CSE231 - Lab 11

Introduction to Classes

Quick Announcements

I’ve made a new notebook entirely on classes! On the GitHub page under Extra/More on Classes.ibynb.

This notebook will also act as my final exam notebook. It’s not entirely complete as of right now, but I’ll be adding to it as we keep going here. Specifically, we’ll be talking about two big concepts with classes, “Operator Overloading” and “Inheritance”.

Inheritance is a confusing topic, and is likely going to be used for the last project. Make sure you’re comfortable with it.

Classes

Classes are hugely important to be able to organize and abstract-away code. But, because of how fundamental they are to building up more advanced structures, they can be *very* confusing.

With classes, we create *objects*. Classes are like templates for the instantiation of an object. To give an example, you might consider “fruits” a class, where apples, bananas, mangoes, etc. would be *objects* that are instantiated from your fruit class.

In Python, we create instantiations of ints, with say, value 1. The class is `int`, and the instantiation with value 1 would be the object.

Class Structure Overview

```
class my_cool_class( object ):    # Declaration
    def __init__(self, a, b):    # Constructor function
        self.x = a    # Data member / Attribute
        self.y = b
    def my_method(self, c):    # Method function
        return c + self.x
```

`__init__(self, )`

The constructor is a special, pre-defined function where you can define the behaviour of your object when one is created. In it, you can also initialize ***data members*** (also sometimes referred to as “attributes”), that can store information *about* your class.

You can, of course, give the constructor parameters. The programmer would then have to pass arguments into your class to initialize one.

Example time!

L11-1

We've been using constructors a lot

```
my_str = "hello!"

my_list = list(my_str)    # This is the list constructor!

print(my_list)    # ['h', 'e', 'l', 'l', 'o', '!']
```

The `list()` function that we've been using this entire time is the *constructor* function for the `list` class!

The `list` class' constructor likely has some logic built-in to iterate through other iterable types to create a `list` instantiation.

Method Functions

We've talked a lot about method functions too, right? When we use something like `.lower()` on a string, we're accessing that string's `.lower()` method function. The function goes into its data member (the string value), and lower-cases all upper-case characters.

The "method functions" we're talking about here are the same! Just that now, we're the ones *creating* the methods. They can be whatever you want, and are able to access the data members you created.

`self`

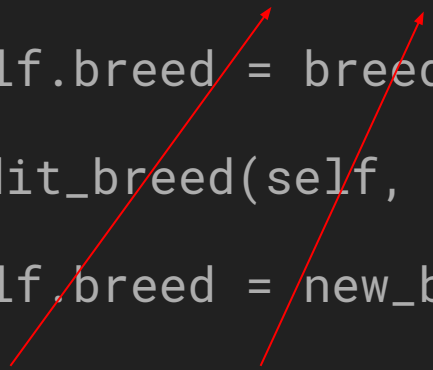
So, you're probably wondering what's up with this "`self`" keyword being spilled everywhere. What does it do?

`self` is a way for the class you're making to *refer* to itself. In a sense, the class doesn't "know" what it contains, and so you have to pass it in as a "parameter", but not in a traditional way.

When you call `.lower()` on a string, for example. The string you're calling the method function on is the `self` in that case. We'll go through an example..

Constructor Call

```
class Doggie(object):

    def __init__(self, breed):

        self.breed = breed

    def edit_breed(self, new_breed):

        self.breed = new_breed

dog = Doggie(“Huskie”)

dog.edit_breed(“Samoyed”)
```



Method Call

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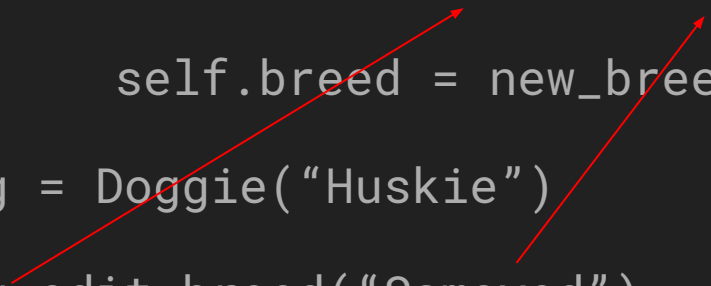
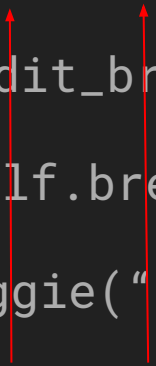


Data Member Call

```
class Doggie(object):

    def __init__(self, breed):

        self.breed = breed

    def edit_breed(self, new_breed):

        self.breed = new_breed

dog = Doggie(“Huskie”)

print( dog.breed )    # ‘Huskie’
```



`__str__(self)` / `__repr__(self)`

In addition to `__init__()`, there's another pre-defined function called `__str__()`. Normally, when you try to print an instance of your class, Python will try to convert your instance into a string. Without this method, you'll get some… unhelpful things. `__str__()` gives you the ability to represent your class as a string if you ever need to.

There's another pre-defined method, `__repr__()`, which does the exact same thing but leans more on the side of industry use. It's usually good practice to make a `__repr__()` method, even if you just call `__str__()` with it.

There are more of these things

There are ***a lot*** more pre-defined functions that can interact with your class that I won't be covering right now. You'll learn about them in the coming weeks.

```
__add__()

__sub__()

__mul__()

__pow__()

__truediv__()

...
```

Lab time