Introduction to Databases

INTRODUCTION TO DATABASES IN PYTHON

Jason Myers

Co-Author of Essential SQLAlchemy and Software Engineer

A database consists of tables

Census

state	sex	age	pop2000	pop2008
New York	F	0	120355	122194
New York	F	1	118219	119661
New York	F	2	119577	116413

State_Fact

name	abbreviation	type
New York	NY	state
Washington DC	DC	capitol
Washington	WA	state

Table consist of columns and rows

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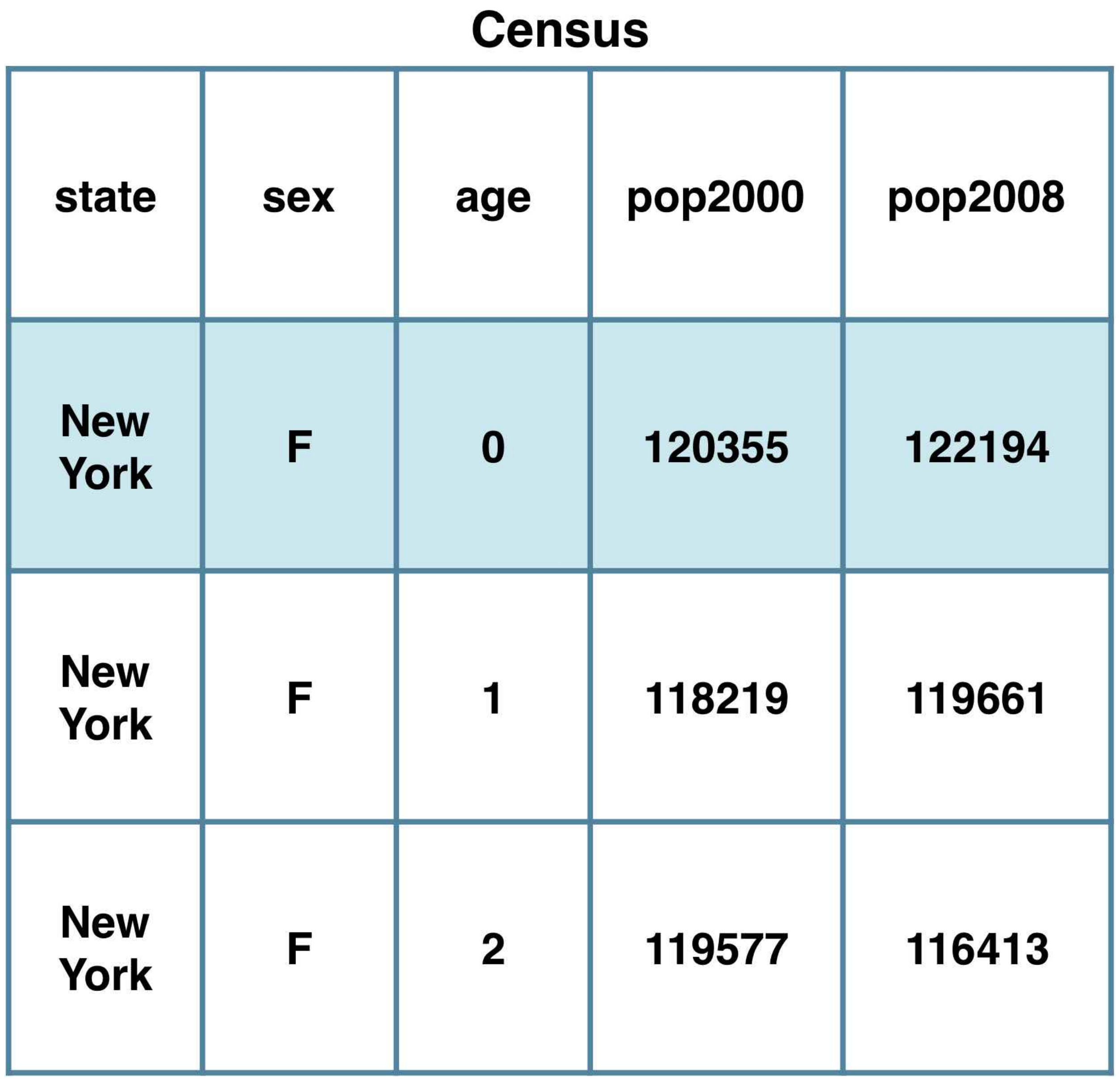
Table consist of columns and rows



