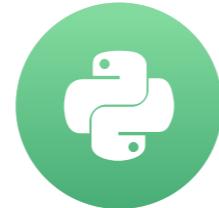


# Introduction to relational databases

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<br>12:00:00 AM  | 8/1/1996<br>12:00:00 AM | 7/16/1996<br>12:00:00 AM | 3       | 32.38   | Vins et alcools Chevalier | 59 rue de l'Abbaye |
| 10251   | VICTE      | 3          | 7/8/1996<br>12:00:00 AM  | 8/5/1996<br>12:00:00 AM | 7/15/1996<br>12:00:00 AM | 1       | 41.34   | Victuailles en stock      | 2, rue du Commerce |
| 10254   | CHOPS      | 5          | 7/11/1996<br>12:00:00 AM | 8/8/1996<br>12:00:00 AM | 7/23/1996<br>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 |
| 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  |

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# Example: Northwind database

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# Example: Northwind database

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# Example: Northwind database

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# The Orders table

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

# The Orders table

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

# The Orders table

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

# The Orders table

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

# Tables are linked

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# Tables are linked

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# Tables are linked

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# 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

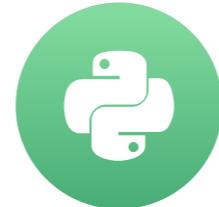


# Let's practice!

## 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

Note: The database engine will communicate our queries to the database.

- 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)
```

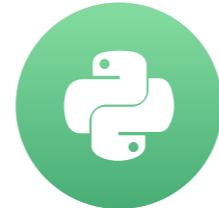
```
['Categories', 'Customers', 'EmployeeTerritories',  
'Employees', 'Order Details', 'Orders', 'Products',  
'Region', 'Shippers', 'Suppliers', 'Territories']
```

# Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

# Querying relational databases in Python

INTRODUCTION TO IMPORTING DATA IN PYTHON



Hugo Bowne-Anderson  
Data Scientist at DataCamp

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

# 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 Order")
    df = pd.DataFrame(rs.fetchmany(size=5))
    df.columns = rs.keys()
```

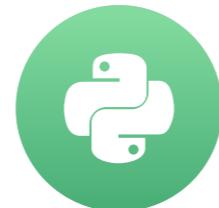
# Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

# Querying relational databases directly with pandas

INTRODUCTION TO IMPORTING DATA IN PYTHON

Hugo Bowne-Anderson  
Data Scientist at DataCamp



# The pandas way to query

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

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

Note:  
Query from database

[4 lines of code way](#)  
step1 - Connecting  
step2 - Executing a query  
step3 - Passing the results to a dataframe  
step4 - Naming the columns

[1 line of code way](#)  
using pandas function read\_sql\_query

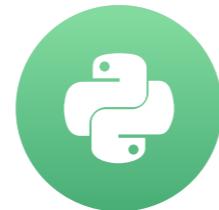
# Let's practice!

INTRODUCTION TO IMPORTING DATA IN PYTHON

# Advanced querying: exploiting table relationships

INTRODUCTION TO IMPORTING DATA IN PYTHON

Hugo Bowne-Anderson  
Data Scientist at DataCamp



# Tables are linked

- Orders table

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

# Tables are linked

- Orders table

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

# Tables are linked

- Orders table

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

- Employees table

| EmployeeID | LastName  | FirstName | Title                 | TitleOfCourtesy | BirthDate                | HireDate                 | Address                     | City     | Region |
|------------|-----------|-----------|-----------------------|-----------------|--------------------------|--------------------------|-----------------------------|----------|--------|
| 1          | Davolio   | Nancy     | Sales Representative  | Ms.             | 12/8/1948<br>12:00:00 AM | 5/1/1992<br>12:00:00 AM  | 507 - 20th Ave. E.\nApt. 2A | Seattle  | WA     |
| 2          | Fuller    | Andrew    | Vice President, Sales | Dr.             | 2/19/1952<br>12:00:00 AM | 8/14/1992<br>12:00:00 AM | 908 W. Capital Way          | Tacoma   | WA     |
| 3          | Leverling | Janet     | Sales Representative  | Ms.             | 8/30/1963<br>12:00:00 AM | 4/1/1992<br>12:00:00 AM  | 722 Moss Bay Blvd.          | Kirkland | WA     |

# JOINing tables

- Orders table

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

# JOINing tables

- Orders table

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

# JOINing tables

- Orders table

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

# JOINing tables

- Orders table

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

# JOINing tables

- Orders table

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

# 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())
```

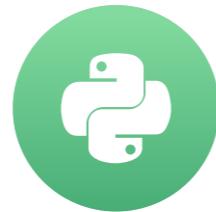
```
OrderID      CompanyName
0    10248  Vins et alcools Chevalier
1    10251        Victuailles en stock
2    10254          Chop-suey Chinese
3    10256  Wellington Importadora
4    10258           Ernst Handel
```

# 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