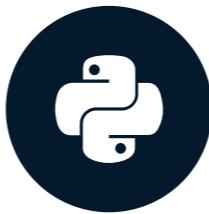


Welcome to the course!

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

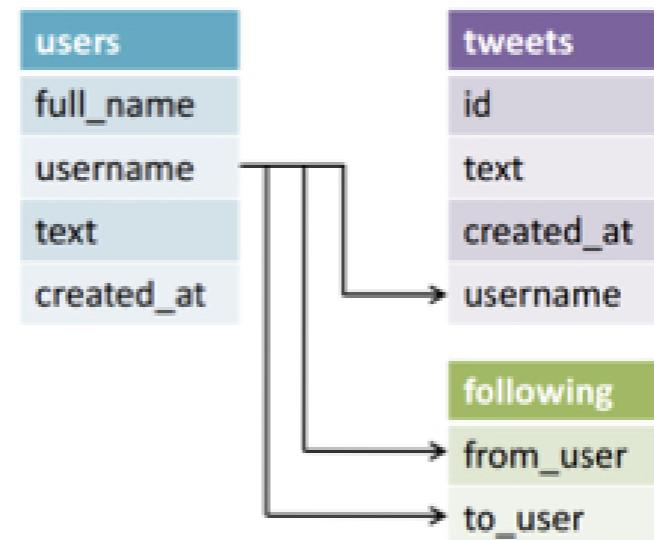
Import data

- Flat files, e.g. .txts, .csvs
- Files from other software

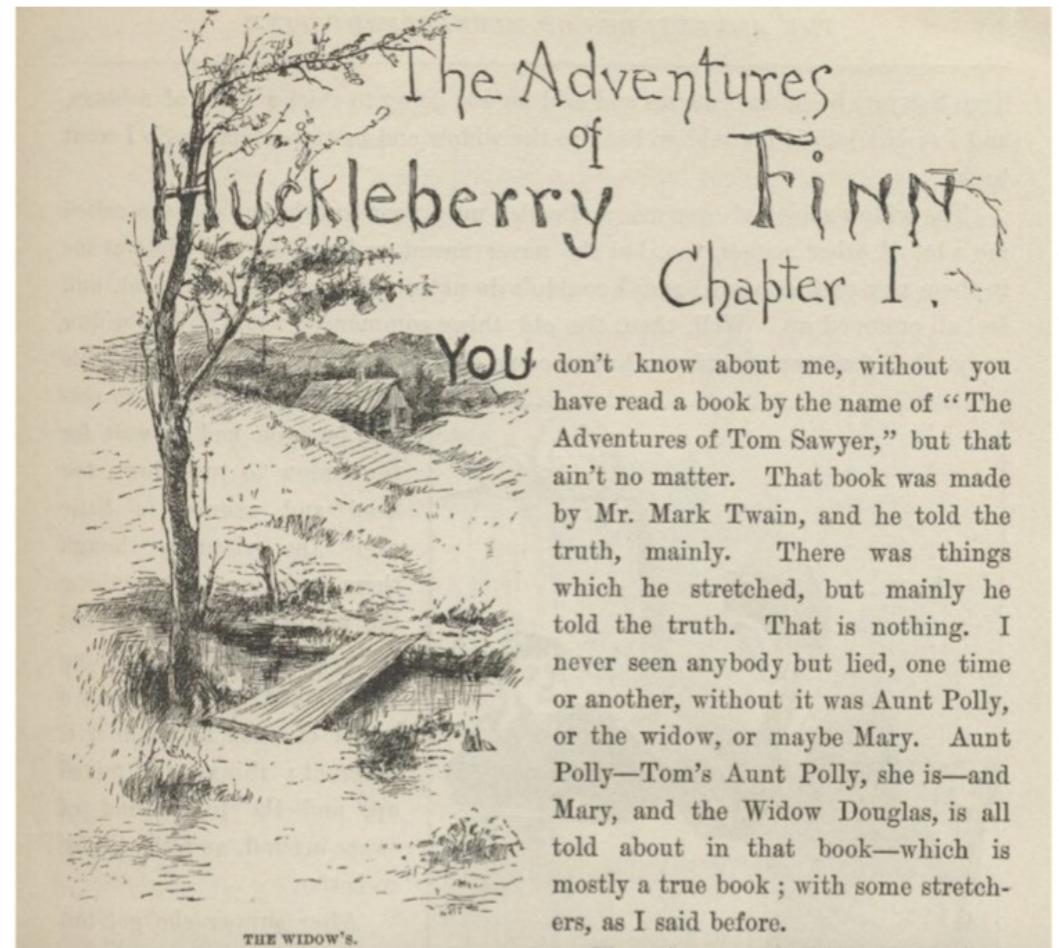


Import data

- Flat files, e.g. .txts, .csvs
- Files from other software
- Relational databases



Plain text files



Source: Project Gutenberg

Table data

titanic.csv

	Name	Sex	Cabin	Survived
	Braund, Mr. Owen Harris	male	NaN	0
	Cumings, Mrs. John Bradley	female	C85	1
	Heikkinen, Miss. Laina	female	NaN	1
	Futrelle, Mrs. Jacques Heath	female	C123	1
	Allen, Mr. William Henry	male	NaN	0

¹ Source: Kaggle

Table data

titanic.csv

row

	Name	Sex	Cabin	Survived
	Braund, Mr. Owen Harris	male	NaN	0
	Cumings, Mrs. John Bradley	female	C85	1
	Heikkinen, Miss. Laina	female	NaN	1
	Futrelle, Mrs. Jacques Heath	female	C123	1
	Allen, Mr. William Henry	male	NaN	0

Table data

titanic.csv

Name	Sex	Cabin	Survived
Braund, Mr. Owen Harris	male	NaN	0
Cumings, Mrs. John Bradley	female	C85	1
Heikkinen, Miss. Laina	female	NaN	1
Futrelle, Mrs. Jacques Heath	female	C123	1
Allen, Mr. William Henry	male	NaN	0

row

column

- Flat file

Reading a text file

```
filename = 'huck_finn.txt'  
file = open(filename, mode='r') # 'r' is to read  
text = file.read()  
file.close()
```

Printing a text file

```
print(text)
```

YOU don't know about me without you have read a book by the name of The Adventures of Tom Sawyer; but that ain't no matter. That book was made by Mr. Mark Twain, and he told the truth, mainly. There was things which he stretched, but mainly he told the truth. That is nothing. never seen anybody but lied one time or another, without it was Aunt Polly, or the widow, or maybe Mary. Aunt Polly--Tom's Aunt Polly, she is--and Mary, and the Widow Douglas is all told about in that book, which is mostly a true book, with some stretchers, as I said before.

