



Introduction to SQLAlchemy

Data Boot Camp



Class Objectives

By the end of today's class you will be able to:



Connect to a SQL database with SQLAlchemy.



Perform a SQL query with SQLAlchemy.



Create Python classes and objects.



Use a Python class to model a SQL table.



Instructor Demonstration

Introduction to SQLAlchemy

SQLAlchemy is a Python library that works across a variety of SQL dialects.

**Write the query once,
run it anywhere!**

SQLAlchemy ORM

Object Relational Mapper (ORM)

SQLAlchemy Core

Schema / Types

SQL Expression
Language

Engine

Connection
Pooling

Dialect

Third party libraries / Python core

DBAPI

Database

SQLAlchemy ORM Is Flexible

It's possible to query a database using more SQL...

```
data = engine.execute("SELECT * FROM BaseballPlayer")
```

...or more Python!

```
players = session.query(BaseballPlayer)
for player in players:
    print(player.name_given)
```



Instructor Demonstration

Building a SQLAlchemy Connection

Today we will only be working with one SQL dialect - **SQLite!**

Looking at SQLAlchemy Documentation

Let's take a moment to look at the SQLAlchemy documentation!





Instructor Demonstration

SQLAlchemy and Pandas

One of the most
impressive aspects
of **SQLAlchemy...**

...is how
it integrates
with **Pandas!**

Pandas integrates with SQLAlchemy

- Once we connect to our SQL database using SQLAlchemy
- We can query directly using pandas

```
# Create Engine
```

```
engine = create_engine(f"sqlite:/// {database_path}")  
conn = engine.connect()
```

```
# Query All Records in the the Database
```

```
data = pd.read_sql("SELECT * FROM Census_Data", conn)
```

<Time to Code>





Activity: Ice Cream Connection

In this activity, you will create, connect and insert data into a new database using SQLAlchemy.

Suggested Time:
15 Minutes



Ice Cream Connection Instructions

- Use the database path to create a sqlite engine
- Use the engine to select all of the rows and columns from the table `icecreamstore.csv`
- Create a new query that finds the ice cream flavors that cost \$1.25 or greater





Time's Up! Let's Review.

<Time to Code>





Activity: Read All the SQL

In this activity, you query an external server using Pandas and SQLAlchemy to create new dataframes based on US census data.

Suggested Time:
10 Minutes



Read All the SQL Instructions

- Create an engine to connect to the census database.
- Query all the data from the Census_Data table and load into pandas.
- Create an engine to connect to the zip database.
- Query all the data from the Zip_Census table and load in pandas.
- Show the .head() of your newly imported data.





Time's Up! Let's Review.



Instructor Demonstration

Preview SQLAlchemy with Classes

SQLAlchemy with Classes

- SQLAlchemy is not just for making SQL queries in Python
 - It can also **update** a SQL database using Python classes
- Python classes are traditionally used to bundle data and functions together
 - In SQLAlchemy they are used to define structures

```
# Create Dog and Cat Classes
# -----
class Dog(Base):
    __tablename__ = 'dog'
    id = Column(Integer, primary_key=True)
    name = Column(String(255))
    color = Column(String(255))
    age = Column(Integer)

class Cat(Base):
    __tablename__ = 'cat'
    id = Column(Integer, primary_key=True)
    name = Column(String(255))
    color = Column(String(255))
    age = Column(Integer)
```

<Time to Code>





Countdown timer

15:00

(with alarm)



Instructor Demonstration

A Schooling on Classes

Object Oriented Programming

Programming paradigm that structures programs so that properties and behaviors are bundled into individual **objects**.

