Case Study: Python
Functional Programming

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08, 2020

Functional Programming

- Immutable Data
- lambda function
- First-class functions
- High-order functions: map, filter, reduce
- Closure
- Decorator

Lambda function

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- Body is just one expression
- Used in high-order functions

First-class function

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  - assigned to a variable

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  def g(y):
    return x * y
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  => [97.7, 98.6, 99.5, 100.4, 102.2]

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  from functools **import** reduce
  reduce(**lambda** x,y: x+y,[1,2,3,4]) => 10

Example

```
class Exp(ABC): pass
class IntLit(Exp): #val: int
class BinExp(Exp): #op:str,left:Exp,right:Exp
exp = [12, ("+", 23), ("-", 14)]
reduce(lambda acc,ele:
    BinExp(ele[0],acc,IntLit(ele[1])),
    exp[1:],IntLit(exp[0]))
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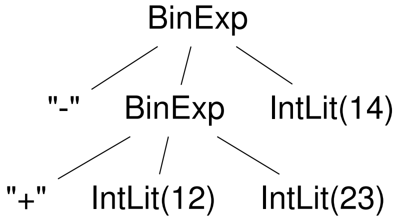

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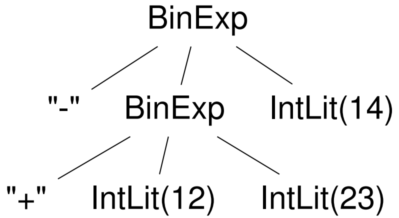

```python
acc = IntLit(exp[0])
for ele in exp[1:]:
  acc = BinExp(ele[0],
               acc,
               IntLit(exp[1]))
```

Closure

- **Closure** is a function object together with an environment.

```
def power(y):
  def inner(x):
    return x ** y
  return inner
square= power(2)
square(5)
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def power(y):
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square(5)  => 25
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def foo(x,y):
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def foo(x,y):
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@log_decorator
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      => foo is running
      => 12
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- How?

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def log_decorator(func):
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    return func(*arg)
  return inner
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    return x*y
foo = log_decorator(foo)
print(foo(3,4))
```

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References I

[1] Python Tutorial, http:w3schools.com/python, 10 08 2020.

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