Census

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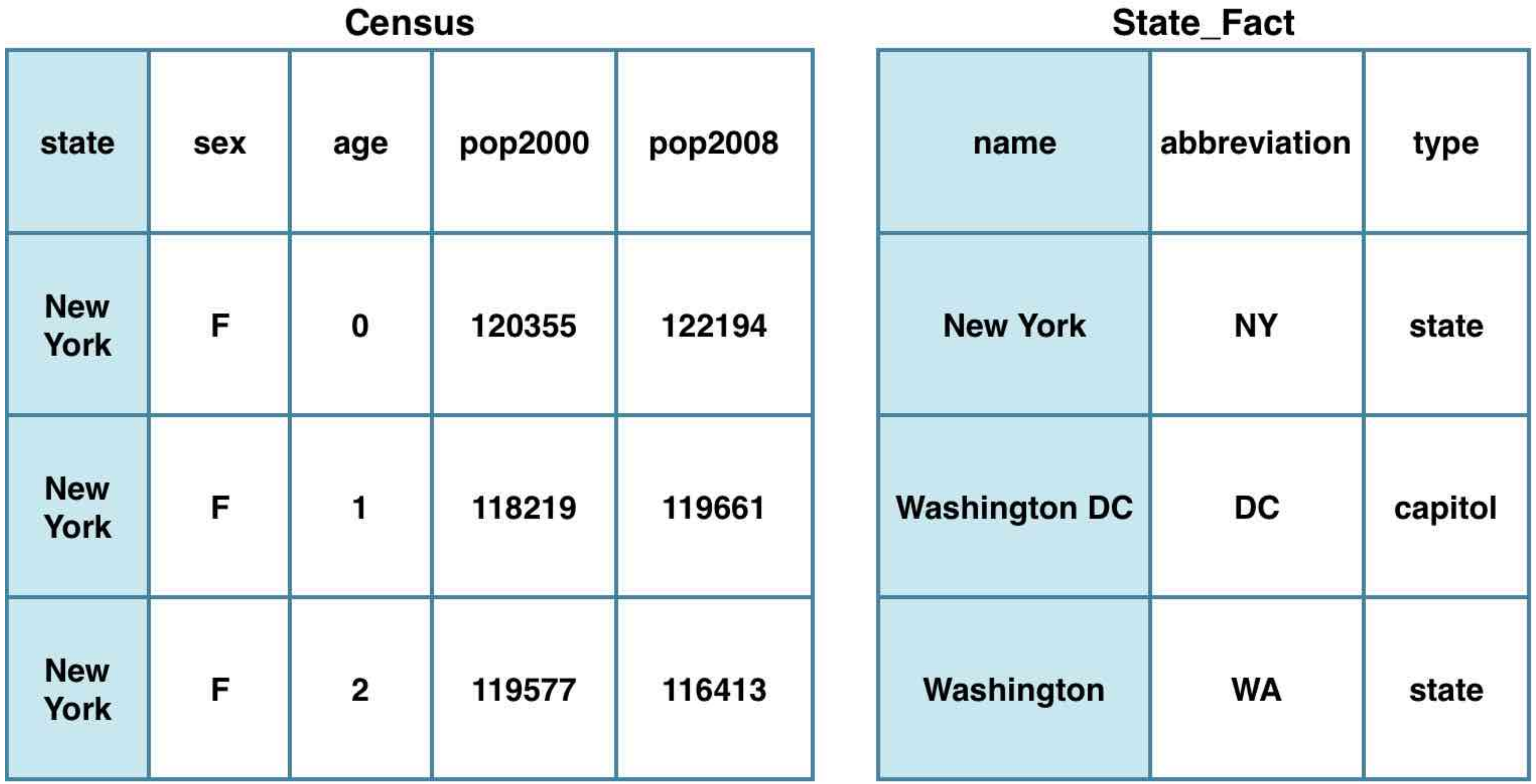
Tables can be related



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New York	NY	state
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Let's practice!