Object Oriented Programming

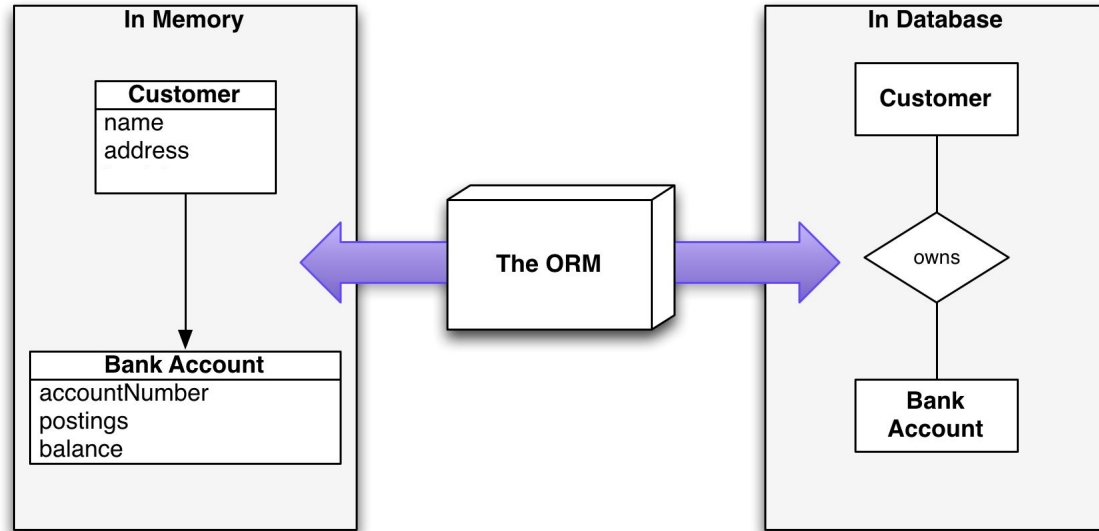
Programming paradigm that structures programs so that properties and behaviors are bundled into individual objects.

Classes are essentially **blueprints or templates** for Python **objects**.

This means that objects can be created according to user-created blueprints, thus allowing developers to rapidly create objects of similar structure/purpose but with differing values.

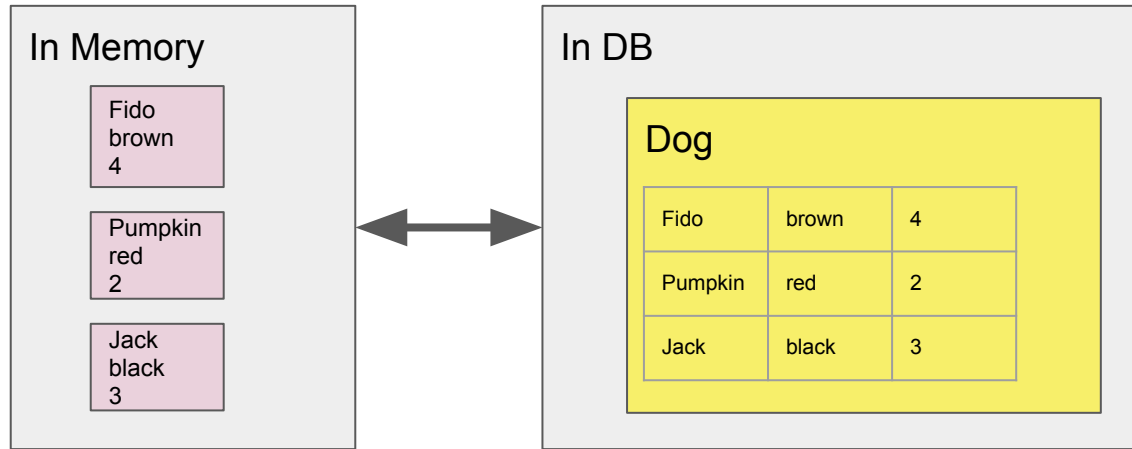
Object Oriented Programming

In the case of SQLAlchemy, we can use classes to make a table blueprint and update the SQL schema



