Python 101

Lec07 Classes Continued

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May 21, 2019

Inheritance

One usage of classes is Inheritance.

Inheritance

The child inherits every thing about its parent, and $+\alpha$.

Inheritance

```
class MyList(list):
    """a list that keeps track of max and min"""
   def __init__(self, iterable):
        super().__init__(iterable)
        self._max = max(iterable)
        self._min = min(iterable)
    def __len__(self):
    def append(self, item):
        if item < self._min:</pre>
            self. min = item
        if item > self._max:
            self. max = item
        super().append(item)
a = MyList((1,2,3,5,10))
a.insert(3, 4)
a.append(100)
print(a[3:4])
print(a)
print(a._max)
```

MyList(list) means that this class will inherit from list.

```
class MyList(list):
```

The *super()* returns the parent class. We use super() to access the parent classes data methods etc. Here, we initiate the parent first so that parameters are automatically filled in.

```
class MyList(list):
    """a list that keeps track of max and min"""
    def __init__(self, iterable):
        super().__init__(iterable)
```

min(lst), max(lst) takes time proprotional to N. Here, we keep track of min and max so that it can be known regardless of size.

(Of course, there is no free lunch, there is extra cost of comparing at append.)

```
class MyList(list):
    """a list that keeps track of max and min"""
    def __init__(self, iterable):
        super().__init__(iterable)
        self._max = max(iterable)
        self._min = min(iterable)
```

Here, we override the parent's __len__, which determines the value returned when we do *len(lst)*.

```
# always return 100, just for demonstrational purposes
def __len__(self):
    return 100
```

We override the append() of list, so that we keep track of $_$ min and $_$ max.

After updating _min and _max, we insert to the list via super() call.

```
def append(self, item):
    if item < self._min:
        self._min = item
    if item > self._max:
        self._max = item
    super().append(item)
```



Are we done implementing MyList so that it correctlys keep track of min and max?

Question

NO

The Catch

Everything that can be done to a *list* can be done to a *MyList*. pop(), del, insert(), mylst[3] = 4, mylst[3:4]... you name it.

This means that to correctly keep track of min & max, we have to override *every single* method of a list that is capable of changing its contents.

Can you remember all of them?

Composition over Inheritance¹

So, it is often wise to compose your class with a list, rather than inheriting it.

¹Look this up in Google

MyList Composition Ver.

We can control the methods we provide for interaction with the internal list.

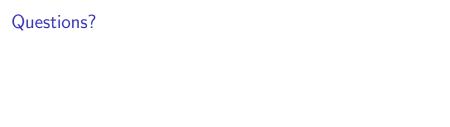
```
class MyList():
   def __init__(self, iterable=[]):
        self.lst = list(iterable)
        self._max = max(self.lst)
        self._min = min(self.lst)
   def __len__(self):
        return len(self.lst)
   def __repr__(self):
        return str(self.lst)
   def __getitem__(self, index):
        return self.lst[index]
   def append(self, item):
        if item < self._min:</pre>
            self._min = item
        if item > self. max:
            self._max = item
        self.lst.append(item)
```

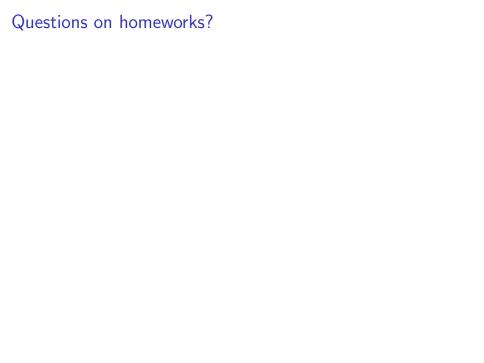
Inheritance?

We might use inheritance when the child has to provide every method its parents provide $+ \alpha$.

(i.e. The Gun class that inherits the Weapon class in an RPG game?).

But Design Patterns are a complicated subject by itself, so we won't deal it in detail.





Assignment

Finish implementing myList using the composition version. It should support len(mylst), mylst[3] = 2, andmylst.append(), updating _min and _max accordingly.

For Next Week

Twitter Crawler

Demonstration

(I will not post the code due to security reasons.)

For Next Week

If we have time, we do the prerequisites together. Else, it's homework.