [7]: weather.T.idxmin(axis='columns')
Out[7]:
Mean TemperatureF    Feb
dtype: object
```

MANIPULATING DATAFRAMES WITH PANDAS

Let’s practice!

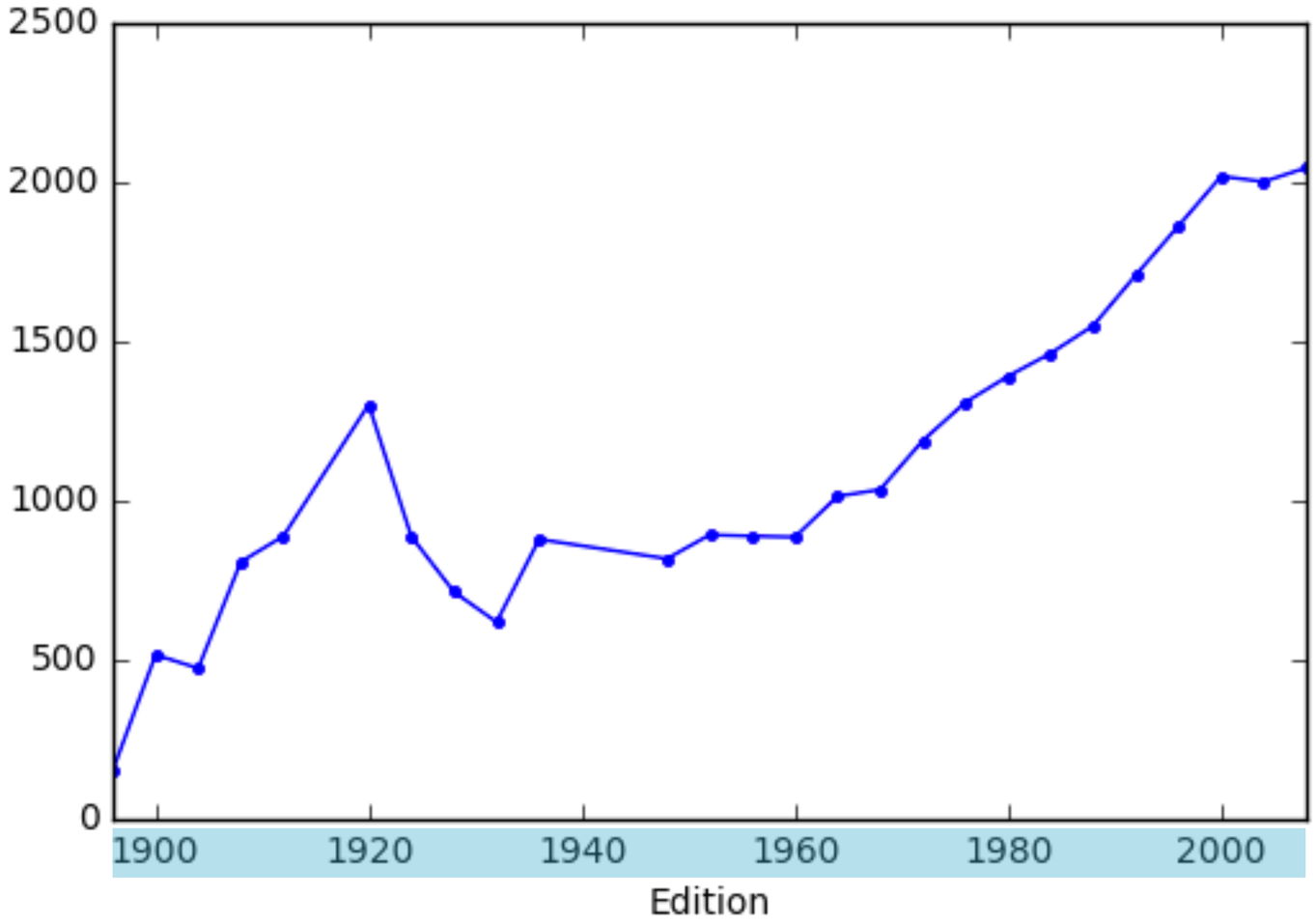
MANIPULATING DATAFRAMES WITH PANDAS

Reshaping DataFrames for visualization

Reminder: plotting DataFrames

```
In [1]: all_medals = medals.groupby('Edition')['Athlete'].count()

In [2]: all_medals.head(6) # Series for all medals, all years
Out[2]:
Edition
1896     151
1900     512
1904     470
1908     804
1912     885
1920    1298
Name: Athlete, dtype: int64

In [3]: all_medals.plot(kind='line', marker='.')