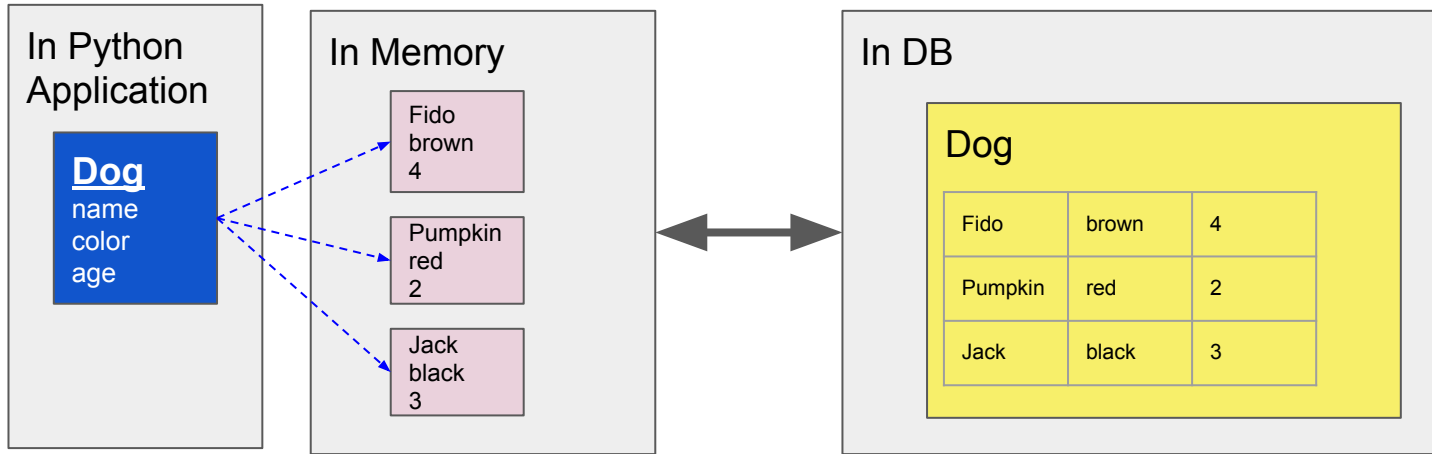
Object Oriented Programming

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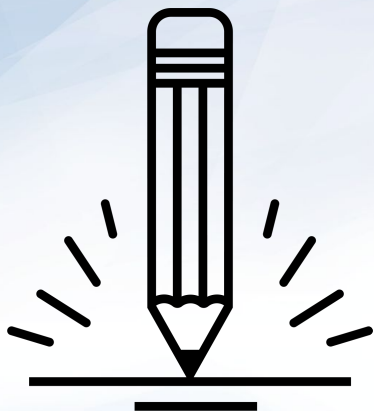
Object Oriented Programming

In the case of SQLAlchemy, we can use classes to make a table blueprint and update the SQL schema



<Time to Code>





Activity: Surfer Class

In this activity, you will work on creating your own classes in Python.

Suggested Time:
15 Minutes



Surfer Class Instructions

- Create a class Surfer and initialize it with name, hometown, and rank instance variables.
- Create an instance of a surfer.
- Then print the name, hometown and rank of your surfer object.

Bonus:

- Create a while loop that will allow you to continuously create new instances of surfers using input().
- Keep the loop going until the user specifies otherwise.





Time's Up! Let's Review.



Instructor Demonstration

A Method to the Classes

Adding Methods to Python Classes is Easy as 1, 2, 3!

