

What is pandas?

INTRODUCTION TO DATA SCIENCE IN PYTHON



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What can pandas do for you?

- Loading tabular data from different sources
- Search for particular rows or columns
- Calculate aggregate statistics
- Combining data from multiple sources

Tabular data with pandas

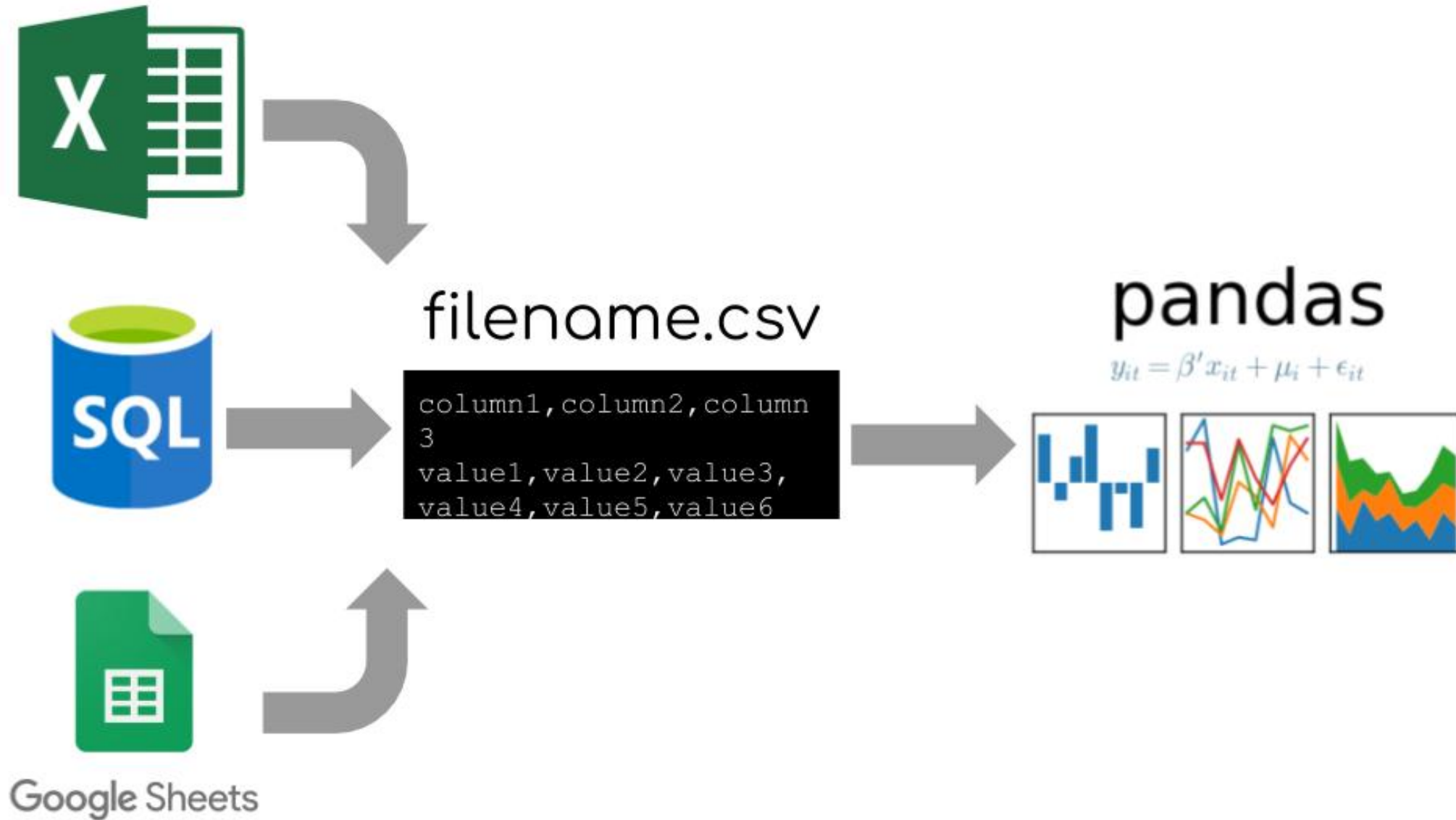
Tabular Data

```
+-----+
|      suspect      |    location    | price |
+-----+-----+-----+
| Fred Frequentist  | Petroleum Plaza | 24.95 |
| Ronald Aylmer Fisher | Clothing Club  | 20.15 |
+-----+-----+-----+
```

DataFrame

```
      suspect      location  price
0  Fred Frequentist  Petroleum Plaza  24.95
1  Ronald Aylmer Fisher  Clothing Club  20.15
```

CSV files



Loading a CSV

```
import pandas as pd
```

```
df = pd.read_csv('ransom.csv')
```