Writing to a file

```
filename = 'huck_finn.txt'  
file = open(filename, mode='w') # 'w' is to write  
file.close()
```

Context manager with

```
with open('huck_finn.txt', 'r') as file:  
    print(file.read())
```

YOU don't know about me without you have read a book by the name of The Adventures of Tom Sawyer; but that ain't no matter. That book was made by Mr. Mark Twain, and he told the truth, mainly. There was things which he stretched, but mainly he told the truth. That is nothing. never seen anybody but lied one time or another, without it was Aunt Polly, or the widow, or maybe Mary. Aunt Polly--Tom's Aunt Polly, she is--and Mary, and the Widow Douglas is all told about in that book, which is mostly a true book, with some stretchers, as I said before.

In the exercises, you'll:

- Print files to the console
- Print specific lines
- Discuss flat files

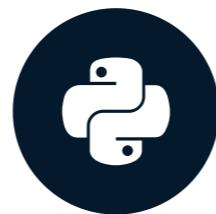
Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

The importance of flat files in data science

INTRODUCTION TO IMPORTING DATA IN PYTHON

Hugo Bowne-Anderson
Data Scientist at DataCamp



Flat files

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fare,Cabin,Embarked
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs Thayer)",female,38,1,0,PC 17599,71.2833,C85,C
3,1,3,"Heikkinen, Miss. Laina",female,26,0,0,STON/O2.3101282,7.925,,S
```

Flat files

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fare,Cabin,Embarked
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs Thayer)",female,38,1,0,PC 17599,71.2833,C85,C
3,1,3,"Heikkinen, Miss. Laina",female,26,0,0,STON/O2.
3101282,7.925,,S
```



	Name	Gender	Cabin	Survived
Braund, Mr. Owen Harris	male	NaN	0	
Cumings, Mrs. John Bradley	female	C85	1	
Heikkinen, Miss. Laina	female	NaN	1	
Futrelle, Mrs. Jacques Heath	female	C123	1	
Allen, Mr. William Henry	male	NaN	0	

Flat files

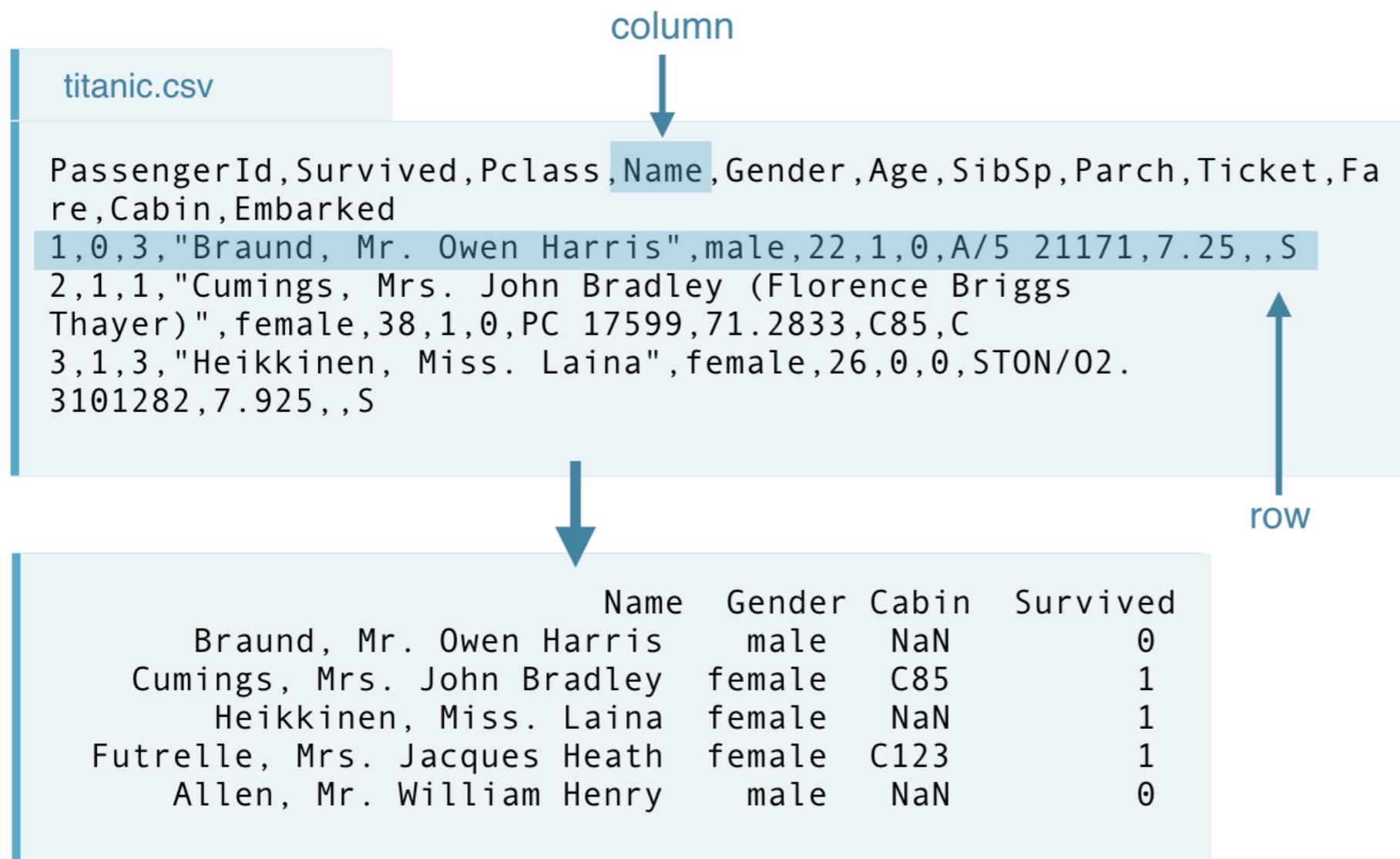
titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fare,Cabin,Embarked
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs Thayer)",female,38,1,0,PC 17599,71.2833,C85,C
3,1,3,"Heikkinen, Miss. Laina",female,26,0,0,STON/O2.3101282,7.925,,S
```

↑
row

	Name	Gender	Cabin	Survived
Braund, Mr. Owen Harris	male	NaN	0	
Cumings, Mrs. John Bradley	female	C85	1	
Heikkinen, Miss. Laina	female	NaN	1	
Futrelle, Mrs. Jacques Heath	female	C123	1	
Allen, Mr. William Henry	male	NaN	0	

Flat files



Flat files

- Text files containing records
- That is, table data
- Record: row of fields or attributes

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fare,Cabin,Embarked
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs Thayer)",female,38,1,0,PC 17599,71.2833,C85,C
```