1. Define the function using `def`
2. Provide a name and list of parameters
3. Use `class.method()` to run the method in your script!

```
# Define the Expert class
class Expert():

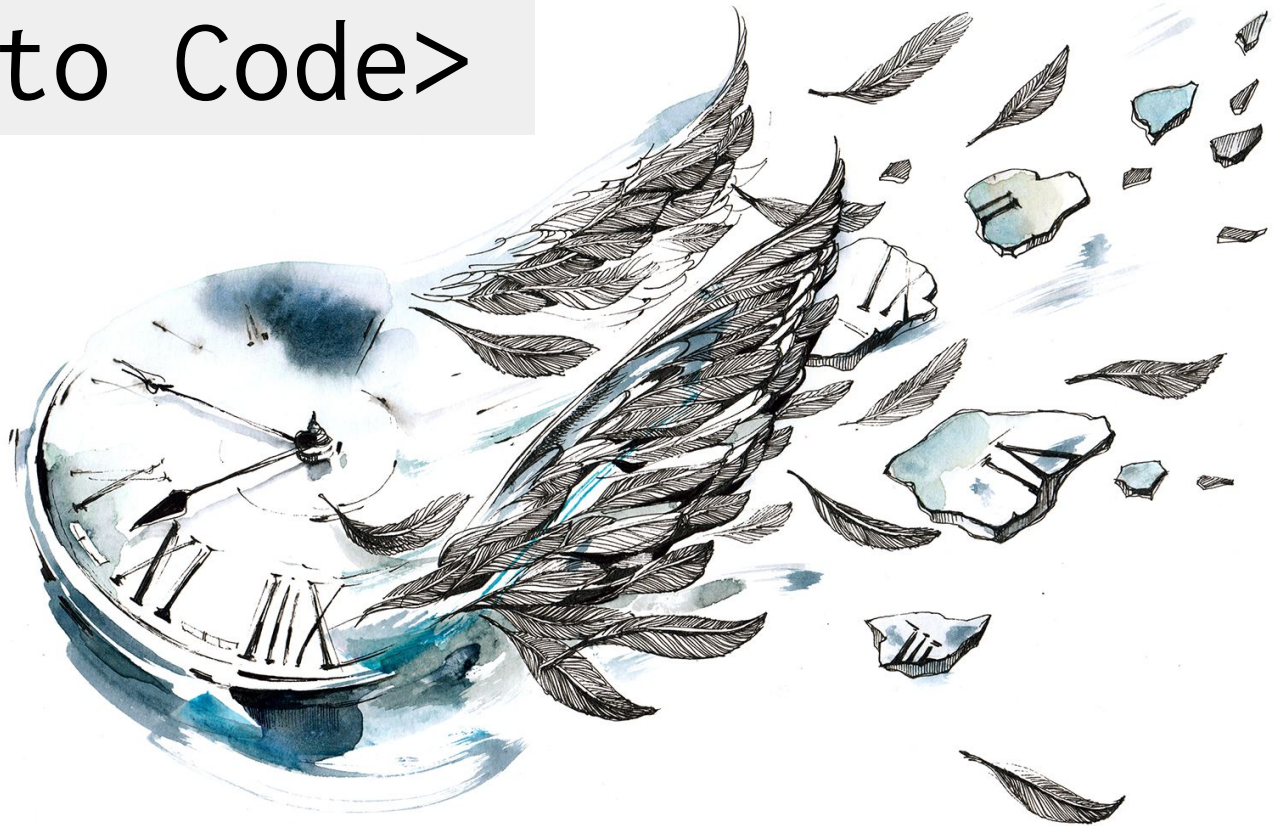
    # A required function to initialize the class object
    def __init__(self, name):
        self.name = name

    # A method that takes another object as its argument
    def boast(self, obj):

        # Print out Expert object's name
        print("Hi. My name is", self.name)

        # Print out the name of the Film class object
        print("I know a lot about", obj.name)
        print("It is", obj.length, "minutes long")
        print("It was released in", obj.release_year)
        print("It is in", obj.language)
```

<Time to Code>





Activity: Surfer Class Extended

In this activity, you will be reworking your Surfer script from earlier as you add in methods to perform specific tasks.

Suggested Time:
10 Minutes



Surfer Class Extended Instructions

- Create a Surfer class that has name, hometown, rank, and wipeouts instance variables.
- Create a method called speak that prints "Hangs loose, bruh!"
- Create a method called biography that prints the surfer's name and hometown.
- Create a method called cheer that will print "I totally rock man, no wipeouts!" if the surfer has no wipeouts. Otherwise, it prints 'Bummer bruh, keep on keeping on!'.
- Create two surfers that print out all their info and run all the methods.





Time's Up! Let's Review.