Displaying a DataFrame

```
df = pd.read_csv('filename.csv')
print(df)
```

	suspect	location	item	price
0	Kirstine Smith	Petroleum Plaza	gas	24.95
1	Fred Frequentist	Burger Mart	fries	1.95
2	Gertrude Cox	Burger Mart	fries	1.95
3	Ronald Aylmer Fisher	Clothing Club	shirt	14.25
4	Kirstine Smith	Clothing Club	dress	20.15
5	Fred Frequentist	Groceries R Us	cucumbers	2.05
6	Kirstine Smith	Clothing Club	dress	20.15
7	Gertrude Cox	Petroleum Plaza	fizzy drink	1.90
8	Gertrude Cox	Burger Mart	fries	1.95
9	Ronald Aylmer Fisher	Clothing Club	shirt	14.25
10	Ronald Aylmer Fisher	Petroleum Plaza	carwash	13.25
11	Ronald Aylmer Fisher	Clothing Club	shirt	14.25
12	Kirstine Smith	Petroleum Plaza	gas	24.95
13	Fred Frequentist	Groceries R Us	eggs	6.50
14	Gertrude Cox	Petroleum Plaza	gas	24.95
15	Fred Frequentist	Groceries R Us	eggs	6.50
16	Ronald Aylmer Fisher	Groceries R Us	eggs	6.50
17	Fred Frequentist	Groceries R Us	cheese	5.00

Inspecting a DataFrame

```
df.head()
```

```
print(df.head())
```

	suspect	location	item	price
0	Kirstine Smith	Petroleum Plaza	gas	24.95
1	Fred Frequentist	Burger Mart	fries	1.95
2	Gertrude Cox	Burger Mart	fries	1.95
3	Ronald Aylmer Fisher	Clothing Club	shirt	14.25
4	Kirstine Smith	Clothing Club	dress	20.15

Inspecting a DataFrame

```
df.info()
```

```
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 26 entries, 0 to 25  
Data columns (total 3 columns):  
letter_index      26 non-null int64  
letter            26 non-null object  
frequency         26 non-null float64  
dtypes: float64(1), int64(1), object(1)  
memory usage: 704.0+ bytes
```


Inspecting a DataFrame

Number
of Rows

<class 'pandas.core.frame.DataFrame'>

RangeIndex: 26 entries, 0 to 25

Data columns (total 3 columns):

Column
Names

letter_index	26 non-null	int64
letter	26 non-null	object
frequency	26 non-null	float64

Data
Types

dtypes: float64(1), int64(1), object(1)

memory usage: 704.0+ bytes

Let's practice!

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Selecting columns

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Why select columns?

- Use in a calculation

```
credit_records.price.sum()
```

- Plot data

```
plt.plot(ransom['letter'], ransom['frequency'])
```

Columns names are strings

```
print(credit_records.head())
```

	suspect	location	date	item	price
0	Kirstine Smith	Groceries R Us	January 6, 2018	broccoli	1.25
1	Gertrude Cox	Petroleum Plaza	January 6, 2018	fizzy drink	1.90
2	Fred Frequentist	Groceries R Us	January 6, 2018	broccoli	1.25
3	Gertrude Cox	Groceries R Us	January 12, 2018	broccoli	1.25
4	Kirstine Smith	Clothing Club	January 9, 2018	shirt	14.25

```
'suspect'  
'location'  
'date'  
'item'  
'price'
```

Selecting with brackets and string

```
suspect = credit_records['suspect']
```

```
print(suspect)
```

```
0      Kirstine Smith
1      Gertrude Cox
2      Fred Frequentist
3      Gertrude Cox
4      Kirstine Smith
5      Gertrude Cox
...
99     Gertrude Cox
100    Fred Frequentist
101    Gertrude Cox
102    Kirstine Smith
103    Ronald Aylmer Fisher
```

Selecting with a dot

```
price = credit_records.price
```

```
print(price)
```

```
0      1.25
1      1.90
2      1.25
3      1.25
4     14.25
5      3.95
...
99     14.25
100    12.05
101    20.15
102     3.95
103     2.05
```

Common mistakes in column selection

Use brackets and string for column names with spaces or special characters (–, ?, etc.)

```
police_report['Is Golden Retriever?']
```

NOT

```
police_report.Is Golden Retriever?
```

```
Object `Retriever` not found.
```


Common mistakes in column selection

When using brackets and string, don't forget the quotes around the column name!

```
credit_report['location']
```

NOT

```
credit_report[location]
```

```
Object `location` not found.
```

Common mistakes in column selection

Brackets, not parentheses

```
credit_report['location']
```

NOT

```
credit_report('location')
```

```
-----  
TypeError Traceback (most recent call last)  
<ipython-input-5-aabdb8981438> in <module>()  
----> 1 credit_report('location')
```

```
TypeError: 'DataFrame' object is not callable
```

Let's practice!