Flat files

- Text files containing records
- That is, table data
- Record: row of fields or attributes
- Column: feature or attribute

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fa  
re,Cabin,Embarked  
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S  
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs  
Thayer)",female,38,1,0,PC 17599,71.2833,C85,C
```

Flat files

- Text files containing records
- That is, table data
- Record: row of fields or attributes
- Column: feature or attribute

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fa  
re,Cabin,Embarked  
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S  
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs  
Thayer)",female,38,1,0,PC 17599,71.2833,C85,C
```

Header

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fare,Cabin,Embarked
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs Thayer)",female,38,1,0,PC
17599,71.2833,C85,C
3,1,3,"Heikkinen, Miss. Laina",female,26,0,0,STON/O2. 3101282,7.925,,S
4,1,1,"Futrelle, Mrs. Jacques Heath (Lily May Peel)",female,
35,1,0,113803,53.1,C123,S
5,0,3,"Allen, Mr. William Henry",male,35,0,0,373450,8.05,,S
6,0,3,"Moran, Mr. James",male,,0,0,330877,8.4583,,Q
7,0,1,"McCarthy, Mr. Timothy J",male,54,0,0,17463,51.8625,E46,S
8,0,3,"Palsson, Master. Gosta Leonard",male,2,3,1,349909,21.075,,S
9,1,3,"Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)",female,
27,0,2,347742,11.1333,,S
```

Header

titanic.csv

