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

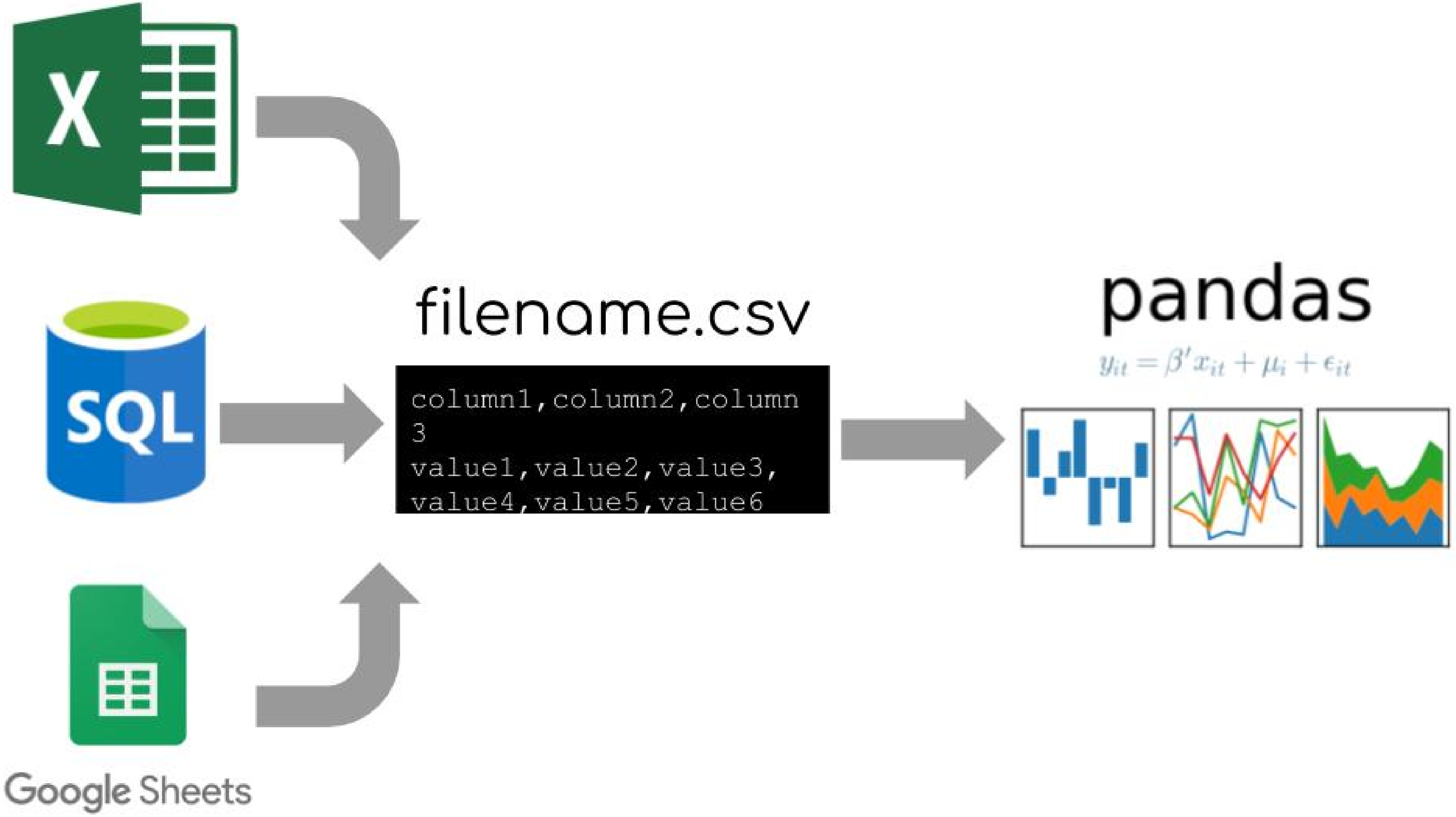
Tabular Data

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

DataFrame

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

CSV files



filename.csv

```
column1,column2,column
3
value1,value2,value3,
value4,value5,value6
```

Loading a CSV

```python
import pandas as pd
```

```python
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
```