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Select rows with logic

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Continuing the investigation

```
print(credit_records.head())
```

	suspect	location	date	item	price
0	Kirstine Smith	Groceries R Us	January 6, 2018	broccoli	1.25
1	Gertrude Cox	Petroleum Plaza	January 6, 2018	fizzy drink	1.90
2	Fred Frequentist	Groceries R Us	January 6, 2018	broccoli	1.25
3	Gertrude Cox	Groceries R Us	January 12, 2018	broccoli	1.25
4	Kirstine Smith	Clothing Club	January 9, 2018	shirt	14.25

Logical statements in Python

```
question = 12 * 8  
solution = 96
```

```
question == solution
```

```
True
```

Booleans: True and False

Other types of logic

>, >=, <, <=

```
price = 2.25  
price > 5.00
```

False

Not equal to

```
name = 'bayes'  
name != 'Bayes'
```

True

Using logic with DataFrames

```
credit_records.price > 20.00
```

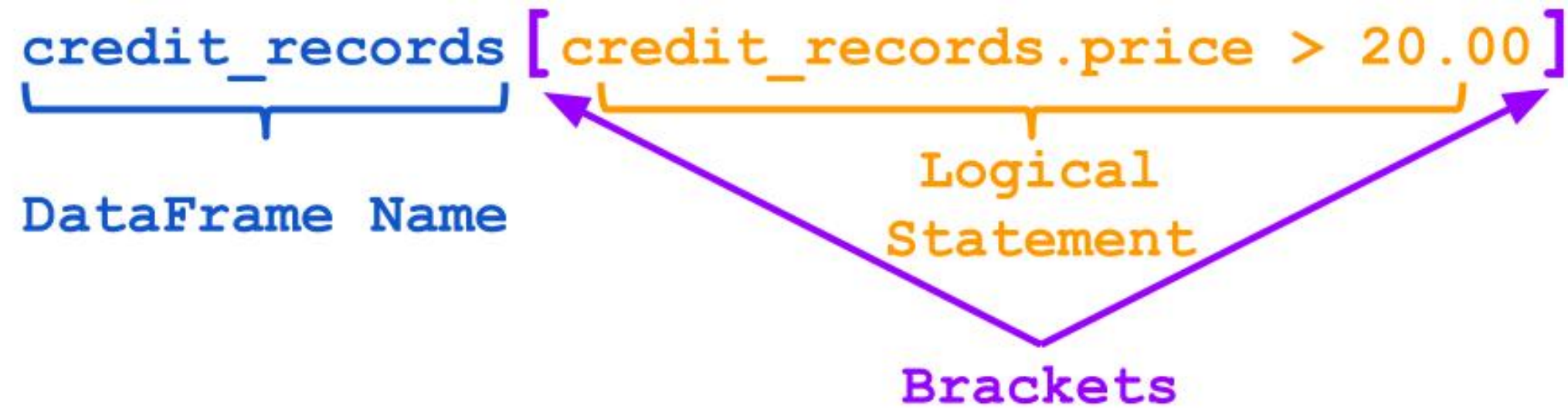
```
0      False
1      False
2      False
3      False
4       True
5      False
...
99     True
100    True
101    True
102   False
103   False
```


Using logic with DataFrames

```
credit_records[credit_records.price > 20.00]
```

	suspect	location	date	item	price
28	Fred Frequentist	Clothing Club	January 3, 2018	dress	20.15
29	Kirstine Smith	Clothing Club	January 5, 2018	dress	20.15
33	Ronald Aylmer Fisher	Petroleum Plaza	January 7, 2018	gas	24.95
37	Fred Frequentist	Clothing Club	January 8, 2018	dress	20.15
40	Gertrude Cox	Clothing Club	January 1, 2018	dress	20.15
41	Kirstine Smith	Petroleum Plaza	January 5, 2018	gas	24.95
...					

Using logic with DataFrames



Using logic with DataFrames

```
credit_records[credit_records.suspect == 'Ronald Aylmer Fisher']
```

	suspect	location	date	item	price
7	Ronald Aylmer Fisher	Clothing Club	January 8, 2018	pants	12.05
8	Ronald Aylmer Fisher	Clothing Club	January 13, 2018	shirt	14.25
12	Ronald Aylmer Fisher	Petroleum Plaza	January 10, 2018	carwash	13.25
22	Ronald Aylmer Fisher	Groceries R Us	January 13, 2018	eggs	6.50
26	Ronald Aylmer Fisher	Burger Mart	January 8, 2018	fries	1.95
...					

Let's practice!

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