```
PassengerId,Survived,Pclass,Name,Gender,Age,SibSp,Parch,Ticket,Fare,Cabin,Embarked
1,0,3,"Braund, Mr. Owen Harris",male,22,1,0,A/5 21171,7.25,,S
2,1,1,"Cumings, Mrs. John Bradley (Florence Briggs Thayer)",female,38,1,0,PC
17599,71.2833,C85,C
3,1,3,"Heikkinen, Miss. Laina",female,26,0,0,STON/O2. 3101282,7.925,,S
4,1,1,"Futrelle, Mrs. Jacques Heath (Lily May Peel)",female,
35,1,0,113803,53.1,C123,S
5,0,3,"Allen, Mr. William Henry",male,35,0,0,373450,8.05,,S
6,0,3,"Moran, Mr. James",male,,0,0,330877,8.4583,,Q
7,0,1,"McCarthy, Mr. Timothy J",male,54,0,0,17463,51.8625,E46,S
8,0,3,"Palsson, Master. Gosta Leonard",male,2,3,1,349909,21.075,,S
9,1,3,"Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)",female,
27,0,2,347742,11.1333,,S
```

File extension

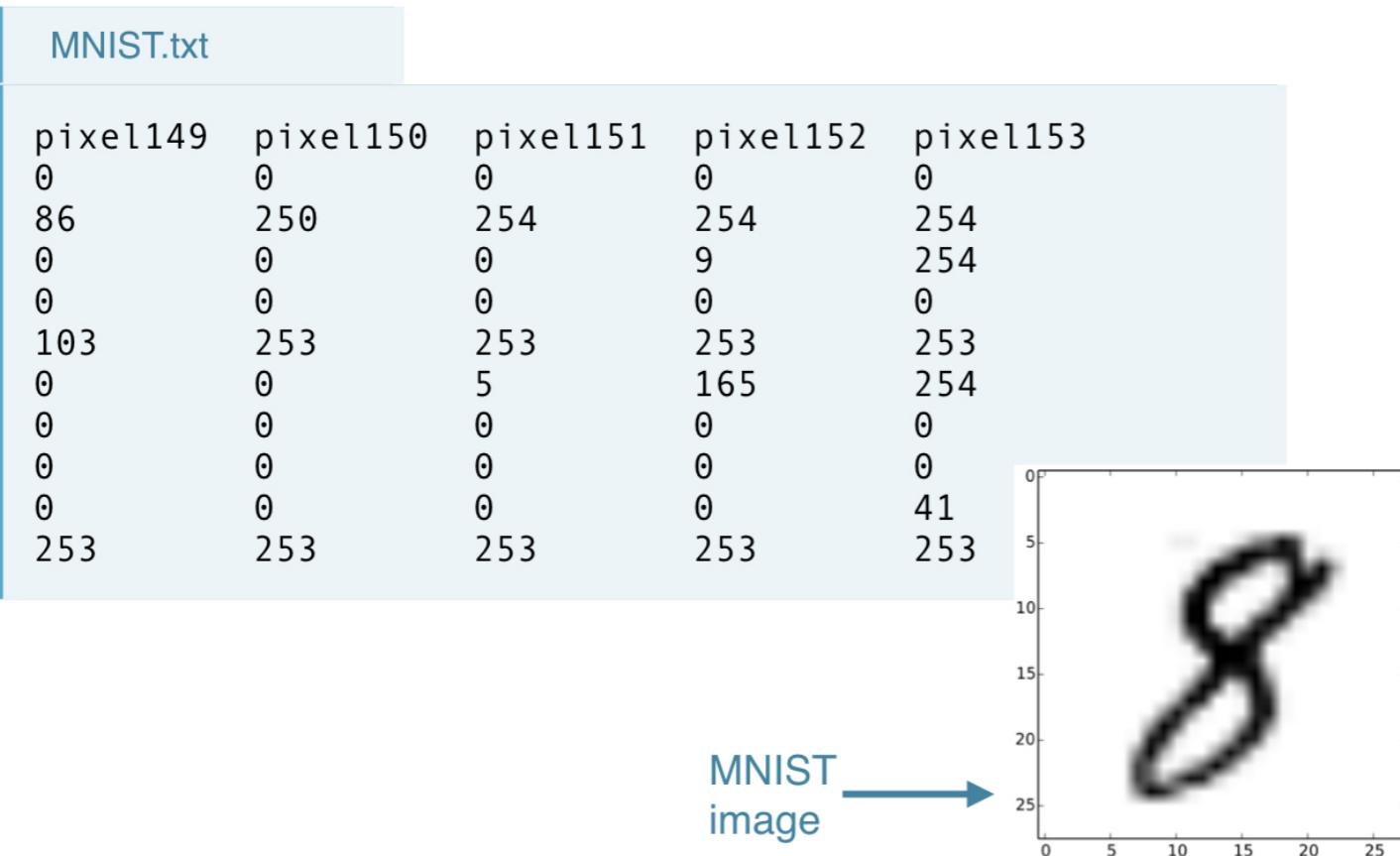
- .csv - Comma separated values
- .txt - Text file
- commas, tabs - Delimiters

Tab-delimited file

MNIST.txt

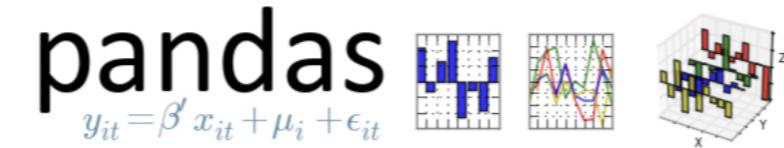
pixel149	pixel150	pixel151	pixel152	pixel153
0	0	0	0	0
86	250	254	254	254
0	0	0	9	254
0	0	0	0	0
103	253	253	253	253
0	0	5	165	254
0	0	0	0	0
0	0	0	0	0
0	0	0	0	41
253	253	253	253	253

Tab-delimited file



How do you import flat files?

- Two main packages: NumPy, pandas



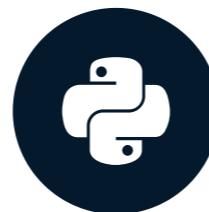
- Here, you'll learn to import:
 - Flat files with numerical data (MNIST)
 - Flat files with numerical data and strings (titanic.csv)

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Importing flat files using NumPy

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Why NumPy?

- NumPy arrays: standard for storing numerical data



Why NumPy?

- NumPy arrays: standard for storing numerical data
- Essential for other packages: e.g. scikit-learn



- `loadtxt()`
- `genfromtxt()`

Importing flat files using NumPy

```
import numpy as np  
filename = 'MNIST.txt'  
data = np.loadtxt(filename, delimiter=',')  
data
```

```
[[ 0.  0.  0.  0.  0.]  
 [ 86. 250. 254. 254. 254.]  
 [ 0.  0.  0.  9. 254.]  
 ...,  
 [ 0.  0.  0.  0.  0.]  
 [ 0.  0.  0.  0.  0.]  
 [ 0.  0.  0.  0.  0.]]
```

Customizing your NumPy import

```
import numpy as np  
filename = 'MNIST_header.txt'  
data = np.loadtxt(filename, delimiter=',', skiprows=1)  
print(data)
```

```
[[  0.   0.   0.   0.   0.]  
 [ 86.  250.  254.  254.  254.]  
 [  0.   0.   0.   9.  254.]  
 ...,  
 [  0.   0.   0.   0.   0.]  
 [  0.   0.   0.   0.   0.]  
 [  0.   0.   0.   0.   0.]]
```

Customizing your NumPy import

```
import numpy as np  
filename = 'MNIST_header.txt'  
data = np.loadtxt(filename, delimiter=',', skiprows=1, usecols=[0, 2])  
print(data)
```

```
[[ 0.  0.]  
 [ 86. 254.]  
 [ 0.  0.]  
 ...,  
 [ 0.  0.]  
 [ 0.  0.]  
 [ 0.  0.]]
```

Customizing your NumPy import