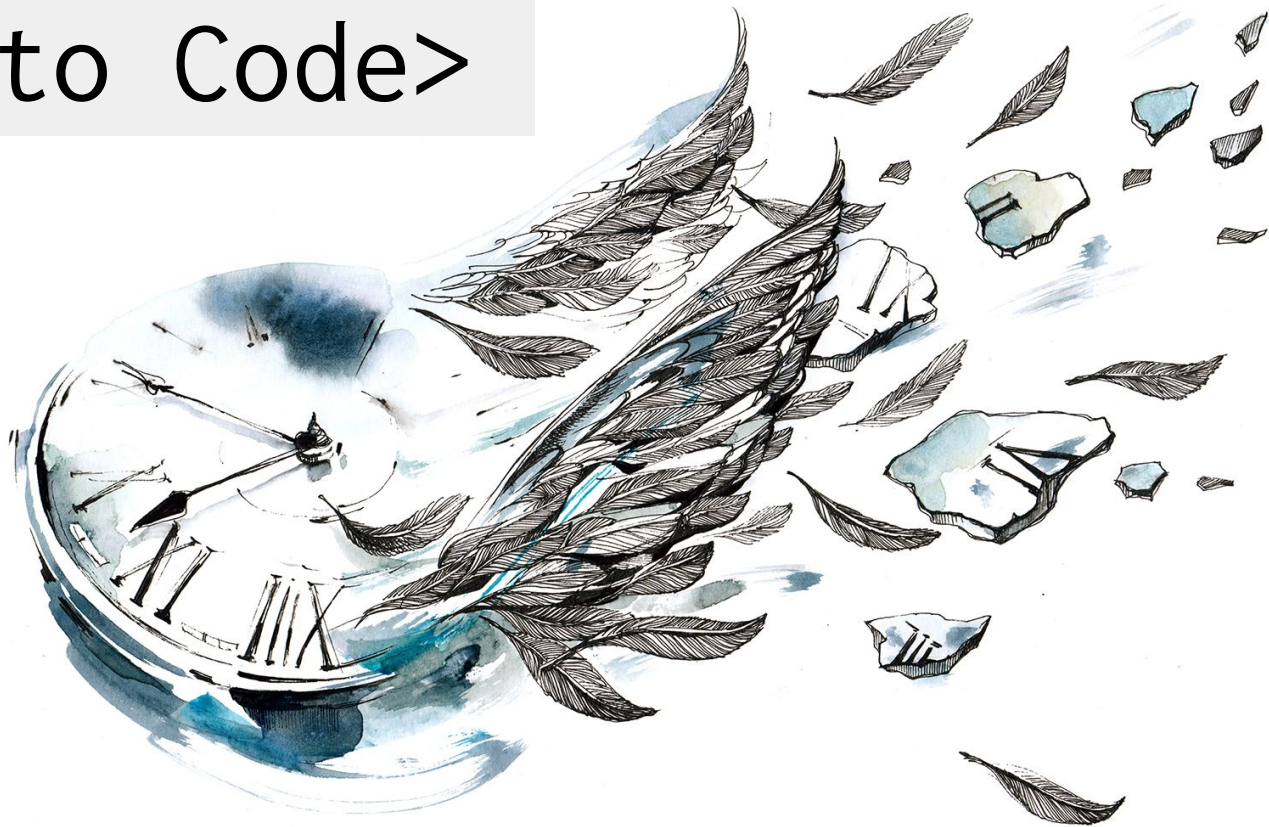
Everyone Do: Back to the SQL

In this activity, we will bring all of our SQLAlchemy concepts together and remake the pets database using classes.

Suggested Time:
20 Minutes



<Time to Code>





Activity: Surfing SQL

In this final activity, you will test your SQLAlchemy skills and update your Surfer database.

Suggested Time:
20 Minutes



Surfing SQL Instructions

- Modify the Surfer class created during the previous activity so that it will function with SQLAlchemy.
- Create a new class called Board which will function with SQLAlchemy and has the following parameters...
- Pull a list of all of the surfers and surfboards already inside the database
- Push a new surfer and surfboard to the tables on the database





Time's Up! Let's Review.