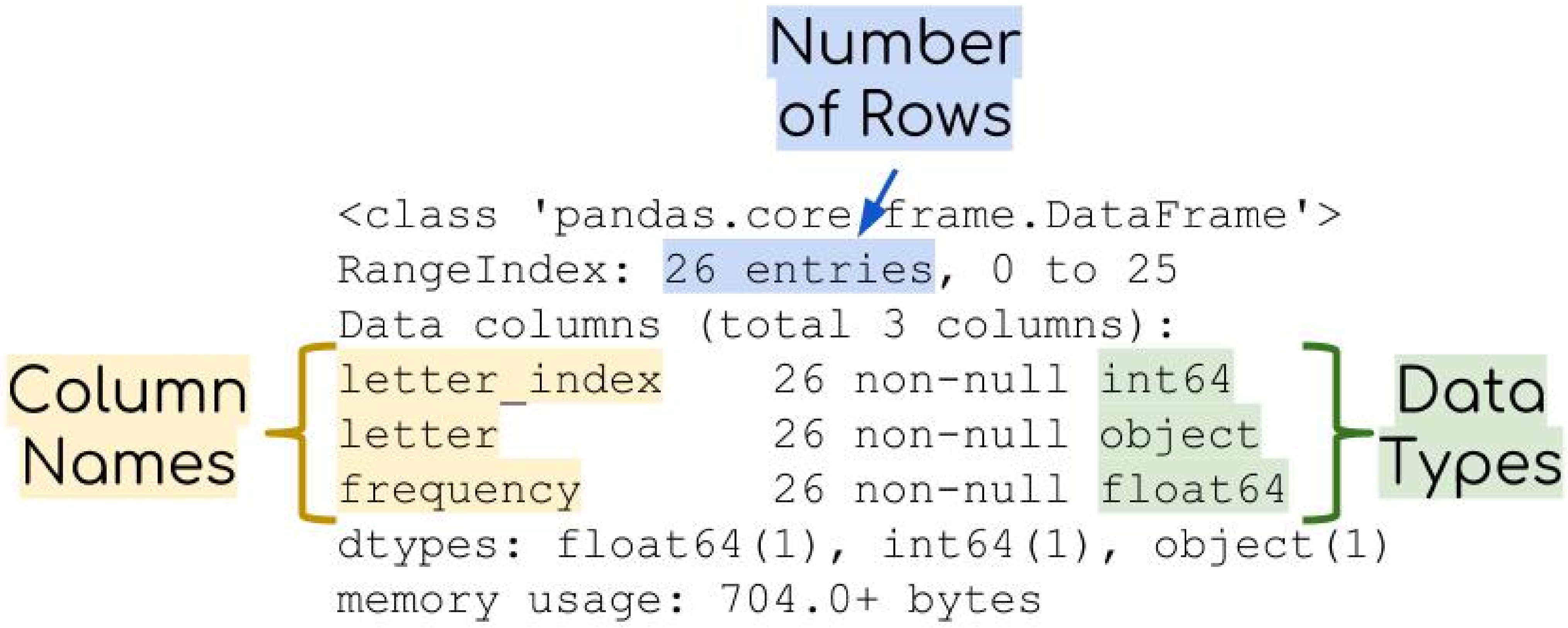
Inspecting a DataFrame

```
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



```
<class 'pandas.core.frame.DataFrame'>
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letter_index    26 non-null int64
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frequency       26 non-null float64
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
```

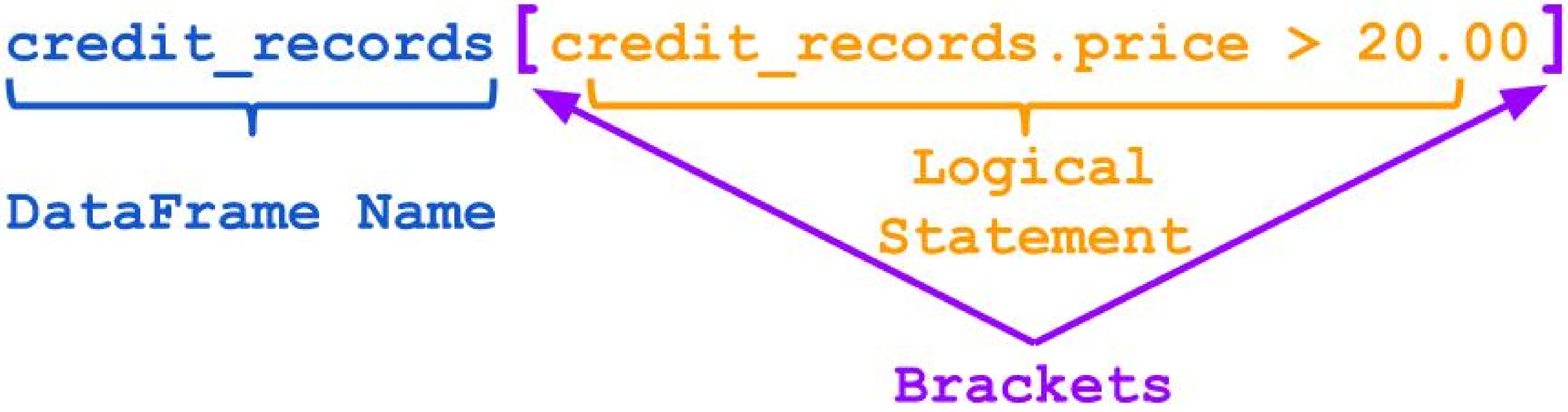
```
0      False
1      False
2      False
3      False
4       True
5      False
...
99      True
100     True
101     True
102    False
103    False
```

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



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

DataFrame Name

Logical Statement

Brackets

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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