```
data = np.loadtxt(filename, delimiter=',', dtype=str)
```

Mixed datatypes

titanic.csv

	Name	Gender	Cabin	Fare
Braund, Mr. Owen Harris	male	NaN	7.3	
Cumings, Mrs. John Bradley	female	C85	71.3	
Heikkinen, Miss. Laina	female	NaN	8.0	
Futrelle, Mrs. Jacques Heath	female	C123	53.1	
Allen, Mr. William Henry	male	NaN	8.05	

¹ Source: Kaggle

Mixed datatypes

titanic.csv

	Name	Gender	Cabin	Fare
Braund, Mr. Owen Harris	male	NaN	7.3	
Cumings, Mrs. John Bradley	female	C85	71.3	
Heikkinen, Miss. Laina	female	NaN	8.0	
Futrelle, Mrs. Jacques Heath	female	C123	53.1	
Allen, Mr. William Henry	male	NaN	8.05	

strings

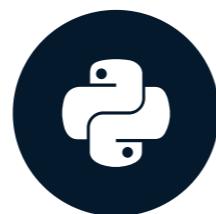
floats

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Importing flat files using pandas

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

What a data scientist needs

- Two-dimensional labeled data structure(s)
- Columns of potentially different types
- Manipulate, slice, reshape, groupby, join, merge
- Perform statistics
- Work with time series data

Pandas and the DataFrame



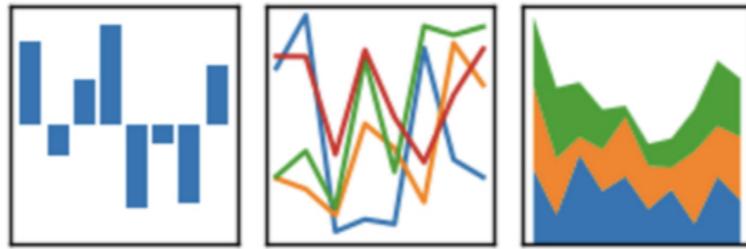
Wes McKinney

Pandas and the DataFrame



pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Wes McKinney

Pandas and the DataFrame

What problem does *pandas* solve?

Python has long been great for data munging and preparation, but less so for data analysis and modeling. *pandas* helps fill this gap, enabling you to carry out your entire data analysis workflow in Python without having to switch to a more domain specific language like R.

- DataFrame = pythonic analog of R's data frame

Pandas and the DataFrame



Hadley Wickham

@hadleywickham



Following

A matrix has rows and columns. A data frame
has observations and variables. [#rstats](#) [#tidydata](#)

RETWEETS

128

LIKES

233



Manipulating pandas DataFrames

- Exploratory data analysis
- Data wrangling
- Data preprocessing
- Building models
- Visualization
- Standard and best practice to use pandas

Importing using pandas

```
import pandas as pd  
filename = 'winequality-red.csv'  
data = pd.read_csv(filename)  
data.head()
```

	volatile acidity	citric acid	residual sugar
0	0.70	0.00	1.9
1	0.88	0.00	2.6
2	0.76	0.04	2.3
3	0.28	0.56	1.9
4	0.70	0.00	1.9

```
data_array = data.values
```

You'll experience:

- Importing flat files in a straightforward manner
- Importing flat files with issues such as comments and missing values

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Final thoughts on data import

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Next chapters:

- Import other file types:
 - Excel, SAS, Stata
- Feather



Wes McKinney
@wesmckinn



Following

Announcing Feather: A fast, language-agnostic
data frame file format, by
[@hadleywickham](#) and [@wesmckinn](#)

- Interact with relational databases

Next course:

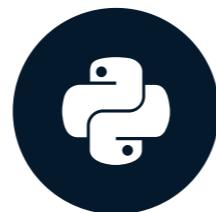
- Scrape data from the web
- Interact with APIs

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Introduction to other file types

INTRODUCTION TO IMPORTING DATA IN PYTHON



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Data Scientist at DataCamp

Other file types

- Excel spreadsheets
- MATLAB files
- SAS files
- Stata files
- HDF5 files

Pickled files

- File type native to Python
- Motivation: many datatypes for which it isn't obvious how to store them
- Pickled files are serialized
- Serialize = convert object to bytestream

Pickled files

```
import pickle  
with open('pickled_fruit.pkl', 'rb') as file:  
    data = pickle.load(file)  
print(data)
```

```
{'peaches': 13, 'apples': 4, 'oranges': 11}
```

Importing Excel spreadsheets

```
import pandas as pd  
file = 'urbanpop.xlsx'  
data = pd.ExcelFile(file)  
print(data.sheet_names)
```

```
['1960-1966', '1967-1974', '1975-2011']
```

```
df1 = data.parse('1960-1966') # sheet name, as a string  
df2 = data.parse(0) # sheet index, as a float
```

You'll learn:

- How to customize your import
- Skip rows
- Import certain columns
- Change column names

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Importing SAS/Stata files using pandas

INTRODUCTION TO IMPORTING DATA IN PYTHON



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Data Scientist at DataCamp

SAS and Stata files

- SAS: Statistical Analysis System
- Stata: “Statistics” + “data”
- SAS: business analytics and biostatistics
- Stata: academic social sciences research

SAS files

- Used for:
 - Advanced analytics
 - Multivariate analysis
 - Business intelligence
 - Data management
 - Predictive analytics
 - Standard for computational analysis

Importing SAS files

```
import pandas as pd  
from sas7bdat import SAS7BDAT  
with SAS7BDAT('urbanpop.sas7bdat') as file:  
    df_sas = file.to_data_frame()
```

Importing Stata files

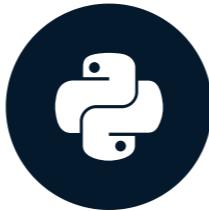
```
import pandas as pd  
data = pd.read_stata('urbanpop.dta')
```

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Importing HDF5 files

INTRODUCTION TO IMPORTING DATA IN PYTHON



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Data Scientist at DataCamp

HDF5 files

- Hierarchical Data Format version 5
- Standard for storing large quantities of numerical data
- Datasets can be hundreds of gigabytes or terabytes
- HDF5 can scale to exabytes

Importing HDF5 files