In [4]: plt.show()
```

Plotting DataFrames



Grouping the data

```
In [5]: france = medals.NOC == 'FRA' # Boolean Series for France

In [6]: france_grps = medals[france].groupby(['Edition', 'Medal'])

In [7]: france_grps['Athlete'].count().head(10)
Out[7]:
Edition  Medal
1896     Bronze     2
         Gold       5
         Silver     4
1900     Bronze    53
         Gold      46
         Silver    86
1908     Bronze    21
         Gold       9
         Silver     5
1912     Bronze     5
Name: Athlete, dtype: int64
```

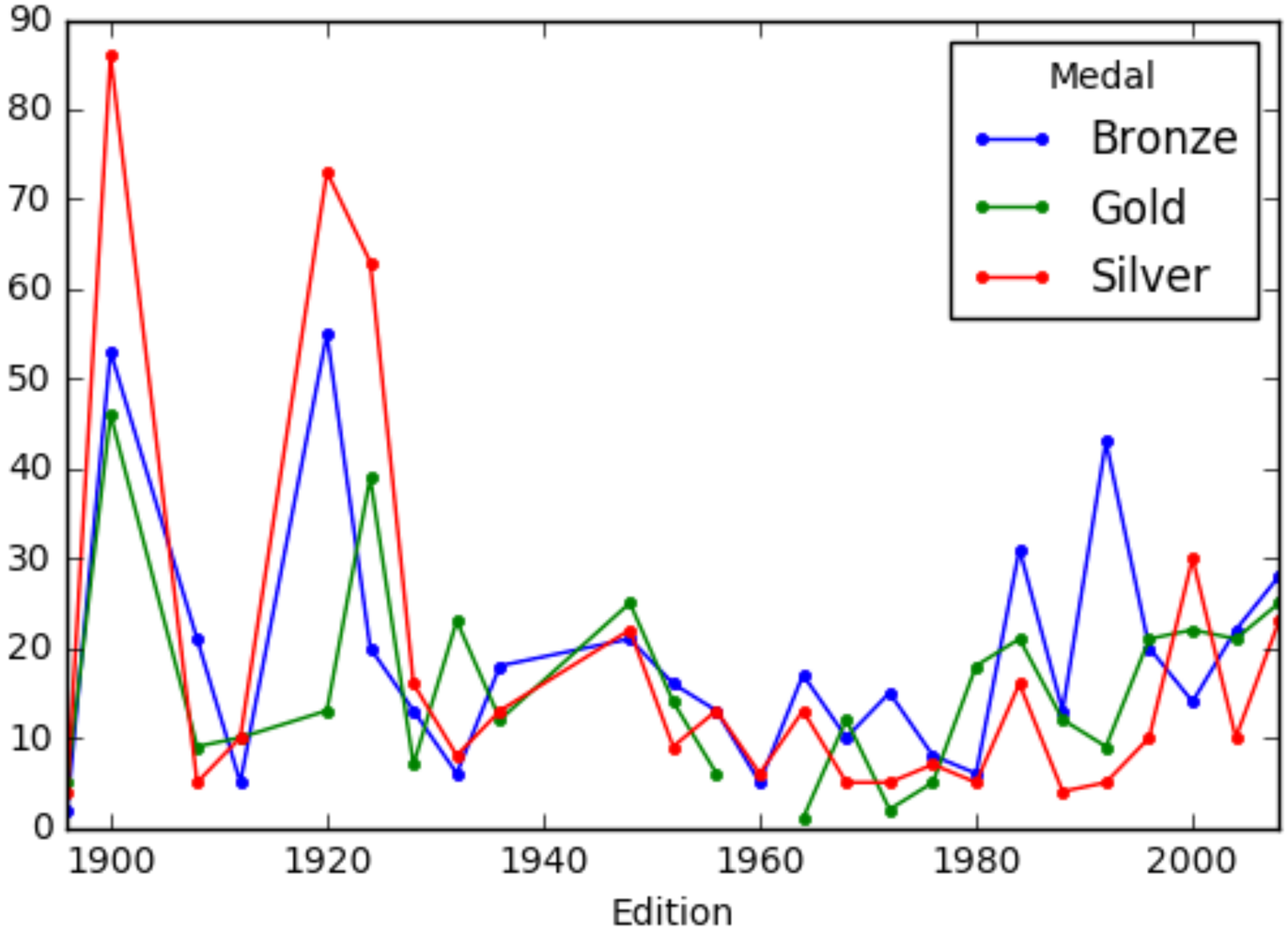
Reshaping the data

```
In [8]: france_medals = france_grps['Athlete'].count().unstack()

In [9]: france_medals.head(12)    # Single level index
Out[9]:
Medal    Bronze  Gold  Silver
Edition
1896        2.0   5.0     4.0
1900       53.0  46.0    86.0
1908       21.0   9.0     5.0
1912        5.0  10.0    10.0
1920       55.0  13.0    73.0
1924       20.0  39.0    63.0
1928       13.0   7.0    16.0
1932        6.0  23.0     8.0
1936       18.0  12.0    13.0
1948       21.0  25.0    22.0
1952       16.0  14.0     9.0
1956       13.0   6.0    13.0
```

Plotting the result

```
In [10]: france_medals.plot(kind='line', marker='.')

In [11]: plt.show()
```

Plotting the result



MANIPULATING DATAFRAMES WITH PANDAS

Let’s practice!

MANIPULATING DATAFRAMES WITH PANDAS

Final thoughts

You can now...

- Transform, extract, and filter data from DataFrames
- Work with pandas indexes and hierarchical indexes
- Reshape and restructure your data
- Split your data into groups and categories

MANIPULATING DATAFRAMES WITH PANDAS

See you in the next course!