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Connecting to your database

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Meet SQLAlchemy

- Two main pieces
    - Core (Relational Model focused)
    - ORM (User Data Model focused)

There are many types of databases

- SQLite
- PostgreSQL
- MySQL
- Microsoft SQL Server
- Oracle SQL
- Many more

Connecting to a database

```python
from sqlalchemy import create_engine

engine = create_engine('sqlite:///census_nyc.sqlite')

connection = engine.connect()
```

- Engine: common interface to the database from SQLAlchemy
- Connection string: All the details required to find the database (and login, if necessary)

A word on connection strings

```
'sqlite:///census_nyc.sqlite'
```

Driver + Dialect

A word on connection strings

```
'sqlite:///census_nyc.sqlite'
```

Filename

What's in your database?

Before querying your database, you'll want to know what is in it: what the tables are, for example:

```
from sqlalchemy import create_engine
engine = create_engine('sqlite:///census_nyc.sqlite')
print(engine.table_names())
```

```
['census', 'state_fact']
```

Reflection

Reflection reads database and builds SQLAlchemy `Table` objects

```
from sqlalchemy import MetaData, Table
metadata = MetaData()
census = Table('census', metadata, autoload=True,
  autoload_with=engine)
print(repr(census))
```

```
Table('census', MetaData(bind=None), Column('state', VARCHAR(
length=30), table=<census>), Column('sex', VARCHAR(length=1),
table=<census>), Column('age', INTEGER(), table=<census>),
Column('pop2000', INTEGER(), table=<census>), Column('pop2008',
INTEGER(), table=<census>), schema=None)
```

Let's practice!

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Introduction to SQL queries

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SQL Statements

- Select, insert, update, and delete data
- Create and alter data

Basic SQL querying

```
SELECT column_name FROM table_name
```

- `SELECT pop2008 FROM People`
- `SELECT * FROM People`

Basic SQL querying

```
from sqlalchemy import create_engine

engine = create_engine('sqlite:///census_nyc.sqlite')

connection = engine.connect()

stmt = 'SELECT * FROM people'

result_proxy = connection.execute(stmt)

results = result_proxy.fetchall()
```

ResultProxy vs ResultSet

```
result_proxy = connection.execute(stmt)


results = result_proxy.fetchall()
```

- `result_proxy` is a `ResultProxy`
- `results` is a `ResultSet`

Handling ResultSets

```
first_row = results[0]
print(first_row)
```

```
('Illinois', 'M', 0, 89600, 95012)
```

```
print(first_row.keys())
```

```
['state', 'sex', 'age', 'pop2000', 'pop2008']
```

```
print(first_row.state)
```

```
'Illinois'
```

SQLAlchemy to build queries

- Provides a Pythonic way to build SQL statements
- Hides differences between backend database types

SQLAlchemy querying

```
from sqlalchemy import Table, MetaData
metadata = MetaData()

census = Table('census', metadata, autoload=True,
  autoload_with=engine)

stmt = select([census])

results = connection.execute(stmt).fetchall()
```

SQLAlchemy select statement

- Requires a list of one or more Tables or Columns
- Using a table will select all the columns in it

```
stmt = select([census])

print(stmt)
```

```
'SELECT * from CENSUS'
```

Let's practice!

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Congratulations!

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You already...

- Know about the relational model
- Can make basic SQL queries

Coming up next...

- Beef up your SQL querying skills
- Learn how to extract all types of useful information from your databases using SQLAlchemy
- Learn how to create and write to relational databases
- Deep dive into the US census dataset!

See you in the next chapter!

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