```
import h5py  
  
filename = 'H-H1_LOSC_4_V1-815411200-4096.hdf5'  
  
data = h5py.File(filename, 'r') # 'r' is to read  
  
print(type(data))
```

```
<class 'h5py._hl.files.File'>
```

The structure of HDF5 files

```
for key in data.keys():
    print(key)
```

```
meta
quality
strain
```

```
print(type(data['meta']))
```

```
<class 'h5py._hl.group.Group'>
```

This gives a high level picture of what's contained in a LIGO data file. There are 3 types of information:

- `meta`: Meta-data for the file. This is basic information such as the GPS times covered, which instrument, etc.
- `quality`: Refers to data quality. The main item here is a 1 Hz time series describing the data quality for each second of data. This is an important topic, and we'll devote a whole step of the tutorial to [working with data quality information](#).
- `strain`: Strain data from the interferometer. In some sense, this is "the data", the main measurement performed by LIGO.

The structure of HDF5 files

```
for key in data['meta'].keys():
    print(key)
```

Description
DescriptionURL
Detector
Duration
GPSstart
Observatory
Type
UTCstart

```
print(data['meta']['Description'].value, data['meta']['Detector'].value)
```

b'Strain data time series from LIGO' b'H1'

The HDF Project

- Actively maintained by the HDF Group



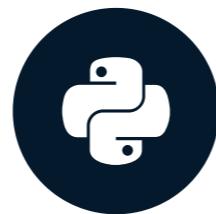
- Based in Champaign, Illinois

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Importing MATLAB files

INTRODUCTION TO IMPORTING DATA IN PYTHON



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Data Scientist at DataCamp

MATLAB

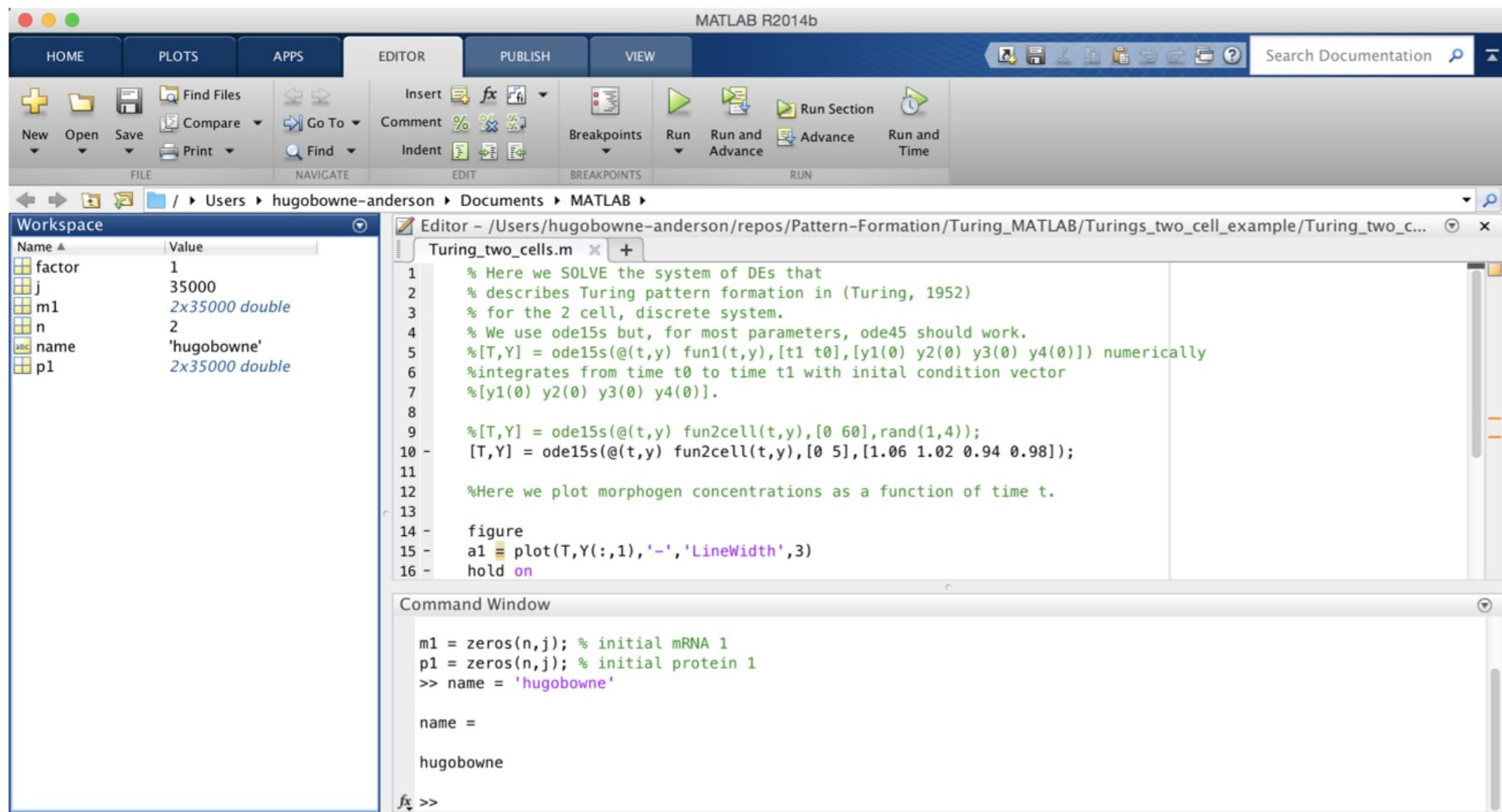
- “Matrix Laboratory”
- Industry standard in engineering and science
- Data saved as .mat files



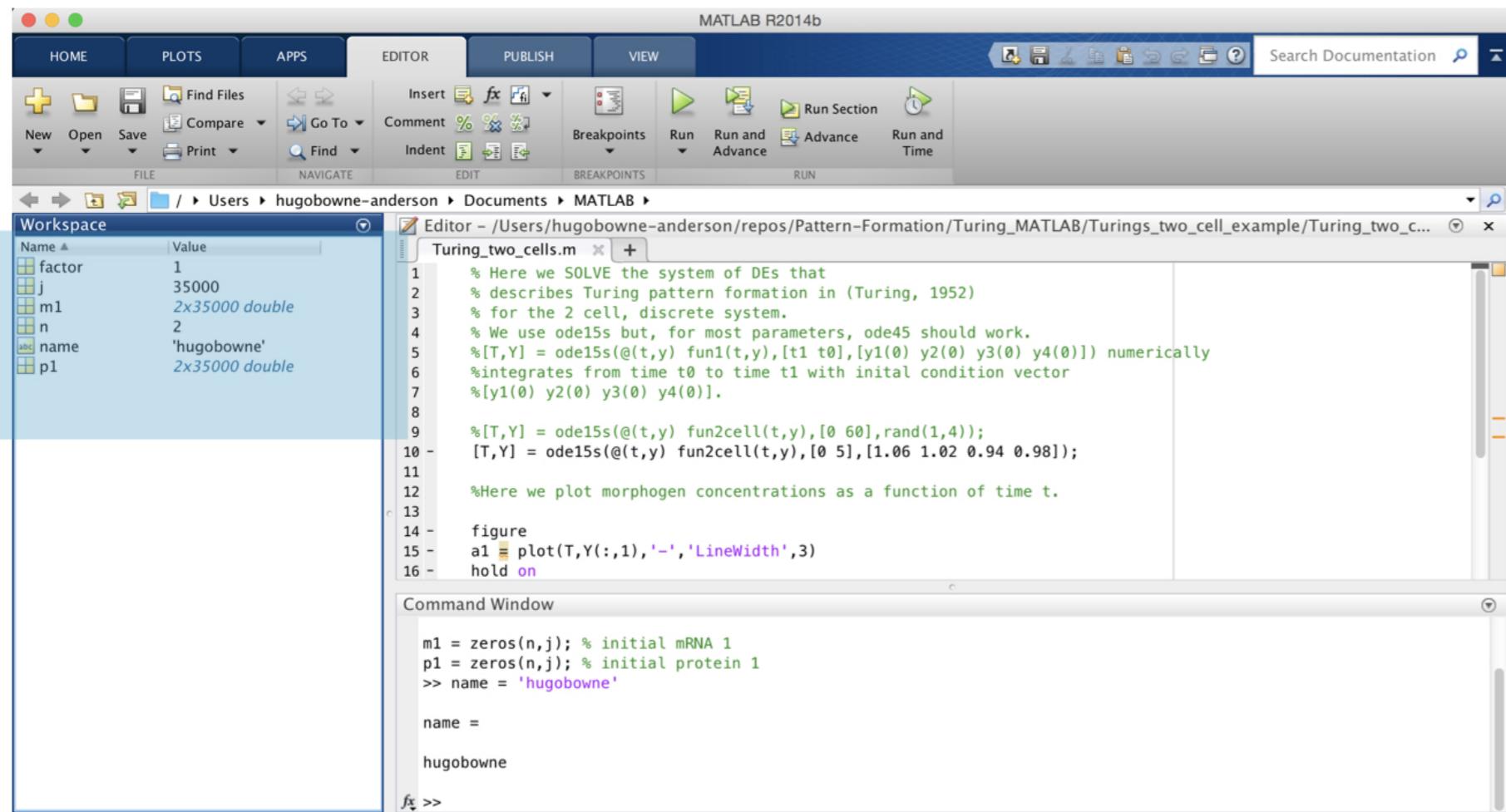
SciPy to the rescue!

- `scipy.io.loadmat()` - read .mat files
- `scipy.io.savemat()` - write .mat files

What is a .mat file?



What is a .mat file?



Importing a .mat file

```
import scipy.io  
filename = 'workspace.mat'  
mat = scipy.io.loadmat(filename)  
print(type(mat))
```

```
<class 'dict'>
```

- keys = MATLAB variable names
- values = objects assigned to variables

```
print(type(mat['x']))
```

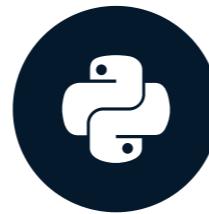
```
<class 'numpy.ndarray'>
```

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Introduction to relational databases

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

What is a relational database?

- Based on relational model of data
- First described by Edgar “Ted” Codd

Example: Northwind database

- Orders table

OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
10248	VINET	5	7/4/1996 12:00:00 AM	8/1/1996 12:00:00 AM	7/16/1996 12:00:00 AM	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
10251	VICTE	3	7/8/1996 12:00:00 AM	8/5/1996 12:00:00 AM	7/15/1996 12:00:00 AM	1	41.34	Victuailles en stock	2, rue du Commerce
10254	CHOPS	5	7/11/1996 12:00:00 AM	8/8/1996 12:00:00 AM	7/23/1996 12:00:00 AM	2	22.98	Chop-suey Chinese	Hauptstr. 31

- Customers table

CustomerID	CompanyName	ContactName	ContactTitle	Address	City	Region	PostalCode	Country
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AROUT	Around the Horn	Thomas Hardy	Sales Representative	120 Hanover Sq.	London	None	WA1 1DP	UK
BLAUS	Blauer See Delikatessen	Hanna Moos	Sales Representative	Forsterstr. 57	Mannheim	None	68306	Germany
BONAP	Bon app'	Laurence Lebihan	Owner	12, rue des Bouchers	Marseille	None	13008	France

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Example: Northwind database

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10251	VICTE	3	7/8/1996 12:00:00 AM	8/5/1996 12:00:00 AM	7/15/1996 12:00:00 AM	1	41.34	Victuailles en stock	2, rue du Commerce
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Relational model

- Widely adopted
- Codd's 12 Rules/Commandments
 - Consists of 13 rules (zero-indexed!)
 - Describes what a Relational Database Management System should adhere to to be considered relational

Relational Database Management Systems

- PostgreSQL



Relational Database Management Systems

- PostgreSQL
- MySQL



Relational Database Management Systems

- PostgreSQL
- MySQL
- SQLite



Relational Database Management Systems

- PostgreSQL
- MySQL
- SQLite
- SQL = Structured Query Language



Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Creating a database engine in Python

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

Creating a database engine

- SQLite database
 - Fast and simple
- SQLAlchemy
 - Works with many Relational Database Management Systems

```
from sqlalchemy import create_engine
engine = create_engine('sqlite:///Northwind.sqlite')
```

Getting table names

```
from sqlalchemy import create_engine  
engine = create_engine('sqlite:///Northwind.sqlite')
```

```
table_names = engine.table_names()  
print(table_names)
```

```
['Categories', 'Customers', 'EmployeeTerritories',  
'Employees', 'Order Details', 'Orders', 'Products',  
'Region', 'Shippers', 'Suppliers', 'Territories']
```

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Querying relational databases in Python

INTRODUCTION TO IMPORTING DATA IN PYTHON



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Basic SQL query

```
SELECT * FROM Table_Name
```

- Returns all columns of all rows of the table
- Example:

```
SELECT * FROM Orders
```

- We'll use SQLAlchemy and pandas

Workflow of SQL querying

- Import packages and functions
- Create the database engine
- Connect to the engine
- Query the database
- Save query results to a DataFrame
- Close the connection

Your first SQL query

```
from sqlalchemy import create_engine
import pandas as pd
engine = create_engine('sqlite:///Northwind.sqlite')
con = engine.connect()
rs = con.execute("SELECT * FROM Orders")
df = pd.DataFrame(rs.fetchall())
con.close()
```

Printing your query results

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

	0	1	2	3	4
0	10248	VINET	5	7/4/1996 12:00:00 AM	8/1/1996 12:00:00 AM
1	10251	VICTE	3	7/8/1996 12:00:00 AM	8/5/1996 12:00:00 AM
2	10254	CHOPS	5	7/11/1996 12:00:00 AM	8/8/1996 12:00:00 AM
3	10256	WELLI	3	7/15/1996 12:00:00 AM	8/12/1996 12:00:00 AM
4	10258	ERNSH	1	7/17/1996 12:00:00 AM	8/14/1996 12:00:00 AM

Set the DataFrame column names

```
from sqlalchemy import create_engine
import pandas as pd
engine = create_engine('sqlite:///Northwind.sqlite')
con = engine.connect()
rs = con.execute("SELECT * FROM Orders")
df = pd.DataFrame(rs.fetchall())
df.columns = rs.keys()
con.close()
```

Set the data frame column names

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

	OrderID	CustomerID	EmployeeID		OrderDate
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Using the context manager

```
from sqlalchemy import create_engine
import pandas as pd
engine = create_engine('sqlite:///Northwind.sqlite')
```

```
with engine.connect() as con:
    rs = con.execute("SELECT OrderID, OrderDate, ShipName FROM Orders")
    df = pd.DataFrame(rs.fetchmany(size=5))
    df.columns = rs.keys()
```

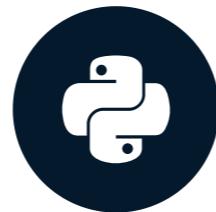
Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Querying relational databases directly with pandas

INTRODUCTION TO IMPORTING DATA IN PYTHON

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The pandas way to query

```
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```
df = pd.read_sql_query("SELECT * FROM Orders", engine)
```

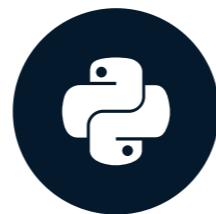
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INTRODUCTION TO IMPORTING DATA IN PYTHON

Advanced querying: exploiting table relationships

INTRODUCTION TO IMPORTING DATA IN PYTHON

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JOINing tables

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BONAP	Bon app'	Laurence Lebihan	Owner	12, rue des Bouchers	Marseille	None	13008	France

JOINing tables

- Orders table

OrderID	CustomerID	EmployeeID	OrderDate	RequiredDate	ShippedDate	ShipVia	Freight	ShipName	ShipAddress
10248	VINET	5	7/4/1996 12:00:00 AM	8/1/1996 12:00:00 AM	7/16/1996 12:00:00 AM	3	32.38	Vins et alcools Chevalier	59 rue de l'Abbaye
10251	VICTE	3	7/8/1996 12:00:00 AM	8/5/1996 12:00:00 AM	7/15/1996 12:00:00 AM	1	41.34	Victuailles en stock	2, rue du Commerce
10254	CHOPS	5	7/11/1996 12:00:00 AM	8/8/1996 12:00:00 AM	7/23/1996 12:00:00 AM	2	22.98	Chop-suey Chinese	Hauptstr. 31

- Customers table

CustomerID	CompanyName	ContactName	ContactTitle	Address	City	Region	PostalCode	Country
ALFKI	Alfreds Futterkiste	Maria Anders	Sales Representative	Obere Str. 57	Berlin	None	12209	Germany
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BLAUS	Blauer See Delikatessen	Hanna Moos	Sales Representative	Forsterstr. 57	Mannheim	None	68306	Germany
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INNER JOIN in Python (pandas)

```
from sqlalchemy import create_engine
import pandas as pd
engine = create_engine('sqlite:///Northwind.sqlite')
df = pd.read_sql_query("SELECT OrderID, CompanyName FROM Orders
INNER JOIN Customers on Orders.CustomerID = Customers.CustomerID", engine)
print(df.head())
```

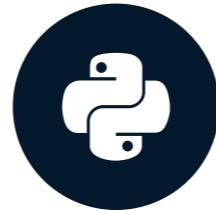
	OrderID	CompanyName
0	10248	Vins et alcools Chevalier
1	10251	Victuailles en stock
2	10254	Chop-suey Chinese
3	10256	Wellington Importadora
4	10258	Ernst Handel

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

Final Thoughts

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson
Data Scientist at DataCamp

What you've learned:

- Relational databases
- Queries
 - SELECT
 - WHERE
 - JOIN

Next course:

- Scrape data from the web
- Interact with APIs

Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON